



Detecting future changes in short-term rainfalls in the Danubian Lowland, Slovakia

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The paper focuses on an analysis of future changes in the seasonality, trends and scaling exponents of short-term rainfall. The analysis was performed for the Bratislava, Sered' and Gabčíkovo climatological stations, in the area of southwestern Slovakia located in the Danubian Lowlands. The short-term rainfall intensity data from outputs from regional climate scenarios such as KNMI-RACMO₂, KNMI-RACMO₂2E, SHMI-RCA4 and MOHC-HadRM-3Q0 were used. The analysis was performed for the historical period of 1960-2000, the future period of 2070-2100, and the actual observed data in the period of 1995-2009. The focus was aimed at comparing of changes in seasonality of any extreme events, trends and changes in the scaling exponents.

From the real observations for all the stations, the analysis shows that the seasonality of extreme events occurs at the end of July and at the beginning of August. Changes for the future in the seasonality of these events will prevail in the first two weeks of August for all the climatological stations. The results of the trend analysis from the actual observations show prevailing trends with increasing tendencies at the Bratislava and Gabčíkovo climatological stations; a decreasing trend prevails at the Sered' climatological station. In the future scenarios there is an insignificant change for the prevailing future rising trends. In the final step of the analysis scaling exponents were derived. The highest scaling coefficient for the Bratislava and Sered' climatological stations was set in the MOHC-HadRM-3Q0 scenario; for the Gabčíkovo climatological station, it was set in the KNMI-RACMO₂2E scenario. The design values of the rainfall intensities and IDF lines were estimated by these scaling exponents for the return periods of 10 and 100 years. The IDF lines constructed from the results of the future scenarios exceed IDF lines constructed from the actual observations. These results show an increase in the design values of short-term rainfall intensities in the future.

Due to the increasing results in the analyzed characteristics of short-term rainfall, there is an assumption of an increasing intensity in short-term rainfalls in the future. Re-evaluating the design values of the rainfall intensities will be necessary for designing water structures in the area.