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The impact of superhydrophobic surface texture on channel-flow turbulence and drag THOMAS JELLY, SEO YOON JUNG, Imperial College London, TAMER ZAKI, Johns Hopkins University, Imperial College London — Fully-developed turbulent channel flow past streamwise-aligned superhydrophobic surface (SHS) textures is simulated at a fixed bulk Reynolds number, Re = 2,800 (Jelly et al., Phys. Fluids, 2014). The influence of the spanwise-repeated surface pattern is examined using phase-averaged statistics of the flow which is decomposed into mean, periodic and stochastic motions. Relative to a reference no-slip channel flow, the mean skin-friction coefficient is reduced by 21.6%. At particular phases, however, the skin friction far exceeds the reference value. The contributions to drag are examined and are attributed to changes in the primary flow, the presence of a secondary flow of Prandtl's second type, and changes in the Reynolds stresses. Each of these contributions is quantified, and the largest performance penalties are examined in detail. Finally, an eduction algorithm is used to identify near-wall turbulence structures and to quantify the changes in their strength and population density by the SHS texture.

Thomas Jelly
Imperial College London

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