

PostDoc
Delft University of Technology

Computational Modeling of CO₂ Sequestration

Department/Faculty: Computational Mechanics, Civil Engineering and Geosciences

Contract: PostDoc: One year, extendable to two/three years.

Salary and Conditions: See www.vacaturesindelft.nl

Job Description

Carbon dioxide is one of the primary greenhouse gases contributing to global warming. Studies have shown that reducing carbon dioxide emissions by capturing and storing the emissions underground in a process called sequestration is vital to the wellbeing of our planet. However, one of the biggest risks of any sequestration project is the potential leak of the injected gas back into the atmosphere through abandoned wells or underground cracks.

The objective of this research work is to develop a computationally efficient multidomain numerical tool for the evaluation and monitoring of long term environmental and structural impact of CO₂ sequestration at a regional level. The focus of this work is to develop a computational model for crack initiation and propagation due to regionally induced thermo-hydro-mechanical forces and the establishment of innovative numerical procedures for solving the resulting governing equations. Modeling of crack initiation will be made on the basis of accurate description of the mechanical and gravitational forces, and on the mechanical properties of the involved materials. Proper rules for crack initiation, direction and crack size will be developed on the basis of fracture mechanics and material nonlinearity. Crack propagation due to mechanical and buoyancy forces will be modeled on the basis of the Partition of Unity Method, PUM. Regional differential settlement and subsidence will be modeled on the basis of multidomain approximation. The models will be implemented in the existing finite element codes JEM/JIVE.

This research project is part of three parallel projects, funded by SenterNovem of the Dutch Ministry of Economic Affairs. The project is immediately available.

Requirements

The PostDoc candidate should have a PhD in civil engineering, computational geoscience, mechanical engineering or computational physics with a strong background in solid mechanics, porous media and finite element modeling and implementation, and a strong interest in multi-physics modeling and analysis.

The candidate should have good skills implementing the finite element method and programming using, preferably, C++. Moreover should possess good command of English language and affinity to writing scientific articles, and be able to conduct research both independently and in collaboration with team members of the university involved in the project.

Conditions of Employment

PostDoc: One year, extendable to two/three years.

Subject to satisfactory performance, the appointment shall be extended for the duration mentioned above. TU Delft offers an attractive benefits package, including a flexible work week, free high-speed Internet access from home, and the option of assembling a customized compensation and benefits package (the 'IKA'). Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities.

Information and Application

For more information about this position, please contact Prof. dr. ir. L.J. Sluys, Phone: +31-(0) 15- 2782728, e-mail: L.J.Sluys@tudelft.nl, or Dr. R. Al-Khoury, e-mail: r.i.n.alkhoury@tudelft.nl (see www.citg.tudelft.nl). To apply, please e-mail a cover letter and the following documents to Dr. Al-Khoury (the call is open): a CV, details of at least three persons that can provide a reference (name, position and e-mail address of references). TU Delft is an equal opportunity employer.