



Comparison of various method of estimation of Instantaneous Unit Hydrographs (IUH) as a tool to estimate flood flows in a small urban catchments

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Abstract

As a consequence of city expansion, the conditions of catchments located in urban areas have been changed. This leads to an increase of flood risk in an urban area resulting from overflows of small streams, which are not prepared to receive more water. Moreover, hydrological data from long-time period are usually not available for small streams in an urban area. Therefore, it becomes hardly possible to use direct methods of estimating flood flows for small streams. For that reason, mathematical modelling is growing as the basic method of evaluation of flood flows in urban area with limited information of the catchment.

The results of modelling of pluvial flooding, conducted in a small urban catchment – Sluzew Creek catchment (located in Warsaw, Poland), will be presented during the Conference. This watershed has been monitored by Department of Water Engineering and Environmental Restoration (Warsaw University of Life Sciences – SGGW) since few years.

The aim of the conducted analysis was to compare various empirical method of estimation of instantaneous unit hydrographs (IUHs) with the one established on recorded data. The empirical methods included the calculated of IUH with SCS formula, Lutz formula, with Rao, Delleur & Sarma equation, and with the use of IUH transformation from the adjoining stream gauge. All of the considered IUHs were based on the Nash model, in which catchment is depicted as a cascade of N linear reservoirs with the same retention parameter k. For separation of the effective rainfall from the recorded storm the CN-SCS method were used. The choice of methods for IUH estimation was based on the amount of data required to do the calculation, from the one with only simple physical data of a catchment (SCS method) till the one with solid data of a catchment (method based on recorded data), and on the possibility of including and changing of urbanization parameters in empirical equations. The recorded data used to calculation include three hydrological years, 2007-2009.

The analysis has shown that IUH estimated with the use of Rao, Delleur & Sarma equation has been the closest one to measured IUH. Therefore, this method could be useful to estimate and predict flood flows in ungauged urban catchments in situation of limited information.

The results of author's analysis are opened for discussion during the Conference.

KEYWORDS: Instantaneous Unit Hydrograph – IUH, Rao, Delleur & Sarma equations, ungauged urban catchment