Dynamics near the subcritical transition of the 3D Couette flow

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Abstract

We discuss the dynamics of small perturbations of the plane, periodic Couette flow in the 3D incompressible Navier-Stokes equations at high Reynolds number. For sufficiently regular initial data, we determine the stability threshold and show that all solutions near the threshold rapidly converge to a class of global "2.5 dimensional" slowly-evolving solutions referred to as "streaks". The primary stability mechanisms are an anisotropic enhanced dissipation effect and an inviscid damping effect of the velocity component normal to the shear, both a result of the mixing caused by the large mean shear. Joint work with Pierre Germain and Nader Masmoudi.

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