Geophysical Research Abstracts, Vol. 7, 02702, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02702

A physical model study on momentum exchange and drag in a partially vegetated compound channel with rigid and flexible roughness elements

I. Schnauder

Institute of Water Resources Management, Hydraulic and Rural Engineering, Universitaet Karlsruhe (TH), Germany, Now at the Hydroenvironmental Research Centre, School of Engineering, Cardiff University, UK (schnauderi1@cf.ac.uk / Phone: +44 29-2087-5737)

The current developments in the field of hydraulic research on floodplains and vegetation can be classified in two main approaches. First, the determination of drag of individual plants to account for the overall hydraulic resistance of floodplains. Second, the effect of vegetation on the velocities and turbulence in open channels. Both are key factors for accurate conveyance estimations of partially vegetated cross sections.

The present study formed a part within the EU project "RipFor" (2000-2003) on floodplain hydraulics and was carried out at the Universitaet Karlsruhe (TH). It united both approaches in a physical model and investigated the flow interaction between the main channel and vegetated floodplain and the overall drag exerted by the vegetation. The model had a 10 m long and 1 m wide compound channel cross section composed of a main channel and a vegetated floodplain. The floodplain was roughened using different rigid and flexible idealised floodplain vegetation in the form of cylinders. They were arranged at two different densities using a regular staggered configuration. Uniform flow experiments were conducted for different discharges and specifically for high relative flow depths to model extreme flood events. Instantaneous velocities in the longitudinal and cross-streamwise directions were measured using a two component LDV with a high spatial resolution measurement grid at different cross-sections in the longitudinal direction. In addition, head-loss tests were carried out to determine the drag and roughness of the floodplain vegetation.

Results pointed out a significant contribution of secondary currents to the momentum exchange between the main channel and floodplain. This mechanism was predeter-

mined by the channel geometry in terms of the relative depth ratio. As a secondary effect, waving motions of the vegetation increased the strength of these currents compared to rigid elements. The vegetative drag for both types remained unaffected and a linear function of the frontal area.