Contribution ID: **840** Type: **Oral Presentation**

A new multi-level discrete fracture model for multiphase flow in complex multi-scale fractured systems

Thursday, 16 May 2024 10:05 (15 minutes)

In this study, we present a new version of the multi-level discrete fracture model (MLDFM) for multiphase flow in complex fractured systems with features present at various scales. In MLDFM, two levels of unstructured grids conforming with each other are constructed. In a fine-scale grid, both large and small features are represented in conformal DFM manner, and in a coarse grid, only large fractures are conformable depicted. The small-scale features in a coarse grid are dynamicly upscaled as a third continuum similar to the Dual Porosity Dual Permeability model. The DFM treatment for all fractures guarantees accurate solutions for simulations adopting fine-scale grid but unavoidably increases the computational burden. In this work, we developed a computational framework, where the conformal DFM is used to capture the small-scale flow response and homogenize it to the coarse-scale unstructured model applied for forward simulation. An adaptive local-global upscaling formalism is employed to couple the two scale solutions. In detail, we generate local boundary conditions in the fine-scale domain following the basis function interpolation approach and subsequently resolve the flow response. Then, we update the transmissibility for the triple continuum model through the dynamic flow-based upscaling method. Finally, we test the MLDFM approach for several realizations of complex multi-scale fracture systems against fine-scale solution, The simulation results demonstrate the exceptional accuracy and performance of the proposed method.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

China

Porous Media & Biology Focused Abstracts

References

Conference Proceedings

I am not interested in having my paper published in the proceedings

Primary author: LI, Longlong (Institute of Mechanics, Chinese Academy of Sciences)

Co-authors: WANG, Luting (Institute of Mechanics, Chinese Academy of Sciences, Beijing, China); VOSKOV, Denis (TU Delft)

Presenter: LI, Longlong (Institute of Mechanics, Chinese Academy of Sciences)

Session Classification: MS03

Track Classification: (MS03) Flow, transport and mechanics in fractured porous media