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Experimental studies of turbulence lifetimes in differentially rotating flows E.M. EDLUND, Z. YAN, E.J. SPENCE, A.H. ROACH, J. RHOADS, H. JI, Princeton Plasma Physics Laboratory — Inference of accretion rates from observations of stellar systems suggests inward mass fluxes which can only be reasonably explained by a turbulent transport process. While the magneto-rotational instability (MRI) is likely active in systems above a critical ionization, there remains some question as to whether the MRI can be active in cooler bodies such as proto-planetary systems, and if not, what mechanism is then responsible for angular momentum transport? Keplerian rotation profiles are hydrodynamically linearly stable in the inviscid limit, however, it is not known if there exists a subcritical transition. A series of studies in the Hydrodynamic Turbulence Experiment (HTX), a modified Taylor-Couette device, have explored quiescent flows in the quasi-Keplerian regime. Operating in the wide-gap limit and with split axial boundaries to control the Ekman circulation, azimuthal flows in HTX can be brought very close to ideal Couette. These flows are subjected to external perturbations to test their ability to sustain incompressible hydrodynamic turbulence. Under no circumstances has a subcritical transition to turbulence been observed. Turbulence decay lifetimes are measured and compared to theoretical models.

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