

Abstract Submitted
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Nonlinear phenomena in two-fluid shear flows in the presence of surfactants ANNA KALOGIROU, DEMETRIOS PAPAGEORGIOU, Imperial College London — The flow of two superposed fluids in a channel in the presence of an insoluble surfactant is studied. The surfactant is present at the interface in a dilute concentration. Asymptotic analysis in the limit of a thin lower layer is performed and a system of coupled weakly nonlinear evolution equations is derived. The system describes the evolution of the film thickness and the local surfactant concentration. A novel feature is the presence of a nonlocal term due to multiphase coupling. The system of nonlinear evolution equations is solved numerically and the effect of surfactants on the dynamics is investigated. Numerical experiments for zero and for finite Reynolds numbers indicate that the solutions are mostly nonlinear travelling waves of permanent form or time-periodic travelling waves. As the length of the system increases, the dynamics of the system become more complex and include quasi-periodic and chaotic solutions.

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