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Evaluation of the National Water Model for Potential Application in the NLDAS Drought Monitor

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1. Introduction

The NCEP North American Land Data Assimilation System (NLDAS, Ek *et al.*, 2011) Drought Monitor is a multi-model ensemble drought monitor and analysis system that provides land surface hydrological conditions across the contiguous United States (CONUS) domain in near real time. NLDAS runs four uncoupled land surface model simulations using a common meteorological forcing from the CPC North American Regional Reanalysis and the CPC daily global gauge precipitation analysis (Xie *et al.*, 2010). Daily, weekly, and monthly anomalies and percentiles of land surface water cycle variables including precipitation, soil moisture, snowpack, streamflow, and evapotranspiration, are calculated at 1/8th degree grids and provided to users including CPC and NIDIS (National Integrated Drought Information System, https://www.drought.gov/drought) for drought monitor and outlook. The NOAA National Water Model (NWM, Cosgrove, 2018) is a hydrologic model that simulates observed and forecast land surface water cycle over CONUS. NWM runs an hourly uncoupled analysis, and forecasts on short-range (18 hours), medium-range (10 days), and long-range (30 days) time scales on 1km and 250m grids. The simulations are forced with meteorological data from the NCEP forecast models (HRRR, RAP, GFS, and CFS) along with the MRMS radar and gauge-adjusted observed precipitation products. The Noah-MP land surface model is implemented in NWM to simulate land surface processes. The objective of this study is to make a comparison between the NLDAS and NWM products and to evaluate the potential application of NWM in monitoring and forecasting the drought conditions across the U.S., and to integrate NWM with NLDAS to support the CPC and NIDIS Drought Monitor and Outlook operations.

2. Results

Drought can be described conceptually as a deficiency in water supply over a temporal and spatial extent. Soil moisture content relative to climatology has been commonly used for drought assessment over regional to continental scales. The NLDAS and NWM monthly mean top 2-meter column volumetric soil moisture percentiles relative to their corresponding multi-decades retrospective simulations are analyzed and compared. Figure 1 presents a selected set of sample maps of monthly mean soil moisture percentiles of NLDAS and NWM, represented for August 2011 during the historical event of Texas drought. The official

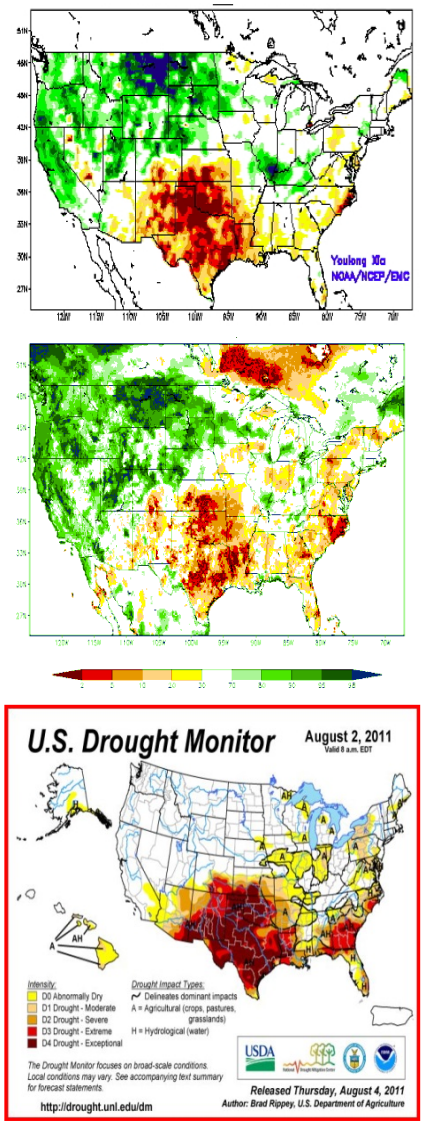

Fig. 1 Monthly 2-meter column soil moisture percentiles of August 2011 from NLDAS (top), NWM (middle), and US Drought Monitor guidance (bottom).

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US Drought Monitor guidance upon the same time is included as a reference. Both NLDAS and NWM successfully depict the soil moisture deficit in the broad extent of Texas, Oklahoma, and Louisiana that is consistent with the US Drought Monitor.

3. Remarks

The NLDAS Drought Monitor uses a 31-year (1979-2009) retrospective simulation to generate the soil moisture climatology and percentiles. On the other hand, the NWM V1.2 retrospective runs for a 25-year (1993-2017) period that the climatology is generated from. The impact of such a mismatch on the drought condition assessment is under investigation.

References

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