



Master research internship position at University Pau & Pays Adour

Characterization of the spatial correlations induced during seismic tremors: focus on the 2010 eruption of Eyjafjallajökull

Research project context and objectives

The objective of the research project is firstly to automate the monitoring system of seismic tremor generated in Iceland in different contexts: volcanoes (tremor of magmatic origin), geothermal systems (tremor generated by geothermal activity, including geysers), glaciers (tremor generated by circulating water under glaciers, hydrothermal vents, or the sliding of glaciers on their own base) and fault systems (tectonic tremor). This monitoring consists of the detection, location and automatic classification of the various tremor sources, by analyzing both the seismic data passed since 2015 and the current data using routines operating in real time. These analyses will make it possible to obtain a catalog of the different families of tremor observed in Iceland over a sufficiently long time base, in order to characterize them in terms of spectral content, spatial dynamics of sources, temporal recurrences, spatiotemporal patterns, etc.

Once these families have been identified, the second step will be to propose physical models of the tremor sources for each of them. These models will be based in part on the existing tremor models in the literature, some recently proposed by ISTerre researchers, as well as on the specific knowledge of the different Icelandic natural contexts possessed by IMO. In the particular case of volcanic tremor, special attention will be paid to the distinction between superficial tremor sources related to the interaction of magmatic fluids with the fragile superficial crust, and deeper tremor sources (> 5-10 km) which require to take into account the ductile behavior of the crust and the transport of magma in porous media.

Partners

Academic partners: ISTerre, France & IMO, Iceland Dr. Jean Soubestre (volcano seismology)
E2S-UPPA – LFCR/G2MP team Pr. David Grégoire (mechanics and physics of porous media)

Master candidate objectives

Within this research project, the master candidate will be in charge of the characterization of the spatial correlations induced during seismic tremors with a particular focus on the 2010 eruption of Eyjafjallajökull volcano. Particularly, he will use Ripley's functions – a statistical analysis tool initially developed in order to exhibit special patterns in spatial ecology and already used to characterize the correlations involved during failure in quasi-brittle materials – in order to study the evolution of the correlation involved during volcanic tremor episodes associated with both effusive and explosive phases of the eruption. The final purpose would be to propose a specific tool allowing to better characterize the dynamics of volcanic tremor, which is a key signal preceding and during volcanic eruptions. Even if the main task will consist in adapting and transferring an analytical tool already developed for the characterization of concrete failure, the master candidate will benefit from the presence of Dr. Jean Soubestre as invited researcher in the LFCR/G2MP team from November 22nd 2021, to May 6th 2022 to deepen his knowledge on volcano seismology and apply this tool in a totally novel context.

Laboratories

Full location G2MP research team, LFCR lab (UMR5150 UPPA CNRS Total), Anglet, France.

Grant

560 € / month.

Duration

From February 1st to June 30th, 2022 (5 months).

Candidate's profile

MSc student (M2) in geomechanics, rock mechanics or civil engineering with a strong interest in performing analytical and numerical studies in a multidisciplinary team. Proficiency in English is mandatory for both oral and writing communication.

Contact and supervision

Pr. David Grégoire
Dr. Jean Soubestre

Application at www.davidgregoire.fr before December 15th, 2021