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Homogeneous variable-density turbulence with asymmetric initial density distributions[1] DENIS ASLANGIL, Lehigh University, DANIEL LIVESCU, Los Alamos National Laboratory, ARINDAM BANERJEE, Lehigh University — In most natural and engineering applications, turbulent mixing occurs between unbalanced amounts of two or more miscible fluids of different densities. For example, during Rayleigh-Taylor and Richtmyer-Meshkov instabilities, the mole fraction percentages of the pure fluids change from zero to unity from edge to edge within the mixing layer. In this study, we investigate the effects of differential amounts of mixing fluids on the evolution of HVDT by using high-resolution direct numerical simulations (up to 2048ˆ3) for two different density ratios- 1.1:1 and 7:1. Three cases with different initial compositions characterized by an initial composition ratio (χ =mole fraction of heavy fluid/ mole fraction of heavy fluid) was chosen for each density ratio; a heavy fluid dominated case (HF) with χ =3, a light fluid dominated case (LF) with χ =1/3 and the classical HVDT case where χ =1. It is found that at large density ratios, upon increasing the initial amount of the pure light fluid, the turbulence kinetic energy generation is enhanced, whereas upon increasing the initial amount of the pure heavy fluid, the turbulence generation is suppressed. In addition, it takes longer for turbulence to disperse into the regions of heavy fluid compared to regions of light fluid.

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