Comparison of the capability of the Meteorological and Remote Sensing Drought Indices

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Abstract

According to the importance of selecting the appropriate index for assessing drought, in this study, the performance of ten drought indices including six meteorological and four remote sensing drought indices for assessing drought conditions in 1, 3, 6, and 12-month time scales at the Fars province was compared. In this research, the climatic data series of ten synoptic stations, actual data series of annual rain-fed winter wheat yield (AWWY) in 25 counties, and data of Tropical Rainfall Measurement Mission (TRMM) and Moderate Resolution Imaging Spectroradiometer (MODIS) from 2000 to 2020 were used. First, the zoning map of drought indices and AWWY (for each year) was prepared. Then, the 1000 random points over the study area were selected, and based on the data series of these points, the correlation coefficient (CC) between drought indices and AWWY, based on the XI correlation method (XICOR), was estimated for each year. Eventually, the clustering analysis method was used to cluster drought indices (based on estimated correlations). The results indicated that the Vegetation Condition Index (VCI) had the lowest CC with the AWWY in all years. Among remote sensing drought indices, the overall level of the estimated CC between the Temperature Condition Index (TCI), and Precipitation Condition Index (PCI) with the AWWY was more than other indices. Also, among meteorological drought indices, the overall level of the estimated CC between the Modified Standardized Precipitation Evapotranspiration Index (MSPEI), Modified Reconnaissance Drought Index (MRDI), and Modified Standardized Precipitation Index (MSPI) with the AWWY was more than other indices. According to the results, on average, the MSPEI, MRDI, and MSPI indices with the highest CC with the AWWY were the best drought indices, respectively.

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