InterPore2023



Contribution ID: 224

Type: Oral Presentation

A discontinuous approximation for modeling multiphase flow and transport in complex porous media structures

Monday, 22 May 2023 14:30 (15 minutes)

The control volume finite element (CVFE) method is inherently flexible for modelling flow and transport in complex geological features such as faults and fractures. The finite element method that captures complex flow characteristics is combined with the control volume approach known for its stability and mass conservative properties. The classical CVFE approach exploits two meshes: the element mesh that represents the petrophysical properties element-wise and the control volume mesh, centered on the element vertices, representing the saturation solution in the medium. The discrepancy between those two meshes introduces inconsistency in the transport solution especially along material discontinuities or abrupt material interfaces.

In this work, we present an original discontinuous formulation based on the CVFE method for modeling multiphase flow and transport in porous media. We introduce the element pair $P_{1,DG} - P_{0,DG}$ denoting a linear discontinuous Lagrangian velocity approximation and an element-wise pressure approximation, respectively. The formulation enables the use of a single mesh that, in return, does not exhibit the inconsistency issues described earlier. We validate the method and demonstrate the effectiveness of the approach with numerical examples of complex fractures in highly heterogeneous domains.

Participation

In-Person

References

MDPI Energies Student Poster Award

No, do not submit my presenation for the student posters award.

Country

United Kingdol

Acceptance of the Terms & Conditions

Click here to agree

Energy Transition Focused Abstracts

Primary authors: Ms AL KUBAISY, Jumanah (Imperial College London); Dr SALINAS, Pablo (OpenGoSim); Prof. PAIN, Christopher C. (Imperial College London); Prof. JACKSON, Matthew D. (Imperial College London)

Presenter: Ms AL KUBAISY, Jumanah (Imperial College London)

Session Classification: MS03

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