Post-doc Position

Characterization of water distribution evolution within a specimen of sapphire spheres with x-ray tomography during hydraulic loading – Experiment and comparison with DEM modeling

Project summary

The project concerns the characterization of the evolution of the water distribution within a specimen of beads during drying and wetting paths. The sample used will be made of polydisperse sapphire spheres with a sphericity better than the micrometer. The sample will be prepared in a water-saturated state, then progressively dried (and then later re-wet) in small steps under suction control. This means that the main drying path and the main wetting path will be tracked (a possible extension of the program, that depends on the results obtained, is be to study scanning paths and a second cycle of drying wetting). At each step of this drying and wetting processes, the sample will be imaged using x-ray computed tomography and the resulting images will be analyzed to study the evolution of the water distribution. The three phases will be first separated: the solid phase will be first subtracted by using a locally-developed tool that uses the *a-priori* knowledge of the sphericity of the particles to accurately account for their x-ray attenuation, leaving only the two fluid phases to be separated using their grey values. The final goal will be to provide a quantitative measurement, for each investigated state, of the number of fluid clusters, their volume, their shape, their location and the number of grains connected by each water cluster. These data will be compared with the results of DEM modeling obtained by a PhD student currently in the third year of his PhD and will be used to quantify the internal capillary forces induced by the liquid bonds within the media. The applicant will benefit from the experience of our team in image analysis and DEM modelling of unsaturated soil mechanics.

Location and practical aspects

The successful applicant will be hosted by the laboratory 3SR in the geomechanical team. He/she will work under the supervision of Dr S. Salager and Dr E. Andò in Laboratoire 3SR.

In addition this project will be done in collaboration with Tokyo University (Dr Y. Higo) and with B. Chareyre (Laboratoire 3SR) for comparison with DEM modeling.

The gross salary will be 2518 euros/months, equivalent to a net salary of 2037 euros/month.

Qualifications of the applicant

We are looking for a postdoctoral researcher with skills in experimental (geo-)mechanics. Knowledge of x-ray tomography and image analysis is appreciated. The candidate should hold a PhD in geomechanics, micromechanics, mechanical engineering or similar field, and must be familiar with the concepts of geomechanics. Knowledge of the framework of unsaturated soil mechanics is an asset, as well as experience in computer-aided design software. Close interactions with the researcher in charge of the computational aspects of the project will require basic knowledge in computational mechanics.

Applications

Interested candidates should send their CV and cover letter to Simon Salager simon.salager@3sr-grenoble.fr, copying Yosuke Higo higo.yohsuke.5z@kyoto-u.ac.jp, Edward Ando' edward.ando@3sr-grenoble.fr and Bruno Chareyre bruno.chareyre@3sr-grenoble.fr.