

Competition notice

PRELUDIUM BIS

Project title: Micro-weathering and spectral signatures of rock surfaces in glacier forelands

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Project description

The global climate change results in world-wide shrinkage of glaciers and freshly deglaciated landscapes undergo complex adjustment to non-glacial conditions. Subaerial weathering of rock surfaces within glacial forelands developed since 19th c. (Little Ice Age or LIA) glacial maxima are at the forefront of such changes. However, there are only few studies focusing on differences in rock surface deterioration within contemporary glacial forelands.

Field studies will be carried out in the Midtre Lovénbreen (Svalbard), and in the Hallstaetter Glacier foreland (Salzburger Alps). The first foreland contains local Proterozoic metamorphic and Carboniferous sedimentary rocks while Hallstaetter Glacier foreland is developed in fine-grained Upper Triassic limestone. The rate of recession of the glaciers and the age of the outermost LIA moraines are known. This will allow to infer about the rate of rock surface deterioration and weathering alteration of minerals.

Following research questions are put forward: 1) What is the rate of rock surface decay (development of weathering microrelief, weathering rind, rock surface weakening, surface mineral alteration) in High-Arctic and temperate Alpine proglacial environments of various petrography? 2) Can mineral alterations of rock surfaces resulting from weathering since the end of LIA be registered in radiation spectra? Can spectral signatures be used in relative dating of glacial landforms.

Following hypotheses are put forward: 1) There is a significant rate of rock surface decay (visible in a dozen or so years after deglaciation), manifested by a rapid development of surface micro-roughness, weathering rind, rock surface weakening and chemical alteration of minerals on the rock surface. 2) Mineral alterations of rock surfaces resulting from weathering since the end of LIA can be registered in infrared radiation. Spectral signatures can be used in relative dating of glacial landforms.

In each of the forelands five test polygons will be designed along transects running from the youngest rock surfaces (near the glacier margin) to the oldest (at LIA glacial maximum). The polygons will be located on bedrock or boulders embedded in the moraines with distinct traces of glacial abrasion, allowing to infer that older weathering rind (developed before glacial accumulation) has been completely eroded. Micro-roughness will be measured with a use of an electronic profilometer and Schmidt hammer (SH) tests will provide information of rock surface hardness. On the rock surfaces previously checked for micro roughness and SH rebound, spectral measurements will be performed using a spectroradiometer (visible and infrared wavelengths). Next, the weathering rinds including underlying rock will be chipped-off in order to determine the color and thickness of the rind and collect samples for microscopic analyses. Photogrammetric surveys based on the unmanned aerial vehicle will provide high-resolution images which will be used to provide high accuracy orthophoto maps and Digital Elevation Models. Identification of landform assemblages will help in determination of a topographic characteristics and age of rock surfaces used for detailed weathering studies (test polygons) and type of deglaciation.

Collected rock samples will be used to determine petrography, mineral composition and porosity of weathering rinds as well as possible coatings and interior of rocks by optical microscope in passing light. The chemical composition of the samples will be analyzed using a scanning electron microscope. A statistical analysis of the spectral characteristics of minerals composing studied rocks will be carried out and statistically significant differences in the spectrum range between the type of minerals and their location will also be checked.

Finally, all data on rock types, weathering micro-relief, rock strength, weathering rinds (tested statistically), and landform settings will be correlated with results of the spectral measurements in order to verify hypothesis put forward.

Requirement

The call is open to all those who are not PhD holders and are not students at the doctoral schools.

Requirements:

- Master's degree in geography or related fields
- Knowledge of research topics
- Knowledge of remote sensing tools and methods
- Proficiency in English at least B2 level or higher
- Experience in field work, availability and the ability to work in a research team
- Knowledge of information technology: GIS, statistical analysis tools, programming in R
- Ability to develop orthophotos and Digital Elevation Models (DEM) based on UAV data

Description of tasks:

- Active participation in field campaign, including active participation in all measurements during field research and UAV surveys
- Analysis and interpretation of remote sensing data based on spectral libraries of minerals
- Preparation and obtaining terrestrial remote data
- Elaboration of orthophoto and DEM images
- Elaboration of final results
- Preparation of scientific articles and conference presentations
- The scholarship holder will be obliged to submit an application to the National Agency for Academic Exchange (NAWA) for funding an internship abroad at The University Center in Svalbard, (UNIS), and after obtaining funding for this internship during the Preludium Bis 2 project
- Preparation of a doctoral dissertation with the project manager as the supervisor. According to the rules of the competition, the project must be completed with a doctoral degree within 12 months of the completion of the project.

Discipline: Earth and related environmental sciences

Admission limit: 1

Recruitment schedule

- registration in the Internet Registration of Candidates, referred to as "IRK", submitting an application to the IRK: from 16 August to 30 August 2021
- qualification procedure: from 01 September to 06 September 2021
- announcement of the ranking list: by 08 September 2021
- accepting documents from qualified candidates: 09 – 23 September 2021, until 2 p.m.
- announcement of the list of accepted candidates: by 28 September 2021

Recruitment fee

150 PLN

Form of the qualification proceedings

Qualification proceedings include the assessment of the following items:

- 1) the candidate's scientific activity, based on their CV or Resume, documented by scans of materials attached to the application for admission to the School;
- 2) an interview with the candidate;
- 3) other achievements.

Language of the selection process, including the interview

The interview shall be carried out in Polish or English – in accordance with the candidate's preferences presented in IRK. If the Polish language is selected, the interview may include parts in English.

Required documents

The candidate shall submit a School admission application only through the IRK. The application shall include the following:

- 1) indication of the selected discipline in which the candidate plans to pursue education. By submitting an application for admission to the Doctoral School is understood as submitting a completed and paid recruitment application via the Internet Recruitment of Candidates (IRK). Submission of an application via the IRK is tantamount to submitting an application for admission to the Doctoral School chosen by the candidate;
- 2) a scan of the graduation diploma of uniform master's degree or postgraduate studies or an equivalent diploma obtained under separate regulations. In the case of a diploma equivalent to a uniform master's degree or postgraduate studies graduation diploma, a candidate shall justify such equivalence. In case the diploma was issued in a language other than Polish or English, the candidate shall attach its certified translation;
- 3) a resume or CV outlining the candidate's scientific activity, including scholarly interests and achievements during the five calendar years preceding the application (if a candidate became a parent during this time, as evidenced by a scan of the child's birth certificate attached to the application, this period shall be extended by two years for each child), including, but not limited to:
 - publications,
 - research and organizational work at student research groups,
 - participation in scientific conferences,
 - participation in research projects,
 - awards and honorable mentions,
 - research internships,
 - research skills training programs completed,
 - activities promoting science,
 - activity in science movement representative bodies,
 - average of their university grades,
 - professional career,
 - level of proficiency in foreign languages;
- 4) scans of materials evidencing scientific activity mentioned in their CV and/or resume;
- 5) a document confirming at least B2 proficiency level in English or a declaration of the level of proficiency in English allowing education at the School;
- 6) the scan of a declaration by the planned supervisor, confirming their agreement to undertake the duties of a supervisor and of the number of doctoral students, for whom they perform the duties a designated supervisor, in accordance with the template constituting Appendix no.4 to the Resolution no. 17 of the Senate of the University of Warsaw of 20th January 2021 on rules of admission to doctoral schools at the University of Warsaw (the University of Warsaw Monitor of 2021, item 13, as amended), the candidate may also attach a scan of their planned supervisor's opinion and opinions of other academics about the candidate and their scientific activity and/or proposed research project;
- 7) the photograph of a candidate's face that allows for their identification;
- 8) a declaration confirming whether the candidate was or is a doctoral student or a participant of doctoral studies or whether they have initiated a doctoral dissertation process or whether proceedings to award them a doctoral degree have been initiated – and if yes, the title of their doctoral dissertation or the research project prepared by a candidate, including the name and last name of the candidate's tutor or supervisor;
- 9) a declaration confirming that they have reviewed the Resolution no. 17 of the Senate of the University of Warsaw of 20th January 2021 on rules of admission to doctoral schools at the

University of Warsaw (the University of Warsaw Monitor of 2021, item 13, as amended) and Articles 40 and 41 of the Code of Administrative Procedure;

- 10) scanned transcripts of records of the graduate and postgraduate studies or the uniform Master's degree studies, or equivalent documents (e.g. diploma supplement);
- 11) abstract of the master's thesis or master's project in English (up to 3,000 characters with spaces);

Evaluation criteria

- a) competencies to perform specific tasks in a research project (70% of the final score)
 - 3 points - very good
 - 2 points – good
 - 1 point – poor
 - 0 points - no competencies
- b) publication track record, including publications in renowned scientific papers / magazines (30% of the final score)
 - 4 points – prominent
 - 3 points - very good
 - 2 points – good
 - 1 point – poor
 - 0 points - no publication track record

Education program

The education lasts 4 years. It includes obligatory classes (no more than 300 hours in total during the whole period of education) and the implementation of an individual research program, carried out under the supervision of a supervisor. Beginning of education – October 1, 2021.

Scholarships

PRELUDIUM BIS doctoral scholarships shall amount to:

- PLN 5,000 gross gross per month, by the month in which a PhD student's mid-term evaluation is performed at the doctoral school and
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shall be awarded pursuant to the Act on Higher Education and Science of 20 July 2018.