

Dynamics of hydrological droughts propagation in Poland in 1989-2018

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Summary

The main aim of the presented dissertation was to assess the dynamics of hydrological droughts propagation in Poland. The research was conducted on the basis of the multiannual series of daily discharge for 92 gauging stations located in 5 catchments that differ significantly in physico-geographical conditions. The research period was 1989-2018.

The algorithm of hydrological droughts identification was proposed. It considered both the temporal and spatial dimensions. The new drought indicators were also constructed and existing ones were used to assess the dynamics of drought propagation. Thanks to the adopted methodology, multiannual and seasonal variability of drought duration and rate of its progression, the degree of its severity and concentration, as well as the range and direction of spatial development of drought were made. The analyses were conducted in catchments that differ significantly in physico-geographical conditions, especially those that significantly determine the low-flows regime and the streamflow deficits occurrence. The carried out analyses resulted in a number of new information on the temporal and spatial structure of drought and the degree of its intensity. Moreover, the factors that have crucial impact to hydrological drought propagation in various geographical regions of Poland have been identified. The use of constructed drought estimators enabled comparisons between catchments areas.

The existence of systematic component in multiannual time series of the studied drought characteristics was also verified. Almost no statistically significant trends were observed but grouping of years with droughts of similar characteristics was noted. Moreover, hydrological drought classification was carried out on the basis of a hierarchical cluster analysis. The clustering procedure was performed using standardized data by the Ward's method. As a result, 5 types of hydrological droughts were identified in the studied catchments.

The conducted research indicates that the algorithm of hydrological drought identification met the expectations. The analyses carried out in this dissertation have completed a certain stage of research on the dynamics of hydrological droughts propagation in Poland. The obtained results and conclusions may constitute a potential tool for water management planning in terms of range, rate and development direction of hydrological droughts in Poland.