Contribution ID: **487** Type: **Oral Presentation**

An image-based hybrid pore network-continuum modeling framework for fluid flow and transport in multiscale porous media

Monday, 30 May 2022 17:35 (15 minutes)

Hydrocarbon transport in unconventional reservoir rocks remains poorly understood due to the presence of a wide range of pore sizes (from sub-nanometer to micrometers) and their complex spatial connectivity. In the present work, we combine hyper-resolution imaging techniques and image-based modeling to develop a novel hybrid pore network-continuum modeling framework for the flow and transport processes in the multiscale pore domains. The hybrid framework treats the smaller pores (i.e., pores below the image resolution) as a continuum using models described by the Darcy equation and explicitly represents the flow and transport processes in the larger pores (i.e., pores that are resolved in the images) using a computationally efficient pore network model. We validate the new framework via comparisons to direct numerical simulations (DNS) for several scenarios including steady-state single-phase flow, solute transport, and transient compressible single-phase flow. The results demonstrate that the new hybrid model accurately predicts the overall flow and transport process and the mass transfer between the pore network and the subresolution continuum domains, while being much more computationally efficient than the DNS methods.

Acceptance of the Terms & Conditions

Click here to agree

MDPI Energies Student Poster Award

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

Country

China

References

Guo, B., Ma, L. and Tchelepi, H.A., 2018. Image-based micro-continuum model for gas flow in organic-rich shale rock. Advances in Water Resources, 122, pp.70-84.

Guo, B., Mehmani, Y. and Tchelepi, H.A., 2019. Multiscale formulation of pore-scale compressible Darcy-Stokes flow. Journal of Computational Physics, 397, p.108849.

Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

Online

Primary authors: ZHANG, Li (University of Arizona); GUO, Bo (University of Arizona); QIN, Chao-Zhong (Chongqing University); Prof. XIONG, Yongqiang

Presenter: ZHANG, Li (University of Arizona)

Session Classification: MS09

Track Classification: (MS09) Pore-scale modelling