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Finite-time Properties of the Navier-Stokes Equations Under Lebesque Space Disturbances KUMAR BOBBA, University of Massachusetts-Amherst — A complete understanding of the stability characteristics of the Navier-Stokes equations involve understanding both the transient response and the steady state response. The steady state (or infinite-time) response of the Navier-Stokes equations is characterized by the point spectrum and has been well studied. In this work, we study the transient (or finite-time) response of the unsteady Navier-Stokes equations linearized about plane Couette base flow under spatial and temporal varying disturbance forcing. The forcing and response are assumed to belong to infinite-dimensional Lebesque function spaces, L_2 and L_∞. An analytical characterization is given for the induced norms that characterize the response. It is shown that the L_2 induced norm is tightly bounded by the H_∞ norm of the transfer function operator and the L_∞ induced norm is upper bounded by the L_1 norm of the impulse response operator. The structure of the worst case disturbances and their amplification rates are computed using spectral methods—with Fourier modes in homogeneous direction and Chebyshev collocation in non-homogeneous direction. The relevance of the present results to the channel flow laminar-turbulent transition experiments will be discussed.

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