

PhD Position in Experimental Soil Mechanics

Faculty/department Civil Engineering and Geosciences/ Geoscience and Engineering
Level Master degree
Maximum employment 38-40 hours per week (1 FTE)
Duration of contract 4 years
Salary scale €2434 to €3111 per month gross

Project motivation

Soft highly organic soils are widespread in the foundation layers of the built environment all over the world. They contain organic matter, roots and fibres, which improve their mechanical response (Figure 1). However, these soils are extremely vulnerable to climate-related hazards. Increasing climatic stresses, such as heat waves, drought, and more frequent intense precipitation accelerate the degradation of organic soils, by increasing their drying and shrinkage rate above the water table (Figure 2(a)) and their decomposition rate under water, with gas generation and exsolution (Figure 2(b)). Both these mechanisms, drying and gas exsolution, ultimately contribute to significant land subsidence and reduction in available resistance. Quantifying the geotechnical engineering consequences of seasonally varying loads, including drying-wetting, temperature cycles and degradation, on organic soils is extremely challenging due to the complexity of a proper description of multi-physics gas-liquid-solid interaction. The project aims at deepening the understanding and the modelling of these coupled processes, to mitigate the climate-related hazard in natural soils and to assist in the design of durable innovative green solutions.



Figure 1. Organic soil samples with multiple fibrous structures

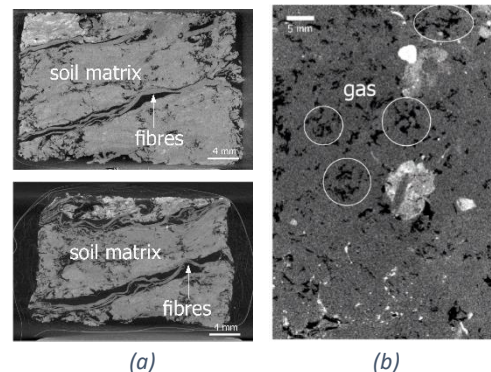


Figure 2. Drying and shrinkage (a) and gas exsolution (b) in organic soils

Job description

The twofold aim of the PhD project is:

- To experimentally investigate the coupled hydro-mechanical behaviour of organic soils subjected to cycles of environmental (e.g. drying and wetting, temperature) and mechanical loads. Soft soils reinforced with natural and artificial organic fibres will be tested, to quantify the role played by fibres, gas and fabric on their mechanical behaviour.
- To enhance existing constitutive models in order to include the effects of environmental factors such as drying-wetting cycles, temperature cycles and degradation in the prediction of their geotechnical properties.

The PhD candidate will benefit from advanced experimental laboratory facilities including unsaturated triaxial apparatus, biaxial plane strain apparatus, large-scale testing facility, geotechnical centrifuge and imaging facilities already available in the Faculty of Civil Engineering and Geosciences of TU Delft and partner institutions, and the support of experienced technical staff.

Requirements

Applicants should possess a MSc in Civil Engineering, Geoscience or related disciplines. Experience in experimental soil mechanics is essential, as well as an aptitude for scientific programming. Communication skills are relevant, and applicants should have a high level of proficiency in written and spoken English. The successful candidate is expected to cooperate with other members of the research team and external partners.

Conditions of employment

TU Delft offers PhD-candidates a 4-year contract, with an official go/no go progress assessment after one year. Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities, increasing from € 2434 per month in the first year to € 3111 in the fourth year. As a PhD candidate you will be enrolled in the TU Delft Graduate School. The TU Delft Graduate School provides an inspiring research environment with an excellent team of supervisors, academic staff and a mentor. The Doctoral Education Programme is aimed at developing your transferable, discipline-related and research skills.

The TU Delft offers a customisable compensation package, discounts on health insurance and sport memberships, and a monthly work costs contribution. Flexible work schedules can be arranged. For international applicants we offer the Coming to Delft Service and Partner Career Advice to assist you with your relocation.

Department of Geoscience and Engineering

The Department of Geoscience and Engineering resides within the Faculty of Civil Engineering and Geosciences and encompasses 5 sections: Applied Geology; Applied Petrophysics and Geophysics; Geo-Engineering; Resource Engineering; and Reservoir Engineering. Current collaborations between Geo-Engineering and the wider Faculty include the Section of Offshore Engineering, and the Departments of Structural Engineering, Hydraulic Engineering, and Geoscience and Remote Sensing. The Section of Geo-Engineering has 12 full-time and 6 part-time academic staff, and ~40 PhD and Post-Doctoral researchers. Areas of expertise include soil mechanics, dykes and embankments, foundation engineering, underground space technology, engineering geology, and geo-environmental engineering. There are extensive experimental laboratory facilities, including large-scale soil-structure interaction testing facilities and a geotechnical centrifuge, as well as excellent computing facilities including access to national High-Performance Computing networks.

Additional information

For more information about the position and informal discussion please contact:

- Dr. Stefano Muraro S.Muraro@tudelft.nl
- Prof. Dr. Cristina Jommi C.Jommi@tudelft.nl.

Application procedure

Are you interested in this vacancy? Please apply before **17 October 2021** via the TU Delft website ([Job details \(tudelft.nl\)](https://www.tudelft.nl)) and upload:

- a detailed CV
- motivation letter (1 page maximum)
- contact details of 2 referees