Post-Doctoral Position at Grenoble University
« Modeling of internal erosion by suffusion in soils »

Project summary

Internal erosion by suffusion may develop in the bulk of a soil volume when the particle size grading and the porosity are such that the fine fraction of the soil can migrate through the skeleton formed by the coarse fraction. During suffusion, fine solid particles are firstly detached by the action of water seepage, secondly transported, and finally these transported particles may be redeposited (filtered) within the interstitial space of the soil itself, possibly resulting in a clogging of this interstitial space. Suffusion is generally considered as a phenomenon characterized by a low kinetic. However recent experimental results showed that this last step of filtration and clogging may be at the origin of a second erosion phase, characterized by a high kinetic, and very aggressive for the soil micro-structure. Therefore this second erosion phase may be damaging for the durability of water retaining structures made of soil, and would allow little time to take actions.

The objectives of the research work developed by the successful applicant will be to characterize conditions of transition between such successive erosion phases, and to improve the understanding and the description of the second quick and aggressive erosion phase. Investigations will be principally based on numerical simulations performed with the coupled DEM-PFV method (discrete element method – pore network finite volume) implemented in the code YADE and developed at 3SR Laboratory. These numerical investigations will benefit from laboratory tests performed in GeM Institute where experimental devices (erodimeter) dedicated to the characterization of suffusion have been developed.

Location and practical aspects

The present offer is a 1 year post-doc fellowship starting in 2014 (gross salary: 2518 €/month). The successful applicant will be based at 3SR laboratory (Grenoble University, France) where he will conduct the numerical approach. He will also perform visiting periods at GeM institute (Nantes University, site of Saint-Nazaire, France) to carry out laboratory tests on an erodimeter.

The numerical method DEM-PFV has already been developed and the experimental erodimeter device is existing. Consequently the successful applicant will focus on performing the numerical experiments and laboratory tests, and on the analysis and the interpretation of the data.

Qualifications

Candidates should have a strong knowledge and experience of numerical modelling and computation. They should also be confortable with laboratory experiments and self-sufficient regarding practical experimental tasks.

A background in hydro-mechanical behaviour of porous media or fluid-solid interactions will be greatly appreciated. Knowledge in micromechanics of granular matter will be also appreciated but is not essential.

Applications

Interested candidates should send their CV and cover letter by e-mail to:

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Applications will close as soon as a suitable candidate is found.