InterPore2021



Contribution ID: 795

Type: Poster (+) Presentation

Towards HPC simulations of Billion-cell Reservoirs by Multiscale Mixed Methods

Tuesday, 1 June 2021 20:00 (1 hour)

A three dimensional parallel implementation of Multiscale Mixed Methods based on non-overlapping domain decomposition is proposed and its computational performance is assessed by means of numerical experiments. As a prototypical method the Multiscale Robin Coupled Method [1] is chosen and its implementation is explained in detail. Numerical results for problems ranging from millions up to more than 2 billion computational cells in highly heterogeneous anysotropic rock formations based on the SPE10 benchmark [2] are shown. The proposed implementation relies on direct solvers for both the local problems and the interface coupling system. It exhibits good weak and strong scalability as compared against a state-of-the-art global fine grid solver based on Algebric Multigrid preconditioning [3] in single and two-phase flow problems.

Keywords: Porous media, Darcy's law, Two-phase flow, High Performance Computing, Multiscale method, Domain Decomposition

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. Journal of Computational Physics, 355:1–21, 2018.

[2] M. Christie and M. J. Blunt. Tenth SPE comparative solution project: a comparison of upscaling techniques. 2001. SPE Reservoir Simulation Symposium 2001.

[3] R. Falgout. Hypre user's manual. http://www.llnl.gov/CASC/hypre, 2017. Accessed: 2020-11-30.

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Student Poster Award

Primary authors: AUSAS, Roberto (University of Sao Paulo); JARAMILLO, Alfredo (USP, Brazil); Dr T. GUIRALDELLO, Rafael (University of São Paulo - São Carlos); Dr PAZ, Stevens; SOUSA, Fabricio (University of

Sao Paulo); PEREIRA, Felipe (Mathematical Sciences Department, The University of Texas at Dallas, Richardson, TX, USA); BUSCAGLIA, Gustavo (University of Sao Paulo)

Presenter: AUSAS, Roberto (University of Sao Paulo)

Session Classification: Poster +

Track Classification: (MS14) Uncertainty Quantification in Porous Media