



Hydrological drought evaluation with the use of meteorological drought indices

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This study evaluates the relationship between meteorological and hydrological drought in selected small, medium and large watersheds in the region of Thessaly, Greece. Thessaly is an agricultural plain region surrounded by mountains and is traversed by Pinios River. The study watersheds have areas that range from 132 to 7150 km² and they are forested or mixed land use (agricultural lands and forests) watersheds. The Standardized Precipitation Index (SPI) at multiple time scales and the Palmer four indices (PDSI, Weighted PDSI, PHDI and the moisture anomaly Z-index) were used as indicators of meteorological drought severity. Most of the study watersheds have intermittent runoff data. For this reason, the hydrological drought severity was evaluated according to the following procedure. A monthly conceptual water balance model which uses as inputs areal precipitation, temperature and potential evapotranspiration was calibrated with the available observed runoff data to extend and reconstruct the runoff timeseries for the period of analysis 1960-2002 for all study watersheds. Monthly precipitation and temperature data for the period were used for estimation of the basin-wide precipitation by the Thiessen polygon method adjusted for the mean elevation of the study watersheds. The synthetic runoff timeseries were statistically validated with the observed runoff data and used for the estimation of hydrological drought. The synthetic runoff was normalized through Box-Cox transformation and standardized to the mean runoff. The transformed and standardized runoff timeseries were used as an indicator of hydrological drought severity and were compared with the meteorological drought indices timeseries estimated by basin-wide meteorological data. The results showed that SPI is better related to hydrological drought compared to Palmer indices. However, different time scales of SPI were best correlated to hydrological drought for the study watersheds depending on their area, geo-

physical, and hydroclimatic characteristics. Of the four Palmer indices, the Weighted PDSI was found to better represent the hydrological drought for all study watersheds irrespectively to their characteristics.