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Model-based design of drag-reducing spanwise wall oscillations MIHAILO JOVANOVIC, ARMIN ZARE, University of Minnesota — We study the model-based design of spanwise wall oscillations for drag reduction in a turbulent channel flow. Our approach selects the optimal period of oscillations by examining the influence of periodic base-flow-modification on Reynolds stresses. These are obtained from the linearized Navier-Stokes equations that are driven by colored-in-time stochastic forcing. Forcing correlations are selected, through a convex optimization procedure, to reproduce the statistical signature resulting from direct numerical simulation of the uncontrolled flow. We show that our analysis reliably predicts the optimal period of wall-oscillations in a simulation-free-manner. This demonstrates the effectiveness of our model-based approach in designing drag reducing wall oscillations and lays ground for utilizing such techniques in other passive or active flow control setups.

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