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Buoyancy-driven homogeneous turbulence with large density fluctuations[1] DENIS ASLANGIL, DANIEL LIVESCU, Los Alamos National Laboratory, ARINDAM BANERJEE, Lehigh University — We explore the dynamics of buoyancy-driven homogeneous variable-density turbulence (HVDT) by using high-resolution (2048^3) direct numerical simulations (DNS) within a triply periodic domain. Initially, large regions of two pure miscible fluids with different densities are randomly distributed and start to move in opposite directions upon application of an acceleration field. These motions enhance the stirring and turbulence generation due to the different buoyancy forces in the flow domain. Thus, the available potential energy (PE) is converted into kinetic energy (KE). Simultaneously, the fluids are molecularly mixing, which reduces the PE. At some point, the turbulence dissipation starts to overcome the turbulence generation, which leads to a decay in KE. In this talk, we summarize our recent findings on the large density contrast effects on the highly non-linear evolution of the HVDT. Briefly, increasing the density contrast between the mixing fluids causes a significant divergence between the turbulence structure of the classical single fluid turbulence and turbulence with large density fluctuations as the lighter fluid regions become turbulent faster and reach higher turbulence intensities than the heavier fluid regions due to their smaller inertia.

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