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Mixing efficiency in shear-driven and convective turbulent stratified flows[1] ALBERTO SCOTTI, BRIAN WHITE, Dept. of Marine Sciences, UNC, Chapel Hill — DNS of steady-state and time-evolving mixing layers are used to calculate the mixing efficiency under different forcing conditions. Two basic mechanisms to sustain turbulence are considered: shear acting against a stably stratified background, and zero-shear, but convectively unstable regions embedded in a stratified fluid. When turbulence is produced by shear the mixing efficiency can be collapsed in terms of the buoyancy Reynolds number for values of the latter less than 20, whether the flow is steady or time evolving. For higher values, no such collapse exists. The efficiency of time-evolving shear-driven mixing layers approaches a constant value during the turbulent phase of about 0.15. In steady-state flows, on the contrary, the mixing efficiency is controlled to leading order by the externally imposed Richardson number. We show that the difference is due to the different way in which buoyancy and momentum are fed into the mixing layer. In overturning mixing layers we observe larger values of the mixing efficiency, approaching 1/2. The results suggests that the practice of adopting a constant mixing efficiency in parameterizing shear-driven episodic mixing events is justified in environmental flows.

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