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## Spatio-temporal analysis of precipitation-based drought indices in Kucuk Menderes River Basin, Turkey

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Drought is one of the extreme hydrological events which may seriously affect the majority of the population in many ways such as economically, socially and environmentally. Researches on the drought analysis may prevent these adverse consequences to a significant extent. Droughts are characterized by using various meteorological and hydrological indicators (i.e. precipitation, temperature, streamflow etc.). These indicators are used to derive drought indices. Spatio-temporal drought is analysed both in time and space by using drought indices based on site-specific precipitation and temperature data. In this study, Standardized Precipitation Index (SPI) using only precipitation data and Standardized Precipitation Evapotranspiration Index (SPEI) using precipitation and temperature data are considered at various time scales changing from 1 to 24 months for a more detailed drought characterization. On the other hand, so-called Dimensionless Precipitation Anomaly Index (DPAI) is introduced at annual scale in this study. The DPAI is used to determine dry periods from the recorded precipitation data. Cases are studied in Kucuk Menderes River Basin located in the Aegean region of Turkey. Precipitation and temperature data obtained from five meteorological stations over the river basin are used to determine drought index time series. Drought risk graphs and drought severity maps are obtained from time series of the drought indices. Drought risk is the likelihood of the drought occurrence that is quantified with the frequency calculated from the SPI and SPEI time series. As for the drought severity maps, they are created to understand its basin-scale variation by using the severities calculated from the dry periods of SPI and SPEI time series. Results show that the prolonged severe historical dry periods of the river basin are correctly identified by the drought indices. These indices used in this study based on easily available meteorological data are simple tools to explain temporal variability at a site or spatial variability over the basin. Also, the spatial distribution of drought severity over the river basin does not show a significant variability though more severe droughts are observed in the inner part of the river basin. Mild drought dominates at each time scale, this stems from the

tendency of precipitation fluctuating around the average. Results in the study have considerable importance both in science and practice of drought. Although the methodology established from basic tools using meteorological data, the outcomes of the study are expected to become beneficial for drought management plans.