Contribution ID: **689** Type: **Oral Presentation**

A sequential implicit solver for two-phase subsurface flows using the Multiscale Robin Coupled Method

Wednesday, 2 June 2021 15:30 (15 minutes)

Multiscale domain decomposition methods are a suitable choice when dealing with huge meshes arising from the discretization of the equations modeling multiphase flows in reservoir simulations. They allow the global solution to be computed in coarse meshes, while detailed basis functions are produced locally (usually in parallel) in a much finer grid. We are concerned with the solution of non-linear two-phase flow models using the recently developed Multiscale Robin Coupled Method (MRCM, [1]). This method allows for great flexibility on the choice of interface spaces that couple local solutions, with a clear advantage in highly heterogeneous porous media when compared to some standard multiscale mixed methods. In the presence of strong heterogeneities, it is well known that explicit schemes for the transport of saturation suffer from severe time-step restrictions. Therefore we investigate the combination of the MRCM with implicit transport schemes, allowing for the use of large time steps when compared to explicit time integration approaches. A sequential implicit strategy is proposed, with different trust-region algorithms to ensure the convergence of the transport solver. Improvement in the accuracy of the MRCM is investigated, considering alternative choices for the interface spaces other than the classical polynomials, since they are not optimal for high-contrast channelized permeability fields. Our numerical results have shown that the proposed method yields accurate and computationally efficient results for two-phase subsurface flows.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

[1] R.T. Guiraldello, R.F. Ausas, F.S. Sousa, F. Pereira, and G.C. Buscaglia. The multiscale Robin coupled method for flows in porous media. J. Comput. Phys., 355:1-21, 2018.

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Student Poster Award

Primary author: ROCHA, Franciane (University of Sao Paulo)

Co-authors: SOUSA, Fabricio (University of Sao Paulo); AUSAS, Roberto (University of Sao Paulo); BUSCAGLIA, Gustavo (University of Sao Paulo); PEREIRA, Felipe (Mathematical Sciences Department, The University of Texas at Dallas, Richardson, TX, USA)

Presenter: ROCHA, Franciane (University of Sao Paulo)

Session Classification: MS14

Track Classification: (MS14) Uncertainty Quantification in Porous Media