replacement of DFD16-2016-000931 .

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Characterisation of a quasi-periodic mixing mechanism in stratified turbulent Taylor-Couette flow[1] KANWAR NAIN SINGH, JAMIE PARTRIDGE, STUART DALZIEL , DAMTP, University of Cambridge, C.P. CAULFIELD, DAMTP, University of Cambridge BPI, University of Cambridge, MATHEMATICAL UNDERPINNINGS OF STRATIFIED TURBULENCE (MUST) TEAM — We conduct experiments to examine a quasi-periodic mixing event that occurs in stratified Taylor-Couette flow, i.e. axially-stratified flow in the annular region between two concentric cylinders which can rotate at different angular velocities. It has been previously observed that, in two-layer density stratified Taylor-Couette flow, there is an intermittent periodic mixing event which is continuously advected around the annulus. We track this mixing event within the annular gap of the Taylor-Couette apparatus by continuously measuring density perturbations at the sharp interface separating the two layers as a function of radial location. It has been seen that when $Ri = \frac{g' R_o}{(R_i \Omega_i)^2} \sim 7$, where R_i, R_o are the inner and outer cylinder radius, respectively, g' the reduced gravity characterising the density jump between the layers and Ω_i is the rotation rate of the inner cylinder, the power of the mixing event in the frequency spectrum of the density data drops significantly. This process seems to be consistent at all radial locations throughout the annulus. This phenomenon is further investigated using velocity information obtained from particle image velocimetry (PIV).

[1]EPSRC programme grant EP/K034529/1 SGPC-CCT Scholarship

Kanwar Nain Singh
DAMTP, University of Cambridge

Date submitted: 29 Jul 2016 Electronic form version 1.4