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Turbulent mixing in a uniformly stratified shear layer at high Reynolds number HIEU PHAM, ALEXANDRA VANDINE, SUTANU SARKAR, University of California, San Diego — Direct numerical simulations (DNS) are performed to investigate the dynamics of turbulent mixing in a shear layer with uniform stratification. The Reynolds number (Re) is large and the stratification is varied over a wide range of Richardson numbers (Ri). A myriad of secondary convective and shear instabilities develop on top of the primary Kevin-Helmholtz (KH) billows similar to what has been observed at high Re in the often-studied case of shear between two constant-density layers with different values of density. However, the mixing efficiency in the present study is considerably smaller and it remains relatively constant as the Richardson number approaches the viscous, finite-domain KH instability limit of Ri ≈ 0.18. After the turbulence has become fully-developed, the mixing efficiency peaks in the transition layers (which form at the edges of the shear layer) where the local shear and stratification are enhanced and evanescent internal waves are excited. Turbulence parametrization using buoyancy Reynolds number and bulk Richardson number shows a scaling that is more similar to what has been observed in homogenous stratified shear turbulence rather than in the two-density shear layer.

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