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Direct Numerical Simulation of Turbulent Flows over Microstructured Surfaces at $Re_\tau = 180$ JEE HANN NG, RAJEEV KUMAR JAIMAN, TEE TAI LIM, National University of Singapore — Direct numerical simulations (DNSs) are used to investigate drag-reducing performance of microstructured surfaces (i.e. riblets) in a turbulent channel flow. The present numerical study aims to analyze systematically the influence of riblet geometry on the near wall properties and flow structures. In previous studies, a reduction in the skin friction drag was attributed to two mechanisms: (i) riblets shield the wall from the action of near wall streamwise vortices, (ii) mitigate the cross-stream motions of these eddy structures. The present work aims to investigate the validity of these propositions for a various set of riblet configurations. To begin with, a standard V-groove riblet geometry with six different heights and spacings, spanning both drag-reducing and drag-increasing regimes, is considered. These simulations are conducted in a channel flow at a friction Reynolds number $Re_\tau = 180$, where riblets are mounted on one of the walls. The results from these simulations reveal the interactions of the near wall structures with riblets, and the modifications of these flow structures to enable the drag reduction. Finally, the effects of spacing and height of the riblets are summarized for $Re_\tau = 180$.

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