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**A phase-field method to analyze the dynamics of immiscible fluids in porous media** MARCO DE PAOLI, Vienna Univ of Technology , ALESSIO ROCCON, University of Udine, FRANCESCO ZONTA, ALFREDO SOLDATI, Vienna Univ of Technology — Liquid carbon dioxide (CO2) injected into geological formations (filled with brine) is not completely soluble in the surrounding fluid. For this reason, complex transport phenomena may occur across the interface that separates the two phases (CO2+brine and brine). Inspired by this geophysical instance, we used a Phase-Field Method (PFM) to describe the dynamics of two immiscible fluids in satured porous media. The basic idea of the PFM is to introduce an order parameter ($\phi$) that varies continuously across the interfacial layer between the phases and is uniform in the bulk. The equation that describes the distribution of $\phi$ is the Cahn-Hilliard (CH) equation, which is coupled with the Darcy equation (to evaluate fluid velocity) through the buoyancy and Korteweg stress terms. The governing equations are solved through a pseudo-spectral technique (Fourier-Chebyshev). Our results show that the value of the surface tension between the two phases strongly influences the initial and the long term dynamics of the system. We believe that the proposed numerical approach, which grants an accurate evaluation of the interfacial fluxes of momentum/energy/species, is attractive to describe the transfer mechanism and the overall dynamics of immiscible and partially miscible phases.

Marco De Paoli
Vienna Univ of Technology

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