Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Efficient numerical computation of fluid interfaces with soluble surfactant (II) a viscous drop KUAN XU, MICHAEL SIEGEL, MICHAEL BOOTY, New Jersey Institute of Technology — We address a difficulty in the computation of fluid interfaces with soluble surfactant. At the large values of bulk Peclet number typical of fluid-surfactant systems, a transition layer forms adjacent to the interface in which the surfactant concentration varies rapidly, while its gradient at the interface must be evaluated accurately to determine bulk-interface exchange of surfactant, surface tension, and the drop's dynamics. We present a fast and accurate hybrid numerical method that incorporates a separate singular perturbation reduction of the transition layer into a full numerical solution of the interfacial free boundary problem. Results are presented for a drop of arbitrary viscosity in the Stokes flow limit, where the underlying flow solver for insoluble surfactant uses a direct (primitive variable) boundary integral method.

Michael Booty
New Jersey Institute of Technology

Date submitted: 05 Aug 2009 Electronic form version 1.4