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Experimental and Numerical Study of Transition to Turbulence in a Kolmogorov-Like Flow[1] BALACHANDRA SURI, JEFFREY TITHOF, RADFORD MITCHELL JR., 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. In our talk, we present a combined numerical and experimental study of electromagnetically driven flows in a shallow layer of electrolyte. Our experimental results include the sequence of bifurcations the flow undergoes en route to becoming weakly turbulent. We discuss the effects of boundaries on the flow structure. On the numerical front, we present results from a 2D DNS, comparing them with the experiment. Also, in the weakly turbulent simulation of the flow, we search for exact coherent structures and present a few we have identified.

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Balachandra Suri
Center for Nonlinear Science and School of Physics,
Georgia Institute of Technology

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