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Simulation of US droughts by global reanalysis products and the implication in global drought monitoring

Lifeng Luo[†]; Youlong Xia; Eric Wood
[†] Michigan State University, USA
Leading author: lluo@msu.edu

Droughts are high impact climate extremes that are difficult to detect until they have become severe and some damages have occurred. Accurate assessment of current drought conditions at regional to continental scales are critical for water resource management and for drought mitigation. Such information can be obtained by remote sensing, in-situ observations and models. The second phase of the North America Land Data Assimilation System (NLDAS2) has used multiple land surface model/hydrological models to estimate the realtime drought conditions over the continental US. These models are forced with meteorological forcings from observations and regional model reanalysis. Outside of US such high quality data might not be readily available historically and in realtime for drought assessment. However, the recent global reanalysis products, such as the climate forecast system reanalysis (CFSR) from NCEP, NASA Modern Era Reanalysis for Research and Applications (MERRA) and ECMWF Interim reanalysis (ERA-Interim), provide a means to producing realtime global drought monitoring. In this study, we examine the ability of these global reanalysis products to properly simulate historical droughts in the US by comparing several drought indices derived from precipitation, soil moisture and streamflow in each of the reanalysis product and the offline simulation by NLDAS2 models. The comparisons are carried out at various spatial and temporal scales to assess the feasibility and limitations of these global products in drought monitoring.