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Topological chaos in a lid driven cavity flow at finite Reynolds number PRADEEP RAO, Virginia Tech, ANDREW DUGGLEBY, Texas A&M, MARK STREMLER, Virginia Tech — Topological chaos, or chaos that is guaranteed to exist in a system due to sufficiently complex motion of a few periodic orbits, has been demonstrated for creeping flow in a lid driven cavity. Nearly-periodic systems can by analyzed in a similar way based on the presence of Almost Invariant Sets (AIS) with similarly complex space-time trajectories. We extend this analysis to finite Reynolds number flows in a lid driven cavity using a 2D Fourier-Chebyshev spectral algorithm for the streamfunction-vorticity formulation, which enables accurate particle tracking that can resolve the exponential stretching of material lines in the flow. Simply extending the Stokes' flow parameters to stirring at finite Reynolds number leads to a decrease in system performance, but tuning the system based on the topological analysis can lead to enhanced stirring.

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