Shock Solutions for Particle-Laden Thin Films BENJAMIN COOK, ANDREA BERTOZZI, Department of Mathematics, UCLA — This is an analysis of the lubrication equations derived by Zhou, Dupuy, Bertozzi, and Hosoi (PRL 2005) for a thin film containg sedimenting particles. The equations take the form of a pair of conservation laws regularized by a fourth-order nonlinear surface tension term. Guided by the experimental observation of a thick, particle-rich ridge near the contact line, we seek a solution to the Riemann problem consisting of two shocks. For some left (upstream) and right (precursor) states we find such a solution, and when it exists it agrees excellently with numerical solutions of the PDE system. However due to bifurcations in the Hugoniot locus a shock solution sometimes does not exist, and there appears to be no Riemann solution in this case. Numerical solutions using a diffusive scheme suggest the solution may involve a singular shock in which fluid and sediment accumulate at the contact line.

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