EFFECT OF BED VEGETATION ON FLOW STRUCTURE WITH FAVOURABLE PRESSURE GRADIENT

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One of the most raised issues during the turbulent structure is determined by the substrate and vegetation. Turbulence has an important role in mass exchange and momentum. However, engineers and researchers have a little attention to non-uniform flow structure in the presence of vegetation with uniform flow. From an application point of view, any natural channel has a uniform bed and most of them change in longitudinal and transverse directions. In this study, accelerating turbulent flows and some other parameters such as minimum, maximum and mean velocity profiles, turbulent intensity and reynolds shear stress distribution for different density of rigid bed and artificial grass coverage have been studied. The physical modeling experiments were done in a flume of 7 m long, 0.30 m wide and 0.36 m deep in the hydraulic laboratory of Isfahan University of technology with the use of artificial grass of 3cm height. In this research peg with a height of 4 cm has been used as a rigid bed and the accelerating flow was generated in a rectangular flume (slopes are -0.01 and -0.02) Flow velocity components were measured over cross sections throughout the flow using vectrino ADVs. The experiments have been done in 3 categories: no cover, artificial grass cover and rigid vegetated cover. Two runs have been done in both artificial grass cover and no cover experiments with the mentioned slopes. 6 other runs have been done in three different densities of pegs as a rigid bed. These densities are created by placing the pegs at 2 cm, 4 cm and 8 cm in transverse and longitudinal direction. Measurements were made at 3 cross sections along the flume with 3 profiles per each cross section.In this research ADV results are studied and indicated that the mean velocity profiles cannot show the characteristic of flow structures by own while the Japanese candlestick charts has a good preview of flow structure. Other advantages of this Japanese candlestick charts is a good ability to have a preview of minimum and maximal velocity profiles. Minimum and maximum velocity profiles also indicate that in the covered area, the positive and negative velocities are rising and they will continue up to the crest and after that the negative velocities will be decreased while the positive velocities going to rise. These profiles also can give good details of maximum stress and maximum turbulence intensity in the crest of grass canopy. Because of high roughness by increasing the density of the vegetation the mean velocities changes to lower value. change of velocity profile in the inner layer that applied with log low are low and when entrance into outer layer, velocity profiles are the same. The distributions of Reynolds stress and turbulence intensity are as the same as velocity profile.

Keywords
vegetation, accelerating turbulent flows, minimum and maximum velocity profiles, Reynolds stress