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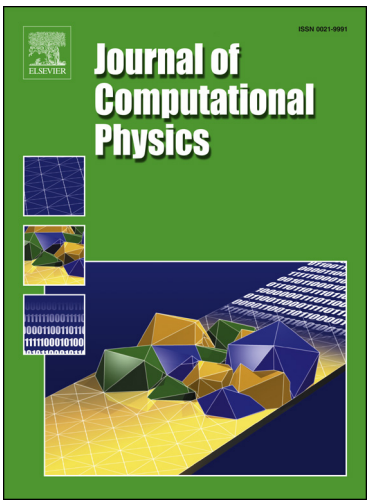

Multiscale finite volume method for discrete fracture modeling on unstructured grids (MS-DFM)

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Highlights

- The manuscript 'Multiscale Finite Volume Method for Discrete Fracture Modeling on Unstructured Grids (MS-DFM)" presents the first general multiscale method for 3D reservoirs with discrete fracture networks of lower dimensional space with fully unstructured grids.
- It is known that the 3D unstructured discrete fracture model is computationally challenging when dealing with large-scale real-field applications.
- To resolve this challenge, the present paper develops a novel multiscale method, which allows for capturing the effect of the highly resolved explicit fine-scale fractures in a coarse-scale system, the solution of which is then interpolated back to the original fine-scale resolution (and not just coarse-scale resolution).
- As such, MS-DFM provides efficient and accurate solutions to DFM unstructured 3D problems, and allows for relying less on the excessively upscaling quantities.
- The flexibility is achieved by developing the MS-DFM in a way that general coarse grids can be employed for fractures and matrix, thanks to the enriched (additional) basis functions introduced in the matrix and fractures.
- Finally, the iterative multiscale procedure is developed to allow for error reduction and control of the multiscale solutions.
- The developed method and the proof-of-concept systematic numerical results illustrate that the MS- DFM provides a promising framework for modeling flow in fractured media in real- field applications.