

Institut für Geologie, Baltzerstrasse 1-3, CH-3012 Bern

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Institut für Geologie

Call for applications for 3 fully funded, closely related PhD positions

The institute of Geological Sciences, University of Bern, invites applications for three PhD positions, starting from January 1st 2018 and funded through the Swiss National Science Foundation for a total of four years. All PhD students will closely collaborate with each other within an interdisciplinary team including geologists (Prof. Schlunegger), geophysicists (Prof. Kissling) and paleoecologists (Prof. Tinner)

Scientific background of project

This project aims at understanding the origin, and the chronology, of the c. 250 m-deep Quaternary overdeepenings in the Bern area, Central Switzerland, where the landscape has evolved under the influence of two piedmont glaciers with moisture sources on the northern and southern sides of the Alpine crest. We plan to explore whether these erosional features were formed through fluvial processes, or by a combination of glacial carving and incision by overpressurized subglacial meltwater. In addition, we intend to answer the question of whether or not these valleys were formed in response to one or multiple glaciations, and when this/these phase(s) of bedrock carving occurred. Since the tunnel valleys are all buried by hundreds of meters-thick lacustrine mudstones, glacial till and fluvial gravels, the search for the origin and the timing of tunnel valley formation can only be accomplished through indirect approaches. Here, the plan is to infer the erosional mechanisms through reconstructions of the geometry of these tunnels through a detailed gravity survey (PhD project A). In a second related project, we intend to reconstruct the sedimentary architecture of the tunnel valley fill and the provenance of the material through the analyses of deep core drillings where the sedimentary fabric will be studied in detail (PhD project B). As a third major task, we plan to date the tunnel valley fill through the analysis of the palynomorphic records encountered in the drilled cores (PhD project C).

Details of PhD project A: gravity survey

The main tasks of this project include the mapping of the tunnel valley occurrence and reconstructions of the erosional morphometry through a combination of drillhole information and results from targeted and detailed gravity surveys. Successful candidates will be responsible for the collection of new gravity data within the Bern area. The ensemble of collected data will be transformed to residual Bouguer anomalies through standard gravity reduction procedures. The scope here lies in the three dimensional reconstruction of the overdeepenings in the Bern area. This particular task is designed for a PhD student (A) with a strong flair in computational geology and fieldwork, and a particular interest in the principles of geophysics. The PhD student will be supported by a team of geologists (Prof. Schlunegger, UniBern), geophysicists (Prof. Kissling, ETH Zurich), and colleagues from Swisstopo.

Details of PhD project B: sedimentology of unconsolidated sediment

The sediments above and within the tunnel valleys bear important information about the ages and the origin of these erosional forms. Accordingly, the tasks of the second PhD student B are mainly centered towards establishing the stratigraphic and sedimentological framework of the deposits overlying the tunnel valley systems. This includes (i) the search for (useful) sedimentological information from the available dataset of drillings through compilations, (ii) collection of new data from ongoing and further drilling campaigns in the region, (iii) collection of detailed sedimentological data and related density data (to be used for gravity modeling) from two (possibly three) c. 250-m-deep cores that will be drilled for the purpose of this study, (iv) determination of the provenance of the material through geochemical investigations on detrital garnet, and (v) establishment of a chronological framework using the ²³⁰Th/²³⁴U

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methodology on calcareous fossils. This particular task is designed for a PhD student (B) with a strong flair in classical geology. The PhD student will be supervised by Prof. Schlunegger (UniBern).

Details of PhD project C: Biostratigraphic dating and vegetation history during the Quaternary Successful PhD students will compile available palynological data into a correlation chart. Subsequently, as a second major task, the sedimentary records provided by the drillings in the Bern area will be analyzed for palynomorphs and macrofossils. The new palynological results will be correlated with the correlation chart developed within the framework of the first task. The PhD student will prepare own palynological and macrofossil samples. This task involves a significant learning effort as material preparation is technically and scientifically demanding. Sample preparation will be accomplished using in-house infrastructure. The PhD student will, in parallel, be trained (c. 1 year) in the identification of palynomorphs and macrofossils to reconstruct the interglacial vegetation histories at the different sites. Interpretations of paleobotanical results (e.g. reconstruction of vegetation histories, biostratigraphic comparisons) will be supported by Prof. Tinner together with Prof. Schlunegger (both UniBern). Successful candidates have a strong flair in Quaternary ecology, with expertise in paleoecology, paleolimnology, paleoclimatology, plant ecology or sedimentology.

Questions?

Do you have questions and need further information? Please do not hesitate to contact the responsible project manager: <u>fritz.schlunegger@geo.unibe.ch</u>

How to apply

Are you interested in any of these three projects? Then we greatly appreciate to receive your application. Please send the following items:

- Cover letter, which outlines the motivation for your application including the specification of one of the three subprojects
- Curriculum Vitae
- Two names of potential referees
- List of Bs and Ms classes including grades

Please send your application via email to <u>fritz.schlunegger@geo.unibe.ch</u> The deadline of your application is the 15th of November 2017