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Using DNS Data for Modeling of Bubbly Flows[1] GRETAR TRYGGVASON, University of Notre Dame, JIACAI LU, Worcester Polytechnic Institute — Direct numerical simulations (DNS) of bubbly flows in vertical channels have lead to significant insight into the structure and dynamics of the flow. However, for applications to industrial systems the range of scales is sufficiently large so that DNS will remain impractical for the foreseeable future. Furthermore, there are indications that the dynamics at the smallest scales is sufficiently universal so that it should not be necessary to recomputed those scales to accurately predict the large-scale motion. Thus, models where the large-scale motion is computed and the unresolved scales are modeled will continue to be of importance. Here, we report two efforts to generate data that can be used to help modeling. In the first study we have computed the lift and drag force on a single bubble in shear flow under a variety of conditions, focusing on both the effect of the deformability of the bubble as well as the changes in drag and lift as the bubbles are placed close to a wall. In the other study we examine the transient dynamics of a large number of bubbles of different sizes, initially placed in a turbulent upflow in a vertical channel, and use the fully resolved DNS date to compute the various quantities that are generally unresolved in a model of the large-scale flow.

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