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

Master ès Sciences in Earth sciences

Plumbing system of Galeras Volcano, Colombia.

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Context

The plumbing system of magmatic volcanoes have been investigated for decades with passive seismic methods such as local earthquake (e.g. (Koulakov et al., 2011)) and ambient noise (e.g.(Fallahi et al., (2017)) tomography, microseismic studies and other geophysical methods. Yet, little is still known about the spatial and temporal relationships between the magmatic reservoir and the hydrothermal system(s) developed in the upper part of the volcanic cone(s). Vargas et al., (2017) have shown that the plumbing system of volcanoes evolves over time and the architecture of the plumbing system may evolve rapidly. To date, volcanoes have been imaged using traditional seismic networks using few dozens of broadband sensors. Today, nodal hardware allows a much higher degree of resolution for the imaging of the plumbing systems of magmatic volcanoes.

Objectives and Methods

Methods: Seismology

Objectives: Understand the architecture and the spatial relationships between magmatic reservoirs and hydrothermal systems at active volcanoes.

Similar to what previously performed at Mount S. Helens (Wang et al., 2017) his MSc project will deploy nodal sensors at the Galeras volcano, Colombia to investigate the shallow structure of this system. The data will be processed with ambient noise methods and will define the size and shape of the shallow magmatic reservoir(s). Furthermore, the ambient noise tomography may help understanding the spatial relationships between the development of hydrothermal systems and the underlying intrusions.

Literature

- Fallahi, M.J., Obermann, A., Lupi, M., Karyono, K., Mazzini, A., 2017. The Plumbing System Feeding the Lusi Eruption Revealed by Ambient Noise Tomography. J. Geophys. Res. Solid Earth. doi:10.1002/2017JB014592
- Koulakov, I., Gordeev, E.I., Dobretsov, N.L., Vernikovsky, V.A., Senyukov, S., Jakovlev, A., 2011. Feeding volcanoes of the Kluchevskoy group from the results of local earthquake tomography. Geophys. Res. Lett. 38. doi:10.1029/2011GL046957
- Vargas, C.A., Koulakov, I., Jaupart, C., Gladkov, V., Gomez, E., El Khrepy, S., Al-Arifi, N., 2017. Breathing of the Nevado del Ruiz volcano reservoir, Colombia, inferred from repeated seismic tomography. Sci. Rep. 7, 46094. doi:10.1038/srep46094
- Wang, Y., Lin, F., … B.S.-J. of G., 2017, undefined, 2017. Ambient noise tomography across Mount St. Helens using a dense seismic array. Wiley Online Libr. 122, 4492–4508. doi:10.1002/2016JB013769

The Galeras volcano, Colombia during a recent eruption. The city of Pasto may be affected by the eruptive activity of the volcano.

Choice of orientation:

1) Dynamic earth, geological hazard