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Subcritical Transition to Turbulence in Plane Couette Flow

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We present results of numerical simulations of a model of plane Couette flow derived from the Navier–Stokes equations by truncation of an appropriate Galerkin expansion. The model mimics its basic properties, especially conservation of kinetic energy by nonlinear terms, linear stability for all Reynolds numbers and direct transition to turbulence beyond some global stability threshold. Simulations using a pseudo-spectral numerical scheme have been performed in a large enough periodic box. Here we focus on the nucleation and development of turbulent domains from spots around that threshold. Before merging into featureless turbulence, they form oblique turbulent stripes well separated from laminar domains by propagating sharp fronts, thus giving insight in the transition to turbulence via spatio-temporel intermittency in extended subcritical systems.

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