

A creek's hydrological model's generates in HEC-RAS

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Abstract. During my research I have studied the Ronyva creek's 3.7 kilometers long stage and the Ronyva-spillway, both are located in Sátoraljaújhely. The area had significant flood damages in 2010 which resulted great reconstructions along both beds. During my work I used all the available data, I have made the hydrological model of the streams, then I ran flood models according to real and hypothetic flowrate in the built-out model-environment. By the help of the models the mostly endangered areas during an inundation can be predicted, and the bed's ability of excess water control can be studied.

The collection of significant amount of data is required to create the model-environment. To build the geometrical frame of the model a DEM (Digital Elevation Model) was needed which covered the whole study area including the riverbed. Based on field survey and satellite images the Manning's Roughness Coefficients of the bed and the surface has been identified. The further components have been measured on the basis of topographical maps in 1:10000 scale and the results of the field surveys. The built-in modul of ArcGIS, the HEC-GeoRAS was used to develop the geometrical frame. Further modelling processes were performed in HEC-RAS.

I have added the flowrate to the geometrical frame in HEC-RAS. The 1D permanent models have been run with the value of 160 m³/s and 142 m³/s flowrates. I have studied both bed's ability of excess water control. The first given value is the specified design discharge from the studies of '70s, the second value is the highest measured flowrate. As the results showed, in the case of both defined flowrates the flood was not successfully drained. The water covered a significant part of the study area. The generated flood maps can support the watermanagement and the decision-makers to elaborate prevention plans for floodings.

Keywords: flood, HEC-GeoRAS, HEC-RAS, hydrological modelling, Ronyva,

1 Introduction

In the last years and decades larger and larger climatic extremities affected by the climate change have characterized Hungary and the Carpathian basin. Due to this and the different anthropogenic effects the flow regime of the rivers and the creeks are altering. The increasing size of highwaters mean steady risks. The records of the flowrates fall after each, therefore the service of the flood barriers and the up-to-date protective plans stand first. For assistance of these, more and more hydrologic models started to be used in more and more projects also in Hungary in the last one and a half decade. I refer to the HEC-RAS software models, since I used them in this work: Kocsis (2013), Koncsos et al. (2011), Nagy (2009), Pregun et al. (1999), Réti (2012).

1.1 The hydrological modelling

First of all, the relevant discipline, the hydrology has to be defined. According to Urbanovszky (2002) the hydrology investigates the occurrence, the distribution, the exploration and the recording of the water on Earth, furthermore the circulation of the water in the nature. The processes of the nature are considerably different, as well as their modelling processes. The hydrological modelling is a more and more significant auxiliary science of the hydrology. This is also a complex process, like all the model-using sciences. Passed processes can be reproduced and serious water management problems can be answered by means of the complex hydrological models, they can facilitate the decision-making of the engineers (Sztatmári, 2013). According to Sztatmári (2013) the category of the hydrological modelling is considered wider. It includes the collecting, storing, assimilation, modelling, analysis of the data, respectively the presentation of the gained data and the drawn conclusions, therefore he nominates as hydroinformatics. The working phases mentioned above constitute the process of the mapping of the reality.

1.2 The Ronyva creek and its problem

The Ronyva creek, the subject of my research is a stream located in Borsod-Abaúj-Zemplén County, in the North-eastern part of Hungary (Fig. 1). Its major length represents the border line between Slovakia and Hungary. It belongs to the catchment area of the river Tisza via river Bodrog. In this paper I concentrate the stage of the creek