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Roughness Effects on the Third Moments in a Turbulent Boundary Layer DONALD BERGSTROM, OLAJIDE AKINLADE, University of Saskatchewan — Profiles of the third moments of the fluctuating velocity field ($<u'^3>$, v'^3, $<u'^2v'>$, and $<u'v'^2>$) and distributions of the skewness of the longitudinal and wall-normal velocity fluctuations over smooth and three different rough surfaces were measured in a zero pressure-gradient turbulent boundary layer using cross hot-film anemometry. The freestream velocity and physical geometry of the three rough surfaces (i.e. perforated sheet, sand grain, and woven wire mesh) were chosen to create fully rough flow regimes. The Reynolds numbers based on momentum thickness were approximately the same for all three rough-wall flows. Two different scaling parameters, i.e. the friction velocity, U_τ , and a mixed scale, $U_e U_\tau^2$, proposed by George and Castillo (1997), were used to assess the effect of roughness on the triple velocity correlations. The experimental results indicate that surface roughness significantly alters some components of the third moment in the inner region, and this effect also extends into the outer region of the boundary layer. This observation is at variance with the wall similarity hypothesis. On the other hand, the distributions of the skewness for both the longitudinal and wall-normal velocity fluctuations are largely unaffected by surface roughness.

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