

Abstract Submitted
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Direct numerical simulation study in turbulent boundary layers with the cube-roughened walls¹ JUNSUN AHN, JAE HWA LEE, HYUNG JIN SUNG, KAIST — Direct numerical simulations of turbulent boundary layers over the cube-roughened walls were performed to investigate the effects of the streamwise (p_x/k) and spanwise (p_z/k) extents between the cubes on the properties in the outer-layer statistics. The streamwise extent of the cubes was varied from $p_x/k=2, 3, 4, 6, 8,$ and 10 at fixed $p_z/k=2$ and, the spanwise extent of the cubes was varied from $p_z/k=2, 3, 4, 6$ including aligned configuration at fixed $p_x/k=3$, where k is the roughness height. The results showed that the outer peak values of the Reynolds stresses are increased with increasing streamwise spacing, indicating the strong inner and outer-layer interaction at large p_x/k and the profiles of the Reynolds stresses with varying spanwise spacing show the similar trends in the outer region except $p_z/k=4$. In addition, we found that there is no difference between staggered and aligned cube geometries.

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