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Note generali	"July 2020, volume 266, number 1294 (fourth of 6 numbers)."
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Outline of the proof -- Regularization and continuation -- High norm estimate on Q2 -- High norm estimate on Q3 -- High norm estimate on Q1/0 -- High norm estimate on Q1/[not equal] -- Coordinate system controls -- Enhanced dissipation estimates -- Sobolev estimates.
Sommario/riassunto	"We study small disturbances to the periodic, plane Couette flow in the 3D incompressible Navier-Stokes equations at high Reynolds number Re . We prove that for sufficiently regular initial data of size $[\epsilon]$ $[\leq \text{or equal to}] c_0 Re^{-1}$ for some universal $c_0 > 0$, the solution is global, remains within $O(c_0)$ of the Couette flow in L^2 , and returns to the Couette flow as $t \rightarrow [\text{right arrow}] [\text{infinity}]$. For times $t \geq Re^{1/3}$, the streamwise dependence is damped by a mixing-enhanced dissipation effect and the solution is rapidly attracted to the class of "2.5 dimensional" streamwise-independent solutions referred to as streaks. Our analysis contains perturbations that experience a transient growth of kinetic energy from $O(Re^{-1})$ to $O(c_0)$ due to the algebraic linear

instability known as the lift-up effect. Furthermore, solutions can exhibit a direct cascade of energy to small scales. The behavior is very different from the 2D Couette flow, in which stability is independent of Re , enstrophy experiences a direct cascade, and inviscid damping is dominant (resulting in a kind of inverse energy cascade). In 3D, inviscid damping will play a role on one component of the velocity, but the primary stability mechanism is the mixing-enhanced dissipation. Central to the proof is a detailed analysis of the interplay between the stabilizing effects of the mixing and enhanced dissipation and the destabilizing effects of the lift-up effect, vortex stretching, and weakly nonlinear instabilities connected to the non-normal nature of the linearization"--
