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Experimental study of mixing mechanisms in stably stratified Taylor-Couette flow PIERRE AUGIER, COLM-CILLE CAULFIELD, STUART DALZIEL, Univ of Cambridge — We consider experimentally the mechanisms of mixing in stably stratified Taylor-Couette (TC) flow in a TC apparatus for which both cylinders can rotate independently. In the case for which only the inner cylinder rotates, centrifugal instability rapidly splits an initially linear density profile into an array of thin nearly homogeneous layers. Shadowgraph, PIV and density profiles measured by a moving conductivity probe allow us to characterise this process and the resulting flow. In particular, we observe turbulent intrusions of mixed fluid propagating relatively slowly around the tank at the interfaces between the layers, leading to a time-dependent variation in the sharpness and turbulent activity at these interfaces, whose period scales with (but is much larger than) the rotation period. Interestingly, the turbulent intrusions are anti-correlated between adjacent interfaces leading to snake-skin-like patterns in the spatio-temporal diagrams of the density profiles. We also explore how the presence of a density stratification modifies end effects at the top and bottom of the cylinders, in both the presence and absence of primary centrifugal instability.

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