Contribution ID: **738** Type: **Oral Presentation**

A Maximum Principle Preserving Finite Element Method with Mass Conservation Property for Solving Two-Phase Flow in Heterogeneous Porous Media

Wednesday, 2 June 2021 19:35 (15 minutes)

We present a first-order finite element method with mass-lumping and flux upwinding, to solve the immiscible two-phase incompressible flow problem in porous media. The primary unknowns are the wetting phase pressure and saturation. Recently, the theoretical convergence analysis of the method was derived in [1]. Here, we propose a comprehensive computational methodology and extend the scheme to heterogeneous porous media, which makes the method appealing to reservoir simulators.
Numerical examples of quarter-five spot problems in two and three dimensions, confirm that the method is accurate, and robust, even in the case of realistic discontinuous highly varying permeability. We also show that the proposed method is locally mass-conservative and the resulting solutions satisfy the maximum principle. The method is mesh-independent and does not require penalization or any external bound-preserving mechanism.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

[1] V. Girault, B. Riviere, and L. Cappanera. Convergence of a finite element method for degenerate two-phase flow in porous media. arXiv:2001.08859, 2020.

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Session Classification: MS7

Track Classification: (MS7) Mathematical and numerical methods for multi-scale multi-physics, non-linear coupled processes