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Learning new knowledge from the results of hydrologic measurements at experimental river basins

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Development of modern measuring equipment has enabled us to measure water velocity on the basis of the Doppler effect. The chosen method enables measurements and data logging of water velocity in a fragment of a second, and thus measurements of phenomena in the water bodies that we are unable to measure with the classic propeller-type current meter. Measurements with Doppler 1D and 3D flowmeters and the classic current meter were performed at the in-take channel of the hydro power plant and on several cross sections, ranging from a small creek to a medium size river with a mean discharge of more than one hundred cubic meters per second. We recorded the actual relation between the water stage and the flow velocity during floods. Unsteadiness in the water stage-water velocity relation causes the trajectory of the high flow event to appear as a loop on the stage-velocity diagram. Results of the 5-year time measurements show non-negligible differences in water velocities on the rising and falling limbs of the flood waves at the same water stage. Very often velocities of water in the rising limb were lower than those in the falling limb. Neglecting the influence of different water flow velocities on the rising and falling limbs of the flood waves can result in underestimation of peak discharges during highly dynamic floods and less accurate estimation of the time of flood peaks. More detailed information on impact morphology of channel cross sections, vegetation and other anthropogenic impacts on the hydrological regime (like discharges from the local sewage system to the river in the urbanised areas of the experimental river basins) was also obtained. Additional measurements of velocity could explain the irregularity in the water discharge, seasonal impact of vegetation on stage-discharge relations and increase the accuracy of discharge estimation. We obtained phenomena that could not be recognised by classic discharge curves. The analysis of results showed that each measuring site had its

own characteristics that would need to be investigated with prior measurements.