Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Attenuation of numerical artefacts in the modelling of fluid interfaces[1] FABIEN EVRARD, BEREND G.M. VAN WACHEM, FABIAN DENNER, Imperial College London — Numerical artefacts in the modelling of fluid interfaces, such as parasitic currents or spurious capillary waves, present a considerable problem in two-phase flow modelling. Parasitic currents result from an imperfect evaluation of the interface curvature and can severely affect the flow[Denner and van Wachem, Numer. Heat Trans. B-Fund. 65, 218 (2014)], whereas spatially underresolved (spurious) capillary waves impose strict limits on the time-step and, hence, dictate the required computational resources for surface-tension-dominated flows [Denner and van Wachem, J. Comp. Phys. 285, 24 (2015)]. By applying an additional shear stress term at the fluid interface, thereby dissipating the surface energy associated with small wavelengths, we have been able to considerably reduce the adverse impact of parasitic currents and mitigate the time-step limit imposed by capillary waves. However, a careful choice of the applied interface viscosity is crucial, since an excess of additional dissipation compromises the accuracy of the solution. We present the derivation of the additional interfacial shear stress term, explain the underlying physical mechanism and discuss the impact on parasitic currents and interface instabilities based on a variety of numerical experiments.

[1]We acknowledge financial support from the Engineering and Physical Sciences Research Council (EPSRC) through Grant No. EP/M021556/1 and from PETROBRAS.

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Date submitted: 31 Jul 2015 Electronic form version 1.4