



UNIVERSITÉ DE GENÈVE

PhD position in computer science - physical volcanology at the University of Geneva (Switzerland)

Developing and applying the Lattice Boltzmann (LB) technique to numerically simulate volcanic processes

Volcanic eruptions are the end-products of a sequential series of complex natural phenomena that are difficult to quantify or predict without insights from numerical simulations. We propose to develop a Lattice-Boltzmann (LB) code to address some fundamental questions pertaining to volcanic behaviour. The LB technique is considered as a very promising alternative to traditional Computational Fluid Dynamics (CFD) methods, such as Finite Element Modelling, and Finite Difference Modelling, to deal with complex flow problems (Chopard and Droz, 1998). In particular the LB method has been very successful to describe multi-component flows (Martis and Chen, 1996; Swift et al., 1996) and flows in complex geometries (e.g. flow in porous media), situations that are common in volcanology.

Chopard, B. and Droz, M., 1998. Cellular Automata Modeling of Physical Systems. Cambridge University Press.
Martis, N.S. and Chen, H., 1996. Simulation of multicomponent fluids in complex 3D geometries by the lattice Boltzmann method. *Physical Review E*, 53: 743-749.
Swift, M.R., Orlandini, E., Osborn, W.R. and Yeomans, J.M., 1996. Lattice boltzmann simulations of liquid-gas and binary fluid systems. *Physical review E*, 54: 5041-5052.

Specific tasks include:

- Design a LB code for multiphase, thermal flow in porous media
- Apply it to volcanological problems (gas percolation in highly crystalline magma chambers, magma degassing close to the earth's surface, pyroclastic flow emplacement).
- Help managing the computer facilities at the Section des Sciences de la Terre of the University of Geneva

We ask

- Masters degree in Physics, Geophysics, or Computer Science (with a taste for natural phenomena)
- Proven abilities to use and write computer codes
- Interest in natural processes

We offer

- A dynamic environment in one of the leading European centers for computer simulations with LB methods and volcanology
- All the facilities necessary for the completion of this project
- An appointment as a Doctoral Assistant for an initial period of 3 years



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Please send (1) your CV, (2) copy of University degree(s), (3) a short letter explaining your interest in the project and the reasons for undertaking a PhD study, and (4) names and complete addresses of two referees to prof. Bastien Chopard and Dr Olivier Bachmann (**before January 31, 2006**), either electronically or by mail at the addresses below:

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