Edge States in Transitional Pipe Flow TOBIAS M. SCHNEIDER,
BRUNO ECKHARDT, Philipps-Universitaet Marburg — We study the boundary
of the laminar region near the onset of turbulence. Approaching the boundary
from the laminar side, the lifetime of perturbations increases, diverges when the
boundary is reached, and varies chaotically for larger amplitudes. In the chaotic
region, lifetimes vary sensitively with amplitude, consistent with the strange saddle
picture of the turbulence proposed earlier. The trajectory on the edge between the
laminar and chaotic regions is asymptotic to a single well defined state, essentially
independent of the type of perturbation. The edge then becomes the stable manifold
of this structure. In the case of a model shear flow, the edge states are simple or
period doubled or chaotic trajectories. In the case of pipe flow the edge state seems
to remain close to a state with simple vortical structure.
Edge of Chaos in a Parallel Shear Flow, Joseph D. Skufca, James A. Yorke, and
Bruno Eckhardt, Phys. Rev. Lett. 96, 174101 (2006)

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