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

Master ès Sciences in Earth sciences

Imaging of the La Soufrière, Guadaloupe, with a combined geophysical approach.

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Context

Understanding the internal structure of hydrothermal systems is important for volcanic hazard and for the general understanding of the upper part of volcanic systems. Furthermore, high-enthalpy hydrothermal systems are often investigated for the extraction of geothermal resources. In the framework of a collaborative research project with GEG Experts, we deployed deep electrical resistivity methods and nodal networks to investigate the geological structure of the upper part of the La Soufrière Volcano, Guadaloupe.

Objectives and Methods

Methods: Processing of nodal ambient noise tomography and interpretation of deep electrical resistivity tomography.
Objectives: This MSc subject aims at processing nodal ambient noise seismic data, that is an innovative method for the investigation of the upper crust. The inverted velocity model will help constraining the subsurface geological structure of the upper part of the volcanic system and help understanding how to jointly interpret geoelectrical and ambient noise data. Ultimately, joint testing of acquisitions with innovative geophysical methods are necessary to support the so-much necessary energetic transition.

Early ambient noise tomography studies have shown that the noise generated by oceans, anthropic activity, winds resonating in cliffs and forests as well as thunderstorms can be exploited and treated as a source signal (Shapiro et al., 2005; Shapiro and Campillo, 2004). This MSc project proposes using nodal sensors to increase resolution and use ambient noise tomography for the investigation of a volcanic environment. Data acquisition for ambient noise tomography is fully passive. The project will process data acquired by about 50 3C wireless geophones to record ambient noise for about one month. This quantitative project is suited for students interested in geophysics, willing to learn programming languages and enjoying fieldwork.

Literature

Shapiro, N.M., Campillo, M., 2004. Emergence of broadband Rayleigh waves from correlations of the ambient seismic noise. Geophys. Res. Lett. 31, n/a-n/a. doi: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. doi:10.1126/science.1108339

Aerial view of the summit of the La Soufrière volcano where instruments will be deployed.

Choice of orientation:

1) Dynamic earth, earth resources