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Surface roughness effects on turbulent Couette flow[1] YOUNG MO LEE, JAE HWA LEE, Ulsan Natl Inst of Sci Tech — Direct numerical simulation of a turbulent Couette flow with two-dimensional (2-D) rod roughness is performed to examine the effects of the surface roughness. The Reynolds number based on the channel centerline laminar velocity (U_{co}) and channel half height (h) is Re=7200. The 2-D rods are periodically arranged with a streamwise pitch of $\lambda = 8k$ on the bottom wall, and the roughness height is $k = 0.12h$. It is shown that the wall-normal extent for the logarithmic layer is significantly shortened in the rough-wall turbulent Couette flow, compared to a turbulent Couette flow with smooth wall. Although the Reynolds stresses are increased in a turbulent channel flow with surface roughness in the outer layer due to large-scale ejection motions produced by the 2-D rods, those of the rough-wall Couette flow are decreased. Isosurfaces of the u-structures averaged in time suggest that the decrease of the turbulent activity near the centerline is associated with weakened large-scale counter-rotating roll modes by the surface roughness.

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