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Density-ratio effects on buoyancy-driven variable-density turbulent mixing[1] DENIS ASLANGIL, Lehigh University, DANIEL LIVESCU, Los Alamos National Laboratory, ARINDAM BANERJEE, Lehigh University — Density-ratio effects on the turbulent mixing of two incompressible, miscible fluids with different densities subject to constant acceleration are studied by means of high-resolution Direct Numerical Simulations. In a triply periodic domain, turbulence is generated by stirring in response to the differential buoyancy forces within the flow. Later, as the fluids become molecularly mixed, dissipation starts to overcome turbulence generation by bouyancy. Thus, the flow evolution includes both turbulence growth and decay, and it displays features present in the core region of the mixing layer of the Rayleigh-Taylor as well as Richtmyer-Meshkov instabilities. We extend the previous studies by investigating a broad range of density-ratio, from 1-14.4:1, corresponding to Atwood numbers of 0.05-0.87. Here, we focus on the Atwood number dependence of mixing-efficiency, that is defined based on the energy-conversion ratios from potential energy to total and turbulent kinetic energies, the decay characteristics of buoyancy-assisted variable-density homogeneous turbulence, and the effects of high density-ratios on the turbulence structure and mixing process.

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