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Multiresolution Operator Decomposition for Flow Simulation in Fractured Porous Media

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Fractures should be simulated accurately given their significant effects on whole flow patterns in porous media. But such high-resolution simulation imposes severe computational challenges to numerical methods in the applications. Therefore, the demand for accurate and efficient technique is widely increasing. A near-linear complexity multiresolution decomposition is proposed for solving flow problems in fractured porous media. In this work, discrete fracture model (DFM) is used to describe fractures, in which the fractures are explicitly represented as (n-1) dimensional element. The solution space is decomposed into several subspaces and we then compute the corresponding solutions of DFM in each subspace. The pressure distribution of fractured porous media is obtained by combing the DFM solutions of all subspaces. Numerical results are presented to demonstrate the accuracy and efficiency of the proposed multigrid method. The comparisons with standard method show that the proposed multigrid method is a promising method for flow simulation in fractured porous media.

References

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