US National Oceanic and Atmospheric Administration
Climate Test Bed Joint Seminar Series
IGES/COLA, Calverton, Maryland, 9 April 2009

Drought Monitoring over the United States

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1. Introduction

The purpose of this presentation is to give an overview of the real time drought monitoring at CPC. We use the drought indices to monitor precipitation (P), soil moisture (SM) and runoff deficits. Soil moisture and runoff are based on the North American Land Data Assimilation system (NLDAS) products. The uncertainties of the NLDAS are assessed by intercomparing the NLDAS products from the NCEP and the University of Washington (UW).

2. Results

Drought indices derived from the NLDAS from NCEP and UW from 1979 to 2007 are intercompared and evaluated for their ability to assess drought severity over the United States. Each system has four models. The uniformly weighted ensemble means of four models are used for comparison. For meteorological drought, the Standardized Precipitation Index (SPI) is used to measure precipitation deficits. The Standardized Runoff Index (SRI) similar to the SPI is used to classify hydrological drought. Agricultural drought is measured by monthly mean soil moisture anomaly percentiles based on probability distributions (PDs). The PDs for total SM are regionally dependent and influenced by the seasonal cycle, but the PDs for SM monthly mean anomalies are unimodal and Gaussian.

Over the eastern United States (east of 95ºW), the indices derived from NCEP and UW are similar and they are able to detect the same drought events. Indices are also well correlated. For River Forecast Centers (RFCs) over the eastern United States, different drought indices are likely to select the same drought events.

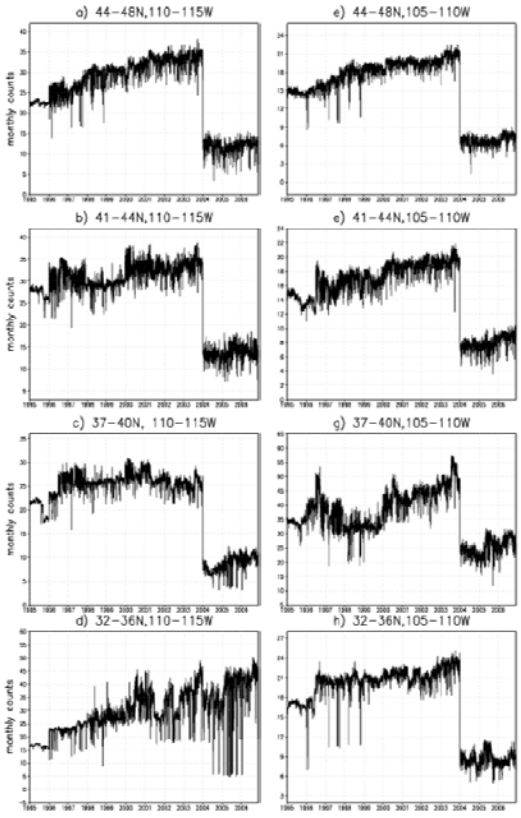

Fig. 1 Monthly total P data counts averaged over grid points in 4^{o} x 5^{o} boxes.

The monthly mean SM percentiles and runoff indices between NCEP and UW have large differences over the western interior United States. For small areas with a horizontal resolution of 0.5 degrees on the time scales of one to three months, the differences of SM percentiles and SRI between NCEP and UW are larger than the thresholds used to classify drought. For the western RFCs, drought events selected according to the SM percentiles or SRI derived from different NLDAS systems do not always overlap.

The largest differences came after 2004, when both systems went for near real time production. Figure 1 shows the monthly total data counts for boxes over the western region. After 2004, data counts dropped substantially. The differences in precipitation forcing cause large uncertainties in the NLDAS systems.

3. Concluding remarks

One of the major issues is the precipitation analysis. For real time operation, the P inputs over the western region are sparse. To improve P analysis is essential to improve NLDAS and drought monitoring.

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