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An optimal feedback controller for the reduction of turbulent energy in 3D plane-duct flow PAOLO LUCHINI, Università di Salerno, Italy, THOMAS BEWLEY, UC San Diego, USA, MAURIZIO QUADRIO, Politecnico di Milano, Italy — Feedback control of 3D turbulence was demonstrated by Choi, Moin & Kim (1994) in the form of a simple opposition control with an empyrically adjusted coefficient. Högberg & Bewley (2000) applied modern optimal control to the linearized Navier-Stokes equations in order to develop a spatially localized convolution kernel and tested the controller so obtained on a turbulent DNS with encouraging results. Quadrio & Luchini (2002) suggested that a larger amount of physical information could be embodied in the controller if the linearized problem were replaced by a linear response of the full turbulent flow to external disturbances, and presented preliminary results for the computation of such linear response from a DNS. Here the optimal controller based on the linear response of the turbulent flow will be presented. A numerical version of the Wiener-Hopf method allows us to quickly compute the controller convolution kernel corresponding to any given pair of physical quantities chosen as actuator and sensor.

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