Abstract Submitted
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High Reynolds number decay of turbulent Taylor-Couette flow RUBEN A. VERSCHOOF, SANDER G. HUISMAN, ROELAND C.A. VAN DER VEEN, CHAO SUN, DETLEF LOHSE, Physics of Fluids - University of Twente — We study the decay of high-Reynolds number turbulence in a Taylor-Couette facility for pure inner cylinder rotation. The rotation of the inner cylinder ($\mathrm{Re_i} = 2 \times 10^6$) is suddenly decelerated as fast as possible, thus removing the energy input within seconds. Local velocity measurements show that the decay in this wall-bounded inhomogeneous flow is faster than observed for homogeneous isotropic turbulent flows, due to the strong viscous drag applied by the inner and outer cylinder surfaces. We found that the decay over time can be described with the differential equation $\dot{\mathrm{Re}}(t) = c_f(\mathrm{Re})\mathrm{Re}^2$, where the effects of the walls are included through the friction coefficient. A self-similar behavior of the azimuthal velocity is found: its normalized velocity profile as a function of the radius collapses over time during the decay process.

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