

Glacier recession, glacial sediment export and the morphodynamics of proglacial forefields

The Swiss National Science Foundation has funded a new project at the University of Lausanne that will address the behaviour of the areas that form in front of glaciers (proglacial forcefields) as glaciers retreat. The funding covers two PhD students (4 years each) and a field technician (2 years) as well as all equipment, fieldwork and conference attendance costs.

The project aims to quantify:

- (1) how and over what timescales marginal zones of glaciers regulate the export of glacially-eroded sediment to their forefields, for both bedload and suspended load; and
 - (2) how proglacial forefields modify this glacier-originating signal to influence downstream sediment yield.
- The results will be used to determine; (a) the timescales over which glacier sediment export can be used to infer glacial erosion rates; (b) how proglacial margins filter glacial sediment export to determine basin sediment yield, and (c) how proglacial forefield morphodynamics evolve as glaciers retreat, so impacting frequencies of forefield disturbance and embryonic ecosystem development.

The project will use both field data collection and computational modelling. Field data will be collected for the forefield of a representative temperate Alpine valley glacier, Glacier d'Otemma, in South-West Switzerland. Data collection will include testing new ways of tracing sediment movement through the margins of valley glaciers using intelligent particles as well as more standard monitoring of hydrology and sediment transport using stage recorders, acoustic pipe samplers and turbidity records. Such data will be combined with geophysical data from the glacier margin to quantify the geometry of subglacial channels and the glacier bed. In the proglacial forefield, UAV systems will be used to quantify sub-daily stream morphodynamics and grain size variability. Computational modelling will seek to develop both a treatment for subglacial glacier margin sediment transport and to modify the HSTAR model of Andrew Nicholas for multiple grain sizes to describe proglacial stream morphodynamics. The models will be used to simulate different combinations of glacial hydrology and forefield geometry and slope to generalize findings to a larger number of cases.

The project is supported by two PhD students (4 years each) and a field technician to support data collection and archiving (two years). One PhD position has been filled and they will address question 2 above. We are now seeking to appoint a second PhD student (100% engagement, 4 years) to address the first question (glacier margin regulation of sediment export) and the project technician (100% engagement, 2 years). A suitable candidate for the project technician position, provided they are eligible according to University of Lausanne PhD admission rules, may be considered for cantonal PhD funding after the end of their two-year engagement on this project.

The PhD appointment will be on the Swiss National Science Foundation salary scale (CHF 47'040 rising to CHF 48'540 in the second year and CHF 50'040 in the third and fourth years). An additional teaching/research assistantship will be made available (CHF9'000 per year).

The technician will be appointed as a Junior Researcher on the Swiss National Science Foundation salary scale (CHF 69'908 Year 1, CHF 71'964 Year 2). Both appointments give access to tier 1 and tier 2 pension provision in the Swiss system.

The appointees will join the group AlpWISE (Alpine Water, Sediment Ice and Ecology <http://wp.unil.ch/alpenv/>) in the Institute of Earth Surface Dynamics at the University of Lausanne, Switzerland (www.unil.ch/idyst). This group currently includes five PhD students and two post-docs all working on ice, river hydraulics, sediment transport and ecosystem related research in Alpine glaciated catchments. The working language of the research group is English. The start date for the posts is negotiable but we would wish to have both positions filled by April 2020 at the very latest.

Person requirements: PhD position

- Masters degree in Environmental Science, Civil Engineering, Physical Geography or similar.
- Interest in glacial and fluvial processes, notably sediment transport.
- Experience of a suitable programming language (e.g. Matlab, Python).
- Good quantitative data handling and capacity to apply advanced statistical analyses.
- Fieldwork experience.
- Willingness to work and to camp at altitude (2'400 m plus) for long periods of the summer months.
- Excellent written and spoken English.
- A valid driving licence.

Person requirements: Technician position

- Masters degree in Environmental Science, Civil Engineering, Physical Geography or similar; candidates with experience in applied electrical/electronic engineering may be considered.
- Experience of environmental instrumentation, preferably applied to river and/or glacial systems.
- Fieldwork experience.
- Excellent quantitative data handling, quality control and data archiving skills; experience of database management would be valuable but not necessary.
- Willingness to work and to camp at altitude (2'400 m plus) for long periods of the summer months; the appointee will be expected to be trained to a high level in first aid.
- Excellent organizational skills.
- Good written and spoken English and an ability to communicate in basic French, or willingness to be able to do so through intensive language training.
- A valid driving licence.

Application

Applications should be sent in a single pdf file attached to an email to stuart.lane@unil.ch, or if the file size is greater than 10Mb, should be sent via a suitable large file send (e.g. mail big file). Applications for both posts should include

1. A two page (maximum) cover letter (a) indicating whether you are applying for the PhD position or the technician position; (b) explaining your interest in the position you are applying for; (c) detailing any relevant experience to the position; and (d) summarizing your long-term career objectives.
2. A full Curriculum Vitae, including all previous employment and university and other training, and the dates and title of degrees received and any skills that you have acquired (e.g. programming). Your CV should identify at least two people whom we might approach to secure academic references.
3. A full transcript of academic results from all degree programmes studied.
4. A pdf of your Masters dissertation (or a hyperlink to where it may be consulted).

Deadline

The initial deadline for applications is the **24th October 2019**. If fewer than one third of applications are from women, the deadline will be extended until this threshold is reached. Applicants will be interviewed via the internet and the shortlisted candidates will then be invited to visit Lausanne.

Further information

If you require further information regarding these positions, please contact Stuart Lane (stuart.lane@unil.ch).