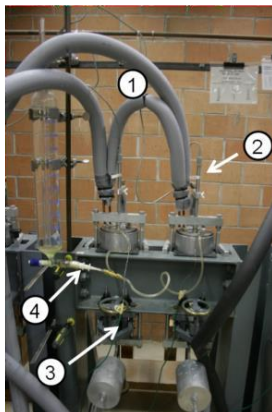


## Effect of varying temperature and degree of saturation on soils THM behaviour: application to energy geostructures

Thesis supervised by B. Loret and A. Di Donna

### Research topic:

Energy geostructures are structures in contact with the ground having the **double role** of providing structural stability and exchanging heat with the ground for heating and cooling of buildings and infrastructures, based on the principles of **low enthalpy geothermal systems** [1]. Technically, they are structures that apply a **mechanical** and a **cyclic thermal loading** on the soil where they are installed. The possibility of using energy geostructures as ground **heat storage** systems could lead to more significant temperature variations. The response of the soil to this solicitation must ensure, on the one hand, the structural stability, and on the other hand, the energy efficiency of the system. Most of energy geostructures involve (at least partially) the **unsaturated** upper portion of the soil profile, i.e. the zone above the phreatic surface where pore-water pressure is negative (suction).



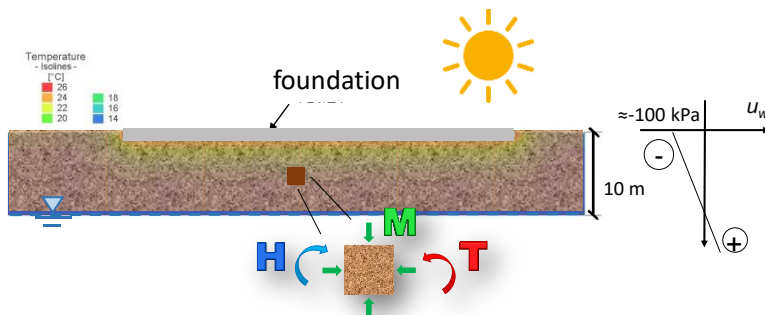
The goal of this project is to characterise experimentally the **coupled multiphysical** behaviour of unsaturated soils subjected to varying temperature and degree of saturation typical of energy geostructures, with the purpose to optimise their performance.



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### Candidate profile:

The candidate should have a background in civil and geotechnical engineering as well as in soil mechanics. Basic knowledge in mechanics of porous media, heat transfer mechanisms in porous media, constitutive modelling of geomaterials and experimental techniques used to test them in the laboratory is also required. Throughout the project, the candidate will anyway benefit of the expertise and support of the supervisors on all these aspects. Curiosity, interest for the work to be performed and willingness to learn are as well essential to accomplish the project. English level required : B2.



### Contact:

Interested students should contact and send their CV to:  
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[1] Laloui L, Di Donna A. Energy geostructures: innovation in underground engineering. ISTE Ltd and Jihn Wiley & sons Inc.; 2013.