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Spatiotemporal Patterns of Drought and Multi-scale Linkages of Seasonal Drought to Climate Indices: A Case Study in the Huaihe River Basin, China

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In the context of the current ocean-atmosphere cycle anomaly, exploring the potential teleconnections between climate indices and regional drought can help us know the variability of natural hazards more comprehensively to cope with them. This study explores the spatiotemporal patterns of drought and its multi-scale relations with typical climate indices in the Huaihe River Basin, China. The spatiotemporal variabilities of meteorological drought are identified using Empirical Orthogonal Function (EOF) and Continuous Wavelet Transform (CWT). The Cross Wavelet Transform (XWT) and Wavelet Coherence (WTC) analysis are used for investigating the multi-scale linkages between seasonal drought and climate indices, including Arctic Oscillation (AO), Bivariate El Niño–Southern Oscillation (ENSO) Timeseries (BEST), North Atlantic Oscillation (NAO), Niño3, Southern Oscillation Index (SOI), and sunspot number. Seasonal Standardized Precipitation Index (SPI)-3 during 1956-2020 are investigated separately for winter and spring seasons. We found that NAO mainly affects the interdecadal variation in spring drought, while AO and Niño3 focus on the interannual variation. In addition, Niño3 and SOI are more related to the winter drought on interdecadal scales. Our results prove that the onset, process, and intensity of El Niño or La Niña events influence the dryness and wetness conditions in the Huaihe River Basin. The results are beneficial for improving the accuracy of drought prediction, considering taking NAO, AO, and Niño3 as predictors for spring drought and Niño3 and SOI for winter drought.