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Advancements to a Dual-Scale approach for Simulating Turbulent Phase Interface Interactions[1] DOMINIC KEDELTY, MARCUS HERRMANN, THOMAS ZIEGENHEIN, Arizona State University — Direct Numerical Simulation remains an expensive task for atomization simulations. To decrease the burden of DNS, a dual-scale modeling approach (Gorokhovski and Herrmann, 2008) that describes turbulent phase interface dynamics in a Large Eddy Simulation spatial filtering context is proposed. Spatial filtering of the equations of fluid motion introduce several sub-filter terms that require modeling. Instead of developing individual closure models for the interface associated terms, the dual-scale approach uses an exact closure by explicitly filtering a fully resolved realization of the phase interface. This resolved realization is maintained using a Refined Local Surface Grid approach (Herrmann, 2008) employing an unsplit geometric Volume-of-Fluid method (Owkes and Desjardins, 2014). Advection of the phase interface on this DNS scale requires a reconstruction of the fully resolved interface velocity. In this work, results from the dual-scale LES model employing sub-filter turbulent eddy reconstruction by combined approximate deconvolution and non-linear spectral enrichment (Bassenne et al. 2019) and sub-filter surface tension model (Herrmann 2013) are compared to DNS results for a phase interface in a homogeneous isotropic turbulent flow at two different Weber numbers.

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