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Hybrid WENO/Central Difference Navier-Stokes Simulation of Rayleigh-Taylor Instability[1] WAI-SUN DON[2], Brown University, OLEG SCHILLING, Lawrence Livermore National Laboratory — A new hybrid weighted essentially non-oscillatory (WENO)/central finite-difference method has been developed for the high-resolution, multi-dimensional, efficient simulation of turbulent mixing induced by interfacial hydrodynamic instabilities. Multi-resolution analysis is used to dynamically determine regions in which large gradients or discontinuities exist (where upwinding is applied) and regions in which the flow is relatively smooth (where central differencing is applied). This method is used to solve the fluid dynamics equations describing Rayleigh–Taylor unstable flow at intermediate and large Atwood number, and is shown to be robust for large initial density contrasts. Comparisons of the mixing layer widths, molecular mixing parameter, energy spectra, and other quantities are used to explore the effects of Atwood number on the evolution of turbulence statistics.

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