Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Direct Numerical Simulation of Insoluble Surfactant Effect on Turbulent Channel Bubbly Flows[1] JIACAI LU, GRETAR TRYGGVASON, University of Notre Dame — Direct Numerical Simulations (DNS) have been successfully used to obtain detailed data for turbulent channel bubbly flows. However, most of DNS that have been done so far remain problematic in comparing to most experiments. One of the major reasons is that real bubbly flows contain surfactants. The surfactants adhere to the interface, and produce an uneven distribution of the surfactant concentration due to the moving of bubbles and result in uneven surface tension over bubble surfaces. In this project, the effect of surfactants on the flow of many bubbles in an upward turbulent channel flow is studied by using of Direct Numerical Simulation with 3D Front-tracking method. The surfactant mass and the interfacial area are directly tracked in the method, and the surfactant mass remains conserved during the evolution. By using of different elasticity numbers in the non-linear equation of state which relates the surface tension to the surfactant concentration, the simulations show that the evolution of the turbulent channel bubbly flow are much different among the cases with contaminated bubbles and clean bubbles. Profiles of many parameters, such as streamwise velocity, shear stress and etc., are also compared at the statistically steady state for these cases.

[1]Research supported by DOE (CASL).

Jiacai Lu
University of Notre Dame

Date submitted: 02 Aug 2016 Electronic form version 1.4