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Direct Numerical Simulations of Turbulent Flows over Superhydrophobic Surfaces[1] MICHAEL B. MARTELL, J. BLAIR PEROT, JONATHAN P. ROTHSTEIN, University of Massachusetts Amherst — Direct numerical simulations are used to investigate the drag reducing performance of superhydrophobic surfaces in turbulent channel flow. Slip velocities, wall shear stresses, and Reynolds stresses are considered for a variety of superhydrophobic surface micro-feature geometry configurations at a friction Reynolds number of $\mathrm{Re}_\tau = 180$. For the largest micro-feature spacing of 90μm an average slip velocity over 75% of the bulk velocity is obtained, and the wall shear stress reduction is nearly found to be nearly 40%. The simulation results suggest that the mean velocity profile near the superhydrophobic wall continues to scale with the wall shear stress, but is offset by a slip velocity that increases with increasing micro-feature spacing.

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