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

Master of Sciences in geology

TITLE: Volcanic cloud top altitudes from Global Navigation Satellite System (GNSS) radio occultations

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Context

The project Volcanic clouds dEtection and monitoring for Studying the erUption impact on climate and aVIatiOn (VESUVIO) has been funded by the Università degli Studi di Padova within the programme „STARS - Supporting TAlent in ReSearch@University of Padova 2017". The objective of this project is to develop an algorithm to evaluate the volcanic clouds thickness and to understand the short- and long-term impact of volcanic clouds on atmospheric variability. The results will be relevant for the air traffic management and to better understand the climate change. The determination of the thickness and height of volcanic cloud is important because of the potential damage that volcanic ash can have on aircraft engines and because of the potential effect on climate. Even though several studies are already ongoing to evaluate with high accuracy the volcanic cloud top height, results are still affected by large uncertainties.

Objectives and Methods

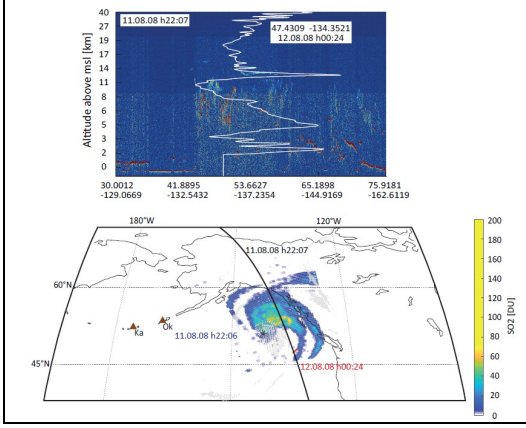
The main objective of this project is to estimate volcanic cloud top heights based on Global Navigation Satellite System (GNSS) measurements and to compare the results with independent estimations obtained with other satellite sensors such as AIRS, IASI and CALIOP. In fact, recent studies demonstrated the large capabilities of GNSS measurements for sounding the atmosphere. Through the GNSS it is possible to estimate the atmospheric profiles of refractivity, density, pressure, temperature and water vapour. A feasibility study in 2017 has demonstrated that the density profiles can be used to estimate the cloud top height of convective and volcanic clouds.

Literature

- *Biondi, R., Steiner, A. K., Kirchengast, G., Brenot, H., Rieckh, T., 2017. Supporting the detection and monitoring of volcanic clouds: A promising new application of Global Navigation Satellite System radio occultation. Advances in Space Research, 60(12), 2707–2722. https://doi.org/10.1016/j.asr.2017.06.039*

- *Prata, A.J., 2008. Satellite detection of hazardous volcanic clouds and the risk to global air traffic. Nat. Hazards 51, 303–324. http://dx.doi.org/10.1007/s11069-008-9273-z.*

- *Clarisse, L., Coheur, P.-F., Theys, N., Hurtmans, D., Clerbaux, C., 2014. The 2011 Nabro eruption, a SO2 plume height analysis using IASI measurements. Atmos. Chem. Phys. 14, 3095–3111. http://dx.doi.org/10.5194/acp-14-3095-2014*



Sites WEB

http://www.biondiriccardo.it/BR/vulcano/indexvesuvio.htm

http://www.unige.ch/sciences/terre/en/research/physical-volcanology-and-geological-risk/

Choice of orientation :

Geological Risk