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Mixing structures in stratified shear flow: Dependence on gradient Richardson number ROBERT ECKE, Los Alamos National Laboratory, PHILIPPE ODIER, Ecole Normale Superieure de Lyon, JUN CHEN, Purdue University — We report experimental measurements of velocity and density fields of wall-bounded stratified shear-flow turbulence as a function of shear velocity and density difference. A turbulent channel flow exits a nozzle onto the underside of a flat transparent plate at fixed velocity $4 < U < 8$ cm/s and with a fractional density difference $0.0027 < \Delta\rho/\rho < 0.0054$ between the inflowing fluid and the quiescent fluid in the tank. Simultaneous velocity and density measurements are obtained using PIV and PLIF, respectively (see P. Odier, J. Chen, and R.E. Ecke, J. Fluid Mech. 794, 498 (2014) for experimental details). For a resultant range of gradient Richardson numbers $0.05 < Ri_g < 0.5$, we compute and compare different measures of turbulent mixing obtained from direct measurement of turbulent dissipation, Reynolds stress, buoyancy flux, and density and velocity gradients. In particular, we obtain mixing lengths, Ozmidov and shear lengths, Thorpe lengths, buoyancy Reynold number, flux Richardson number, diapycnal mixing parameter, and intermittency properties of flows as a function of gradient Richardson number. These quantities characterize the transition from shear dominated flow at low Ri_g to stratification dominated behavior at larger Ri_g.

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