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Dynamically dominant exact coherent structures in turbulent Taylor-Couette flow[1] MICHAEL KRYGIER, ROMAN GRIGORIEV, Georgia Institute of Technology — Unstable Exact Coherent Structures (ECS), which are solutions to the Navier-Stokes equation, provide a connection between turbulence and dynamical systems and offer a method for exploiting the low dimensionality of weakly turbulent flows. We investigate ECS in an intermittent Taylor-Couette flow (TCF) found in a small-aspect-ratio geometry with counter-rotating cylinders ($\eta = 0.5$, $\Gamma = 1$, $Re_i = -1200$, $Re_o = 1200$). The presence of end-caps breaks the axial translational symmetry of TCF, but continuous rotational symmetry remains, which suggest that typical ECS should be the relative versions of equilibria and time-periodic orbits. Indeed, previous studies (Meseguer et al., 2009 and Deguchi, Meseguer Mellibovsky, 2014) found several unstable traveling wave solutions (relative equilibria). We have shown that the dynamically dominant ECS for weakly turbulent TCF in the small-aspect-ratio geometry are relative periodic orbits (not relative equilibria), as evidenced by the frequent visits of their neighborhoods by the turbulent flow.

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