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Droughts during the past 1250 years over the United States in the Community Earth System Model version 1.0.1

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Tree ring proxies indicate that the climate in North America during the past 1000 years has experienced several drought events with centennial time scales that covered vast areas of the continent. This kind of droughts, which in term of areal and temporal extents are not comparable to those of current drought events, is termed as megadroughts. In our study, the ability of the Community Earth System Model version 1.0.1 (CESM) to depict the extreme aridity during the past 1250 years (851 - 2000) over the United States is examined. The model shows its capacity for describing the centennial-scale droughts over south-western region and Central Plain, though, the timing of each individual events is not exactly consistent with those indicated by the proxies. In addition, the conclusions about the severity, areal coverage and duration of the megadroughts seem sensitive to the particular choice of drought metrics. Approaching to the present day, many metrics exhibit different extreme dry conditions over Central Plain. Some metrics indicate pronounced wet conditions after 1900, but others show slightly dry conditions. The CESM does not elucidate very clearly the possible causes of the megadroughts but it supports that individual megadrought events might not share the common causing drivers. As the CESM has showed enough capacity for describing the palaeo-droughts, further work should be focused on finding the causal relationship between climate variability and the megadroughts.