Imperial College London

DEPARTMENT OF EARTH SCIENCE AND ENGINEERING

PhD Studentship: Numerical Modelling of Cyclic Subsurface Fluid Storage

Background: Numerical modelling of cyclic subsurface fluid storage is important in the context of the green transition as it addresses key challenges related to renewable energy integration, seasonal energy storage, greenhouse gas reduction, grid stability, and the advancement of technology for sustainable energy solutions.

Description of Research Project: We are currently recruiting a PhD student to conduct research that will contribute to understanding the behaviour of subsurface rocks during cyclic subsurface fluid storage. The objective of this project is to develop methods to computationally model the effect of multi-scale heterogeneities on rock fracturing processes. The main goal of the project is to numerically model, using rigorous principles of rock and fracture mechanics, the coupled deformation of subsurface rocks, while quantifying the variables that affect damage, fracture nucleation and growth, fracture aperture changes, and matrix permeability changes during cyclic storage of compressed air. Within its scope, the project also proposes to perform a Field Study Case incorporating all existing information of a potential storage site and its analysis within the parametric analysis developed during the first stage. This will constitute an example application of the parametric study developed during the first phase of the project, which will be designed so that it can serve as a generic de-risking methodology for cyclic fluid storage in porous media.

Requirements: Applicants should have an undergraduate degree in engineering, physics, geophysics, applied mathematics, material science, computer science, or related. Experience in one or more of the following is desirable:

- Mechanics: knowledge of continuum and fluid mechanics.

- Numerical methods: knowledge of computational methods, such as numerical modelling, mathematical modelling, scripting, machine learning.

- Scientific programming: ability to program in a scientific programming language such as C/C++, Python, Matlab.

- Communication: excellent writing and presentation skills.

Other details: This is a 3.5-year PhD studentship, paying a non-taxable bursary, and covering UK tuition costs. The studentship is funded through an EPSRC's Industrial CASE partnership with BP Technology centre, UK. The student will work under the supervision of Dr. Adriana Paluszny from the Rock Mechanics Group at Imperial College London, and includes interactions with Dr Ronny Pini from the Department of Chemical Engineering. The student is expected to spend at least three months at BP premises during the studentship, where they will also be involved in supporting reservoir simulation activities.

Application Procedure: Please apply online at: https://www.imperial.ac.uk/study/pg/apply/how-to-apply/apply-for-a-research-programme-/. The closing date for applications is 15th June 2024.

Consistently rated amongst the world's best universities, Imperial College London is a science-based institution with a reputation for excellence in teaching and research.

Applications from women and underrepresented groups are particularly encouraged.