The consortium laboratories

The Earth Science Laboratory (Laboratoire Magmas et Volcans; LMV) has an international reputation based on its expertise in the study of volcanic and magmatic processes. The laboratory is equipped with a range of state of the art analytical, experimental and modelling capabilities. The presence of IRD (overseas research and development agency) personnel in the laboratory reinforces the international development aspect of the laboratory, with especially close links to Latin America.

Website: http://wwwobs.univ-bpclermont.fr/lmv

The Particle Physics Laboratory (LPC) carries out research in the fields of experimental particle physics, astroparticle physics and hadronic physics. The laboratory has several multidisciplinary research groups ensuring knowledge and technology transfer to other scientific fields.

Website: http://clrwww.in2p3.fr

The Laboratory of Social and Cognitive Psychology (LAPSCO) is the only CNRS laboratory in France specialising in social psychology.

Website: http://wwwpsy.univ-bpclermont.fr/lapsco/

The Laboratory of Computing, Modelling and Optimization (LIMOS) specialises in the application of computer sciences to the design and the management of complex organisational systems (e.g., telecommunication, transportation, production, environmental systems).

Website: http://limos.isima.fr/

The Laboratory of Physical Meteorology (LaMP) specialises in the study of clouds, precipitation and atmospheric aerosol particles.

Website: http://wwwobs.univ-bpclermont.fr/atmos/fr

The Mathematics Laboratory (LM) specialises in operator algebra, partial differential equations, numerical analysis and scientific calculus, topology and geometry, mathematical modeling and simulation, statistics and probabilities, and number theory.

Website: http://math.univ-bpclermont.fr

The Observatoire de Physique du Globe de Clermont-Ferrand (OPGC) has a 140-year history of long-term observation of natural phenomena, and offers a research environment closely linked to observational facilities. It is part of a national network of Earth and Space Science Observatories.

Website: http://wwwobs.univ-bpclermont.fr

The French Geological Survey (BRGM) is a research organization embracing most fields of applied earth sciences, such as geology, hydrology and hydrogeology, geophysics, environment, civil engineering, etc. Research of the Natural Risks Division of the BRGM focuses on the prediction, prevention and mitigation of risks associated with earthquakes, volcanic eruptions, tsunamis, landslides, climate change, coastal erosion and risks of human origin.

Website: http://www.brgm.fr

Definitions of jobs and salaries

PhD projects (PhD) will be for three years. The stipend (net, after payment of social charges but prior to income tax) will be about 1584 euros per month.

Postdoctoral research fellowships (PDocRes) will be awarded for one year, extendable to two years upon submission and favourable evaluation of a first-year report. The stipend will depend on the candidate's experience in research, ranging from 2180 to 2465 euros per month (net, after payment of social charges but prior to income tax).

Postdoctoral technical engineer posts (PDocTech) will be awarded for one year, extendable to two years upon submission and favourable evaluation of a first-year report. These projects have a large technical component, and there will be less freedom for independent research than in a research fellowship. The stipend will depend on the nature of the work proposed and on the candidate's prior experience, ranging from 2180 to 2465 euros per month (net, after payment of social charges but prior to income tax).

Application procedure

Descriptions of the projects are provided below, along with the addresses of people they may contact for more details. Enquiries of a general nature can also be made to the ClerVolc administration manager, Socheata Sean (Socheata.SEAN@univ-bpclermont.fr).

Applicants are requested to send a CV, a letter of motivation, the names of two referees, and the pdfs up to five publications to the ClerVolc administration manager, Socheata Sean (Socheata.SEAN@univ-bpclermont.fr). Applications will be accepted until the **17 May 2015**.

Applicants do not need to speak French.

ClerVolc
Centre Clermontois de Recherche sur le Volcanisme

Technical developments for a muon telescope suitable for imaging an active volcano / PDocTech

Background

The Laboratory of Particle Physics of Clermont Ferrand (LPC) is developing a muon telescope suitable for density imaging active volcanoes in collaboration with the Lyon Institute of Particle and Nuclear Physics (IPNL) and the Laboratory Magmas and Volcanoes (LMV). In particular, LPC is in charge of the detector Front End (FE) Electronics.

The telescope is based on Glass Resistive Plate Chambers (GRPCs) read by 1-cm2 pads. In total, about 4 m2 of detection area is read synchronously using the 64 channel HARDROC ASIC developed at OMEGA (CNRS/Ecole Polytechnique). At the moment, the FE board has an USB interface for data readout, direct differential inputs from a dedicated clock board and handles 24 ASICs. Technical developments are underway at LPC to limit the number of FE boards and increase their robustness and data rate tolerance. To this end, the FE board will be re-designed with an increased number of inputs, Ethernet interface for the data readout and local clock generation interfaced with an external synchronisation system.

Job description

The successful candidate will be in charge of the FE electronics upgrade. The working group includes two other electronics engineers working part time on the project and a Master trainee from a local engineering school.

- The candidate will design the printed circuit board hosting the FPGA SoC and all the other necessary components.
- He/she will supervise the outsourced production of the boards and their qualification tests at LPC.
- As person in charge, he/she is expected to provide the documentation for the FE electronics and to ensure a smooth interfacing with the DAQ group.

Required qualifications and competence

- Electronics engineer (Ingénieur de Recherche BAP C)
- Knowledge in analog electronics
- In depth knowledge in numerical electronics and SoC
- Experience with CAO tools (Cadence Allegro), ALTERA's QUARTUS
- Experience in VHDL and C/C++ programming
- Experience with designing and operating synchronous electronics systems will be appreciated.

Contract duration

The contract will be of an initial duration of 1 year, extendable to 18 months.

Contact and further information

C. Cârloganu, LPC / Tel +33 4 73 40 73 60 / email: cristina.carloganu@clermont.in2p3.fr

ClerVolc
Centre Clermontois de Recherche sur le Volcanisme

Probing the mechanics governing the growth, evolution and eruption of large silicic magma bodies / PDocRes

Project objectives

Volcanic systems are inherently non-linear. Complex interactions between competing factors decide whether magma is stored or erupted, thus making eruption forecasting during periods of unrest problematic. This project will test how different mechanical and thermal processes affect the storage or eruption potential of upper-crustal magma reservoirs, to improve our interpretation of geodetic and geophysical monitoring data.

Project context and description

Volcano observatories monitor volcanoes for signals that might indicate a forthcoming eruption. However, this requires accurate knowledge of the subsurface processes causing the signals observed and recorded at the surface. Ground-surface displacement measurements are a common volcano-monitoring tool, but the links between surface displacements and eruption remain enigmatic, and the ability to distinguish signals that will precede an eruption from those which will not is lacking. Much progress has been made in the interpretation of volcanic geodetic signals over the last decade. The use of Finite Element Analysis (FEA) allows for more realistic models that incorporate viscoelastic effects, which in turn strongly influence whether a magma reservoir tends towards eruption or continued magma storage, through viscous accommodation of the growing reservoir in the host-rock. To date models have relied on steady-state temperature distributions to assign the viscosity distribution within the crust *a priori*. In reality, the subsurface temperature distribution is a function of the crust intrusive history, hence of both time and space. Consequently, the mechanical properties of the host-rock will also be altered, and this will have important impacts on the eruption or storage potential of a magma reservoir as well as the spatial and temporal distribution of associated surface deformation. The goal of the project is a model framework that accounts for time-dependent thermal and mechanical properties resulting from repeated magmatic intrusions. This will allow for better quantification of the links between magma supply, surface displacements and eruption potential, and improved constraints on geodetic eruption precursors.

Deliverables

(i) Finite-Element thermo-mechanical models of magma intrusions and associated surface displacements; (ii) Spatial and temporal surface displacements for the specific cases of pluton growth (lower eruptive potential) and magma reservoir recharge (higher eruptive potential); (iii) Model applications to specific case studies.

Candidate profile

The applicants should have a strong background in numerical modelling applied to earth-science problems. Experience with COMSOL Multiphysics would also be appreciated.

Contact and further information

Thierry Menand, email: T.Menand@opgc.univ-bpclermont.fr

Jean-Luc Froger, email: J.L.Froger@opgc.univ-bpclermont.fr

ClerVolc
Centre Clermontois de Recherche sur le Volcanisme

Universal calibration of Raman spectroscopy for the analysis of volatiles in glasses of variable composition / PDocRes

The project seeks the achievement of a universal calibration of water in glasses using Raman spectroscopy. The job will hence involve synthesis of hydrated glasses of various compositions and quantification of water contents using FTIR and Raman spectroscopies. Also the post-doctorate will have to teach and assist researchers from the lab to use the newly installed Raman machine.

Contact and further information

N. Bolfan-Casanova, email: N.Bolfan@opgc.univ-bpclermont.fr

UNION EUROPÉENNE en AUVERGNE
AUVERGNE la région juste et grande
INVESTISSEMENTS D'AVENIR
IRD Institut de recherche pour le développement
UNIVERSITE BLAISE PASCAL CLERMONT-FERRAND UBP
cnrs INSU Institut national des sciences de l'Univers

ClerVolc
Centre Clermontois de Recherche sur le Volcanisme

Kinetics of magmatic processes: Formation and morphological evolution of phenocryst-hosted melt inclusions / PDocRes

The study of melt inclusions hosted in phenocrysts is a major issue of modern volcanology. Most studies on melt inclusions are focused on chemical aspects and are aimed at determining the composition of parental magmas or estimating volatile concentrations and pre-eruptive conditions. In comparison, studies of the physics of melt inclusions are few although the understanding of inclusion formation mechanisms is required to interpret melt inclusion compositions and to identify magmatic events that can lead to the entrapment of liquid droplets in crystals. Furthermore, after their entrapment, inclusions undergo physical changes (evolution toward an equilibrium morphology; crystallization of the host mineral on the inclusion walls), which are potential markers of the duration of pre- and syn-eruptive processes (residence time in the magma chamber, rate of magma ascent and cooling). The objective of this project is to take advantage of our complementary experimental facilities (1-atmosphere furnaces and heating stages, externally- and internally-heated pressure vessels, etc.) to study the entrapment mechanisms of melt inclusions and the kinetics of the transformations they undergo before and during the eruption. A first group of experiments will be focused on the growth of olivine or quartz crystals in basaltic or hydrous rhyolitic melts, respectively, in order to characterize the perturbations that lead to the incorporation of liquid droplets into the crystals. In a second group of experiments, natural or synthetic melt inclusions will be subjected to various thermal paths in heating stages to observe *in situ* with an optical microscope the evolution toward an equilibrium (negative) crystal shape and to study the growth of the host mineral at the expense of the melt inclusion during cooling. The experimental results will be used to estimate the time scales of magmatic processes from the shapes and internal zonations of natural melt inclusions.

Contact and further information

D. Laporte (LMV), email: D.Laporte@opgc.univ-bpclermont.fr

P. Schiano (LMV), email: P.Schiano@opgc.univ-bpclermont.fr

UNION EUROPÉENNE en AUVERGNE
AUVERGNE la région juste et grande
INVESTISSEMENTS D'AVENIR
IRD Institut de recherche pour le développement
UNIVERSITÉ BLAISE PASCAL CLERMONT-FERRAND UBP
cnrs INSU Institut national des sciences de l'Univers

ClerVolc
Centre Clermontois de Recherche sur le Volcanisme

Pyroclastic density currents : continuous spectrum or distinct endmembers? PhD

The emplacement mechanisms of large volume pyroclastic density currents are controversial. Particle transport in these currents and deposition are thought to be governed by two fundamentally different physics. In one case the deposit results from sedimentation of particles from a dilute turbulent current with mean particle concentration <1% and bulk density ~1 kg/m3, while in the other case it results from a dense basal flow (overridden by a dilute cloud) with mean particle concentration >30-50% and bulk density ~1000 kg/m^3. Do these models represent two distinct endmembers or can currents represent a continuous spectrum (i.e. with basal part of intermediate densities)? In order to answer this question, the objective of this project is to investigate the effect of particle concentration on the dynamics of a biphasic current of gas and particles.

A first type of experiments will be carried out in a device in which a turbulent air flow at constant rate and charged with particles will be filmed with a high-speed video. The objective will be to develop a methodology to visualize the particles coupled with the turbulent air in order to determine their field velocity and to quantify the total turbulent kinetic energy as well as the spectral energy. A second type of experiments will be done to investigate the propagation mechanisms of biphasic gravity currents as a function of their initial particle concentration. A gas-particle mixture will be generated in a reservoir and then released in a channel to form a gravity current. The objective will be to study the possible flow turbulence using the method mentioned above, the kinematics of the current, the mode of particle sedimentation, and the possible development of an internal gradient of particle concentration. Complementary numerical modeling will be carried out in collaboration with the Department of Mathematics of Blaise Pascal University. The objective will be to establish a relevant two-phase model (e.g. from the last kinetic theories) that is relevant for both dilute and dense mixtures. These highly complex models require a rigorous mathematical treatment before being incorporated into a computer code. Complementary numerical studies of these models will be performed at the Mathematics Department for comparisons with the experiments described above.

Contact and further information

O. Roche (LMV), email: O.Roche@opgc.univ-bpclermont.fr

L. Chupin (LM), email: Laurent.Chupin@math.univ-bpclermont.fr

T. Dubois (LM), email: Thierry.Dubois@math.univ-bpclermont.fr