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Contribution ID: **162**

Type: **Oral Presentation**

Averaged Models for Two-Phase Flow in a Pore: The Effect of Hysteretic and Dynamic Contact Angles

Tuesday, 1 June 2021 14:55 (15 minutes)

We consider a model for the flow of two immiscible fluids in a two-dimensional thin strip and in a three-dimensional tube of varying width. This represents an idealization of a pore in a porous medium. The interface separating the fluids forms a freely moving interface in contact with the wall and is driven by the fluid flow and surface tension. The contact line model incorporates Navier-slip boundary conditions and a dynamic and possibly hysteretic contact angle law.

We assume a scale separation between the typical width and the length of the thin strip. Based on asymptotic expansions, we derive effective models for the two-phase flow. These models form a system of differential algebraic equations for the interface position and the total flux. The result is Darcy-type equations for the flow, combined with a capillary pressure - saturation relationship involving dynamic effects.

Finally, we provide some numerical examples to show the effect of a varying wall width, of the viscosity ratio, of the slip boundary condition as well as of having a dynamic contact angle law. Furthermore, we compare the effective model to experimental data for the capillarity rise in tubes.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

S. B. Lunowa, C. Bringedal, and I. S. Pop, On an averaged model for immiscible two-phase flow with surface tension and dynamic contact angle in a thin strip, Studies in Applied Mathematics, (2021). Accepted. UHasselt preprint available at uhasselt.be/Documents/CMAT/Preprints/2020/UP2006.pdf.

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