Postdoctoral Researcher in 4D X-ray CT Imaging and THM Testing of Porous Materials

Two-year full-time position | Ghent University, Belgium | Shared collaboration with RWTH Aachen University, Germany | Start ASAP

Position type	Postdoctoral researcher
Duration	2 years, full-time
Main host	UGent Geotechnical Institute, Ghent University
Collaboration	Shared position with RWTH Aachen University
Research focus	4D X-ray CT imaging, image processing, and coupled thermo-hydro-mechanical testing
Start date	As soon as possible

Project context

Ghent University is seeking a highly motivated postdoctoral researcher or research engineer to join a newly funded research infrastructure project focused on the development and scientific use of a miniature thermo-hydro-mechanical (THM) triaxial device for in situ 4D X-ray CT imaging of porous materials.

The project will enable direct observation of microstructural changes, phase transitions, fluid redistribution, cracking, and degradation processes under controlled thermal, hydraulic, and mechanical conditions. The first applications will focus on geomaterials, frozen soils, and other climate-sensitive porous materials, while the platform will also be relevant to rocks, concrete, wood, asphalt binders, and related material systems.

The position is mainly hosted at the UGent Geotechnical Institute and will be closely connected to the Centre for X-ray Tomography at Ghent University (UGCT). It will be a shared collaborative position with RWTH Aachen University, where the selected candidate will benefit from the expertise of Prof. Florian Fusseis and his group in CT-compatible deformation rigs and operando 4D imaging.

Main responsibilities

- Support the design, adaptation, calibration, and validation of a CT-compatible miniature THM triaxial device.
- Develop and optimize experimental protocols for coupled thermal, hydraulic, and mechanical testing.
- Perform in situ and operando 3D/4D X-ray CT experiments on porous materials, with an initial focus on geomaterials and frozen soils at UGCT and synchrotron facilities.
- Develop image processing workflows for segmentation, registration, quantitative analysis, visualization, and interpretation of 3D/4D CT datasets.
- Link CT-derived microstructural information to mechanical and hydraulic behavior.
- Collaborate closely with UGGI, UGCT, RWTH Aachen University, and the broader international consortium.
- Prepare scientific publications, technical reports, user documentation, and experimental protocols.
- Support knowledge transfer and training of PhD students and researchers who will use the infrastructure.

Required profile

- A PhD in geotechnical engineering, civil engineering, materials engineering, mechanical engineering, geosciences, or a closely related field.
- Strong expertise in X-ray CT imaging, preferably including in situ 4D imaging.
- Proven experience with image processing and quantitative analysis of 3D datasets.
- Good programming or scripting skills, for example in Python, MATLAB, ImageJ/Fiji, Avizo, Dragonfly, or similar tools.
- A strong experimental background and willingness to work hands-on with advanced laboratory equipment.
- Excellent written and spoken English.

Desirable experience

- Triaxial testing, soil mechanics, rock mechanics, or porous media testing.
- Frozen soils, freeze-thaw processes, permafrost, or temperature-controlled testing.
- CT-compatible mechanical devices, in situ loading stages, or custom experimental rigs.
- Segmentation of multi-phase materials, including ice-water-soil or pore-solid-fluid systems.
- Digital volume correlation, pore-network analysis, crack analysis, or microstructural quantification.
- Synchrotron imaging experiments.
- CAD, mechanical design, instrumentation, or sensor integration.

We offer

- A full-time two-year position at Ghent University, with extended research stays and training opportunities at RWTH Aachen University.
- A central role in the development of a unique research infrastructure for 4D imaging of coupled THM processes.
- Access to the advanced CT facilities of UGCT and the experimental geotechnical facilities of UGGI.
- Close collaboration with international experts in 4D imaging, geomechanics, porous materials, and experimental rig development.
- A dynamic, interdisciplinary research environment with strong potential for high-impact publications and future career development.

Application procedure

Interested candidates are invited to submit the following documents:

- A motivation letter describing their relevant experience and interest in the project.
- A detailed CV, including publication list.
- Contact details of two referees.
- A short statement describing previous experience with experiment design, CT imaging, image processing, and experimental testing.

Applications should be sent to Prof. Mahya Roustaei, UGent Geotechnical Institute, Ghent University via mahya.roustaei@ugent.be

Please use the subject line: Application - Postdoctoral Researcher in 4D CT Imaging and THM Testing.

Applications will be reviewed continuously until the position is filled. The selected candidate is expected to start as soon as possible.