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Multiscale Issues in DNS of Multiphase Flows[1] GRETAR TRYGGVASON, SIJU THOMAS, JIACAI LU, BAHMAN ABOULHASANZADEH, Worcester Polytechnic Institute — In spite of the enormous information and understanding that DNS are providing for relatively complex multiphase flows, real systems provide challenges that still limit the range of situations that can be simulated, even when we limit our studies to systems well described by continuum theories. The problem is, as one might expect, one of scale. Starting with simulations where the "dominant small-scales" are fully resolved, it is frequently found that multiphase flows also can generate features much smaller than the dominant flow scales, consisting of very thin films, filaments, and drops. Frequently there is a clear separation of scales between these "features," usually inertia effects are relatively small for the local evolution, and in isolation these features are often well described by analytical models. Here we describe the use of a thin film model to account for unresolved features of the flow. By using a semi-analytical model 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 relatively coarse grid that is sufficient to resolve the rest of the flow. Extensions of these ideas to flows with mass and heat transfer as well as phase change and chemical reactions are also discussed.

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