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On the treatment of material interfaces in the presence of finite mass physical diffusion[1] POOYA MOVAHED, ERIC JOHNSEN, University of Michigan, Ann Arbor — In incompressible miscible variable-density flows, density is a function of composition and temperature (but not pressure), and velocity does not remain divergence-free in mixing regions. In numerical simulations of diffuse interfaces, it was previously shown that a specific form of the velocity, based on the density profile, should be prescribed initially, for consistency. In this work, we are interested in extending these ideas to compressible miscible flows, where the density and pressure are coupled through an equation of state. We study the temporal evolution of an isolated material interface in the presence of diffusion processes (mass, momentum and energy). We show that a velocity profile similar to that introduced in the incompressible case should be prescribed initially to avoid generating spurious waves at the interface. A new form of the initial velocity profile is suggested for an isothermal problem in the presence of gravity. The single-mode Richtmyer-Meshkov instability is used to illustrate the importance of this prescribed velocity on large-scale flow dynamics after re-shock.

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