



Attributing changes in recent PDSI droughts over China

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Drought is a major natural hazard measured by water availability significantly below normal conditions for a region. Because of great socioeconomic significance, the occurrence of disastrous droughts has received enormous public attention and discussion including, for example, the recent prominent California droughts in 2011–2015 and the once-in-a-century droughts in southwest China (2009 continuing to now). How droughts change in the past and its attribution are grand scientific questions to be addressed under global climate change. By theory, drought is determined by the balance between precipitation and atmospheric evaporative demand and is further complicated by such as vegetation. To describe the droughts over China (1961–2013), we use the widely used Palmer Drought Severity Index (PDSI), that was forced by two different estimates of evaporative demand, i.e. the Thornthwaite (PDSI_{th}) and Penman-Monteith (PDSI_{pm}). We found that droughts have become more severe in the PDSI_{th} but slightly lessened in the PDSI_{pm} estimate. To quantify and interpret the different responses in the PDSI_{th} and PDSI_{pm}, we designed numerical experiments and found that drying trend of the PDSI_{th} responding to the warming alone is 3.4 times higher than that of the PDSI_{pm}, and the latter was further compensated by decreases in wind speed and solar radiation causing the slightly wetting in the PDSI_{pm}.