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Mixing in Turbulent Fluids: From Quasi Two-Dimensional Systems to Stably-Stratified Shear Flows ROBERT ECKE, Los Alamos National Laboratory — Mixing in fluids represents one of the most important roles of chaotic or turbulent flows, being responsible for, among many things, the dispersion of pollutants, the efficient mixing of fuel/gas in internal combustion engines, and the distribution of heat and salinity in the ocean. I will discuss Lagrangian and Eulerian measurements of a thin layer driven by electromagnetic forcing which is an experimental realization of two-dimensional turbulence. I will also present experimental results of fully three-dimensional stably-stratified shear flows that represent geophysical problems arising from, for example, oceanic overflows and river estuaries. The simultaneous planar velocity and density fields are determined using particle image velocimetry and planar laser-induced fluorescence. Different analysis methods for characterizing the interplay between mixing and turbulence are explored including Lagrangian methods obtained from high-resolution particle tracking, filtering (coarse-graining) applied to both systems, and comparison with traditional turbulence analysis approaches. These different analysis techniques give physical insight into the mechanisms of mixing and transport in scalar advection, both the passive and active cases.

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