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The comparison of the SPI and the SPEI using COSMO model data in two selected Slovakian river basins

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Rising global air temperature is considered to intensify the hydrological cycle, what is connected with an intensification of evaporation. The increase of the air temperature doesn't mean only changes in means, but also an increase in occurrence of extreme events. Some studies using the Standardized precipitation index (SPI) recorded drying conditions in Hungary at the end of spring, beginning of summer and at the end of autumn. Therefore, the assessment of drought episodes in Slovakia is of high interest, especially for the southern agricultural parts of the country. According to the former research on the impact of the North Atlantic Oscillation (NAO), two river basins with a different response to NAO were selected for a drought analysis. In recent years, various methods were developed to evaluate the occurrence of droughts. In this paper, the 6-hourly model data from COSMO-CLM with a horizontal resolution of 18 km were used to calculate the SPI and the SPEI on three time scales (3-, 6- and 12-month) in the Slana (in the southern Slovakia) and Kysuca (in the northern Slovakia) river basins. The potential evapotranspiration (PET) was computed using the Thornthwaite's equation (empirical approach, PET-T), as well as using a bulk approach based on surface similarity theory (PET-E). The Thornthwaite's method gives the higher PET amounts than the bulk approach in months of warm half-year in Kysuca basin. The same results are reached in the rain gauge stations under 300 m a.s.l. in Slana river basin. In the stations above this altitude, the relation is inverted with the exception of one station. The correlation between SPEI-T and the SPI is high on all time scales. The SPI on the 12-month time scale identifies the drier/wetter conditions than SPEI (using PET-T) in the cases of extreme low/high values. The scatter plots between SPEI (using PET-E) and the SPI on the same time scale show in the southern region that the differences are the lowest by the highest positive values and increase with the decreasing indices values. The lowest differences were recorded in the stations, where PET-T is higher than PET-E (bulk approach). A very low correlation between the SPEI and the SPI was identified in southern Slovakia on the 3-month time scales, because the evapotranspiration plays an important role in this region during the summer months.

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