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## **Numerical modeling of water flow conditions with spatial distributed boulder in main channel**

L. KSIĄŻEK<sup>1</sup>, M. WYRĘBEK<sup>1</sup>, M. STRUTYŃSKI<sup>1</sup> and A. WOŚ<sup>1</sup>

<sup>1</sup> University of Agriculture in Krakow, Department of Water Engineering and Geotechnics,  
Al. Mickiewicza 24/28, 30-059 Krakow  
e-mail: rmksiaze@cyf-kr.edu.pl

### **ABSTRACT**

The article presents influence of spatial distribution of boulder placed in the main channel on parameters of flow conditions. Restoration guidelines recommends boulder structures but engineering solutions must be individually adapted to local situation. The depth-averaged 2D unsteady, free-surface flow in open channels numerical model was used to calculate spatial distribution of velocity magnitude, slope of water surface level and water depth. The impact of individual boulders on the flow conditions in river channels increases through the group arrangement. Into calibrated model of the sector of the Wisłoka River, boulders were implemented in various configurations: a group of three or four placed in triangles or rhomboids, openwork deflectors, groups located by the banks, groups alternately to form a curvilinear thalweg. The effect of boulder structure on velocity spatial distribution along the channel was calculated for discharge  $Q_{10\text{-day}}=15 \text{ m}^3\text{s}^{-1}$ . Impact of single boulder structures on flow velocity is visible up to 20 ÷ 30 m and increase when multiple single boulder structures up to 30÷60 m. In addition, stability of individual boulders for discharge  $Q_{1\%}$  and influence the flood hazard were tested.