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Large- vs Small-scale friction control in turbulent channel flow JACOPO CANTON, RAMIS RL, KTH Mechanics, CHENG CHIN, The University of Adelaide, PHILIPP SCHLATTER, KTH Mechanics — We reconsider the large-scale control scheme proposed by Hussain and co-workers (Phys. Fluids 10, 1049–1051 1998 and Phys. Rev. Fluids, 2, 62601 2017), using new direct numerical simulations (DNS). The DNS are performed in a turbulent channel at friction Reynolds number Re_τ of up to 550 in order to eliminate low-Reynolds-number effects. The purpose of the present contribution is to re-assess this control method in the light of more modern developments in the field, in particular also related to the discovery of (very) large-scale motions. The goals of the paper are as follows: First, we want to better characterise the physics of the control, and assess what external contribution (vortices, forcing, wall motion) are actually needed. Then, we investigate the optimal parameters and, finally, determine which aspects of this control technique actually scale in outer units and can therefore be of use in practical applications. In addition to discussing the mentioned drag-reduction effects, the present contribution will also address the potential effect of the naturally occurring large-scale motions on frictional drag, and give indications on the physical processes for potential drag reduction possible at all Reynolds numbers.

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