

PhD position

PhD position in efficient and robust thermodynamic calculations

Title:

Complex phase behavior computations for subsurface CO₂ injection on GPU platform

Project description:

Phase behavior plays an important role in subsurface flow and transport of large-scale CO₂ sequestration operations. Due to the high uncertainty of subsurface characterization, general modelling of such processes requires running large ensembles of models leading to prohibitive CPU runtimes for full-physics simulation. Proxy-models with simplified physics often fail to capture important physical phenomena and lead to inaccurate results. Modern computational architectures (such as GPU systems) open new opportunities to implement highly efficient and accurate phase behavior evaluations. Nevertheless, to adapt existing CPU-centric approaches to multicore architectures, a complete re-design of conventional phase behavior computation methods is required.

This project is a joint effort between University of Pau and TU Delft. It is dedicated to the development of robust and efficient algorithms for predicting of phase behavior and properties for mixtures including brine and composition of gasses relevant to CO₂ sequestration in the depleted gas fields and deep aquifers. All algorithms will be designed for performing at both CPU and GPU architectures based on the modern Equations of State. The resulting library will be tested for reservoir simulation of synthetic and real CO₂ sequestration projects. The PhD candidate will be supervised and located at University of Pau and will be working in a close collaboration with another PhD candidate supervised and located at TU Delft.

Requirements:

We welcome all applicants from various engineering disciplines, including (but not limited to) Civil, Chemical, Mechanical and Petroleum Engineering, as well as Applied Mathematics. Our *strict* requirement is that the candidates must have very strong scientific skills on calculus, matrix algebra, computational methods, numerical analysis and in computer programming. Candidates with good background on thermodynamics and optimization methods will be preferred. Soft skills, including communication skills (both written and spoken English, knowledge of French is a plus) as well as team player attitude, are very important.

Starting date:

The project must start before September 1, 2022.

Application:

The applications must be sent to:

Dan Nichita, University of Pau, e-mail: dnichita@univ-pau.fr

and

Denis Voskov, TU Delft, e-mail: D.V.Voskov@tudelft.nl