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DNS of droplet-laden incompressible turbulence: surface tension in a VoF method ALBERTO BARALDI, ANTONINO FERRANTE, University of Washington, Seattle — We investigated the continuous surface force (CSF) model to include the surface tension within a split-advection and mass-conserving volume of fluid (VoF) method for DNS of droplet-laden incompressible turbulence. The liquid-gas interface curvature is computed accurately using a variable-stencil height-function technique. Different implementations of the surface tension and pressure gradient terms within a projection method were tested, and their stability evaluated in terms of the magnitude of spurious currents for a droplet at rest in both two and three dimensions. The inherent asymmetry of the split-advection algorithm is reflected in the results of this test case. Our results show that a machine-accurate balance between pressure and surface tension forces can be achieved by enforcing symmetry of the VoF function. We have modified the sequence of the advection sweeps, and our results show that, in the case of non-zero Weber number, e.g. when a mean droplet velocity is present, the algorithm is accurate and stable. We present DNS results of fully-resolved droplet-laden incompressible isotropic turbulence.

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