

CHANGES IN THE HYDROLOGICAL REGIME ALONG THE VISTULA RIVER COURSE

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Topic: Spatio-temporal variability and scaling

Abstract. The preliminary results are discussed of research carried out within the framework of the Chinese-Polish HUMDROUGHT project: Human and Climate Impacts on Drought Dynamics and Vulnerability. Hydrological data from the period 1951-2018 at 15 hydrological stations situated along the River Vistula course, 12 on the tributaries in the period 1951-2018 and precipitation data at 16 stations distributed over the basin area were applied to an in-depth analysis of changes in flow and precipitation patterns.

The presentation sets out variables for quantification of the basic features of runoff and precipitation regimes in the form of statistical measures. For runoff they cover five aspects: high flows, low flows, timing, the runoff volume and the concentration of daily flows. Precipitation is characterized by the total precipitation amount, the number of days with precipitation, rainfall total, snowfall total, the number of rainy days and days with snow, the share of snowfall amount in the annual precipitation, the number of days with snow cover and the annual maximum thickness of snow cover, the concentration of daily precipitation, the maximum dry spell and the precipitation totals in September and October, important for the development of the summer-autumn low flows. The structure of the daily precipitation amounts in a range of classes was analyzed as well.

The multi-purpose statistical analyses of runoff and precipitation characteristics were performed to present a general overview of the temporal and spatial changes. Since an important feature of the hydrological regime of Polish rivers is the seasonality of runoff associated with the occurrence of cold (winter) and warm (summer) seasons within a hydrological year, the seasonal approach was applied to describe winter and summer specific characters which can be masked while using annual data. In general the results confirm popular impressions about changes in winter runoff characteristics but also reveal interesting behaviour of daily minima and seasonal number of days under the specified threshold.

Today, planners, designers and other users of hydrological data expect broad and accurate information from hydrologists about the present and, above all, near and far future characteristics of precipitation and runoff. However, at the moment we have no information other than that about past states and processes. Models using climate change scenarios can provide projections of future phenomena, but there is no way to prove whether the results are correct or not. This will be confirmed only by future observations. Perhaps that is why hydrologists attach great importance to constant monitoring and continuous supplementing and analyzing of the information sets .

Keywords: Vistula basin, low flows, characteristics of seasonal and annual runoff and precipitation, statistical analysis