Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Coalescence of Liquid Drops: Modelling, Computation and Scaling JAMES SPRITTLES, University of Warwick, YULII SHIKHMURZAEV, University of Birmingham — The coalescence of two liquid drops surrounded by a viscous gas is simulated by a computational approach which resolves the unprecedentedly small spatio-temporal scales which have recently been accessed experimentally. A systematic study of the parameter space of practical interest allows the influence of the governing parameters in the system to be identified and the role of viscous gas to be determined. In particular, it is shown that the viscosity of the gas suppresses the formation of toroidal bubble predicted in some cases when the gas' dynamics are neglected. Considering the entire parameter space allows us to examine the accuracy of various "scaling laws" proposed for different "regimes" and, in doing so, to (a) reveal certain inconsistencies in recent works and (b) develop a new scaling law for the inertial regime which captures experimental data from the literature remarkably well. Notably, the conventional model is shown to reproduce many qualitative features of the initial stages of coalescence observed experimentally, such as a collapse of calculations onto a "master curve" but, quantitatively, overpredicts the speed of coalescence. Finally, a phase diagram of parameter space, differing from previously published ones, is used to illustrate the key findings.

James Sprittles
University of Warwick

Date submitted: 22 Jul 2014 Electronic form version 1.4