droplet sizes in drop impact fragmentation" (They are the two parts of the full story)

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Rim destabilization in unsteady sheet expansion in the air from drop impact on small surfaces Y. WANG, L. BOUROUIBA, The Fluid Dynamics of Disease Transmission Laboratory, Massachusetts Institute of Technology — Understanding the dynamics of drop fragmentation upon impact on a finite surface has a wide range of industrial and environmental applications, including predicting and controlling the transport of pathogen-bearing droplets created from contaminated surfaces and leaves. Upon impact on a finite solid surface, a drop first expands into a sheet in the air, surrounded by a rim, that itself can destabilize into ligaments that can, in turn, shed droplets. This process is inherently unsteady. Yet, analysis of the destabilization of the rim surrounding the sheet has so far neglected this inherent unsteadiness and it remained unclear which instability selects for the ligament numbers and their growth. We discuss the results of a combined experimental and theoretical study where a universal constraint on the rim dynamics is discovered. This constraint on the rim dynamics throughout the unsteady sheet expansion enables us to derive and validate a unified mathematical model of sheet expansion in the air from drop impact on small surfaces.

L. Bourouiba
Massachusetts Institute of Technology

Date submitted: 02 Aug 2017 Electronic form version 1.4