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# Upscaling of phase-field models for two-phase flow based on fluid morphology

*Wednesday, 1 June 2022 10:45 (15 minutes)*

Two-Phase flow in porous media is relevant for many applications and accurately capturing of interfacial effects in an effective model is central to its modeling. The flow morphology can vary significantly for different physical settings and impact the effective behaviour.

We use phase-fields to model two-phase flow on the pore scale with an advective Allen-Cahn formulation coupled to a Navier-Stokes equation. We aim to specialise this model for different characteristic flow behaviours and investigate the upscaling of such models. Using periodic homogenization we arrive at macroscopic equations and microscopic cell-problems that yield effective parameters.

Based on experimental microfluidic data we characterise fluid morphologies exhitbited in porous medium flows. These allow for specialisation in the micro-scale model and its upscaling process, yielding a more specific micro-macro model to better capture the effects of microscopic interface behaviour on the larger scale.

We implement our phase-field model for two-phase flow in $\mathrm{DuMu}^{\mathrm{X}}$, using a finite volume discretization. It features staggered control volumes and a combination of cell- and facecentered variables, which communicate using a multidomain coupling manager. This serves as a solver for cell-problems in the two-scale formulation that results from upscaling.

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## References

## Time Block Preference

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

## Participation

Online

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