

Turbulence Measurement Over Rough and Smooth Bed in Open Channel Flow

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Abstract : A 3D Acoustic Doppler velocimeter was used in the current investigation to quantify the mean and turbulence characteristics in non-uniform open-channel flows. Results are obtained from studies done in the laboratory, analysing the behavior of sand particles under turbulent open channel flow conditions flowing through rough, porous beds. Data obtained from ADV is used to calculate turbulent flow characteristics, Reynolds stresses and turbulent kinetic energy. Theoretical formulations for the distribution of Reynolds stress and the vertical velocity have been constructed using the Reynolds equation and the continuity equation of 2D open-channel flow. The measured Reynolds stress profile and the vertical velocity are comparable with the derived expressions. This study uses the Navier-Stokes equations for analysing the behavior of the vertical velocity profile in the dominant region of full-fledged turbulent flows in open channels, and it gives a new origination of the profile. For both wide and narrow open channels, this origination can estimate the time-averaged primary velocity in the turbulent boundary layer's outer region.

Keywords : turbulence, bed roughness, logarithmic law, shear stress correlations, ADV, Reynolds shear stress

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