Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Drop coalescence at any Reynolds number JAMES MUNRO, JOHN LISTER, University of Cambridge — When two drops touch, a fluid bridge forms between them and surface tension pulls this bridge wider, fighting against the viscosity of the fluid and the inertia of the drops. We present a new theoretical solution for the early-time behaviour of coalescence which includes both inertia and viscosity; earlier models neglect one or the other and so their predictions do not agree with experimental observations over the full range of fluid parameters. Our new solution is valid at early times for any Reynolds number and offers fresh insight into the physical processes governing this initial stage. Inertia plays a role on a scale proportional to $t^{1/2}$, but viscosity dominates on the smaller scales of the fluid bridge. The $t^{1/2}$ scale sets a boundary condition for the smaller scales, affecting the geometry of the curved surface and changing the prefactor in the rate of coalescence.

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Date submitted: 29 Jul 2016

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