University of Natural Resources and Life Sciences, Vienna
Department of Civil Engineering and Natural Hazards
Institute of Geotechnical Engineering

The Institute of Geotechnical Engineering of the University of Natural Resources and Life Sciences, Vienna offers

two 4-year PHD positions
Project Employment

The research project "**Creep Failure of Landslides in Partially Saturated Soil (CREPASS)**" is funded by the Austrian Science Fund (FWF). Candidates with knowledge and research experience in geotechnical testing, geohazard, constitutive modelling, and /or finite element method are encouraged to apply.

Key information

- Project start: 01.10.2022
- Project duration: 48 months
- Workplace: Institute of Geotechnical Engineering, Feistmantelstrasse 4, 1180, Vienna, Austria
- Gross salary per month: EUR 2,300.30
- Application deadline: 30.07.2022
- Supervision: Prof. Wei Wu

Host overview

The University of Natural Resources and Life Sciences, Vienna (BOKU) is one of the best universities for sustainability in Europe and brings together scientific, technical and socio-economic topics. BOKU sees itself as an innovation leader in the green economy, with the goal of integrating sustainability into all processes in society. The Institute of Geotechnical Engineering houses a well-equipped laboratory suitable for both research and training. It includes some testing facilities that are unique in Austria. The centrifuge facility with a maximum acceleration of 200g is one of its kind presently available in Austria. Other noteworthy unique testing devices include a double-cell unsaturated shear device and a high-speed ring shear device. For numerical analysis and simulation purposes, the institute hosts a great collection of in-house (FEM, SPH and SPFEM codes) and commercial software platforms (ABAQUS, FLAC3D, GEOSTUDIO ect). Furthermore, we have excellent computational facilities including workstations and access to the High-Performance Computing cluster in Vienna.

Project description

Large slow-moving landslides occur worldwide in mechanically weak stratum and are sensitive to hydrological forcing, especially in climate change scenarios. They may creep slowly with slide masses slipping a few centimetres to a few metres each year and can accelerate to fail catastrophically, resulting in destruction and casualties. However, the mechanisms regulating the slow-to-fast transition toward their catastrophic collapse in the in-situ scale remain elusive. As a result, the prediction of the long-term motion of creeping landslides and transient response to hydrologic triggers relies largely on simplified models based on in-situ monitoring observations and on viscous rheology, while the dynamic coupling of time effects and matric suction in variably saturated soil under time-variable hydrologic boundary conditions is often omitted.

This project aims to explore the slow-to-fast transition of a slow-moving landslide in variably saturated soil and develop a numerical model to describe the creeping movement of landslides, including the slow-to-fast transition of creep under time-variable hydraulic conditions. Two slow-moving landslides instrumented with advanced monitoring networks will be collected in a case history to study the effects of external forcing, e.g. rainfall, underground water table change, water level fluctuation at the toe etc, on its slow motion; Both laboratory and in-situ creep tests will be employed to study time-dependent and precursory acceleration behaviours of shear-zone soils; A numerical model with an advanced constitutive model, incorporating the effects of time and suction, will be developed to predict the slow-motion under time-dependent hydrologic conditions.

Job description

Two PhD students will be recruited for this project. The successful candidate for **position 1** will perform experimental investigation, including

- carrying out field work, including field survey of selected slow-moving landslide, in-situ creep tests, and sample gathering
- performing laboratory soil testing, e.g., suction-controlled triaxial creep tests and ring-shear creep tests

and the candidate for **position 2** will perform numerical simulation, including

- developing a hypoplastic constitutive model to include both time-dependency and unsaturation effects
- developing a numerical model advanced by phase-field to simulate localized failure of unsaturated slopes

Prerequisites

- Master's degree in civil engineering or geology engineering with specialisation in geotechnics or related area;
- Candidates from other scientific disciplines with experience in scientific testing are also welcome
- Demonstrated laboratory experience is required for **position 1**
- Demonstrated experience in undertaking research in the fields of constitutive modelling, finite element method, and/or multiscale modelling is required for **position 2**
- Demonstrated programming skills (C/C++/CUDA preferred) or field testing is a plus.

Further qualifications

- Excellent command of written and spoken English
- Outgoing personality with strong communication skills across different cultures
- Drive for excellence and scientific mind-set
- Ability to work in a team and independent working style

Application and additional information

Please send your application to the Institute of Geotechnical Engineering at geotech@boku.ac.at with the subject "**CREPASS-Position 1**" or "**CREPASS-Position 2**" alongside with the following documents:

- A detailed curriculum vitae or resume outlining the academic and industry achievements and the educational background. A list of publications and completed projects or products should be included if applicable
- A short cover letter of maximum one page introducing yourself and describing how the position matches your skills and interests

BOKU values diversity and inclusion and recognizes employment opportunities must not be limited by socio-economic background, race, religion or gender. Hence, BOKU actively encourages applications from women and candidates from culturally and linguistically diverse backgrounds and its selection panel strives for the gender balance among its employees.