

Abstract Submitted
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The origin of turbulent stripes in plane Poiseuille flow BJORN HOF, CHAITANYA PARANJAPE, IST Austria, YOHANN DUGUET, LIMSI-CNRS — Spatio-temporal complexity is a defining feature of turbulence and sets it apart from ordinary chaotic systems. Even for geometrically simple cases such as planar channel flow the multitude of spatial degrees of freedom dominate the dynamics at onset: here turbulence appears in irregular, continuously changing stripe patterns. In direct numerical simulations we identify travelling wave and periodic orbit solutions consisting of streak-vortex pairs arranged in an ordered stripe pattern surrounded by laminar flow. As Re is increased these elementary building blocks undergo a sequence of bifurcations giving rise to chaotic motion, much like in low dimensional dynamical systems. However, due to the spatial degrees of freedom infinitely many routes to chaos co-exist. While temporal chaos develops following standard routes, the spatial complexity originates from the multiplicity of elementary flow states.

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