Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

The effect of surfactant redistribution on interactions of deformable drops in gravity and a temperature gradient MICHAEL ROTHER, University of Minnesota Duluth — Trajectories are calculated by the boundary-integral method for two contaminated deformable drops under the combined influence of buoyancy and a constant temperature gradient at low Reynolds number and with negligible thermal convection. The surfactant is bulk-insoluble, and its coverage is determined by solution of the time-dependent convective-diffusion equation. Two limits are considered. For small drops, the deformation is small, and thermocapillary and buoyant effects are of the same order of magnitude. In this case, comparison is made with incompressible surfactant results to determine when surfactant redistribution becomes important. Convection of surfactant can lead to elimination of saddle points in the relative-trajectory phase plane and can increase the difference between the drops' velocities. For larger drops, deformation can be significant, leading to breakup or capture, and buoyant motion dominates thermocapillary migration. In this case, convection of surfactant can increase deformation and offset previously observed inhibition of breakup for clean drops when the driving forces are opposed.

Michael Rother
University of Minnesota Duluth

Date submitted: 05 Aug 2010 Electronic form version 1.4