Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Effects of Deformation on Drag and Lift Forces Acting on a Droplet in a Shear Flow[1] YOUNGHO SUH, CHANGHOON LEE, Yonsei University — The droplet behavior in a linear shear flow is studied numerically to investigate the effect of deformation on the drag and lift acting on droplet. The droplet shape is calculated by a level set method which is improved by incorporating a sharp-interface modeling technique for accurately enforcing the matching conditions at the liquid- gas interface. By adopting the feedback forces which can maintain the droplet at a fixed position, we determine the acting force on a droplet in shear flow field with efficient handling of deformation. Based on the numerical results, drag and lift forces acting on a droplet are observed to depend strongly on the deformation. Droplet shapes are observed to be spherical, deformed, and oscillating depending on the Reynolds number. Also, the present method is proven to be applicable to a three- dimensional deformation of droplet in the shear flow, which cannot be properly analyzed by the previous studies. Comparisons of the calculated results by the current method with those obtained from body-fitted methods [Dandy and Leal, *J. Fluid Mech.* 208, 161 (1989)] and empirical models [Feng and Beard, *J. Atmos. Sci.* 48, 1856 (1991)] show good agreement.

[1]Supported by WCU Program thourgh the NRF funded by the MEST of Korea (R31-2008-000-10049-0)

Changhoon Lee
Yonsei University

Date submitted: 06 Aug 2010 Electronic form version 1.4