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Study the Effect of Roughness on the Higher Order Moment to Extract Information about the Turbulent Flow Structure in an Open Channel Flow

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Abstract : The present study was carried out to understand the extent of effect of roughness and Reynolds number in open channel flow (OCF). To this extent, four different types of bed surface conditions consisting smooth, distributed roughness, continuous roughness, natural sand bed and two different Reynolds number for each bed surfaces were adopted in this study. Particular attention was given on mean velocity, turbulence intensity, Reynolds shear stress, correlation, higher order moments and quadrant analysis. Further, the extent of influence of roughness and Reynolds number in the depth-wise direction also studied. Increasing Reynolds shear stress near rough beds are noticed due to arrays of discrete roughness elements and flow over these elements generating a series of wakes which contributes to the generation of significantly higher Reynolds shear stress.

Keywords : bed roughness, ejection and sweep, open channel flow, Reynolds shear stress, turbulent boundary layer, velocity triple product
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