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Detecting changes in maximum annual discharges in Slovakia

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Detecting trend in hydrological long-term time series became a topic of rising scientific significance during last years. A number of floods were observed in recent years, increasing the concern about flood risk worldwide as also in the Slovak Republic. The main objective of the study was to find changes in the trend of the annual maximum discharge series. The analysis was performed on data obtained from 152 gauging stations with minimum lengths of the observations ranging from 40 years to maximum of 130 years from the whole territory of Slovakia. Time series analysis usually operates under the assumption of homogeneity, stationarity and independence; therefore the time series were tested by parametric and non-parametric tests at 5% and 10% levels of significance. The Mann-Kendall trend test, which is commonly used in hydrology to detect significance of linear trends in long term hydrological time series, and its correction for autocorrelated data were adapted in this study. The time series were analysed at different lengths of 40, 50, 60 years and for the whole observation period at significance levels of 5, 10 and 20%. The results were compared and their spatial distribution was analysed. Finally, at the territory of Slovakia, the statistically significant decreasing trend in the annual maximum discharge series during the 40 year long time period was found in the location of Strazov and Great Fatra Mountains, increasing trend in this time period was identified in the Danube and Morava River basins. In the 50 and 60- year long time periods decreasing trend was found in the Upper Hron River basin. For the whole time period, which was different for each gauging station, decreasing trend was detected in the Low Tatra, Low Fatra and Slovak Karst regions, increasing trend was found in stations located at the Danube River.