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DNS of Turbulent Channel Flow past Ultrahydrophobic Surfaces with Periodic Microfeatures MICHAEL MARTELL, BLAIR PEROT, JONATHAN ROTHSTEIN, University of Massachusetts — The results from series of direct numerical simulations for fully-developed pressure-driven turbulent channel flow past ultrahydrophobic surfaces will be presented. We have shown previously that these surfaces can produce significant drag reduction in laminar channel flow by supporting a shear-free air-water interface between hydrophobic microridges or microposts. In this talk, we will focus on the turbulent flow between two parallel plates with a periodic array of longitudinal, ultrahyrdophobic ridges and posts with variable size and spacing. The surfaces of the microfeatures are modeled as no-slip while the air-water interfaces supported between the microfeatures are assumed to be flat and shear free. Relevant Reynolds stresses are calculated and will be compared with previous examples of turbulent channel flows without surface micro-features and the results of our ongoing experiments. Differences in the Reynolds stresses, the implications surface micro-features have on mean flow of the channel, as well as results from instantaneous and statistical turbulent structure analysis will be discussed.

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