Evaluating the Observational Analysis in Regional Water Budgets of Reanalyses

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1. Motivation
Evaluating MERRA and Interim global and regional water cycles, Trenberth et al. (2011) show long term avg moisture divergence over the central United States. What part of the observing system and analysis influence this?

2. Temporal variations of budget terms
The water vapor increment interannual variations are tightly coupled with MFD. While this follows to the annual cycle, it does not follow in the diurnal cycle. Any direct influence of the increments on precipitation or evaporation, or vice versa.

3. Water vapor analysis increment and forecast departure
The water vapor analysis increments show a distinct shift, but more noticeable at 06Z and 18Z. A change point detection routine identifies spring 2001 when the shift occurs. This is the first warm season, after the start of NOAA16 ATOVS. In 06Z and 18Z, analysis increments change from nearly zero to significant tendencies (Figure 3). The MERRA GIO data provide innovation statistics from the analysis (e.g. O-F, O-A, A-F) as well as the observations. Figure 4 shows that the analysis of RAOB Qv shows consistent increments at 12Z, and several variations in the 00Z analysis. The RAOB increments are quite different than those at 06Z and 18Z.

4. Summary
The long term central US moisture divergence is generally responding to JJA water increments. Data withholding experiments identify AMSU A Window channels and channel 5 as most influential on the water vapor increments (Figure 5). Data denial experiments showed little impact from HIRS3, AMSUB, and AIRS, while AMSUA window channels and ch5 (at 18Z) had most impact on central US increments (Fig 6).

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