Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Effect of bubble-bubble interaction on mass transfer in bubbly flow using a multi-scale approach[1] BAHMAN ABOULHASANZADEH, GRETAR TRYGGVASON, University of Notre Dame — Mass transfer in the liquid phase of gas-liquid multiphase flows generally takes place at a much shorter time scale than the momentum transfer and so leads to thin mass boundary layers around the bubble which is difficult to capture using direct numerical simulation (DNS). We have developed a subscale analytical approach using a Front Tracking method in which we use solution of a boundary layer equation for mass transfer on the bubble interface to transfer mass from bubble onto a regular grid and then we follow the mass in the domain using a reasonably coarse gird. This way we are able to considerably reduce the computational cost. Here we implement the method in a three-dimensional code and perform direct comparison of its results with experimental data. We show that this approach gives accurate results compared to experimental data and semi-empirical correlations. Then we use our subscale approach to study the effect of Reynolds number and void fraction on the effect of bubble-bubble interactions on the mass transfer in buoyant bubbly flows.

[1]Research supported by NSF.

Bahman Aboulhasanzadeh
University of Notre Dame

Date submitted: 29 Jul 2012 Electronic form version 1.4