Kraków, 30.03.2023 r.

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Title: Analysis of the hydrodynamic equilibrium of the braided channel on the example of the Białka River

Abstract

Within the framework of this dissertation, the influence of six consecutive flood waves on the modeling process of the braiding channel of the Białka River located at km 0+785 - 2+948 was investigated. The aim of the study was to analyze the hydrodynamic equilibrium of the aforementioned study section. The research objective was realized by performing field measurements in the period from 07.2019 to 09.2020. On the basis of the data collected during the measurements and the hydrographs created from the IMGW data, two-dimensional hydraulic models of the mentioned real flood waves were made. The results of the modeling were used to calculate the transport of dragged debris using the MPM-B method, calculate the bank flow using the Riley method, calculate the unit power of the stream, determine the area of shear stress exceedances for d_{50} and d_{90} diameters, and calculate the active width of the channel using the author's hydraulic method. In addition, the author attempted to apply the index of dimensionless active width of the flume developed within the framework of this dissertation for evaluating hydrodynamic equilibrium. The correlation analyses of the hydraulic parameters of water flow in the separated 15 fragments of the study section, carried out on the basis of the modeling results, showed practically full positive correlation between the average shear stress and the average unit stream power. The average unit power of the stream during the simulated boundary flows did not exceed 100 $W \cdot m^{-2}$. The state of hydrodynamic equilibrium of the study section was finally established on the basis of the analysis of differential terrain models, for which the balance of changes in the volume of the bottom after the passage of all the studied flood waves amounted to 1108 m^3.

Keywords: hydrodynamic equilibrium, braided river, bank flow, active channel width

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