



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

**Numerical study on the convection dynamics
of CO₂ in deep saline aquifer**

By

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Abstract

Carbon Capture, Utilization, and Storage (CCUS) is one of the key and viable technologies to mitigate carbon emissions at large scale. Particularly, the sequestration of CO₂ in deep saline aquifer has demonstrated great potentials for carbon storage. After injection, CO₂ spreads under the barrier of the low-permeability cap rocks in a supercritical state due to buoyancy, and gradually dissolves into the top of saline brine to form a dense diffuse layer. This density stratification may lead to instability and subsequent convection in the system, which can enhance the mass transfer of CO₂ into the brine (hydrodynamic trapping) and reduce the risk of leakage. Therefore, the understanding the dynamic behaviors of the CO₂ mixture during this process is important for better prediction the capacity and safety of the storage.

In this talk, we will present our numerical studies on the flow dynamics of CO₂ in saline aquifers at different scales. Particularly, we employ the lattice Boltzmann method (LBM) at the pore scale and the discrete unified gas kinetic scheme (DUGKS) at the Darcy scale to investigate the convection of CO₂ due to density difference in saline brains under different scenarios. The effects of density difference, impurities, reaction, and fractures, on the convective mixing process of CO₂ are analyzed. The results are helpful for understanding the fundamental mechanisms occurring in CO₂ saline storage.

Date : 19 April 2024 (Friday)

Time : 11:00a.m. – 12:00noon

Venue : Room 2611 (near Lifts 31/32)

All are Welcome!