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Search for Exact Coherent Structures in a Quasi-Two-Dimensional Kolmogorov-Like Flow[1] BALACHANDRA SURI, JEFFREY TITHOF, RAVI KUMAR PALLANTLA, ROMAN GRIGORIEV, SCHATZ MICHAEL, Center for Nonlinear Science and School of Physics, Georgia Institute of Technology — Recent theoretical advances suggest that turbulence can be characterized using unstable solutions of the Navier-Stokes equations having regular temporal behavior, 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. On the numerical front we present our research concerning the search for ECS in a two-dimensional Kolmogorov-like flow. We discuss the change in the dynamics of the flow as the Reynolds number is varied. For a weakly turbulent flow, we show that the turbulent trajectory explores a region of state space which contains a number of ECS, including equilibria and periodic orbit solutions. We then discuss the occurrence of states similar to these numerically computed ECS in an experimental quasi-two-dimensional Kolmogorov-like flow.

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