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A kinetic energy and entropy preserving scheme for compressible two-phase turbulence simulations[1] PARVIZ MOIN, SUHAS S JAIN, Center for Turbulence Research, Stanford University, USA, CENTER FOR TURBULENCE RESEARCH TEAM — Compressible two-phase turbulent flows have wide range of applications such as high-speed atomization, droplet combustion, bubble cavitation, cloud dynamics, Rayleigh-Taylor and Richtmyer-Meshkov instability flows. Accurate numerical modeling of such flows requires a method that is non-dissipative and is stable for high-density ratios and at high Reynolds (*Re*) numbers. For a compressible flow, it is known that discrete conservation of kinetic energy is not a sufficient condition for numerical stability unlike in incompressible flows (Honein & Moin, *JCP*, 2004; Chandrashekar, *CCP*, 2013; Kuya et al., *JCP*, 2018). In this study, we adopt the recently developed diffuse-interface method (Jain, Mani & Moin, *JCP*, 2020) that is non-dissipative. We propose discrete consistency conditions between the numerical fluxes of mass, momentum, kinetic energy, and internal energy, such that an exact conservation of kinetic energy and approximate conservation of entropy of each phase are achieved in the absence of pressure work, viscosity, and thermal diffusion. To this end, we present numerical simulations of compressible two-phase turbulent flows at finite and infinite *Re*, to illustrate the stability and accuracy of the method in isotropic turbulence and Taylor-Green vortex flows.

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