



Proposition de post-doctorat

Vacant Research Associate Position

**Duration : 1 year + 1 year
September 2019 to August 2021**

DISCIPLINES

Fluid mechanics, digital image correlation, granular materials, soil mechanics, microstructure

TITLE

Effect of Microstructural factors on deformation and fluid transport in partially saturated low permeability materials

SUMMARY

Storage of energy surplus (converted in CH₄) into underground reservoirs is one of the current solutions to solve irregularities between energy production and needs. For short or long term storage, the interface between the reservoir material and the caprock is a potential area for critical hydromechanical behavior due to different materials and fluid properties. This interface generates possible instabilities and environmental risks so the characterization of its mechanical properties is therefore a high scientific challenge.

The topic deals with the investigation of the **mecanisms of deformation at different fluid interfaces at the microstructure scale of low permeability materials**. In particular, it focuses on the experimental identification of quantitative interactions between the microstructure, the fluid flow and the deformation of low permeability clayey materials.

At the laboratory scale (0.5μm-cm), analogous materials of low permeability clayey soils will be used to study their response to hydraulic loadings and to hydro-mechanical biaxial loadings. The evolution of the microstructure and the fluid's flow will be followed by high speed cameras on the sample cell surface of a new transparent biaxial apparatus adapted to unsaturated soils. Full-field measurements of displacements, strains, fluid distributions and microstructure changes will be quantified by digital image correlation and mark tracking.

Two experimental campaigns will be hold on two different materials with low hydraulic conductivities, to investigate separately chemo-mechanical and physico-mechanical couplings between fluids and microstructure.

The challenge of this experimental activity is multi-fold, from the preparation of analogous geomaterials to the experiments and the development of a new

methodology to compare quantitatively strains, fluid distribution and microstructure in low permeability materials.

The expected results will strongly improve the understanding of quantitative relationships between fluid interfaces and deformation of low permeability geomaterials which constitute the caprock of underground reservoirs.

KEY WORDS

Low permeability materials, digital image correlation, interface, microstructure, deformation, fluid

REQUIRED COMPETENCES

- Strong competences in fluid mechanics, soil mechanics, engineering geology and programming ; knowledge in digital image correlation will be appreciated.
- Ability to work in a group
- Ability to assist with the supervision of master students, produce reports and presentations for project meetings and publications

ADDITIONAL INFORMATION

The study is developed within the framework of the ANR project called «STOWENG» underground STORage of reneWable ENergies in low permeability Geomaterials. The candidate will be actively included in the team in charge of STOWENG's management.

STARTING DATE

2019-09-01

SALARY

28 000 euros / year for one year, renewable for one year

REFEREES TO CONTACT

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