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Spatial and Temporal Characterization of Drought Events in China Using the Severity-Area-Duration Method

Xiaoli Yang

Hohai University, Nanjing, China (yangxl@hhu.edu.cn)

Global climate change not only affects the processes within the water cycle but also leads to the frequent occurrences of local and regional extreme drought events. In China, spatial and temporal characterizations of drought events and their future changing trends are of great importance in water resources planning and management. In this study, we employed self-calibrating Palmer drought severity index (SC-PDSI), cluster algorithm, and severity-area-duration (SAD) methods to identify drought events and analyze the spatial and temporal distributions of various drought characteristics in China using observed data and CMIP5 model outputs. Results showed that during the historical period (1961–2000), the drought event of September 1965 was the most severe, affecting 47.07% of the entire land area of China, and shorter duration drought centers (lasting less than 6 months) were distributed all over the country. In the future (2021–2060), under both RCP[CF1] 4.5 and RCP 8.5 scenarios, drought is projected to occur less frequently, but the duration of the most severe drought event is expected to be longer than that in the historical period. Furthermore, drought centers with shorter duration are expected to occur throughout China, but the long-duration drought centers (lasting more than 24 months) are expected to mostly occur in the west of the arid region and in the northeast of the semi-arid region.