ECOLE LEMANIQUE DES SCIENCES DE LA TERRE
DES UNIVERSITES DE GENEVE ET DE LAUSANNE

Master ès Sciences in Earth sciences

Volcano-seismic study of the Aeolian arc, Southern Thyrrenian Sea, Italy

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Context

The Aeolian arc is an active Volcanic Zone in the Southern Tyrrhenian Sea, Italy. Eruptions and paroxysms often affect Stromboli. Vulcano undergoes volcanic crises frequently interpreted as possible unrests. Panarea and Lipari are also considered active volcanic centres. Recent studies (Walter et al., 2009) have shown that some of the Aeolian volcanoes are sensitive to external forcing. Unfortunately, the architecture and the spatial relationships of the plumbing system(s) feeding the archipelago have yet to be fully understood. To do so, we will deploy 20 broadband stations across the 7 main Aeolian Islands that will integrate the permanent INGV network. This study is part of the CAVEAT project in the framework of the INGV long-term Dynamic Planet initiative.

Objectives and Methods

Methods: Deployment, maintenance and data processing of seismic data.
Objectives: This MSc subject aims at processing broadband seismic data to investigate the plumbing system feeding the Aeolian Volcanoes. The stations will be deployed in early 2024 and will remain in place for at least 2 years. The student will process all collected data to perform an ambient noise tomography imaging of the area (Shapiro and Campillo, 2004, Shapiro et al., 2005, Calo' et al., 2023) and will closely collaborate with INGV colleagues that will develop and use the earthquake catalogue to harvest structural and kinematic information. The model inverted from ambient noise data will provide information about the shear wave velocity structure of the region and will help understanding the interconnections at depth of the volcanic systems. The goal of the study is to identify multilevel magmatic reservoirs.

The project has a prominent programming component and requires field trips to the Aeolian Islands. The project is suited for students interested in seismology and volcanology that are willing to learn programming languages and enjoy fieldwork.

Literature

Pianeta Dinamico: https://progetti.ingv.it/it/pian-din

Walter, T. R., Wang, R., Acocella, V., Neri, M., Grosser, H., & Zschau, J. (2009). Simultaneous magma and gas eruptions at three volcanoes in southern Italy: an earthquake trigger?. *Geology*, *37*(3), 251-254, https://doi.org/10.1130/G25396A

Shapiro, N.M., Campillo, M., 2004. Emergence of broadband Rayleigh waves from correlations of the ambient seismic noise. Geophys. Res. Lett. 31, L07614, https://doi.org/10.1029/2004GL019491

Shapiro, N.M., Campillo, M., Stehly, L., Ritzwoller, M.H., 2005. High-resolution surface-wave tomography from ambient seismic noise. Science 307, 1615–8. https://doi.org/10.1126/science.1108339.

Calo', M., Di Luccio, F., Persaud, P., Ventura, G. (2023). Ambient Noise Tomography of the Lipari Volcanic Island (Southern Italy) From a Dense Nodal Array. Geophys. Res. Lett., 50, 4, https://doi.org/10.1029/2022GL101022

Aerial view of the emerged part of Stromboli volcano where part of the instruments will be deployed.	

Choice of orientation:
1) Dynamic earth, earth resources