Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Behavior of Shock Solutions in Particle-Laden Thin Films BENJAMIN COOK, ANDREA BERTOZZI, UCLA, A.E. HOSOI, MIT — We study a suspension of heavy particles in an advancing film of viscous liquid. Particle settling in the normal and in-plane directions occurs, and is dependent on the angle of the plane with respect to gravity. At steep angles, settling in the normal direction appears insignificant, and in-plane settling leads to the formation of a packed ridge at the contact line. A lubrication-type model of this phenomenon featuring concentration-dependent viscosity and settling rates takes the form of a 2x2 hyperbolic system of conservation laws, with double-shock solutions qualitatively matching these observations. However the Richardson-Zaki hindered settling function leads to a loss of hyperbolicity near the maximum concentration, and sometimes an insoluble Riemann problem. We suggest a modified hinderance function that vanishes at the maximum packing fraction and eliminates these concerns. We also consider rarefaction solutions for the constant volume case and compare these with Huppert's well-known single-rarefaction solution for a clear fluid.

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Date submitted: 05 Aug 2006 Electronic form version 1.4