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Experimental Study of Transition to Turbulence in a Kolmogorov-Like Flow[1] BALACHANDRA SURI, JEFFREY TITHOF, RADFORD MITCHELL, ROMAN GRIGORIEV, MICHAEL SCHATZ, Center for Nonlinear Science and School of Physics, Georgia Institute of Technology — Recent theoretical advances suggest that turbulence can be characterized using exact unstable solutions of the Navier Stokes equations, called Exact Coherent Structures (ECS). Due to their experimental accessibility and theoretical tractability, two-dimensional flows provide an ideal setting for the exploration of turbulence from a dynamical systems perspective. Here, we present results from an experimental implementation of a Kolmogorov-like flow where a thin layer of electrolyte is driven electromagnetically. Using PIV to extract the velocity fields, we quantitatively study the bifurcations that the system undergoes as it transitions to turbulence. These results are in good quantitative agreement with those from a direct numerical simulation of a two-dimensional flow model. We also discuss our on-going work on identifying ECS in these flows and studying their role in the weakly turbulent regime.

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