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Numerical modeling of flow dynamics on a gravel bar during high discharge in a mountain river

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ABSTRACT

Numerical modeling of changing parameters on a gravel bar during different discharges in a small mountain river is presented here. The study bar is one of the best developed bars of the upper Wisłoka. Within its reach, the river may erode its banks and transport bed material. Flowing out from the Magurski National Park, the Wisłoka may be assumed as close to natural river. As fluvial processes are very dynamic there, the bar and channel transformations occur every year. Granulometry measurements demonstrated high variation of bed material composition in different parts of the bar and the channel. The bed material was classified as fine gravel, coarse gravel, cobbles, and coarse sand. This simulation was performed based on a 2015 measurement campaign, however, in situ measurements were started in 2008. From among a wide spectrum of parameters yielded by numerical simulations, the study focused on average vertical velocity and bed shear stresses. They were compared to critical parameters of the bed material movement. The simulations were performed for different flows, from low discharges to bankfull ones, and they indicated potential dynamic changes in the bed activity.