Optimal energy amplification of plane turbulent channel flows with emphasis on different types of perturbation YONGYUN HWANG, ASHLEY WILLIS, CARLO COSSU, Ecole Polytechnique — Optimal perturbations in turbulent channel flow with mean velocity profile and its associated eddy viscosity are investigated, with emphasis on different types of perturbation. We look for linear amplification of both very large-scale outer structures and near-wall streaks arising from three types of perturbations: initial perturbation, harmonic forcing and stochastic excitation. Proper premultiplied energy amplification factors for optimal harmonic forcing and stochastic excitation are suggested to be identified with growth of the outer and inner structures. Finally, response of the turbulent flow to optimal perturbations is studied, based on direct numerical simulation to validate the linear analysis.

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Date submitted: 17 Jul 2009   Electronic form version 1.4