



ÉCOLE DOCTORALE

SCIENCES DE LA TERRE ET DE L'ENVIRONNEMENT ET PHYSIQUE DE L'UNIVERS, PARIS

ed560.stepup@u-paris.fr

Titre du sujet: Understanding real-time monitoring data in terms of pre-eruptive magmatic processes to better constrain eruption forecasts

Director :

Fidel Costa (Pr, costa@ipgp.fr)

Co-directeur, HDR

Jean-Christophe Komorowski (Physicien, komorow@ipgp.fr)

Co-directeur, HDR

Carole Berthod (Physicienne adjointe, berthod@ipgp.fr)

Co-encadrante

IPGP- Equipe de Systèmes volcaniques – UMR7154

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Thesis subject:

Volcanoes are monitored through the real-time acquisition and interpretation of geodetic, seismic, and fluid geochemistry signals, which track changes in the magmatic system before and during an eruption and magma migration towards the surface. For frequently erupting volcanoes, these signals can be cross-referenced with magmatic processes obtained in retrospect from petrological studies, facilitating reliable forecasts weeks/days before an eruption. However, this is not possible at infrequently erupting volcanoes like La Soufrière de Guadeloupe (Lesser Antilles, Komorowski et al., 2005; Metcalfe 2022) that lack a correspondence between old eruptions and instrumentally monitored signals. **In such cases, it is much more difficult to associate the precursory and early warning signals the monitoring network with the processes happening at depth.**

In this context, the challenge of this thesis subject is to elaborate a robust in-depth understanding of the magmatic system and processes feeding effusive and explosive eruptions of La Soufriere de Guadeloupe based on the geochemistry, petrology and modeling of the eruption deposits. The work will include reconstruction of the pre-eruptive conditions using petrological (thermobarometry, volatile concentrations in melt inclusions) and geochemical (major- and trace-elements modeling) methods. The second part of the PhD will be to use the crystal zoning patterns to ascertain the variability of the magma plumbing structure and the processes and time scales that lead to eruption. The results will be then integrated with the thermal and gas output at the surface and with on-going deformation patterns.

The PhD study is part of the ANR project UNREST:

<https://www.ipgp.fr/en/research/research-projects/unrest-understanding-real-time-monitoring-data-in-terms-of-pre-eruptive-magmatic-processes-to-better-constrain-eruption-forecasts/>

The successful applicant will be hosted at the Institut de physique du globe de Paris, a major institution for higher education and research located in Paris (<https://www.ipgp.fr/en/>). He/she will also spend several months at the Guadeloupe Volcanological and Seismological

Observatory (OVSG) during their first and second/third year to understand how the OVSG observatory works, and to continue sampling the deposits from the Soufrière eruptions.

Qualified candidates with a good background on volcanology, petrology, geochemistry are welcomed to apply.

Document requirements

- Curriculum Vitae - Your most recently updated C.V.
- Cover Letter - Describe how your research experience and interests relate to the current project.

Documents should be sent to Fidel Costa (costa@ipgp.fr) Jean-Christophe Komorowski (komorow@ipgp.fr), and Carole Berthod (berthod@ipgp.fr)

References :

Metcalf A. 2022 Insights into the origin and dynamics of past eruptions of La Soufrière de Guadeloupe from melt inclusions: implications for future unrest and environmental impact. Thèse, IPGP.

Komorowski et al., (2005). Volcanic hazard atlas of the Lesser Antilles. by J. Lindsay et al, pp.65-102.