

The contributions of the EU-funded *MEDiterranean SUPersite Volcanoes (MED-SUV)* project to the assessment of volcanic ash hazard



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The MED-SUV Project and Consortium

<http://supersites.earthobservations.org/>

Participant legal Name	Country
Istituto Nazionale di Geofisica e Vulcanologia (INGV) - Coordinator	IT
Consiglio Nazionale delle Ricerche (CNR)	IT
Analisi e Monitoraggio del Rischio Ambientale – (AMRA) S.C.A R.L	IT
Dipartimento di Protezione Civile (DPC)	IT
Universtia di Milano (UMIL)	IT
Deutsches Zentrum für Luft- und Raumfahrt (DLR)	DE
Ludwig-Maximilians-University Munich (LMU)	DE
Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum (GFZ)	DE
Durham University (UNIVDUR)	UK
University of Bristol (UNIBRIS)	UK
Centre national de la recherche scientifique (CNRS)	FR
Bureau de Recherches Géologiques et Minières (BRGM)	FR
Université “Blaise Pascal” de Clermont-Ferrand (UBP)	FR
European Space Agency (ESA)	FR
Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)	ES
University of Granada (UGR)	ES
Universidade dos Açores (UAc)	PT
University of Malta (UoM)	MT
University of Western Ontario (UNIWO)	CA
United States Geological Survey – Hawaiian Volcano Observatory (USGS-HVO)	US
DeltaG – SME	IT
Surveylab - SME	IT
Marwan Technology (MATEC) - SME	IT
Terradue (T2) - SME	UK

MED-SUV is an **FP7 funded project**, prepared in response to the ENV.2012.6.4-2 Call: ***Long-term monitoring experiment in geologically active regions of Europe prone to natural hazards: the Supersite concept*** (**Supersites GEO initiative**)

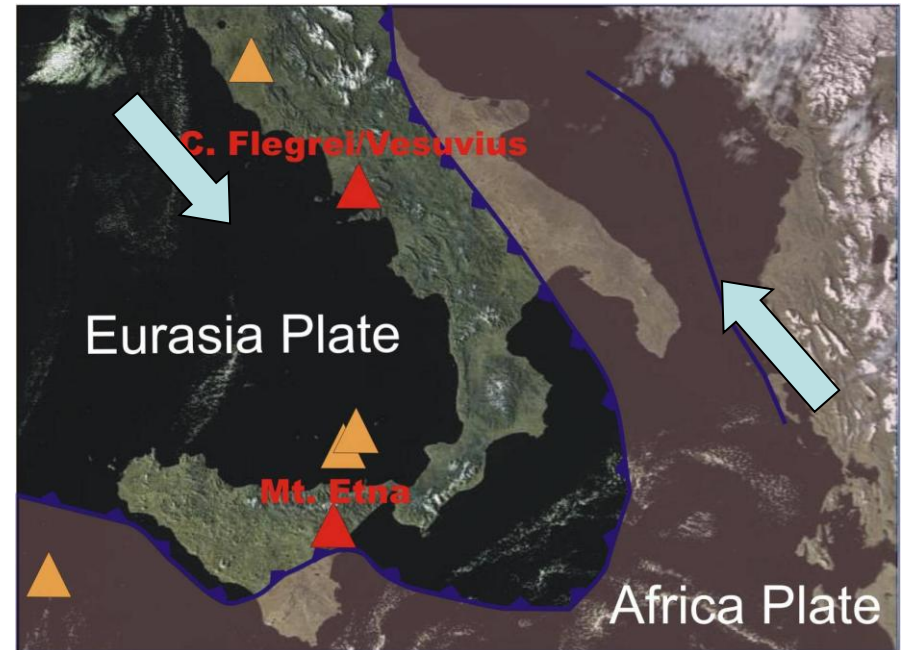
*24 Partners (4 SME)
9 Countries (7EU+2)
Budget 6 M€
Coordinator G.Puglisi*



Italian active volcanoes and the Supersite concept

More than **3 million people** are threatened by volcanic hazards in a large region of the Mediterranean Sea where two among the largest European volcanic regions are located: the **Campi Flegrei/Vesuvio** area and the **Mt. Etna** region.

In particular the project aims to fully exploit the unique ***in-situ monitoring datasets*** available at these volcanoes and integrate them with ***Earth Observation*** data and ***numerical models***, thus producing the basic tools for a significant step ahead in the analysis of the **dynamics of pre-, syn- and post-eruptive processes** and the quantification of their **hazards**.

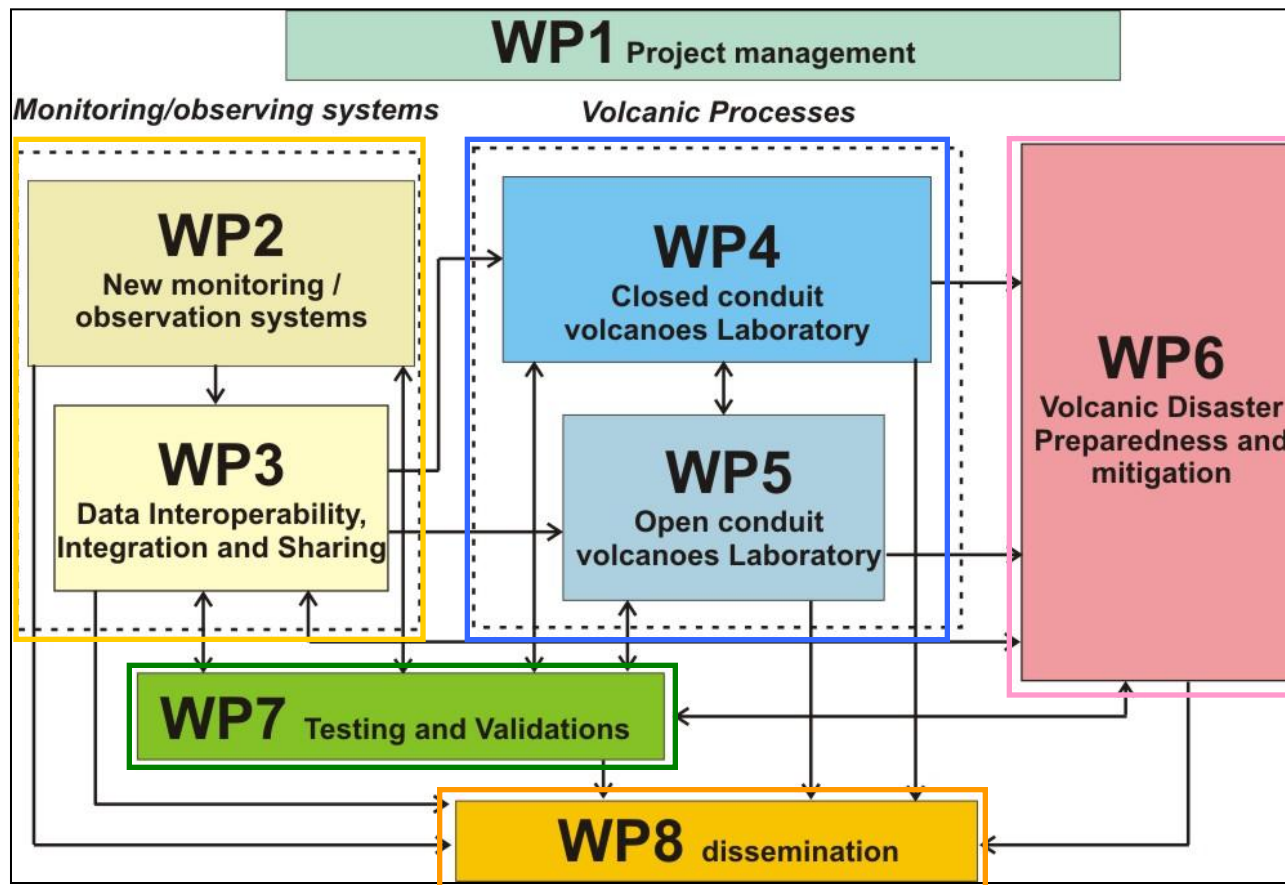


The MED-SUV Work Plan



Objectives:

1. Development of the next generation of geo-hazard monitoring/observing systems.
2. Characterization of the volcanic processes through cutting-edge data analysis/modeling
3. Strategies for volcanic disaster preparedness and mitigation
4. Test and validation of the project outcomes (pilot phase)
5. Dissemination



Some activities related to volcanic ash

- Physical and analogue **laboratory experiments on ash dispersal and aggregation**
- Integration of **satellite data** (e.g. METEOSAT, MODIS), **ground-based measurements** (e.g., RADAR, LIDAR) and **numerical models** of Etna's volcanic plumes **to quantify key source variables** (e.g. eruption rate, grain-size distribution,...)
- Development of **long-term probabilistic ash fallout maps** at the supersite volcanoes
- Development of modelling tools and procedures for the **short-term hazard assessment of volcanic ash** by adopting *multi-model and multi-scenario* approaches
- Development of **short-term probabilistic hazard assessment** modelling tools able to use direct measurements and observations in **almost real-time** (i.e. *now-casting*) and to account for the main sources of **uncertainty**

Physical and analogue laboratory experiments on ash dispersal and aggregation

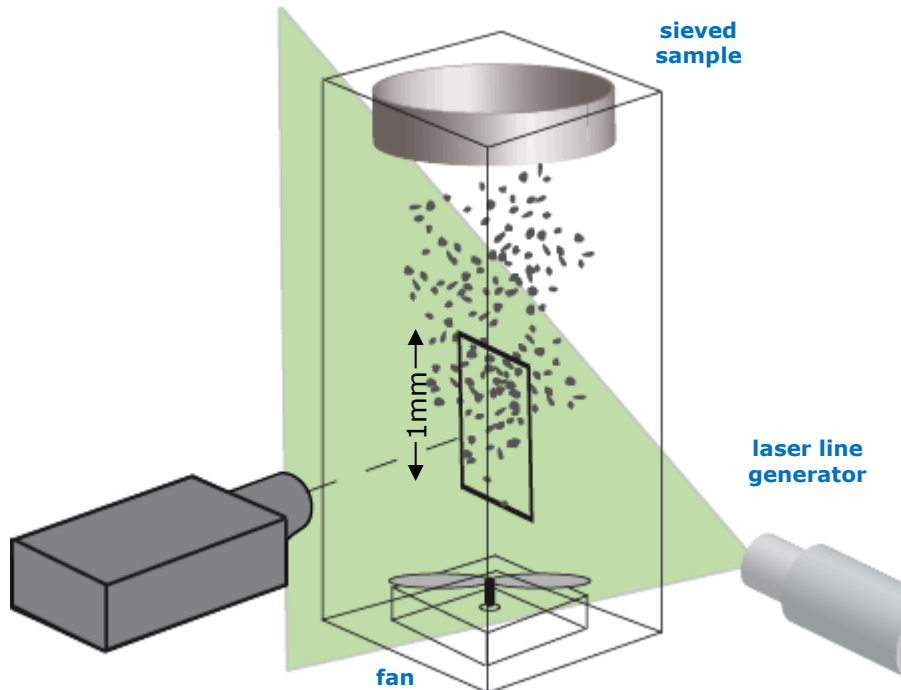
1.OBJECTIVE

Experimental parameterization of ash aggregation and settling at a range of

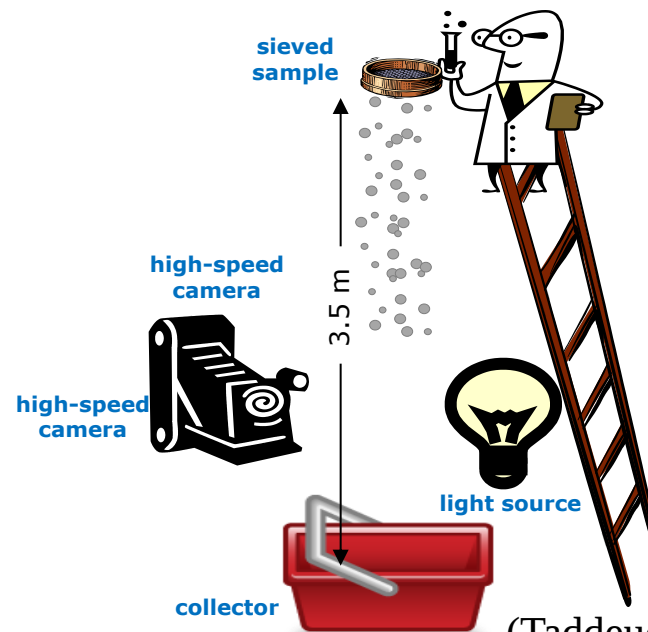
ambient conditions: humidity, air flow temperature, droplet size and composition

volcanic parameters: size, shape distribution, chemical composition of ash particles

small-scale experiments
(controlled environment)



large-scale experiments
(coupled settling and aggregation)

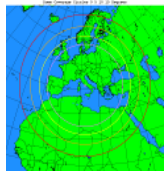


(Taddeucci et al., 2011)

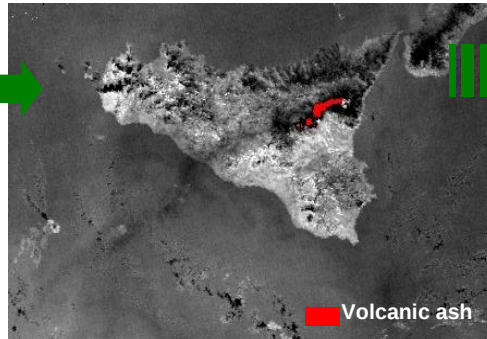
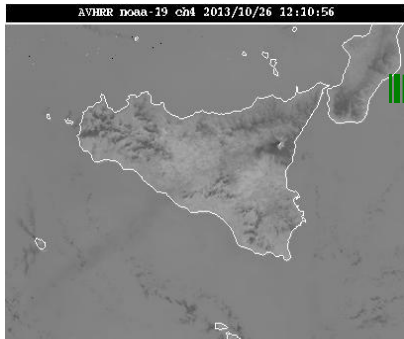
Integration of satellite data, ground-based measurements and models of Etna's plume to quantify key eruptive variables

Detailed comparisons between different observations and dispersal modelling allow **appropriate calibration** of the techniques

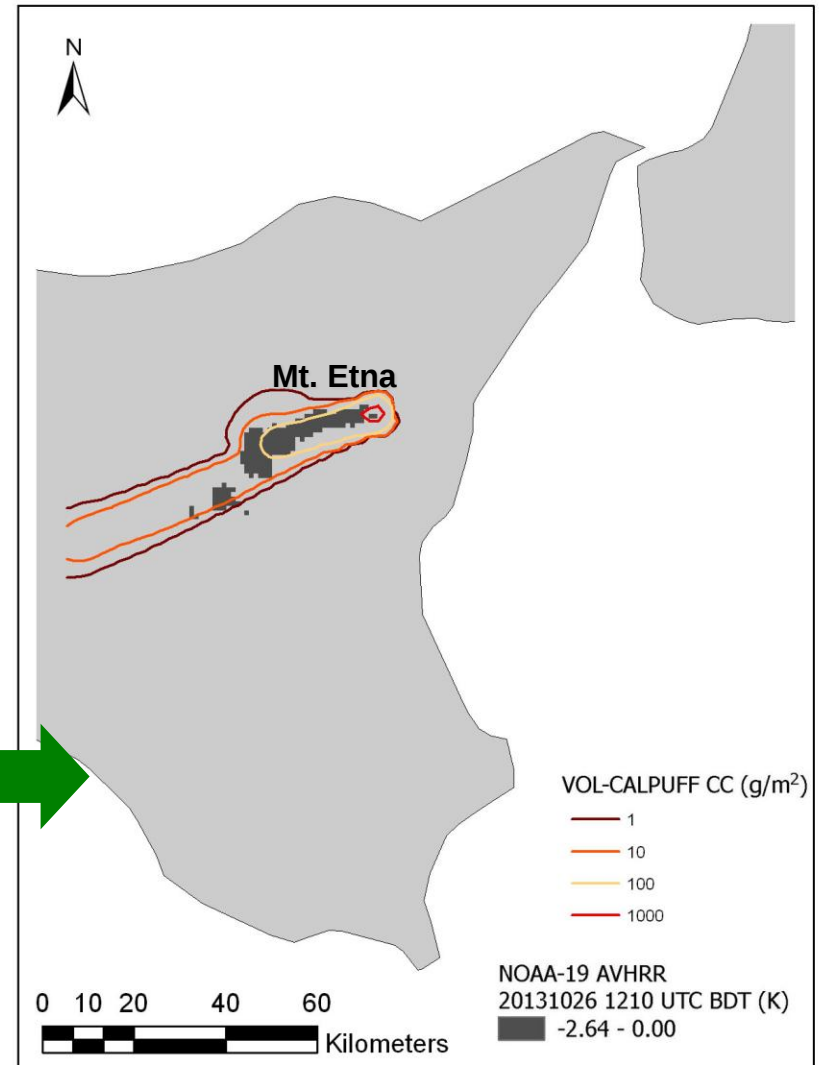
Mt. Etna paroxysm of 26 October 2013, 12:10 UTC



Volcanic Ash identified by using Brightness Temperature Difference on NOAA-AVHRR



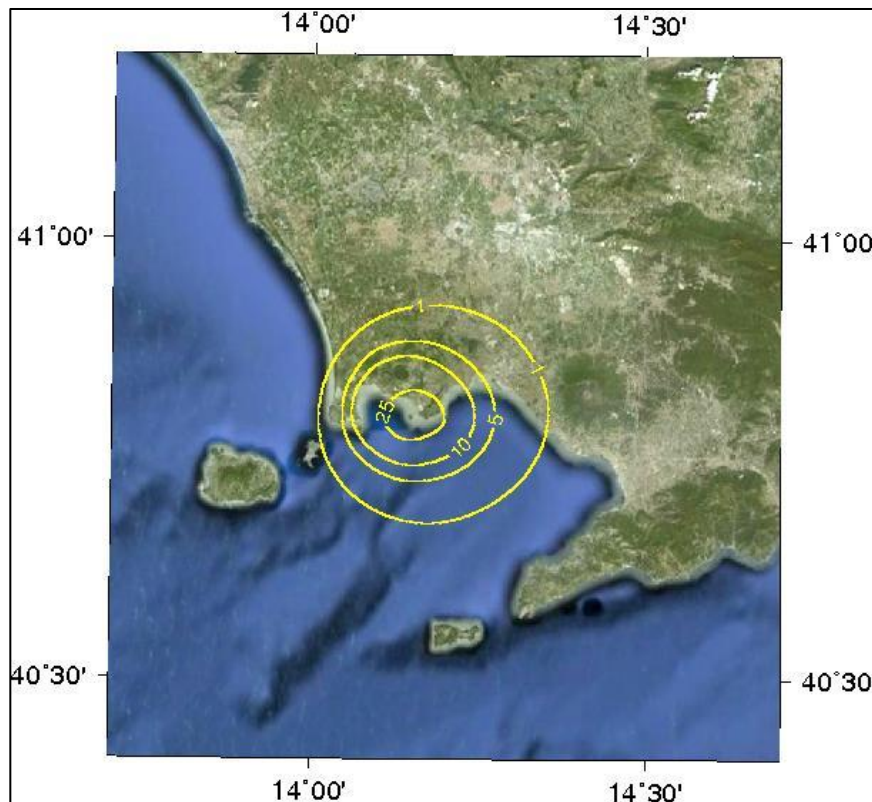
Volcanic ash



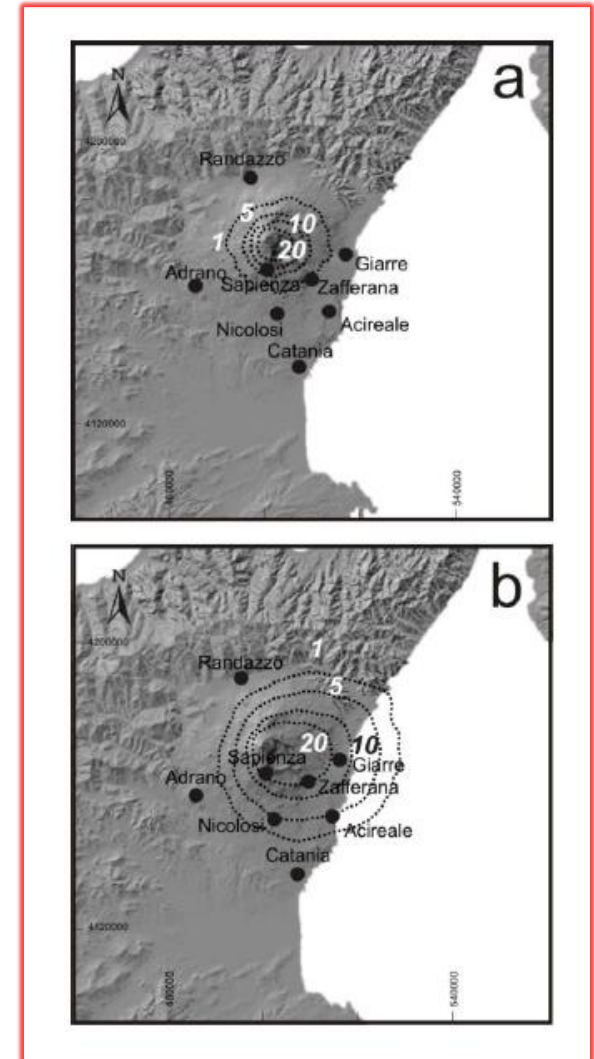
(Barsotti et al. 2008; Spinetti et al. 2013)

Long-term probabilistic ash fallout maps at the supersite volcanoes

Example of probability map for ash loading greater than 300 kg/m^2 at **Campi Flegrei** produced **combining multiple scenarios** (below) and for a **strong short-lasting plume** at **Mt. Etna** (thresholds of 10 and 100 kg/m^2) (right).



(From Macedonio et al. 2012)



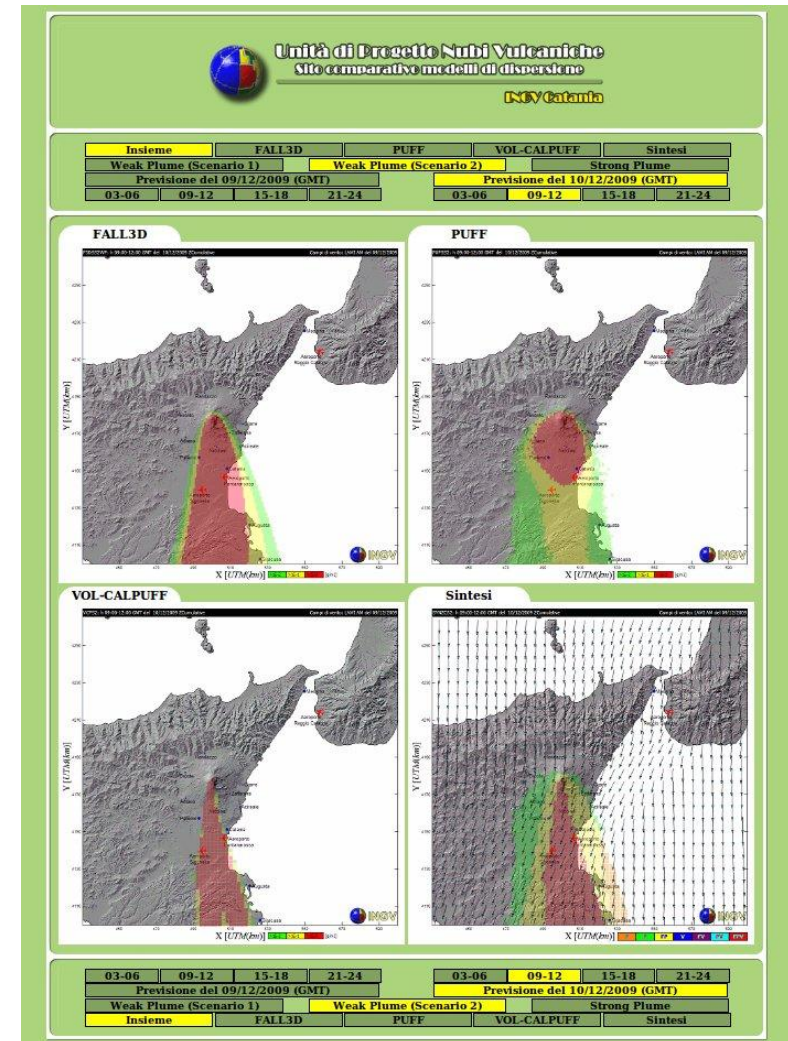
(From Scollo et al. 2013)

Short-term hazard assessment of volcanic ash by adopting multi-model and multi-scenario approaches

The **Etna volcanic ash forecasting system (UPNV)** manages daily outcomes coming from three/five different dispersal and fallout codes (named FALL3d, HAZMAP, Tephra2, PUFF// and Vol-Calpuff). In MEDSUV we plan to:

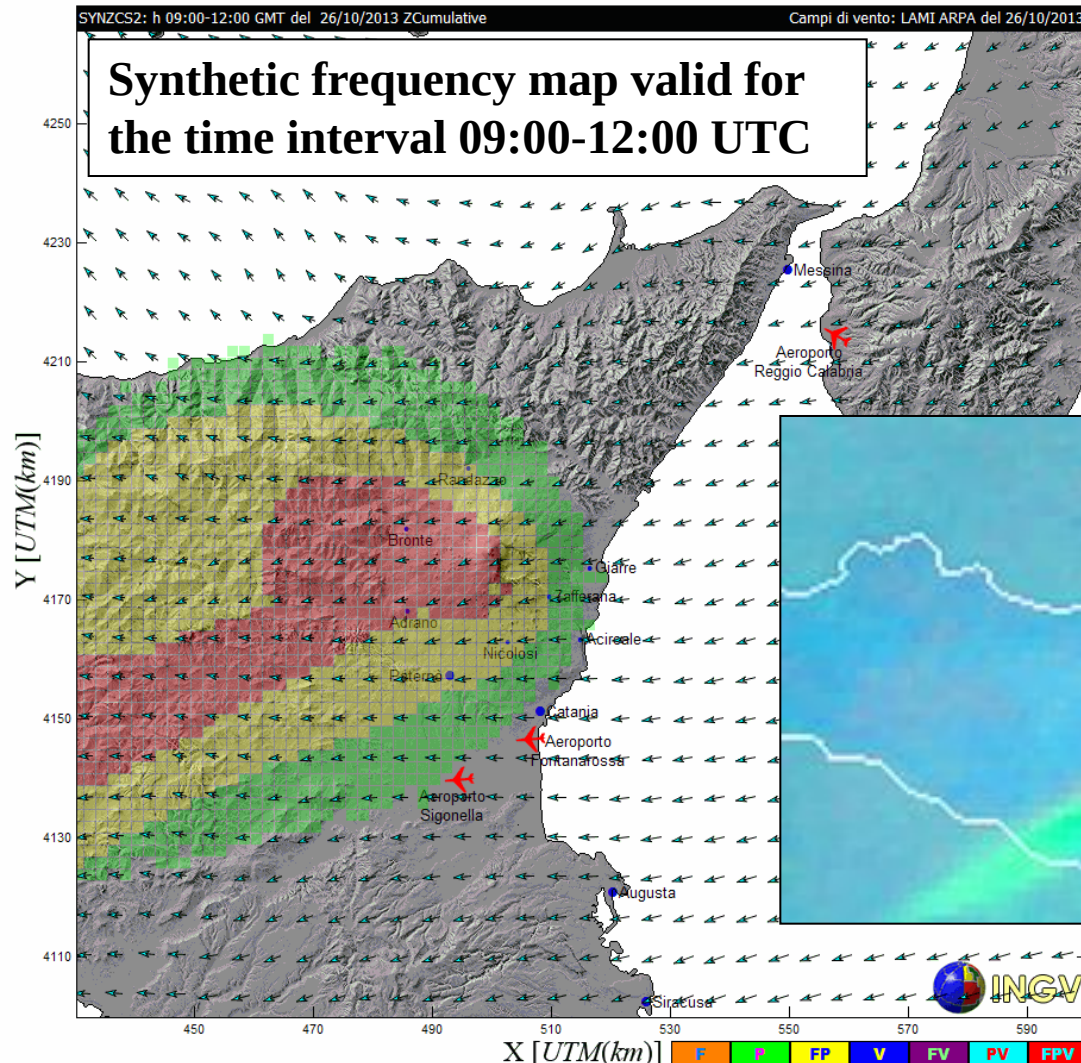
- Further **test** the prediction capability of the current forecasting procedure (2011-2012 dataset);
- **quantify** the model-dependent uncertainty through an intercomparison of model outcomes and statistical analyses;
- **produce** synthetic frequency and probabilistic multi-model or multi-scenario forecasting maps

(see Barsotti et al. @ poster session)

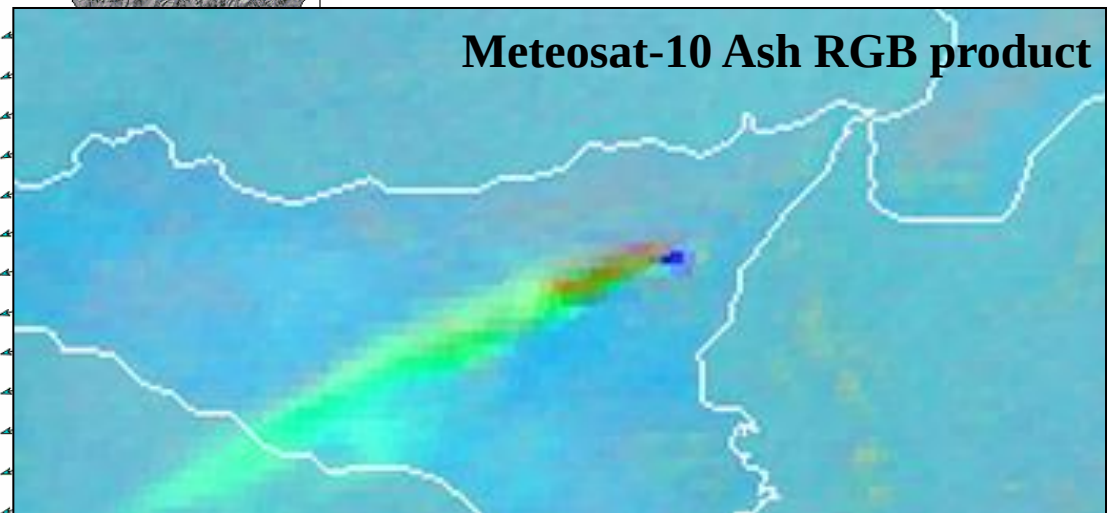


Tephra ground loading and ash concentration forecasting maps

Short-term probabilistic hazard assessment modelling tools (*now-casting*)



The goal is to develop **probabilistic forecasting maps** able to use **measurements** and observations in **almost real-time** and to account for the main sources of **uncertainty** (aleatoric and epistemic)



Event of October 26 2013, Column Height 8.6 km asl vs LLWP#2 (7 km)

Thanks!



(Volcanic activity of Mt. Etna on April 12 2013, photo by B.Bencke, INGV Catania)