Contribution ID: **457** Type: **Poster**

A New Dynamic Single-Pressure Network Model: Experimental Comparisons and Calibrations.

Tuesday, 15 May 2018 18:30 (15 minutes)

We present a simple single-pressure dynamic network simulator for two-phase flow in porous media with a focus on exploring the limits of a single-pressure network model.

Our work builds upon the work of Aker et al.[1] and Knudsen et al.[2], where we aim to more accurately describe and model the interactions of ganglia moving through the porous material. Whereas the previous models assumed constant cross-section pipes, we instead account for a varying cross-section along a pipe. This is important as the size of trapped wetting bubbles is determined by both the throat size and the pore size, and are over-predicted for straight pipes.

Another focus is on accurately modelling the interaction of ganglions across adjacent pipes. This is the dominant mechanism that determines the ganglion size distribution in the network - a ganglion cannot split below the size of a pore for sufficiently slow flow rates.

Our model is of the single-pressure kind, where only one phase can occupy a cross-section at a time. Consequently we neglect wetting fluids in films and corners. One aim of our study is to investigate the limits of a simple single-pressure network model without resorting to a much computationally heavier two-pressure model[3]. This excludes us from modeling strong imbibition invasions where the main transport mechanism is dominated by film and corner flow.

We will present direct comparisons to drainage and mixed-wet invasion studies by Zhu et al.[4], and to experiments by Moura et al.[5,6] studying the burst dynamics of an invasion process. In addition we will present some qualitative comparisons to the experimental work of Avraam and Payatakes[7] on the dynamics of ganglions.

References

[1] E. Aker et al. Transport in Porous Media (1998) 32: 163. https://doi.org/10.1023/A:1006510106194
[2] H.A. Knudsen et al., Transport in Porous Media (2002) 47: 99. https://doi.org/10.1023/A:1015039503551
[3] G. Tørå et al., Transp Porous Med (2012) 92: 145. https://doi.org/10.1007/s11242-011-9895-6
[4] B. Zhao et al., Proc. Natl. Acad. Sci. USA (2016) 113: 37. https://doi.org/10.1073/pnas.1603387113
[5] M. Moura et al., Europhysics Letters (2017) 118: 1. https://doi.org/10.1209/0295-5075/118/14004
[6] M. Moura et al., Physical Review Letters (2017) 119: 154503. https://doi.org/10.1103/PhysRevLett.119.154503
[7] D. G. Avraam et al., Ind. Eng. Chem. Res. (1999) 38: 3. https://doi.org/10.1021/ie980404o

Acceptance of Terms and Conditions

Click here to agree

Primary author: Mr VASSVIK, Morten (Department of Physics, Norwegian University of Science and Technology)

Co-authors: GJENNESTAD, Magnus Aa. (Norwegian University of Science and Technology); HANSEN, Alex (NTNU)

Presenter: Mr VASSVIK, Morten (Department of Physics, Norwegian University of Science and Technology)

Session Classification: Poster 2

Track Classification: MS 2.23: Network Models