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Lag times of runoff and sediment yield processes in a small urbanized catchment

Adam Krajewski (1), Anna Sikorska (2), and Kazimierz Banasik (1)

(1) Department of Hydraulic Engineering, Warsaw University of Life Sciences – SGGW, Warsaw, Nowoursynowska 159, 02-776, Poland, (2) Department of Geography, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland

Lag time of runoff (Lag) is defined as the time elapsed between the centroids of the effective rainfall hyetograph and the direct runoff hydrograph. It is an important parameter in the event based rainfall – runoff modelling that relies on the instantaneous unit hydrograph (IUH). In a similar way, lag time of the sediment yield (Lags) is defined as the time elapsed between the occurrence of the centroids of sediment production during a storm event and the observed sediment graph (changes of suspended sediment load over time) at the gauging station. Knowing the ratio between both lag times, i.e. Lags/Lag, enables an estimation of the instantaneous unit sediment graph (IUSG), which is crucial for predicting the sediment graph at the station of interest.

This work presents results of field investigations carried out in a small urbanized catchment of Służew Creek (drainage area = 28.7 km2), located in Warsaw, Poland. The measurements of rainfall, runoff and suspended sediment transport were used to estimate lag times for eight storm events recorded in years 2016-2018. Based on the considered set of data, average values of lag time for runoff and sediment yield equaled 5.5 h and 2.5 h respectively, while the ratio Lags/Lag was equal to 0.45. These results are consistent with previous findings for small catchments of other authors who have concluded that: (i) there is a strong significant linear relationship between Lag and Lags, (ii) the ratio of Lags/Lag is less than one.