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Identifying Exact Coherent Structures in 2D Turbulence: Experiments and Simulations MICHAEL SCHATZ, JON PAPROCKI, CHRISTOPHER LESESNE, JAMES ANDREWS, Center for Nonlinear Science and School of Physics, Georgia Institute of Technology — Recent theoretical advances suggest ways to find unstable exact Navier Stokes solutions that capture many features of coherent structures, which have long been observed in turbulent flow. At present, it remains unknown whether these solutions, termed Exact Coherent States, can describe observations of turbulent flow in laboratory experiments. We describe our experimental and numerical investigations, which search for unstable solutions in quasi-2D flows driven by electromagnetic forces. In the experiments, time series of velocity fields are obtained from images of the visualized flow. In the simulations, long time series of velocity fields are calculated for flows with forcing similar to that in the experiments. The velocity field data from both experiments and simulations are used to construct recurrence plots that provide evidence for the existence of unstable periodic orbits.

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