Laboratoire de Mathématiques et de leurs Applications de Pau CNRS-UMR 5142
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Date: February 15th, 2024

POST DOCTORATE POSITION

Subject: Modeling and development of a code for numerical simulation of Underground Hydrogen Storage (UHS)
Laboratory: **LMAP** UMR CNRS 5142 – Pau, France.
Location: **Université de Pau et des Pays de l'Adour**, France.
Opening: : 2024, as soon as possible.
Duration: 1 to 2 years.
Contract: Fixed-term work contract for a duration of 12 months (renewable once). Salary: approx. 2300 € net per month including healthcare cover.
Qualifications: PhD or equivalent in applied mathematics, Fluid Physics/Mechanics or computational engineering and a strong background in numerical modeling, discretization methods, and scientific computing. Computer and programming skills in C++ and/or Matlab.
Knowledges in numerical simulation of flow and transport in porous media and interest in interdisciplinary cooperation will be appreciated.
Contact: Brahim Amaziane, brahim.amaziane@univ-pau.fr and Fabrice Golfier, fabrice.golfier@univ-lorraine.fr
This study is part of a collaboration between the universities of Pau (LMAP), Lorraine (GeoRessources) and IFP Energies nouvelles as part of the ANR project HyStorEn: Hydrogen storage in an underground hydrosystem: physicochemical behaviour, monitoring and environmental impact.
To apply: send your CV in English or French including your background in numerical analysis, discretization methods and scientific computing, a list of your publications, and a cover letter explaining interests and goals. Reference letters will be appreciated. **Applications should be submitted as a single PDF document by e-mail to** brahim.amaziane@univ-pau.fr and fabrice.golfier@univ-lorraine.fr
The review of applications will start on March 1st, 2024, and will continue until the positions are filled, but early application is strongly encouraged.

Post doc research project:
Hydrogen stands poised as a pivotal component in shaping the future energy mix and offering promising prospects as a clean and sustainable vector for storing renewable energy and catalyzing industrial decarbonization efforts. This promotes the development of large-scale hydrogen storage solutions to meet energy demands and mitigate the intermittency of wind and solar energy.
In contrast with surface storage facilities limited by their capacity, subsurface hydrogen storage in salt caverns or porous reservoirs has the potential to supply energy on such a large scale. Major concerns remains, however, about the biogeochemical conditions which could affect hydrogen or

the mixture of gas stored within the reservoir itself or during H_2 leakage trough upper shallow aquifers.

The aim of this post-doctoral project, is to model the behavior of H_2 storage in porous media at a reservoir scale. One of the challenges is to take into account the bio-geochemical reactions that may occur in the reservoir during the on-site operations. This approach will be carried out in a unique pilot natural site (underground cavities in Saint-Emilion, SW France), which will be used as the model of formations above a H_2 storage.

The objectives of this project are twofold: (a) to elaborate a mathematical model of population kinetics for hydrogenotrophic microorganisms under the conditions of shallow aquifer and vadose zone in the Saint-Emilion site, France and (b) to develop in the framework of **DuMuX** (C++) or **MRST** (Matlab) a code to couple two-phase flow, transport, microbial population dynamics, and biogeochemical reaction processes in deformable porous media. Due to the size of the considered problems and consequently the long computational time, high performance computing (HPC) will be used. The simulator thus constructed is designed to be easily used by the scientific community and to provide users with efficient algorithms for the simulation of UHS processes in porous media.