Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Multiscale Issues in DNS of Multiphase Flows[1] GRETAR TRYGGVASON, University of Notre Dame, SIJU THOMAS, ASCOMP GmbH, Zurich, Switzerland, JIACAI LU, BAHMAN ABOULHASANZADEH, Worcester Polytechnic Institute — In direct numerical simulations (DNS) of multiphase flows it is frequently found that features much smaller than the "dominant" flow scales emerge. Those features consist of thin films, filaments, drops, and boundary layers, and usually surface tension is strong so the geometry is simple. Inertia effects are also small so the flow is simple and often there is a clear separation of scales between those features and the rest of the flow. Thus it is often possible to describe the evolution of this flow by analytical models. Here we discuss two examples of the use of analytical models to account for small-scale features in DNS of multiphase flows. For the flow in the film beneath a drop sliding down a sloping wall, we capture the evolution of films that are too thin to be accurately resolved using a grid that is sufficient for the rest of the flow by a thin film model. The other example is the mass transfer from a gas bubbly rising in a liquid. Since diffusion of mass is much slower than the diffusion of momentum, the mass transfer boundary layer is very thin and can be captured by a simple boundary layer model. The coupling of the model for the unresolved features to the rest of the flow is discussed for both examples.

[1]Research supported by NSF

Gretar Tryggvason
University of Notre Dame

Date submitted: 10 Aug 2010 Electronic form version 1.4