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A DNS study on bubble-induced turbulence ALESSIO INNOCENTI, SERGIO CHIBBARO, University Pierre et Marie Curie, RODNEY FOX, Iowa State University — Incompressible Eulerian-Eulerian two-fluid models, applied to gas-liquid flows, may experience the onset of non-physical instabilities. Recent works have shown that a dispersion term, which depends on the drag coefficient and the gradient of the gas volume fraction, is required to ensure the hyberbolicity of the PDEs. In the present work, a study on bubble-induced turbulence has been done to characterize this term. Three dimensional numerical simulations of nearly spheroidal bubbles deforming and rising in a quiescent liquid have been performed. Bubbles are initialized in a compact layer at the bottom of a tank in order to recreate a steep gradient of the volume fraction, which is locally moderate ($0.05 \leq \alpha \leq 0.15$), for the estimate of the dispersion term. Simulations are done with the one-fluid formulation together with a geometrical Volume-Of-Fluid (VOF) interface representation. Interfacial forces have been evaluated to propose closures for the dispersion coefficient. Moreover, the agitation in the liquid phase has been quantified, both inside and past the bubble swarm, evaluating the main scaling laws, expressed as functions of the characteristics of a single rising bubble. Results are compared with experimental works of similar configurations.

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