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Reynolds number dependence of large-scale friction control in turbulent channel flow JACOPO CANTON, RAMIS ÖRLÜ, Linné FLOW Centre, KTH Mechanics, CHENG CHIN, NICHOLAS HUTCHINS, JASON MONTY, Department of Mechanical Engineering, University of Melbourne, PHILIPP SCHLATTER, Linné FLOW Centre, KTH Mechanics — The present study reconsiders the control scheme proposed by Schoppa & Hussain (Phys. Fluids 10, 1049–1051 1998), using new direct numerical simulations (DNS). The DNS are performed in a turbulent channel at friction Reynolds number (Re_τ) between 104 (employed value in original study) and 550. The aim is to better characterise the physics of the control, investigate the optimal parameters and *Re* dependence. The former purpose lead to a re-design of the method: moving from imposing the mean flow to the application of a volume force. Results show that the original method only provides transient drag reduction (DR) but actually increases the drag for longer times. The forcing method, instead, leads to sustained DR, and is therefore superior for all wavelengths investigated. A DR of 18% is obtained at the lowest Re_τ for a viscous-scaled spanwise wavelength of the vortices of 230; the optimal wavelength increases with Re_τ, but the efficiency is reduced, leading to a zero DR for $Re_\tau = 550$, confining the method to low *Re* for internal flows. Although the findings by Schoppa & Hussain are invalidated, the forcing method is currently implemented in a spatially developing boundary layer to check whether it might lead to a different conclusion in external flows.

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