

Abstract Submitted
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Long structures in a turbulent boundary layer with a rod-roughened wall¹ JUNG HOON KIM, JAE HWA LEE, UNIST — Direct numerical simulation (DNS) of a turbulent boundary layer (TBL) over a rod-roughened wall is performed with long streamwise domain to examine streamwise scale growth mechanism of streamwise velocity fluctuating structures. The surface roughness is the two-dimensional (2-D) rod arranged regularly in the streamwise direction. Inspection of the instantaneous flow fields and streamwise two-point spatial correlations of the streamwise velocity fluctuations shows that the streamwise and spanwise length scales of the structures over the rough wall are generally larger than those over the smooth wall, while the spanwise inclination angle to the streamwise direction (helix angle) is smaller over the rough wall. Inspection of time-evolving instantaneous fields clearly exhibits that adjacent long structures combine to form a longer structure by spanwise merging process over the rough wall, and the occurrence of the spanwise merging for the streamwise scale growth is expected to be more active over the rough wall due to turbulent scales generated by the 2-D roughness.

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