Abstract Submitted
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Computational investigation of effective interfacial dynamics in porous media[1] ANTONIOS VERVERIS, *, MARKUS SCHMUCK, *, *Maxwell Institute and Heriot-Watt University — We consider the flow of immiscible fluids in strongly heterogeneous domains. To this end, we use a Cahn-Hilliard/Ginzburg-Landau phase field formulation which allows to account for the fluids' specific free energies and which has recently been rigorously upscaled towards the so-called porous media phase-field equation in [1,2]. The upscaled equation [1,2] is validated by comparing the numerical solution of the microscopic formulation fully resolving the pore space with the solution of the upscaled equation. As a result, we computationally observe the rigorously derived convergence rate $\mathcal{O}(\epsilon^{\frac{1}{4}})$. Additionally, we recover the experimentally validated and rigorously derived coarsening rate $\mathcal{O}(t^{\frac{1}{3}})$ for homogeneous media in the periodic porous media setting [3]. Finally, for critical quenches and under thermal noise, the coarsening rate shows after a short, expected phase of universal coarsening, a sharp transition towards a different regime [3]. [1] M. Schmuck & S. Kalliadasis, SIAM J. Appl. Math., accepted (2017). [2] M. Schmuck et al., Nonlinearity, 26(12):3259-3277 (2013). [3] A. Ververis & M. Schmuck, J. Comp. Phys., 344:485-498 (2017).

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