



36-month PhD research position at University of Dundee
*Enhanced mechanical strength of vegetated soil through
transpiration*

Post description:

The University of Dundee (UoD) seeks to recruit a PhD student for a period of 36 months to explore the hydro-mechanical behaviour of unsaturated rooted soil under the effects of transpiration. The successful candidate will predominantly implement the experimental work at the Geotechnical Laboratory at the UoD and the laboratory and field facilities at the James Hutton Institute (JHI; the largest agricultural/environmental research institute in the UK). The candidate will be directed by two supervisors with a background in Geotechnical Engineering (Dr Anthony Leung at UoD; primary supervisor) and Plant and Soil Science (Dr Glyn Bengough at JHI (Invergowrie); co-supervisor).

The studentship is only open to **UK and EU nationals**. The full award will cover tuition fees at the Home/EU rate and will provide an annual stipend at standard EPSRC rate.

Candidates should hold a minimum of a UK 2.1 Honours degree, or equivalent, in a relevant scientific or engineering subject. Due to the interdisciplinary nature of this project, a wide range of subjects may provide an appropriate background, including Civil and Mechanical Engineering, Forestry, Physics/Physical Sciences, Physical Geography, Earth and Environmental Sciences, Biophysics, and Environmental Biology/Biological sciences.

How to apply:

Application must include the following Information:

- A full CV (including transcript of marks from their first degree);
- A letter of motivation stating (i) why you are interested in pursuing a PhD degree; (ii) why you are interested in working on this project; (iii) what you would bring to the project; and (iv) what you would hope to gain from the project

The application should be emailed to Dr Anthony Leung (a.leung@dundee.ac.uk) before **25th July 2014, 17:00pm GMT**. Applicants will be shortlisted and an interview will be arranged in **August 2014**. The expected start date of the post will be **October or November 2014**. *Note that application after the deadline will still be considered if no offer has been made on the basis of applications received by the deadline.*

Any enquiries with regard to the PhD position can be directed to Dr Anthony Leung.
Email: a.leung@dundee.ac.uk.

Research excellence of UoD and JHI

Dundee has particular strengths in Geotechnical physical modelling (Beam centrifuge) and Earthquake geotechnics (centrifuge mounted earthquake shaker) and has recently received nearly £1 million to invest in specialist geotechnical testing and characterisation facilities. The Division of Civil Engineering, where the PhD candidate will be registered, was rated top in Scotland at the last Research Assessment Exercise.

The research groups at the UoD and the JHI have a strong track record in the area of soil-root-water interaction and its application on geotechnical engineering. We have worked on root reinforcement of slopes, physical modelling of scaled slopes in the Dundee geotechnical centrifuge, and the impacts of climate change on forest management.

The JHI recently hosted the 8th Symposium of the International Society for Root Research, at the UoD: involving more than 320 scientists from 38 countries.

Project description:

Climate change threatens the stability of infrastructure slopes, which form a large proportion of the European transport network. Slope failures due to increasing intense rainfall have already resulted in significant socio-economic loss across the Europe. Slope revegetation is identified as a more environmentally friendly and aesthetically pleasing stabilisation technique, when compared to other high-embodied-CO₂ methods such as sprayed concrete cover. However, there are series of research questions at the interface of unsaturated soil mechanics and plant biophysics relating to this application that, if answered, will allow better engineered and widespread deployment of this 'green' solution. Many of these questions relate to the effects of plant transpiration on slope stability.

The aim of this PhD project is to develop and apply new testing methods to quantify the effects of plant transpiration on the hydro-mechanical behaviour of vegetated soil. The research will be predominantly based on laboratory testing to identify the effects of transpiration-induced suction on mechanical shearing and its induced volumetric behaviour of unsaturated vegetated soil. Detailed soil-root interaction including interface sliding and root straining will be investigated. Key soil properties (such as water retention curve) that govern the root-water uptake capability of vegetated soil will also be identified. Output from this research will provide a comprehensive high-quality dataset that could help improving the understanding of soil-water-root interaction.