Post-doc position in geomechanics

Influence of inherent rock heterogeneity and property variability on underground rupture based on a multi-scale hydro-mechanical numerical approach

Supervisor:
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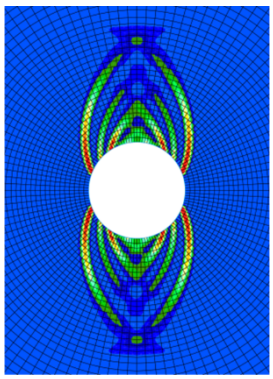
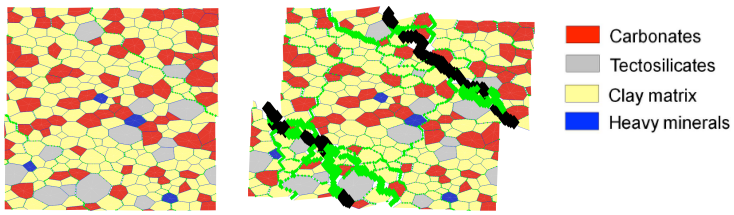
Project description

Objectives:

The goal of this project is to investigate the multi-scale behaviour of clay rock, going from microscopic to macroscopic scale. Rock materials are studied for various geological and geotechnical applications. Among them, deep geological structures and underground drillings require to predict the deformation, strength, and failure of the surrounding rock. The latter are of high importance and require a good understanding of the material behaviour. Based on experimental observations, clay rocks can exhibit a complex structure which is heterogeneous at different scales. The heterogeneity is observable at large macroscale but also at smaller levels of the material structure (from millimetric to microscopic scales). Various scientific questions have risen recently on how microstructural characteristics of heterogeneous materials can be considered at larger scale, and enrich macroscale modelling. Furthermore, the heterogeneity and variability of clay rocks' properties have an influence on their behaviour under solicitation.



Underground deformation



Microstructure deformation

Method:

The research will be based on multi-scale approach and numerical method allowing to model microstructure media in a double-scale framework (FEMxFEM). The objectives are related to three main aspects: the heterogeneity and variability characterisation, the predictions of deformation or rupture, and the hydro-mechanical behaviour. The modelling requires taking into account microstructural information defined experimentally (the type of mineral phases, their shape, their surface density, etc.).

Candidate profile

The post-doctoral position is available at 3SR Laboratory (P. Bésuelle, CNRS, UGA). Applications are welcome from PhD graduated in the areas of civil/mechanical engineering and geomechanics. Knowledge in mechanics of porous media, constitutive modelling of geomaterials and interest for numerical methods is required. The 1-year project will give the applicant opportunities to develop various technical skills (advanced numerical methods, poromechanics, elastoplasticity, damage approach, etc.) and to integrate a dynamic geomechanics network having a large experience in numerical modelling. The successful applicant will use and improve the non-linear finite element code LAGAMINE.

Application

Applications should be submitted by the 30th of November 2018 by emailing a CV and their academic grades (detail of marks) to the supervisor. Any additional document relevant for the application can also be transmitted, especially for international applications.