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Estimation of the Probable Maximum Flood for a Small Lowland River in Poland

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The planning, designe and use of hydrotechnical structures often requires the assesment of maximu flood potentials. The most common term applied to this upper limit of flooding is the probable maximum flood (PMF). The PMP/UH (probable maximum precipitation/unit hydrograph) method has been used in the study to predict PMF from a small agricultural lowland river basin of Zagozdzonka (left tributary of Vistula river) in Poland. The river basin, located about 100 km south of Warsaw, with an area – upstream the gauge of Plachty - of 82 km2, has been investigated by Department of Water Engineering and Environmenal Restoration of Warsaw University of Life Sciences – SGGW since 1962. Over 40-year flow record was used in previous investigation for predicting T-year flood discharge (Banasik et al., 2003). The objective here was to estimate the PMF using the PMP/UH method and to compare the results with the 100-year flood.
A new relation of depth-duration curve of PMP for the local climatic condition has been developed based on Polish maximum observed rainfall data (Ozga-Zielinska & Ozga-Zielinski, 2003). Exponential formula, with the value of exponent of 0.47, i.e. close to the exponent in formula for world PMP and also in the formula of PMP for Great Britain (Wilson, 1993), gives the rainfall depth about 40% lower than the Wilson's one.
The effective rainfall (runoff volume) has been estimated from the PMP of various duration using the CN-method (USDA-SCS, 1986). The CN value as well as parameters of the IUH model (Nash, 1957) have been established from the 27 rainfall-runoff events, recorded in the river basin in the period 1980-2004. Varibility of the parameter values with the size of the events will be discussed in the paper.
The results of the analyse have shown that the peak discharge of the PMF is 4.5 times larger then 100-year flood, and volume ratio of the respective direct hydrographs caused by rainfall events of critical duration is 4.0.

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