Reduced-Order Estimator-Based Feedback Control of Transitional Channel Flow[1] MILOS ILAK, CLARENCE ROWLEY, Princeton University — Reduced-order models obtained using empirical balanced truncation and balanced proper orthogonal decomposition (BPOD) are used for feedback control of transitional channel flow. The models are developed for linearized flow and the controllers designed for the models are then applied to full DNS simulations. Both localized body forces and wall blowing/suction are used as actuation. Low-order computationally efficient estimators based on the models are designed for all cases, and the state estimates are computed from measurements of wall shear or velocity inside the channel. As a measure of controller performance, we demonstrate that transition energy thresholds for the nonlinear evolution of certain classes of standard perturbations, including localized perturbations and optimals at different wavenumbers, are successfully increased by applying our feedback controllers.

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