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Spatiotemporal variability and assessment of drought in the Wei River basin of China

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Abstract The temporal variations and spatial patterns of drought in the Wei River basin (WRB) were investigated by calculating the meteorological drought Index (Standardized Precipitation Evapotranspiration Index, SPEI; Standardized Precipitation Index, SPI) and the agricultural drought index (Vegetation Health Index, VHI; Crop Water Stress Index, CWSI). Monthly precipitation and air temperature time series during the period 1960-2015 were collected at 22 meteorological stations uniformly distributed over the region. Monthly Evapotranspiration (ET) and Potential Evapotranspiration (PET) were provided from the National Aeronautics and Space Administration (NASA) during 2000-2014. 16-days Normalized Difference Vegetation Index (NDVI) and 8-days Land Surface Temperature (LST) for the period 2000-2015 were also adopted. The results showed that the drought initially increased and then decreased, reaching at the maximum value in 1990s. For the seasonal distribution, the frequency of extreme drought was greater in winter, the frequency of severe drought occurred greater during the summer and the frequency of moderate drought in summer was greater. The spatial pattern of meteorological drought showed that the drought in eastern WRB was heavier than that in western WRB, while the drought in northern WRB was greater than that in southern WRB. By comparing the two agricultural drought indices with crop yield, it was proved that the two indices were applicable in the WRB and could well reflect the fluctuation of agricultural drought. The WRB suffered from serious agricultural drought in 2000, 2001, 2005 and 2010. By calculating precipitation and temperature, the contribution of precipitation to the agricultural drought was greater than that of temperature, indicating that precipitation had greater effect on agricultural drought than temperature.
Key Words Drought, SPI, SPEI, VHI, CWSI, Wei River