Contribution ID: **199** Type: **Oral Presentation**

Coupled Hyperbolic Approach to Solve Buoyant Two-Phase Flow and Transport in Heterogeneous Porous Media

Monday 19 May 2025 14:20 (15 minutes)

Recently, a new approach for simulating buoyant two-phase flow and transport in porous media, which is based on a coupled hyperbolic system, was proposed. This new scheme incorporates Darcy's law by adding a source term to the isothermal Euler equations plus an extra equation for phase transport. The system allows for explicit computations and is solved in its hyperbolic form with a characteristics based Riemann solver. Thus, since all required operations are local, for many problems this method has significant advantages over previous ones in terms of computational cost and parallelizability.

Here, this approach is generalized for heterogeneous porous media, which has implications for the numerical solution algorithm. In particular, it is crucial that the source terms are considered by the Riemann solver, otherwise the results get contaminated by numerical errors. To achieve this, a new Rankine-Hugoniot-Riemann (RHR) solver is devised. It accounts for the source terms by introducing consistent Rankine-Hugoniot jumps in each finite volume cell (separately in all coordinate directions) while still honoring conservation.

Numerical results confirm that the new RHR solver is effective and that the explicit hyperbolic solution approach to coupled buoyant flow and transport in heterogeneous porous media is computationally efficient and leads to accurate results.

Country

Switzerland

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

I would like to submit this presentation into the InterPore Journal Student Paper Award.

Water & Porous Media Focused Abstracts

This abstract is related to Water

References

Author: RIESS, Armin (ETH Zürich)

Co-author: JENNY, Patrick

Presenter: RIESS, Armin (ETH Zürich)

Session Classification: MS07

Track Classification: (MS07) Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes