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Intermittent dynamics in stably stratified plane Couette flows[1]
ENRICO DEUSEBIO, JOHN R. TAYLOR, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, COLM-CILLE CAULFIELD, BP Institute & DAMTP, University of Cambridge, RICH R. KERSWELL, School of Mathematics, University of Bristol — Turbulence in a stratified fluid is a fundamental process in the atmosphere and oceans, responsible for mixing density and various tracers and dissipating kinetic and potential energy. Although turbulence is generally suppressed in very statically stable conditions, intermittent bursts of turbulence are still seen when the Reynolds number is sufficiently large. In this work, we study stratified turbulence in plane Couette flow using direct numerical simulations, focusing on the complexity arising from the spatio-temporal intermittency of the flow as the stabilizing stratification increases. Two external dimensionless parameters control the dynamics: the Reynolds number Re and the bulk Richardson number Ri_b. We trace the boundary between laminar and turbulent states in the Re-Ri_b plane and discuss the relevant dynamical quantities involved in the relaminarization process. We analyze the structures populating the intermittent regime and the coexistence between laminar and turbulent patches, focusing on similarities and differences between small-Re-small-Ri_b and large-Re-large-Ri_b intermittent dynamics. We conclude by discussing the applicability and breakdown of existing stratified turbulence theories, including the Monin-Obukhov self-similarity theory.

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