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Turbulent Mixing in Gravity Currents with Transverse Shear BRIAN WHITE, UNC Chapel Hill, Marine Sciences, KARL HELFRICH, Woods Hole Oceanographic Institution, ALBERTO SCOTTI, UNC-Chapel Hill — A parallel flow with horizontal shear and horizontal density gradient undergoes an intensification of the shear by gravitational tilting and stretching, rapidly breaking down into turbulence. Such flows have the potential for substantial mixing in estuaries and the coastal ocean. We present high-resolution numerical results for the mixing efficiency of these flows, which can be viewed as gravity currents with transverse shear, and contrast them with the well-studied case of stably stratified, homogeneous turbulence (uniform vertical density and velocity gradients). For a sheared gravity current, the buoyancy flux, turbulent Reynolds stress, and dissipation are well out of equilibrium. The total kinetic energy first increases as potential energy is transferred to the gravity current, but rapidly decays once turbulence sets in. Despite the non-equilibrium character, mixing efficiencies are slightly higher but qualitatively similar to homogeneous stratified turbulence. Efficiency decreases in the highly energetic regime where the dissipation rate is large compared with viscosity and stratification, $\varepsilon/(\nu N^2) > 100$, further declining as turbulence decays and kinetic energy dissipation dominates the buoyancy flux. In general, the mixing rate, parameterized by a turbulent eddy diffusivity, increases with the strength of the transverse shear.

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