Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Rising motion of a bubble layer near a vertical wall SADEGH DABIRI, PRAMOD BHUVANKAR, Purdue University — Bubbly flows in vertical pipes and channels form a wall-peak distribution of bubbles under certain conditions. The dynamics of the bubbles near the wall is different than in an unbounded liquid. Here we report the rising motion of bubbles in a liquid near a vertical wall. In a simulation of a bubbly flow in a periodic domain with a vertical wall on one side, an average pressure gradient is applied to the domain that balances the weight of the liquid phase. The upward flow is created by the rising motion of the bubbles. The bubbles are kept near the wall by the lateral lift force acting on them as a result of rising in a shear flow which is in turn generated by rising motion of bubbles. The rise velocity of the bubbles on the wall and the average rise velocity of the liquid depend on three dimensionless parameters, Archimedes number, Eotvos number, and the average volume fraction of bubbles near the wall. In the limit of small Eo, bubbles are nearly spherical and the dependency on Eo becomes negligible. In this limit, the scaling of the liquid Reynolds number with Archimedes number and the void fraction is presented.

Sadegh Dabiri
Purdue University

Date submitted: 01 Aug 2015 Electronic form version 1.4