

Postdoctoral position: Modeling the erosion of a granular soil with cohesion

*Position open from January 2014
at IRSTEA, Aix-en-Provence, France
www.irstea.fr*



The Geomechanics Group at IRSTEA in Aix-en-Provence is pleased to invite applications for the position of a postdoctoral researcher in numerical modeling of erosion in a granular soil with internal cohesion for an initial period of 1 year with the possibility of an extension. The successful applicant will develop a numerical tool to study the elementary processes leading to erosion at the surface of a cohesive soil. The work will be conducted in direct collaboration with F. Radjai at University of Montpellier and with J.-Y Delenne at INRA Montpellier in the frame of project ESCAPE funded by the Provence Alpes Côte d'Azur Region (Program APEX).

This project aims at analyzing the basic mechanisms involved in erosion of cohesive soil by a fluid flow. While granular soil erosion is rather satisfactorily accounted for by the Shields diagram, the case of cohesive soils is poorly understood and the prevailing approach is purely empirical but rather unsuccessful and removed from the actual mechanisms. Along with experimental work to be carried out with model materials by a PhD student, the post-doctorate fellow will address this issue from a numerical point of view. The objective is to couple the Discrete Element Method (DEM) and the Lattice Boltzmann Method (LBM). The first method will be used to model the solid material made of grains between which it is possible to generate adhesive interactions to simulate a cohesive soil. The second one allows resolving the Navier-Stokes equations for the surrounding fluid, outside the material and inside the interstitial space. The modeling will be first validated after comparison with recent experimental results in a situation with no adhesive interactions between grains, which will be introduced in a second time. Once completed, the model will provide a valuable tool to conduct a comprehensive parametric study of various elementary processes of erosion to identify the basic ingredients for subsequent theoretical modeling of physically sounded erosion laws.

Required knowledge and skills: Requirements for the position are a doctoral degree with skills in numerical modeling of granular systems or/and computational fluid dynamics. Previous experience in DEM and/or LBM programming would be appreciated.

Salary and term: Salary is in accordance with French public service rate (about 2600 euros/month). The position is scheduled starting anytime from January 2014 for a minimum period of 12 months.

Location: Aix-en-Provence center of IRSTEA (National Research Institute of Science and Technology for Environment and Agriculture).

Contacts:

Pierre PHILIPPE, IRSTEA, Aix-en-Provence - pierre.philippe@irstea.fr

Stéphane BONELLI, IRSTEA, Aix-en-Provence – stephane.bonelli@irstea.fr

Franck RADJAI, LMGC, Montpellier - franck.radjai@univ-montp2.fr

Jean-Yves DELENNE, INRA, Montpellier - jean-yves.delenne@univ-montp2.fr