

INTERACTIONS BETWEEN TURBULENT BOUNDARY LAYER AND RIGID VEGETATED BEDS: COMPARISON AMONG HYDRODYNAMIC CHARACTERISTICS IN DIFFERENT POINTS AROUND THE CYLINDERS

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Studying of the effects that a vegetated bed has on the main hydrodynamic characteristics (as flow rate and flow resistance) of the stream flowing down on it began much time ago, but now it takes a new and more weighty significance because either the ecology advises to protect the natural characteristics of the river or the modern development of the measurement instruments and of the numerical modelling allow to deepen the study of the turbulence statistical quantities of the stream itself.

For these reasons, recently, numerous either experimental or numerical studies on streams flowing down on vegetated beds were carried out, in particular with reference to uniform or steady flows, with different kinds of vegetation (rigid, flexible, wholly or partially submerged) [1] [2] [3].

This work is strictly linked to the previous ones [4][5][6] concerning the hydrodynamic characteristics of a turbulent boundary layer developing in a channel on a rigid vegetated bed, but it arises also from a review of the experimental works concerning the uniform or steady streams flowing down in channels with rigid vegetation where the distributions of the turbulence statistical quantities were obtained averaging in space as well as in time the measurements of the instantaneous velocity data collected in different verticals around the cylinders themselves [1] [3].

In previous papers [4] [5] [6] the instantaneous velocity data were measured in verticals located along the axis of the flow. In this paper, the data have been measured in the same test sections but in verticals located in different position in respect of the cylinders.

The conclusions that can be drawn from the performed experimental measurements are the following ones:

- Shift of the measurement verticals around the cylinders does not give rise to meaningful changes of the boundary layer thickness values;
- The non dimensional local mean velocity distributions (Figs.1 and 2) show a “total” or “partial” equilibrium characteristics with every kind of vegetation (that is cylinder height and density). The loss of “total” equilibrium in a section depends on the ratio between the thickness of the boundary layer in the section and the height of the cylinders: the limit values of this ratio depends on the density of vegetation, and are the same apart from the measurements verticals positions;
- Apart from the measurements verticals position, the equilibrium (“total” or “partial”) characteristics depend on the type of vegetation;
- Unlike what happens in cases of the measurements carried out in [4] [5] [6], the equilibrium loss concerns either the lower part or the higher one of the non dimensional profiles.

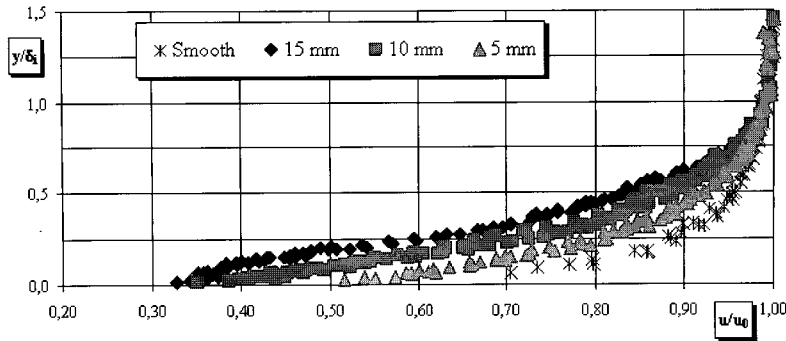


Fig. 1 Non dimensional local mean velocity distributions (0, 5, 10, 15 mm single density).

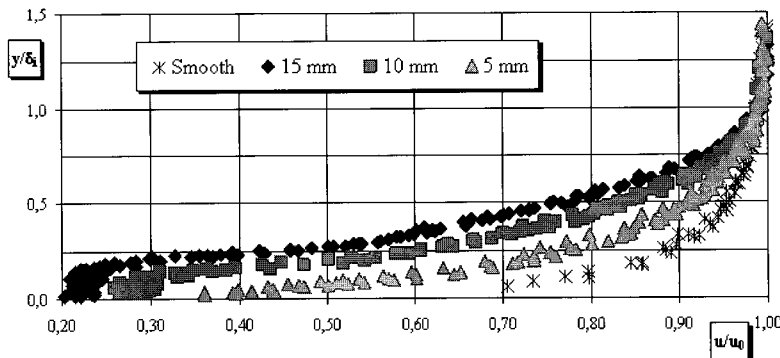


Fig. 2 Non dimensional local mean velocity distributions (0, 5, 10, 15 mm double density).

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