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Control of transition in channel flows by a streamwise traveling wave[1] MIHAILO JOVANOVIC, RASHAD MOARREF, University of Minnesota
— Sensorless flow control is a promising technology for implementation, as it represents a much simpler alternative to feedback flow control with wall-mounted arrays of sensors and actuators. In this paper, we assess effectiveness of using a zero-net-mass-flux blowing and suction in the form of an upstream traveling wave for transition control in channel flows. Our study is motivated by a recent paper by Min *et al.* (J. Fluid Mech., vol. 558) where it was shown that this type of surface actuation yields a sustained sub-laminar drag in fully developed channel flows. We develop models that govern the dynamics of velocity perturbations in the presence of stochastic outside disturbances (such as free-stream turbulence and acoustic waves) and show how changes in control parameters affect perturbation kinetic energy density. Effectively, we establish that properly designed streamwise traveling waves can be used to weaken intensity of both streamwise streaks and Tollmien-Schlichting waves in transitional channel flows.

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