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Direct Numerical Simulations of Rayleigh-Taylor instability with gravity reversal DANIEL LIVESCU, Los Alamos National Laboratory, TIE WEI, New Mexico Tech — In order to study the variable acceleration effects on the development of Rayleigh-Taylor instability (RTI), two unit problems are proposed: reversing the gravity and setting the gravity to zero in the turbulent stage of classical RTI. Data from high resolution Direct Numerical Simulations, covering the range of Atwood numbers from 0.04 to 0.9, are used to examine the modifications in the layer structure and turbulence properties following the change in gravity. After gravity reversal, the density inversion regions lead to new local RTI development, which efficiently mixes the large scales of the flow. This also introduces a strong directionality in the alignment of vorticity and strain rate eigenvectors. In addition, the turbulent transport reacts much faster to the change in gravity compared to the mean density. This renders the popular gradient diffusion hypothesis inappropriate for such flows, which pose significant challenges for engineering turbulence models.

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