

Magmato-tectonic characterization of the Vulcano-Lipari system, Italy

Contact persons: Prof. C Bonadonna, Prof. Matteo Lupi, Prof. Joel Ruch, Dr C. Frischknecht, Prof. Luca Caricchi

Context

The regional stress field in volcanic areas may be overprinted by that produced by magmatic activity, promoting volcanism and faulting. The Vulcano-Lipari system (southern Italy) is the ideal natural laboratory to explore the interaction between magmatic and faulting processes, which affects the geometry of magma emplacement and hydrothermal fluid circulation with significant implications for hazard distribution and volcanic risk. Vulcano and Lipari are two separate islands sharing the same deep plumbing system. The last eruptions of Vulcano and Lipari occurred in 1888-90 and 1230, respectively. However, the two islands often experienced simultaneous eruptions. In order to characterize the risk for these two densely populated and touristic islands an integrated approach is required that combines geological and geophysical strategies.

Objectives and Methods

This is a large multidisciplinary project designed for multiple MSc students willing to work in a dynamic team at the University of Geneva taking advantage of the large expertise of the UNIGE research groups. The main goal is the identification of the controlling structures responsible for the propagation of magmatic fluids leading to eruptive events. The identification of the eruptive vents will be crucial to a comprehensive risk assessment of both islands. The project aims at combining state-of-the-art geological and geophysical methods, namely:

- Structural mapping using drones equipped with thermal and optical sensors;
- Time-lapse geomorphological evolution for hazard monitoring and risk assessment of selected areas;
- Geophysical investigation of magmatic fluids controlled by tectonic structures;
- Modelling of vent opening probability based on detailed topographic and bathymetric data;
- Ambient noise measurements (HVSr) to investigate subsurface shallow structures;
- Effects of external forcing (i.e. earth and moon tides) on the hydrothermal system.

Literature

- Ruch J, Vezzoli L., De Rosa R., Di Lorenzo R., Acocella V. (2016) Magmatic control along a strike-slip volcanic arc: The central Aeolian arc (Italy), tectonics
- Recil A., Johnson TC, Finizzola A (2010) Three-dimensional resistivity tomography of Vulcan's forge, Vulcano Island, southern Italy, GRL
- Di Traglia, F and Pistolesi, M and Rosi, M and Bonadonna, Costanza and Fusillo, R and Roverato, M. (2013) Growth and erosion: The volcanic geology and morphological evolution of La Fossa (Island of Vulcano, Southern Italy) in the last 1000 years, Geomorphology
- Guardo R., De Siena L. (2017) Integrating ambient noise with GIS for a new perspective on volcano imaging and monitoring: the case study of Mt Etna, JVGR



View of the island of Vulcano from Lipari showing the two main volcanic centres: Gran Cratere of the La Fossa Cone and Vulcanello.

Sites WEB

http://cms.unige.ch/sciences/terre/research/Groups/physical_volcanology/physical%20volcanology.php

<http://www.unige.ch/sciences/terre/en/research/crustal-deformation-and-fluid-flow/>

<http://www.unige.ch/sciences/terre/en/research/petrology-and-volcanology/>

Choice of orientation :

RGEOL and GATO