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Heteroclinic and Homoclinic Connections in a Kolmogorov-Like Flow[1] BALACHANDRA SURI, Institute of Science and Technology, Austria, RAVI KUMAR PALLANTLA, LOGAN KAGEORGE, MICHAEL F. SCHATZ, ROMAN O. GRIGORIEV, Georgia Institute of Technology, USA — Recent studies suggest that unstable recurrent solutions of the Navier-Stokes equation provide new insights into dynamics of turbulent flows. In this study, we compute an extensive network of dynamical connections between such solutions in a weakly turbulent quasi-two-dimensional Kolmogorov flow that lies in the inversion-symmetric subspace. In particular, we find numerous isolated heteroclinic connections between different types of solutions – equilibria, periodic, and quasi-periodic orbits – as well as continua of connections forming higher-dimensional connecting manifolds. We also compute a homoclinic connection of a periodic orbit and provide strong evidence that the associated homoclinic tangle forms the chaotic repeller that underpins transient turbulence in the symmetric subspace.

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