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Heteroclinic Connections as Predictors of Extreme Events in Weakly Turbulent Flow[1] JOSHUA PUGHE SANFORD, ROMAN O. GRIGORIEV, Georgia Institute of Technology — Formally, extreme events occur in dynamical systems when an observable varies from its mean by many standard deviations. In practice, this describes events such as earthquakes, rogue waves, seizures, and heart attacks. Due to the catastrophic nature of these events on both an environmental and personal scale, an understanding of how these events occur is crucial. We investigate a two-dimensional Kolmogorov flow, where extreme events correspond to short-lived spikes in global dissipation. Using direct-adjoint iterations, we found a number of heteroclinic connections between unstable recurrent solutions characterized by very different rates in dissipation. We also found that extreme events correspond to the turbulent trajectories shadowing some of these connections in state space. These results suggest that heteroclinic connections may be used to understand and predict extreme events in this and other systems.

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