

PhD position at the University of Lorraine

Hydrodynamics and particle transport modelling in preferential flow

A PhD opportunity in the research field *Hydrodynamics and Transport Processes* is available at GeoRessources laboratory of the University of Lorraine. Applications are invited for a three years PhD scholarship in the field of *Fluid Mechanics* and *Solid-Fluid Interaction*.

The role

The applicant will carry out fundamental and applied research in the field of fluid mechanics and granular mechanics. The research will involve laboratory experiments, numerical simulations and analytical developments. The aim of this research is: (i) to identify the mechanisms governing transport and deposition of particles in preferential flow and (ii) to built up models in order to better predict the dynamics of particles immersed in moving fluids using a multi-scale approach (contact dynamics, fluid mechanics, solid-fluid interaction). The experiments will investigate the influence of particle properties (density, size, geometry) and of the topology of the fracture (wavelength, amplitude and phase of the sinusoidal length of the walls) on the flow dynamics. The numerical study will consist in implementing a conceptual model coupling a discrete element method (DEM) and a lattice Boltzmann method (LBM). Finally, the analytical study will focus on describing the dynamics of non-spherical particles when inertia of both the particle and the fluid is non-negligible. The final goal is to characterize the conditions governing transport and deposition of immersed particles in order to better predict erosion or clogging phenomena in geological systems.

The applicant

Applicants need to satisfy the eligibility criteria for PhD enrolment at the RP2E Doctoral School (see below). Backgrounds in *hydro-geology, civil and environmental engineering, fluid mechanics, applied mathematics, numerical methods* and *programming* will be appreciated.

The successful applicant will demonstrate a strong commitment to academic research in the proposed field. He/she will have excellent written and oral communication skills. He/she will be willing to create and develop original approaches to tackle open questions.

Research environment

The PhD will be supervised by Dr M. Buès and Dr. L. Scholtès. The applicant will join the Multi-scale HydroGeomechanics (HGM) group at the GeoRessources Laboratory / University of Lorraine. The HGM group comprises 8 academics and 10 postgraduate researchers. It is an emergent, vibrant and pro-active group in the fields of *Geomechanics* and *Transfer in Porous Media*. For its study, the applicant will benefit from dedicated experimental facilities as well as homemade and open source numerical codes.

The opportunity

It is a three years full-time position, financed by a national research fund with a tax-free stipend of approximately €15,000/year. The position is available now.

Application

Applications should be sent by email to Dr Luc Scholtès luc.scholtes@univ-lorraine.fr. They should include a Resume and a Cover Letter. In their Cover Letter, applicants are invited to include a short research statement (about 250 words) explaining how they understand the issues related to transport

phenomena in porous media and the significance of solid-fluid interaction in the overall process.

Online info:

RP2E doctoral school: <http://www.rp2e.univ-lorraine.fr/index.php?id=41>

HGM: <http://georessources.univ-lorraine.fr/content/hydrogeomecanique-multi-echelles-0>

GeoRessources: <http://georessources.univ-lorraine.fr/>

University of Lorraine: <http://www.univ-lorraine.fr/>