Abstract Submitted
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Regime transitions and energetics of sustained stratified shear flows[1] ADRIEN LEFAUVE, JAMIE PARTRIDGE, PAUL LINDEN, DAMTP, Univ of Cambridge — We describe the long-term dynamics of laboratory sustained stratified shear flows relevant to geophysical flows. The stratified inclined duct (SID) experiment sets up a sustained two-layer exchange flow in an inclined duct connecting two reservoirs containing salt solutions of different densities. Varying the two key parameters and Re (the tilt angle of the duct and the Reynolds number based on the density difference driving the flow) leads to four qualitatively different regimes: laminar flow; mostly laminar flow with Holmboe waves; spatio-temporally intermittent turbulence; and vigorous interfacial turbulence. In this talk we provide a quantitative basis for this regime classification and explain the power law scaling of the transitions in the (,Re) plane. We employ (i) newly-available, state-of-the-art simultaneous volumetric measurements of the density field and the three-component velocity field; (ii) time- and volume-averaged potential and kinetic energy budgets. We show and explain how regime transitions are caused by an increase in the non-dimensional time- and volume-averaged kinetic energy dissipation within the duct, which scales with the non-dimensional group Re.

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