

Abstract Submitted
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Influence of large-eddy breakup device on near-wall turbulent structures in turbulent boundary layer¹ JOON-SEOK KIM, JINYUL HWANG, MIN YOON, JUNSUN AHN, HYUNG JIN SUNG², KAIST, FLOW CONTROL LAB TEAM — Direct numerical simulation of a large-eddy breakup (LEBU) device in a spatially developing turbulent boundary layer was performed to investigate the influence of outer structures on the near-wall turbulence. The thin and rectangular shaped LEBU device was placed on $y/\delta = 0.8$ and the device reduced the skin-friction coefficient (C_f) up to 17%. Decomposition of C_f showed that the contribution of the Reynolds shear stress decreased along the wall-normal direction. The reduction of the Reynolds shear stress was associated with the decrease of the ejection and sweep events, and in particular the latter was significantly reduced compared to the former in the near-wall region. The spanwise length scale of high-speed structures was more shortened than that of low-speed very near the wall ($y^+ = 20$). As a result, the dispersive motions induced by the outer sweeps were weakened leading to the reduction of C_f even the LEBU device located far from the wall.

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