

PhD position at University Savoie Mont Blanc
Influence of hydric sollicitation on earth structure damage
(Influence des sollicitations hydriques sur l'endommagement du bâti en terre)

1/ Context

Raw earth was traditionally employed for construction through many techniques: cob, mud bricks, pisé, etc. Abandoned since the advent of industrial techniques in the mid 20th century, this building method has nevertheless great advantages for savings of manufacturing energy and raw materials. Indeed, the material can be found locally without needs of transport and is fully recyclable. These characteristics make raw earth constructions more and more relevant in the actual context.

However, one of the most limitless properties for the development of this building method is the sensibility to water of the material, even if this influence on the mechanical properties still suffers from a lack of characterization.

2/Objectives

This PhD project thus proposes to focus on the influence of hydric sollicitation on earth structure damage and aims to determine, understand and reproduce this effect on its elasto-plastic behavior. Notably 3 questions would be investigated:

- What is the quantitative effect of suction on the mechanical behavior (elastic properties, plasticity and damage)?
- Does the mechanical behavior undergo irreversibility when earth is subjected to hydric cycles?
- Is it possible to efficiently model the hydro-mechanical behavior of an earthen structure by using unsaturated soil mechanics approach?

2/Works of the PhD student

The main part of the PhD will be dedicated to the experimental investigation of the hydro-mechanical behavior of compressed earth. This will be led at the material scale in a first step and at the structural scale in a second time.

In addition, existing models of unsaturated soils mechanics would be adapted to the building application. Finite element simulation will be led with the aim to perform predictive simulations of the mechanical capacities loss/gain for unfavorable/favourable hydric conditions.

Different hydric sollicitations would be considered, such as a water vapor transfer across the wall, capillary pathology, seasonal variation of relative humidity, etc.

The student will be encouraged to valorize his/her work by oral presentation in national/international congresses, and by the redaction of scientific publications.

Candidate's profile

The candidate should hold a master degree in civil or mechanical engineering, with strong skills in continuum mechanics and/or geomechanics and/or structures mechanics and/or porous media.

The candidate should have a real interest for both experimental and numerical work. Good communication skills and autonomy are also required.

Job details

Type of contract: 3-year contract, starting from September-October 2017

Host laboratories: LOCIE laboratory, UMR CNRS 5521, Université Savoie Mont Blanc
<http://www.polytech.univ-smb.fr/index.php?id=2884>

Gross salary: 1768 euros € per month.

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Contact possible until may 20th.