Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

A Sub-Grid Model for Surface Tension Induced Phase Interface Dynamics[1] MARCUS HERRMANN, Arizona State University — In many flows involving liquid/gas phase interfaces, small scale interface dynamics play an important role. In atomization of liquids, for example, surface tension forces can dominate the final stages of topology change events. Resolving such surface tension dominated small scale interface dynamics in a flow solver quickly becomes prohibitively expensive, especially for turbulent flows of engineering relevance. However, filtering the governing equations introduces unclosed terms that require modeling, among them the filtered surface tension force. In single phase flows, models, like the Large Eddy Simulations approach, rely on the existence of a cascade process, which is not necessarily present in two phase flows with surface tension forces. We thus propose a novel sub-grid model for the surface tension force based on the Refined Level Set Grid method that does not imply the existence of a cascade process. It is based on a local Taylor analogy, with surface tension acting as a local spring and viscosity as a local damper. We present results for the sub-grid motion of oscillating drops and sub-grid Rayleigh-Plateau instabilities commonly encountered in turbulent atomization.

[1]This work was supported by NSF grant CBET-0853627 and the Center for Turbulence Research 2010 Summer Program.

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Date submitted: 03 Aug 2010 Electronic form version 1.4