13ᵗʰ Annual Meeting
31 May - 4 June 2021

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Contribution ID: **219**   Type: **Poster (+) Presentation**

Upscaling of two-phase flows in porous media

Tuesday, 1 June 2021 19:00 (1 hour)

We consider a mathematical model for two-phase immiscible flow in a porous medium. A solute is present in and transported by one fluid phase, leading to a non-constant surface tension. At the scale of pores, the main challenge is to account for the movement of the fluid-fluid interfaces, depending on the velocities and pressures of the two fluids, and on the concentration-dependent surface tension.

Using asymptotic methods, an upscaled, Darcy-scale model is derived. This is expressed in terms of effective macroscopic quantities, like saturation, concentration, pressure or Darcy velocity. In view of simplicity, we use first a two-dimensional strip as starting geometry at the pore scale. Then we consider a periodically perforated medium as a more general representation of a porous medium. In the former case, the evolving fluid-fluid interface is modelled as a freely moving sharp interface. In the latter case, a phase-field formulation is used. Employing asymptotic expansion methods and periodic homogenization, the corresponding Darcy-scale models are derived. For validating the results, we compare the numerical results for the Darcy scale models with those obtained by averaging the numerical results obtained for the pore-scale models.

Time Block Preference

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

References

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Student Poster Award

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Session Classification: Poster +

Track Classification: (MS7) Mathematical and numerical methods for multi-scale multi-physics, non-linear coupled processes