

## A new approach to the determination of depth-duration-frequency (DDF) curves for maximum rainfall

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The Upper Vistula Basin is a flood-prone region in the summer season (May–October) due to intensive rainfall. From the point of view of water management, it is particularly important to: (1) assess the variability of the main factor of flood risk; (2) establish the depth–duration–frequency (DDF) relationship for maximum precipitation, this having not yet been derived for the region.

The Mann–Kendall test for trend detection and the Pettitt test for change point detection were used to investigate the stationarity of the series of seasonal maximum precipitation. Whereas a new approach for the determination of the DDF relationship was proposed, where the best-fitted distribution for each station is selected from among the set of candidate distributions, instead of adopting one fixed distribution for all stations.

The article analyzes the series of daily precipitation during the summer half-year from the period 1951–2018 collected by 11 meteorological stations. The main results show that:

1. Data series are stationary, which supports the conclusion that there is no increase in the risk of rainfall floods due to the intensification of extreme precipitation.
2. New approach increases the accuracy of the DDF relationships for individual stations as compared to the commonly used approach of one distribution for all surveyed stations.
3. The three-parameter distributions show a better fit to the seasonal (May–Oct) maximum precipitation in the Upper Vistula Basin than their two-parameter counterparts.
4. Traditionally used Gumbel distribution turns out to be not well fitted to the investigated data series, and the advantage of the recently popular GEV distribution is not significant.

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