Regional Climate and Variability of the Summertime **Continental United States In Reanalyses**

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1. Motivation

Despite the large amount of observations in a modern analysis system, short term regional precipitation forecasts still have uncertainty (Bosilovich et al. 2009). How well do the latest reanalyses represent summertime interannual variability of precipitation?



Figure 1 Regions of the continental United States considered here. These generally relate to those of the USGCRP National Climate Assessment (NCA) except that the Great Plains has been split into Northern and Southern regions.

2. JJA Regional Precipitation Variability



The summer Pr means tend to track observation in all the reanalyses, thought some regional biases are evident. Likewise, there are similarities in the temporal correlation from year to year, better in the north western region, and worse for MW. Note that, all reanalyses NW tracks CPC remarkably well. In the central states and NE, MERRA has lower than CPC variance. MW has lowest observation correlation in all reanalyses.

mm day-1.



0.31 0.36 0.44 0.46 -0.36 -0.31 -01 Figure 4 Spatial distribution of the time series correlation between summertime (JJA) precipitation and spring (MAM) ENSO34, for time series consisting of seasonal anomalies from 1979-2008.. The colors indicate level of significance of the correlation (0.31~90%, 0.36~95% and 0.46~99%).



Figure 3 Time correlation of summer seasonal precipitation (as in Figure 3) with ENSO34 seasonal values going back to preceding indices (left).

3. Regional Variability and ENSO

What drives the high positive correlation for all reanalyses to observations in NW? While an ENSO seemed a possibility (e.g. Barlow et al. 2001), the JJA ENSO34 correlation was weak. However, correlation of MAM and AMJ ENSO34 to JJA Pr produce much higher correlation (Figure 3). Reanalyses, MERRA especially, seems to have higher correlation to ENSO34 than observations. However the general patterns of the correlations are comparable across all reanalyses (Figure 4). The agreement of NW and NGP summer precipitation to observations in reanalyses seems driven by large scale ENSO teleconnections. The same correlation in MW in MERRA leads to the MW poor statistical representation.

JJA Pr MERRA Correlation to CPC



0.2 0.3 0.4 0.45 0.5 0.6 0.7 0.8 Figure 5 JJA anomaly correlation between MERRA and CPC. While ENSO drives the good correlation in the NW and NGP regions (Fig 4), the MW region, still dominated by ENSO in MERRA correlates poorly with CPC. This may indicate a deficiency in the mesoscale circulations or convective precipitation interactions with the land surface.

4. Regional Trend



Figure 6 Summer precipitation and temperature trends for the regions. (mm day⁻¹ dec⁻¹ and K dec⁻¹).

5. Main Results

- While ENSO has influence on part of US in summer, reanalyses (esp. MERRA) are too well correlated
- MERRA Pr is improved through ENSO forcing in NW and NGP, but degraded by it in MW and SGP where mesoscale convective processes should dominate

• Pr trends are not reliable, and some show systematic issues, Sfc T trends are more robust, esp when constrained

6. References

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