Abstract Submitted
for the NWS12 Meeting of
The American Physical Society

Rayleigh-Taylor Instability in Disintegration of Liquid Globule due to Constant Acceleration MAZIYAR JALAAL, Department of Mechanical Engineering, The University of British Columbia, Vancouver, BC, Canada, KIAN MEHRAVARAN, School of Engineering, The University of British Columbia, Kelowna, BC, Canada. — Fragmentation of droplets is of fundamental importance in several applications, from volcanic eruption to combustion engines. In the current study, the fragmentation of an initially spherical droplet accelerated by a constant body force is examined in 3D. A finite volume-volume of fluid (FV-VOF) numerical technique is employed for direct numerical simulation (DNS) of the two-phase system. The numerical code uses a combination of octree spatial discretization and a multilevel Poisson solver. It is shown that the fragmentation has four main steps: 1-Deformation of the initially spherical droplet and bag formation. 2-Bursting of the bag generating upper and lower tori. 3-Deformation and breakup of the tori. 4-Disintegration of remaining ligaments and drops. The role of Rayleigh-Taylor instability (RTI) at each step is studied in detail. It is showed RTI is the prevailing mechanism in bursting of the bag, flattened core and tori. Stability analyses are also provided based on the linearized Navier-Stokes equations, and the most amplified wave numbers were compared with the observations in DNS. Reasonable agreement is observed between the numerical and analytical solutions.

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Date submitted: 23 Aug 2012 Electronic form version 1.4