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Homoclinic orbits in Pipe flow[1] AKSHUNNA DOGRA, New York Univ NYU, NAZMI BUDANUR, BJOERN HOF, Institute of Science and Technology, Austria — We study pipe flow numerically in the transitional regime at which spatially localized turbulent dynamics coexists with the laminar flow. Under certain symmetry restrictions, Avila et. al. (Phys. Rev. Lett., vol. 110, 2013, 224502) showed that the laminar-turbulent boundary in this system is set by the stable manifold of a relative periodic orbit (RPO). We investigate the unstable manifold of this RPO in order to demonstrate that it contains so-called "homoclinic orbits" that are the trajectories which lie at the intersections of the stable and unstable manifolds. To this end, we employed a simple bisection algorithm that locates orbits that come back to the vicinity of the RPO after exploring the chaotic regions of the state space. We then visualized these trajectories on Poincaré section projections for verification. Presence of these orbits implies the existence of "homoclinic structure", which in turn explains the transient chaotic dynamics exhibited by the system.

[1]OeAD Sonderstipendien

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