OUR PLANET FROM SPACE

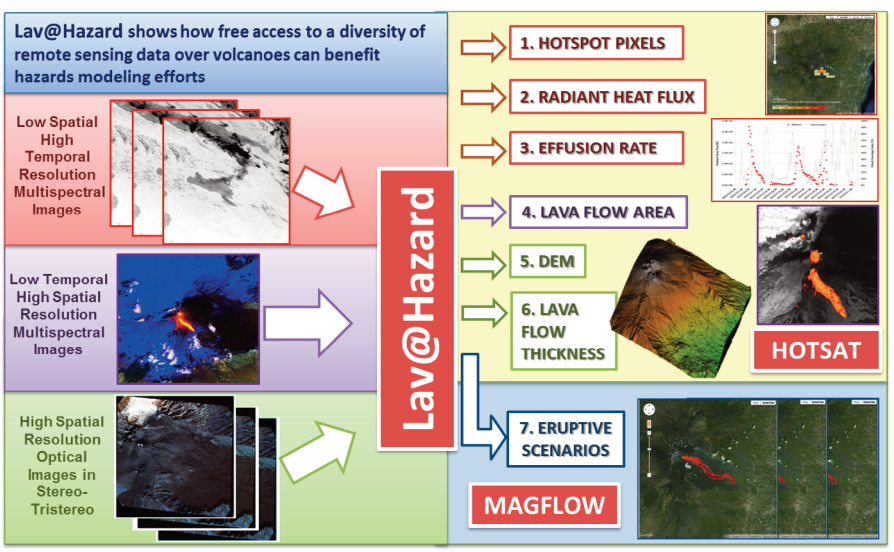
COPERNICUS data and products for Earth monitoring and geophysical processes exploration

The European Union's Earth Observation Programme, Copernicus, provides data, information and services, based on satellite Earth Observation imageries and in situ data. INGV has long experience and practice about Copernicus data, thanks to past and current involvement in EU projects funded in the framework of Copernicus Programme. INGV exploits Copernicus data (e.g. The Sentinels operated by European Space Agency and EUMETSAT), to generate products useful for monitoring purposes, and integrate them with its own ground data network, and expert knowledge, aimed at understanding geophysical processes of our planet. Moreover, INGV, thanks to Copernicus space segment, plays a key role for emergency management especially to address natural hazards and disasters, and provide support to Italian Civil Protection Department.

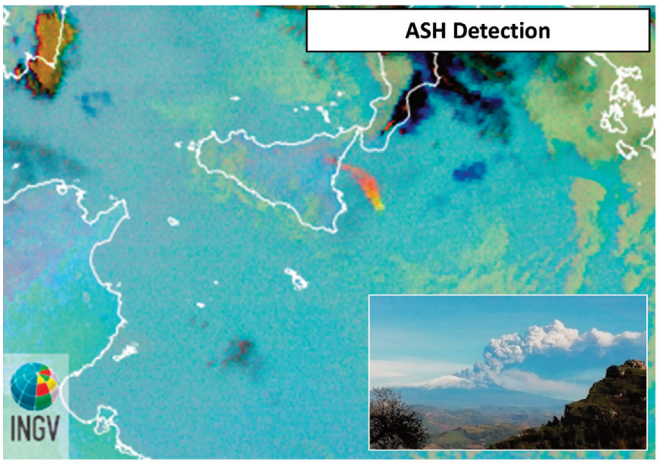
VOLCANO MONITORING FROM SPACE

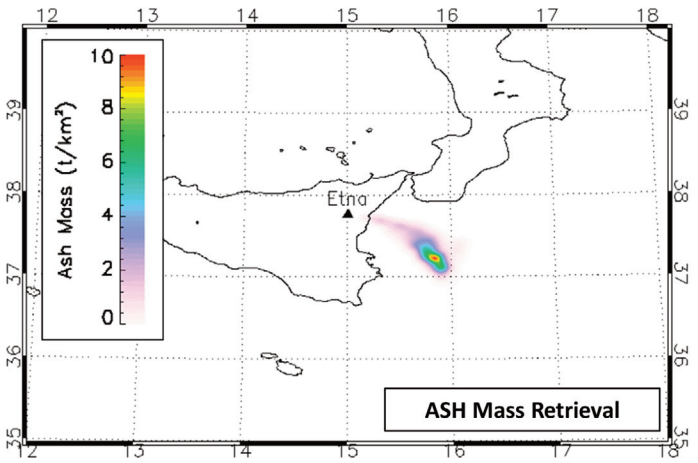
Lava mapping and lava flow modelling

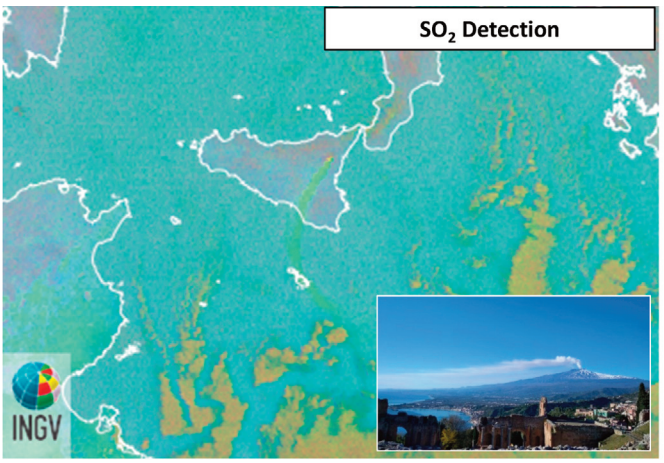
Lav@Hazard is a satellite-driven strategy developed at INGV to assess lava hazard in volcanic areas. areas. By combining a variety of satellite data with the objective of facilitating mutual feedback between satellite-derived source terms (i.e. hotspot pixels, radiant heat flux, effusion rate, lava flow areas, digital elevation model, lava flow thickness distribution) retrieved by the HOTSAT system and accurate numerical lava flow simulations performed by the physics-based MAGFLOW model. Lav@Hazard improves the overall quality of lava flow hazard assessment. High and very high spatial resolution optical satellite data (e.g. Pléiades, PlanetScope, EOS-ASTER) are used to: (i) obtain digital elevation models (DEMs), (ii) complementand refine the mass flux rates derived from low spatial/high temporal resolution multispectral thermal data (e.g. EOS-MODIS, MSG-SEVIRI, Sentinel-3 SLSTR) and (iii) validate the simulation results through the DEM-derived 3D maps of volcanic deposits. Higher spatial/lower temporal resolution satellite data (e.g. Landsat-8 OLI & TIRS, Sentinel-2 MSI, ECOSTRESS), useful to detect active and cooling lava flow fields, are considered as further validation of the simulation results.

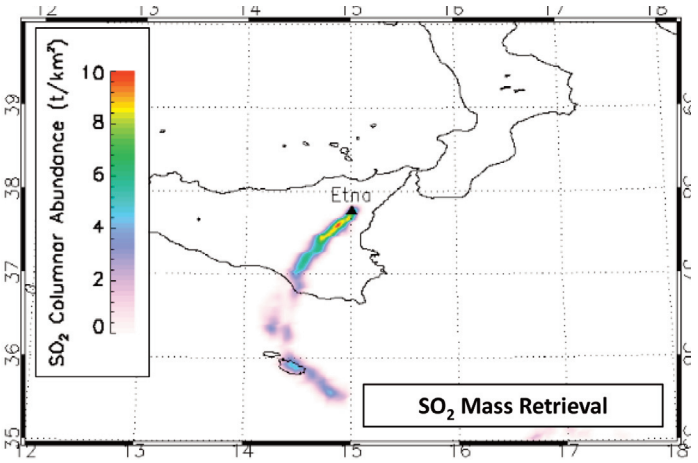


Use this code to access all INGV NSE Expo flyers









VOLCANIC CLOUD characterization

Geostationary and polar satellite sensors are used for the monitoring of the volcanic cloud generated from an eruption. At INGV both the volcanic cloud detection and retrievals are obtained from different satellite image, during paroxysm events. Among others, ash detection and retrieval of its mass is derived from images collected by the SEVIRI sensor on board the MSG geostationary satellite. Complementarily, gas measurements, such as SO2, are performed by the exploitation of MODIS and TROPOMI sensors aboard the NASA/Aqua and Sentinel 5p polar satellites, and SEVIRI as well. The information on presence, extent and possible impact of volcanic ash clouds retrieved from space data at INGV currently provides applicative scenarios and pre-operational services highly valuable for decision makers such as the Italian Civil Protection, the 24/7 monitoring room of the INGV-Osservatorio Etneo (INGVOE, Catania, Italy) and the Volcanic Ash Advisory Centers (VAACs). Other possible stakeholders that would greatly profit from this information are Air and Insurance companies, airport authorities and tourist operators.

ADDRESSING IMPACT OF WILDFIRE DISTURBANCES
Tracking wildfires impact through burn severity

INGV specialists use a number of algorithms adapted to a range of data deployed by a variety of space sensors such as multispectral, hyperspectral and thermal, to characterise the impact of wildfire on vegetation and soil erosion. An example of prompt analysis was performed by using Sentinel-2 imagery. Two data taken respectively before and after the wildfire were exploited to calculate and to deliver a burn severity map at 20m resolution. The adopted algorithms are able to retrieve the rate of degradation in terms of severity. The obtained map allows to localize and delineate the burn scars perimeter with an associated level of severity. High severity means no vegetation is left. Main benefits of wildfire mapping from space are: optimize mitigation and recovery strategies and save money, post fire geo-hazards risk mitigation and management, and health and social impact.