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Sudden relaminarisation and lifetimes in forced isotropic turbulence MORITZ LINKMANN, ALEXANDER MOROZOV, Univ of Edinburgh — We demonstrate an unexpected connection between isotropic turbulence and wall-bounded shear flows. We perform direct numerical simulations of isotropic turbulence forced at large scales at moderate Reynolds numbers and observe sudden transitions from chaotic dynamics to a spatially simple flow, analogous to the laminar state in wall bounded shear flows. We find that the survival probabilities of turbulence are exponential and the typical lifetimes increase super-exponentially with the Reynolds number, similar to results on relaminarisation of localised turbulence in pipe and plane Couette flow. Results from simulations subjecting the observed large-scale flow to random perturbations of variable amplitude demonstrate that it is a linearly stable simple exact solution that can be destabilised by a finite-amplitude perturbation, like the Hagen-Poiseuille profile in pipe flow. Our results suggest that both isotropic turbulence and wall-bounded shear flows qualitatively share the same phase-space dynamics.

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