A new challenge: Volcanic Supersites as total environmental observatories

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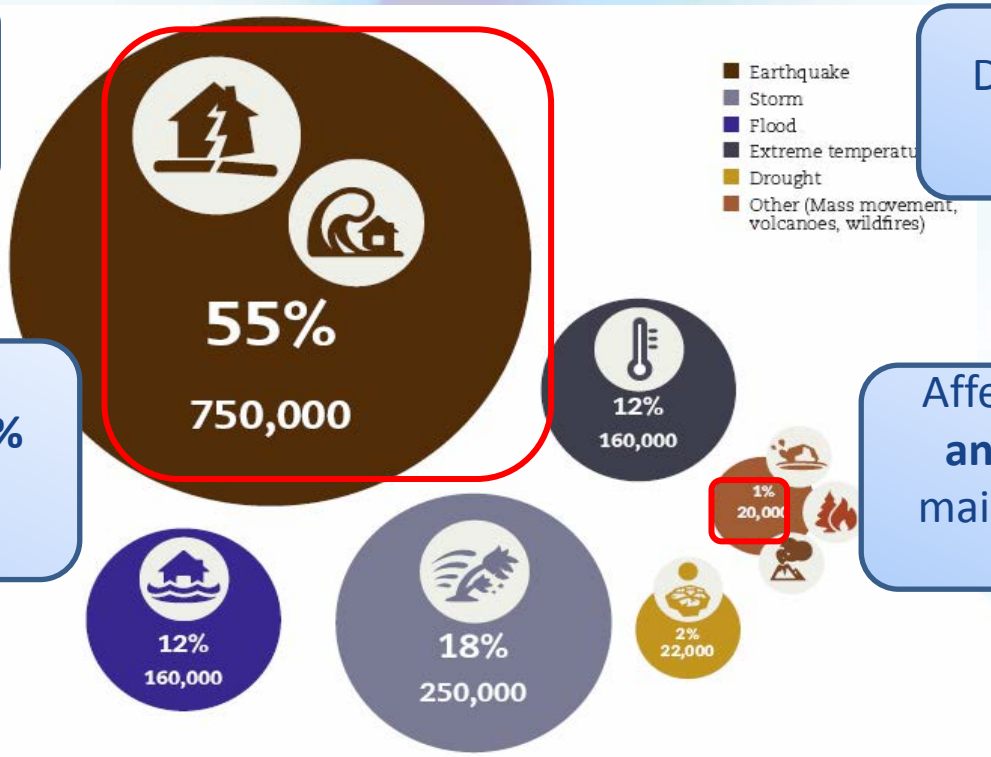
What is a Supersite?

The Supersite concept relates to the study of Geohazards

Geohazard impacts

13% of the total number of disasters



Damages for ~**40 B$ per year**

~ **40.000 dead/yr**, corresponding to **56%** of those caused by natural disasters

Affect >**135 M people and 25 M buildings**, mainly in undeveloped countries

Statistics CRED 1995-2015

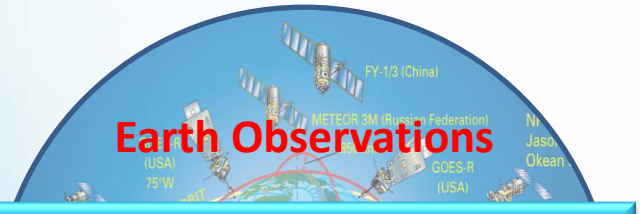
What is a Supersite?

Geohazards: global challenge

- Earthquakes and volcanic eruptions are much less frequent than hydro-met hazards but can have a much larger impact, direct on indirect, on many countries and economy.
- They can trigger cascading events, which may even cause most of the impact.
- They are difficult to study and their global impacts are hard to predict and prevent.

Action required:
more scientific research!

Supersite ingredients



Supersite mandate :

"... to stimulate an international and intergovernmental effort to monitor and study selected reference sites by establishing open access to relevant datasets according to GEO principles to foster the collaboration between all various partners and end-users" (Frascati Declaration, 2007)

GEO-Geohazard Supersite and Natural Laboratories Initiative

Supersites in Europe

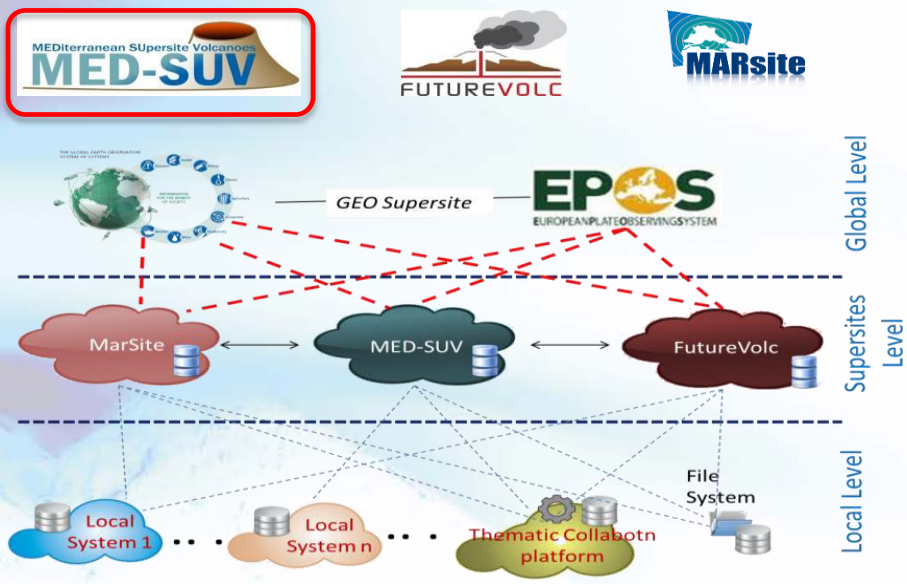
2011

Call: ENV.2012.6.4-2

EUROPEANPLATEOBSERVINGSYSTEM

Expected impact

- Better use and access to observations;
- Advanced monitoring systems;
- Hazard mitigation;
- Coordination among the communities supporting hazard mitigation.



MEDiterranean SUpersite Volcanoes (MED-SUV)

FP7 European Project

EC Contribution: 5.998.851 €

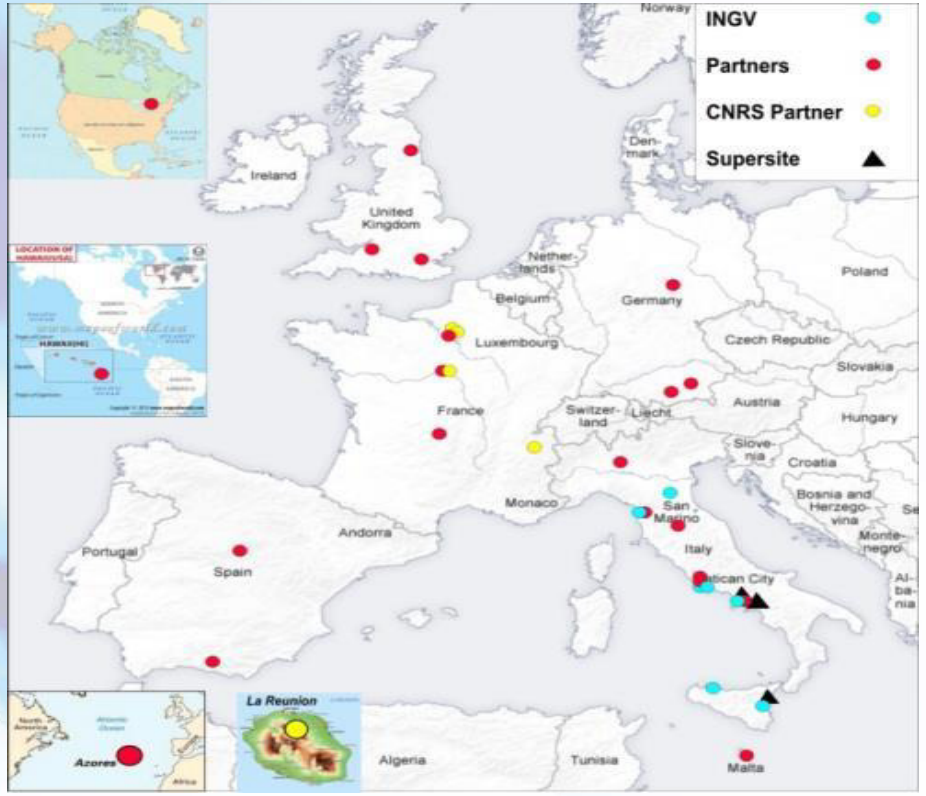
Duration: 36 months (01/06/2013 – 31/05/2016)

Consortium: 24 members belonging to 9 countries

Coordinator: Istituto Nazionale di Geofisica e Vulcanologia

Web site: med-suv.eu

Project portal: medsuv_portal.ct.ingv.it



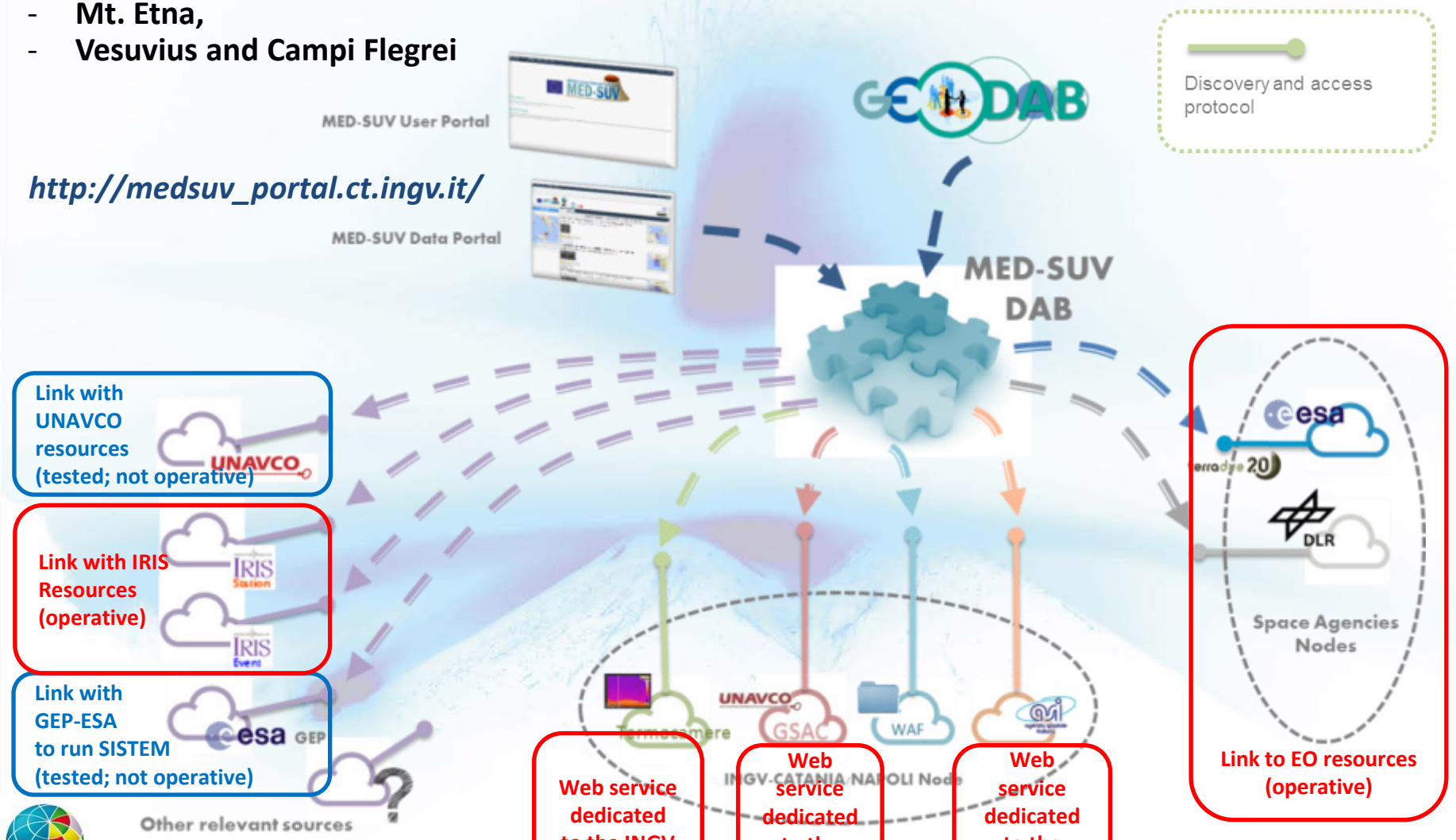
Consortium members

INGV; CNR; AMRA; DPC; DLR; LMU; GFZ; UDUR; UNIVBRIS; CNRS; BRGM; ESA; CSIC; UGR; UoM; Surveylab; MATEC; T2; Western; USGS; UMIL; UBP-LMV; CIVISA

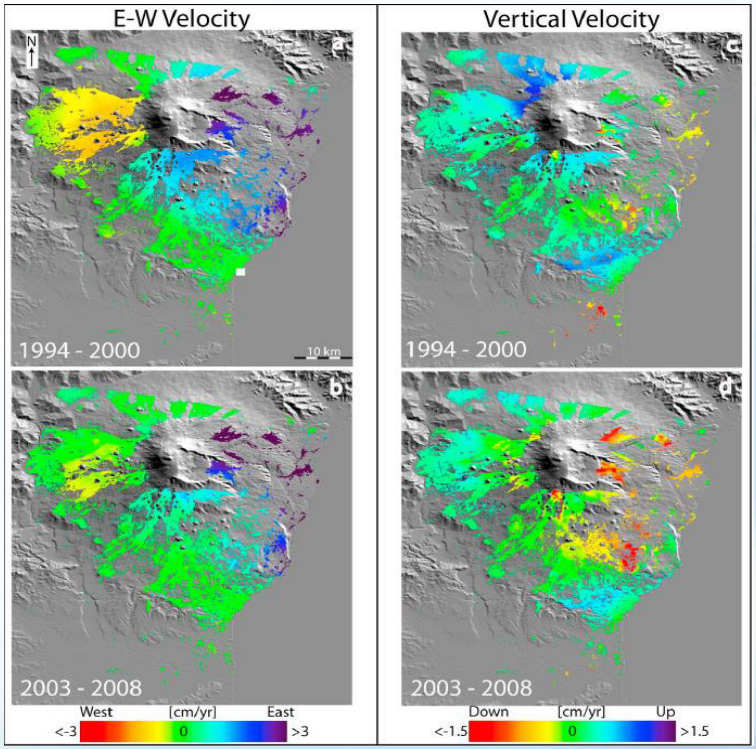
MED-SUV e-Infrastructure

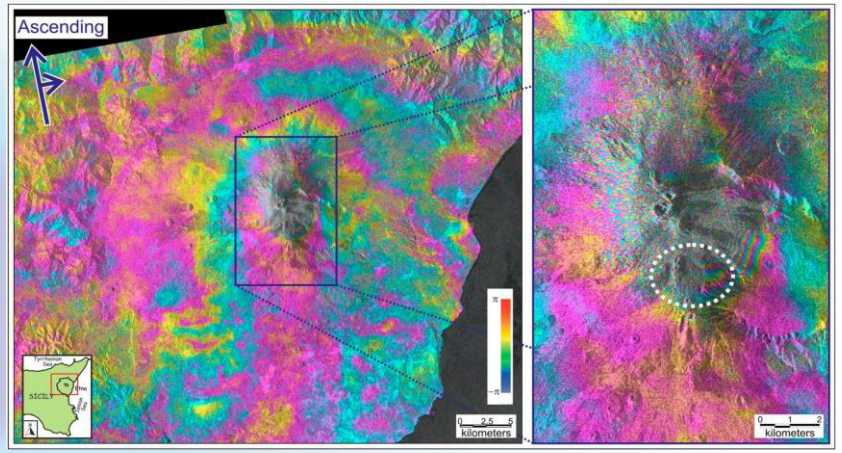
Supersites accessible through the e-infrastructure

- **Mt. Etna,**
- **Vesuvius and Campi Flegrei**

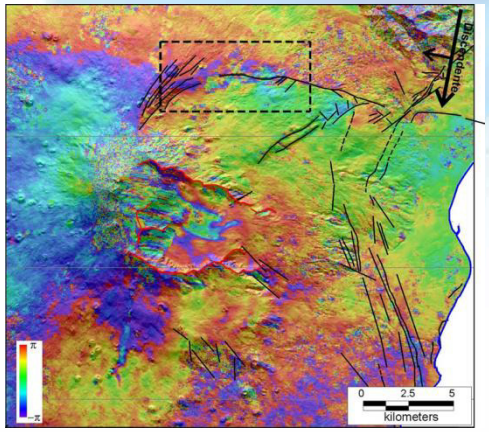


Use of EO data on Mt. Etna area



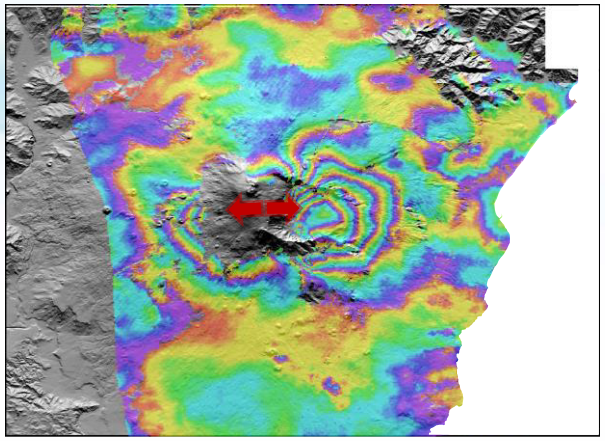


***Sentinel-1A data**. December 2014 paroxysmal activity (Bonforte and Guglielmino, 2015).*



***ERS1/2 & ENVISAT data**. SBAS analysis. (Solaro et al., JGR, 2010).*

***ENVISAT data**. Pernicana Fault Earthquake: April 2, 2010 (Guglielmino et al., EPSL 2011)*

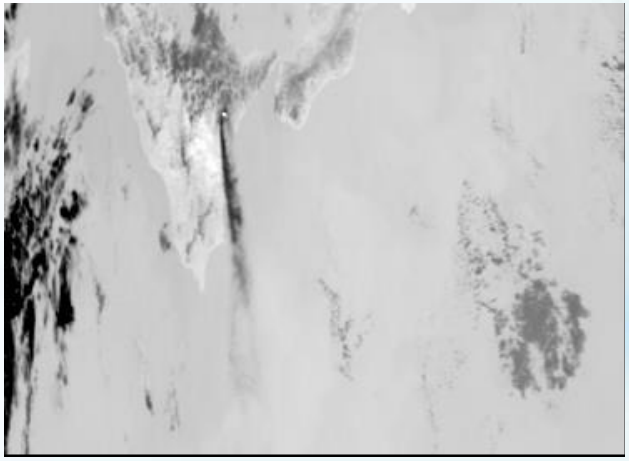


***ERS1/2 data**. July-August 2001 eruption. (Puglisi et al., JGR, 2008).*

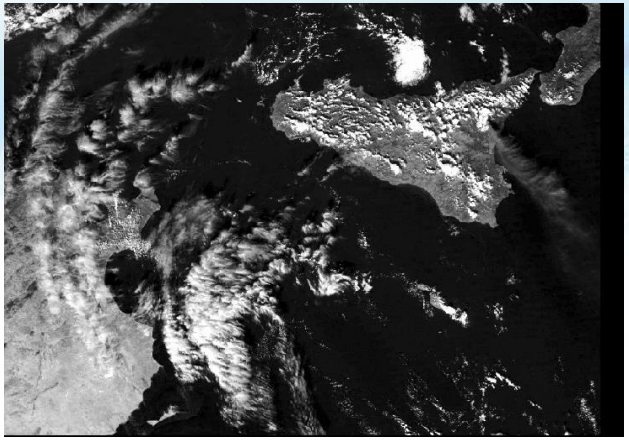
Use of EO data on Mt. Etna area

Volcanic ash retrieval at Mt. Etna using Avhrr and Modis data

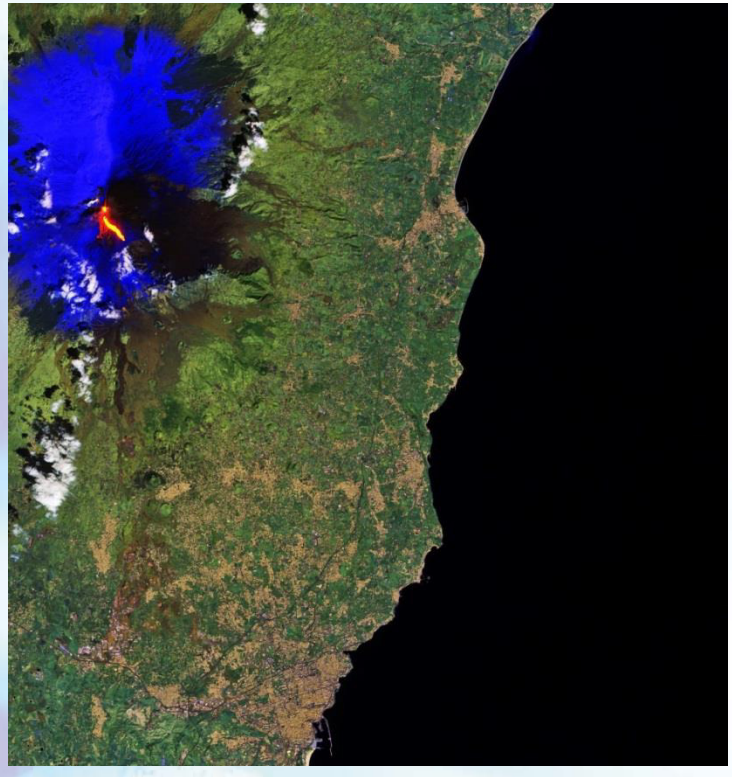
Claudia Spinetti*, Stefano Corradini , Maria F. Buongiorno



NOAA 18 AVHRR image (24/11/2006; 11:20 GMT)



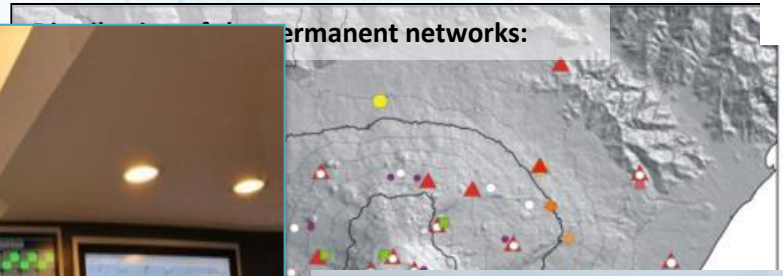
NASA Terra MODIS image (24/11/2006; 12:20 GMT)

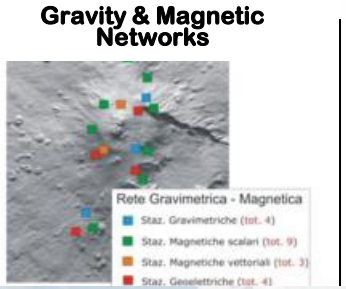


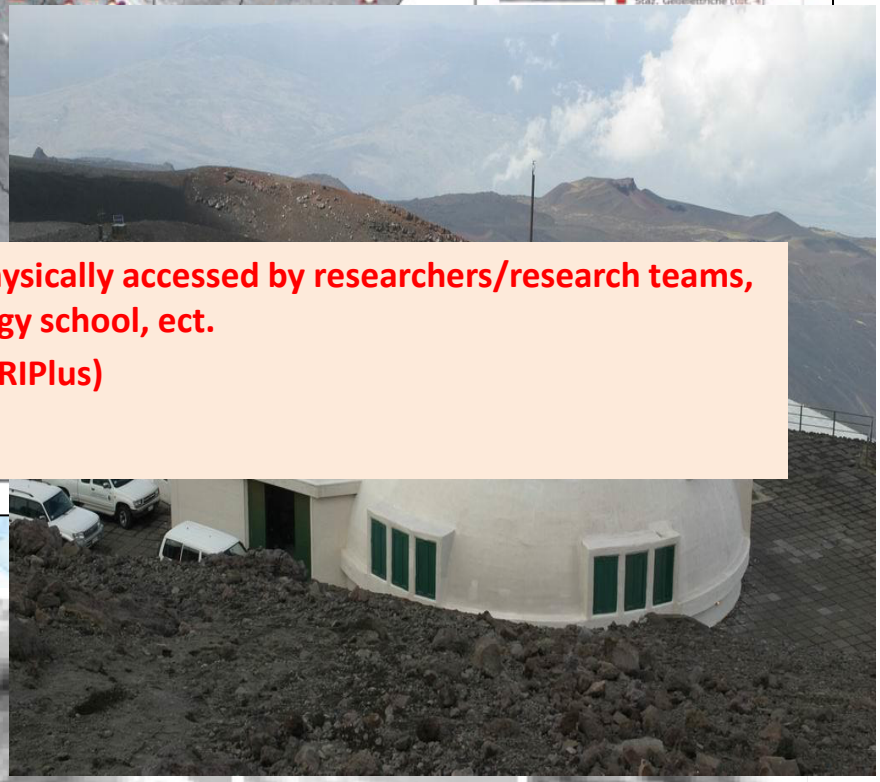
Sentinel-2A image recorded the 16/03/2017 at 10:45 GMT (11:45 CET) by the Copernicus Sentinel-2A satellite.
The red hot lava flowing from Mount Etna can be seen clearly in the image. The surrounding snow has been processed in blue to distinguish from the clouds.

http://www.esa.int/spaceinimages/Images/2017/03/Etna_erupts

Volcanological resources of Mt. Etna

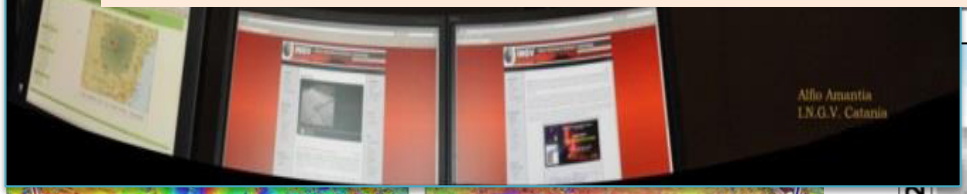


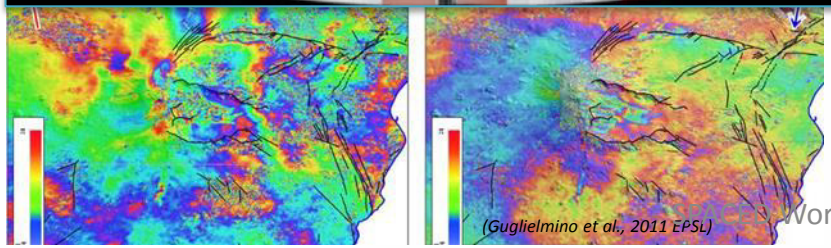




Many of the INGV/Mt. Etna Supersite resources can physically accessed by researchers/research teams, students/volcanology school, ect.

(e.g. TA ENVRIPlus)

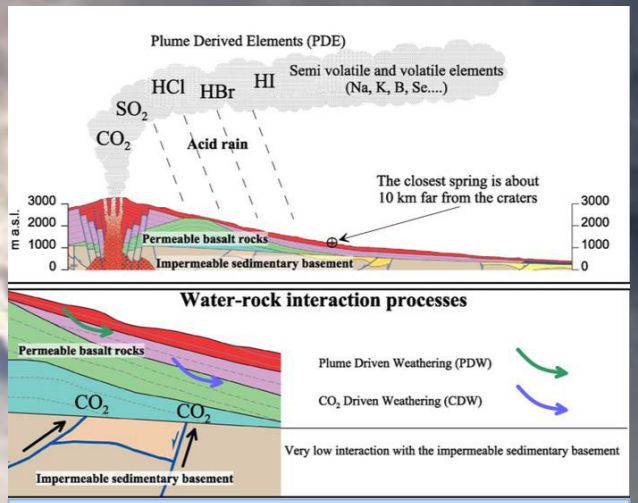




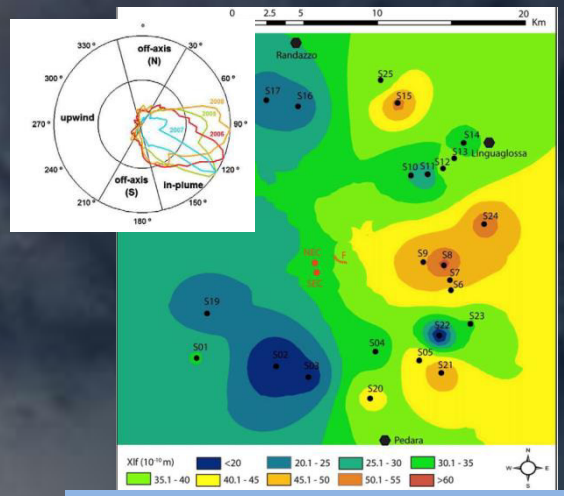
(Guglielmino et al., 2011 EPSL)

(Bonaccorso et al., 2013 BV)

Volcanoes create a special environment

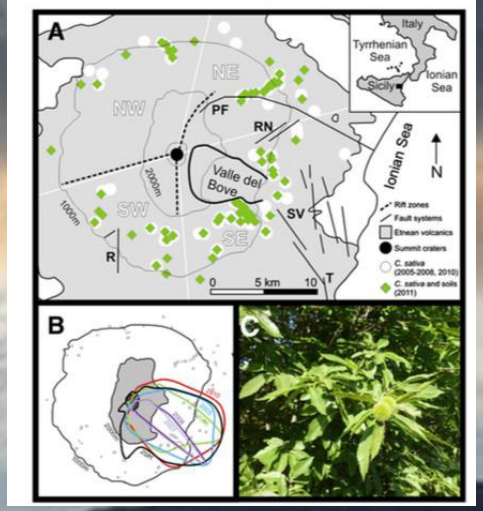


Plume fingerprinting in the critical zone
Liotta et al., 2016



Bioindication of volcanic dispersion and deposition - Quayle et al., 2010; Martin et al., 2012

A persistent volcanic plume supplies volcanogenic elements through rainfall and dry deposition with implication on water, soil, and vegetation

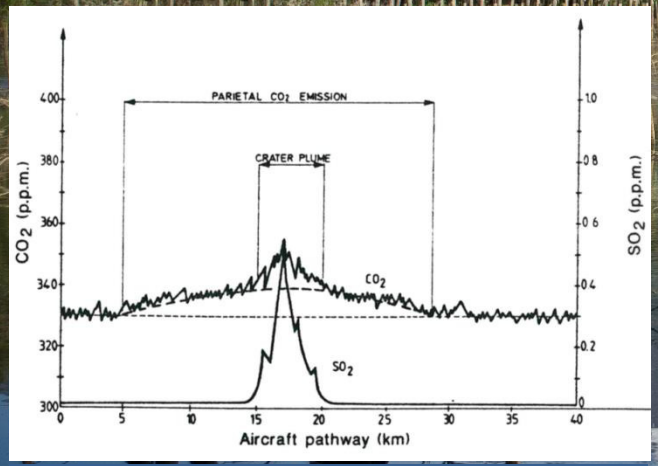


The volcanic environment:

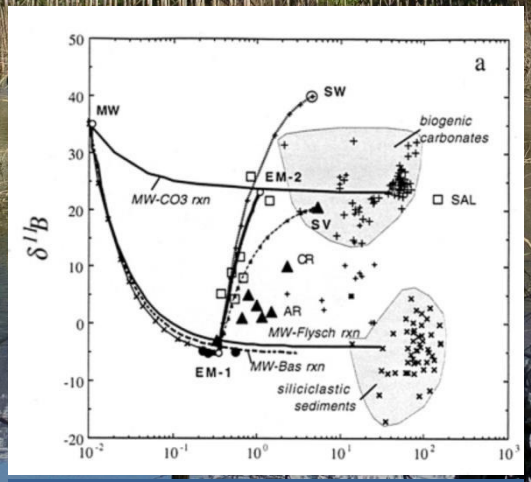
Chemical weathering

Interface reactions between rock-derived chemicals and biota

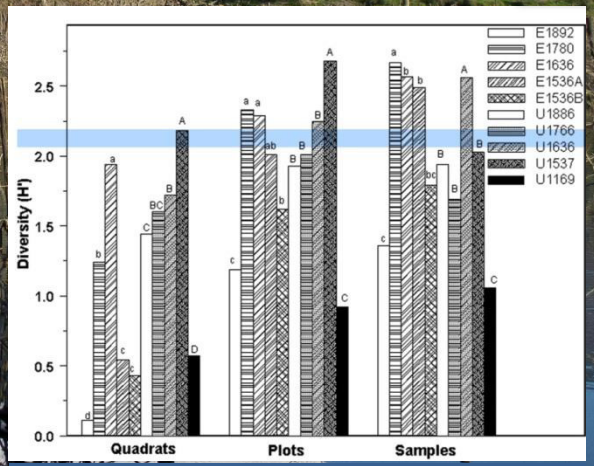
Diffuse emission of magmatic and biogenic carbon dioxide



Diffuse Carbon degassing – Allard et al., 2001

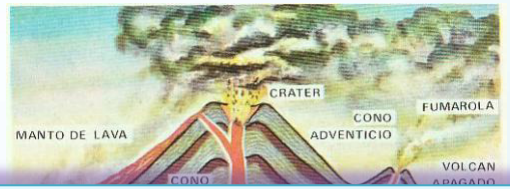


Water-Rock interaction
Pennisi et al., 2000

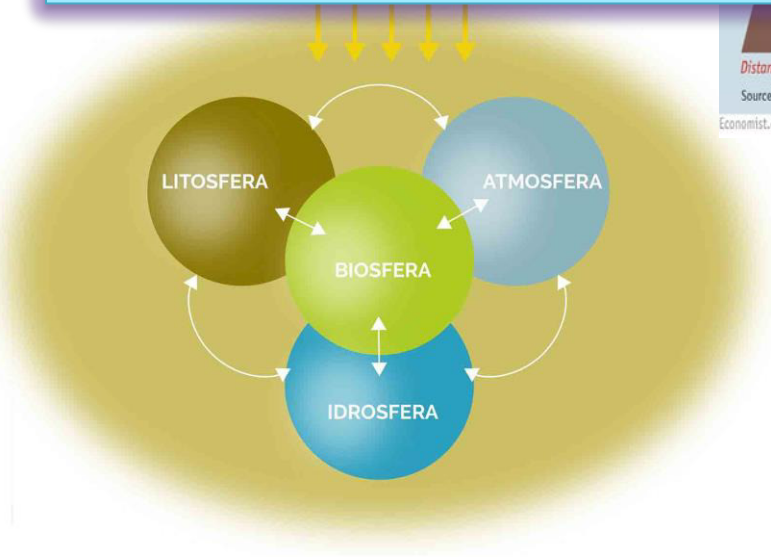


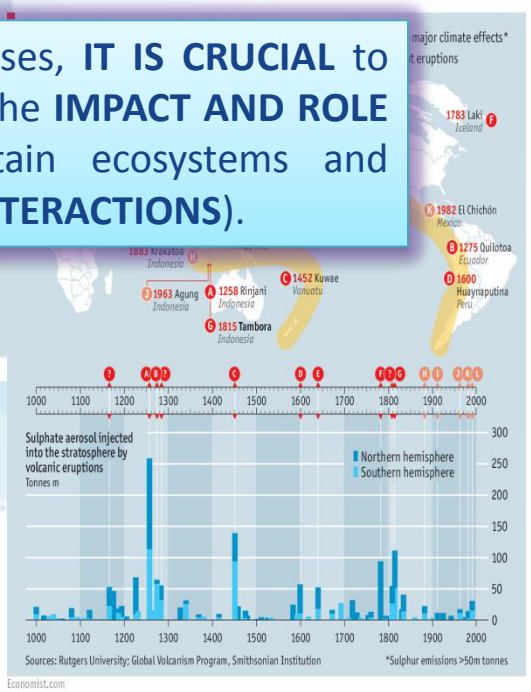
Lava flow – Vegetation interaction
Del Moral and Poli Marchese, 2010

New objective: to study the effects of volcanic activity on environment and ecosystem dynamics by exploiting Supersite's resources



Aside hazard assessment and risk mitigation for civil protection purposes, **IT IS CRUCIAL** to integrate data and models of **DIFFERENT CROSS-DOMAINS** to evaluate the **IMPACT AND ROLE of VOLCANIC PHENOMENA** on the changes recorded in mountain ecosystems and environments (**GEOSPHERE-BIOSPHERE-HYDROSPHERE-ATMOSPHERE INTERACTIONS**).



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for the invitation