Abstract Submitted
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Turbulent skin friction drag reduction with rigid or flexible surface micro-textures[1] JAE BOK LEE, RAYHANEH AKHAVAN, The University of Michigan — Turbulent skin-friction drag reduction with rigid or flexible surface micro-textures has been investigated by direct numerical simulation (DNS) using an immersed-boundary, lattice Boltzmann method. In this method, the dynamics of the flow field is tracked on a fixed Cartesian grid using standard D3Q19, single relaxation time, Bhatnagar-Gross-Krook lattice models, while the motion of the surface micro-texture is tracked by Lagrangian markers which are embedded in the immersed boundary. In contrast to traditional immersed boundary methods, here the interaction forces are determined by reciprocal interpolation-spreading operators, thus obviating the need for empirical parameters and resulting in consistent and more accurate numerical simulations. Grid embedding, of grid ratio 2:1, was employed in all the simulations to improve the accuracy of the computations in the near wall regions. The numerical methods were applied to DNS of skin friction drag reduction with blade riblets and flexible surface micro-textures in turbulent channel flows at $Re_{\tau 0} \approx 222$. DNS results with blade riblets show good agreement with available experimental data. The results with flexible surface micro-textures will be discussed.

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