Albert Kettner <albert.kettner@gmail.com>

[GilbertClub] 2 PhD positions available at UniBern in the fields of geology and geophysics

Fritz Schlunegger <fritz.schlunegger@geo.unibe.ch> Thu, Apr 9, 2015 at 6:30 AM
To: gilbertclub@lists.berkeley.edu

Opening of 2 PhD positions at the Institute of Geological Sciences and the Laboratory for High Energy Physics, University of Bern, Switzerland

The institutes of Geological Sciences and the Laboratory for High Energy Physics of the University of Bern invite talented, motivated and excellent candidates to apply for 2 PhD positions that will be embedded in an interdisciplinary project funded by the Swiss National Science Foundation. We plan to understand the mechanisms of glacial erosion in steep non-accessible mountainous terrains. To this extent, we will map the base of a glacier situated in the Jungfrau region, Swiss Alps, in 3D with emulsion particle detectors exposed to the cosmic muon flux. These particles can penetrate thick sections of rocks, which offers a unique opportunity to map the interior of mountains such as magmatic chambers beneath volcanoes or the base of glaciers, which we plan to accomplish here. We will proceed by installing emulsion detectors in the tunnel of the Jungfrau railway that crosses the massif underneath the glacier. The collected image data will be scanned and analyzed in the Laboratory for High Energy Physics at the University of Bern by automatic optical microscopes. Additional tasks comprise a full 3D reconstruction of the geologic/geomorphic architecture of the massif using state-of-the-art techniques in computational and field geology.
This will be the first time where this technique will be applied to the field of Geosciences in 3D. Both PhD students will thus be trained in a novel and cutting edge methodology offered by particle physics within an interdisciplinary team. If successful, we expect that the technology will open the avenue for applications to a broader field to society (e.g., prediction of magma chambers within volcanoes, detection of over deepened valleys above railway tunnels, inspection of large civil engineering structures and power plants, etc.).

Scientific responsibilities of the 1st PhD candidate
The PhD student will develop a 3D model for the geologic architecture of the Jungfrau region. In addition, she or he will apply thermal frost-cracking and glacial erosion models to explore possible erosional mechanisms leading to the shape of the target mountain belt. Successful candidates will also map the bedrock fabric along the tunnel of the Jungfrau railway, and support the team of physicists in installing the emulsion detectors along the tunnel. No climbing skills are required, but candidates have practical skills to accomplish hand-on tasks upon installation of the detectors in the tunnel. They will collaborate with the technical staff of the Jungfrau railway company and the university. Successful candidates have a Ms degree either in structural geology, geomorphology, geophysics or 3D geology, and they have a background and strong interest in physics. They are willing to experiment with instruments, models and structural/geomorphic geology in 3D. The PhD student is also willing to collaborate with colleagues from physics, thereby learning their ‘scientific language’ and participate in related seminars and projects.
The student will be supervised by Proffs. Fritz Schlunegger (Exogene Geology), Marco Herwegh (Structural Geology and Tectonics), and Antonio Ereditato, (Particle Physics). The PhD student will obtain a PhD degree in Geology.
Questions about the science of the project can be addressed to Fritz Schlunegger, Institute of Geological Sciences, fritz.schlunegger@geo.unibe.ch

Scientific responsibilities of the 2nd PhD candidate
The PhD student will apply this methodology for the case of the Eiger glacier. This will be the first time where the technology of nuclear emulsion particle detectors will be applied to a scientific problem in 3D, and at a spatial resolution of c. 10 meters to inspect an Alpine glacier. The tasks comprise the installation of the detectors along the Jungfrau tunnel (together with technicians and the other PhD of the project). The PhD candidate will then scan the films, filter the data, invert the particle paths across the mountain belt and calculate a 3D model for

the base of the target glacier. Successful candidates have a strong background either in geophysics, physics, geology, or material sciences. Solid programming skills are a prerequisite. They are willing to experiment with machines, automated microscope scanning systems, and they have practical skills to accomplish hand-on tasks upon installation of the detectors in the tunnel. The PhD student is willing to collaborate with colleagues from geology and physics in an interdisciplinary way, which includes the participation in related projects and seminars. Successful candidates will be collaborating the technical staff of the Jungfrau railway company and the university.
The student will be supervised by Proffs. Antonio Ereditato (Particle Physics), Fritz Schlunegger (Exogene Geology), and Paola Scampoli (Particle Physics, Univ. Napoli). She or he will obtain a PhD degree either in Physics or Geology, depending on the personal skills and interests.
Questions about the science of the project can either be addressed to Antonio Ereditato, Director of Laboratory for High Energy Physics, antonio.ereditato@cern.ch, or to Fritz Schlunegger, Institute of Geological Sciences, fritz.schlunegger@geo.unibe.ch.

Both positions are funded for 36 months. Extension of 12 additional months is possible. We schedule the project start for October 1st 2015. Interested candidates send their application including a CV, a statement of research interest and names of 2 potential referees to Fritz Schlunegger, schlunegger@geo.unibe.ch.
The deadline for applications is May 30th. We are looking forward to your participation and a fruitful collaboration in an interdisciplinary team.

Fritz Schlunegger, Institute of Geological Sciences
Antonio Ereditato, Director of the Laboratory for High Energy Physics
Scientific and technical staff