Quantifying observation influence on regional water budgets in reanalyses

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Observations in Reanalyses

• Reanalyses are sensitive to the assimilated observations
  – Climate can shift with changes
  – Weather can be adversely affected by missing data or bad data
  – Observing systems compete for control of the analysis

• While observational data record output exists, evaluation is complicated by data structure
Gridded Innovations and Observations

• Arlindo da Silva gridded MERRA assimilated observations and innovations (O – F and O – A)
  – Includes all conventional (6h and monthly) and radiance (by satellite, instrument and channel) observations on the MERRA grid

• A simplification to the data. Binning can limit the precision in the comparison.

• The simplification leads to an easy way to evaluate the assimilated observations

• **Goal**: Use the GIO to develop statistics and evaluation techniques for regional to global water cycle issues
Issue #1: Long term moisture flux divergence over central US

- Pointed out by Trenberth (2011) in both MERRA and ERA-Interim
- Divergence implies E>P, except the MERRA E<P
- Water vapor increments account for much of the signal
- Water vapor observations do not show the same interannual variability
- Wind observations likely driving the divergence, and water vapor analysis follows
• $A-F \approx \kappa(O-F) + \beta$

• $\kappa$ - **Effective Gain**: A measure of how much the analysis draws to an observing system

• $\beta$ – **Contextual Bias**: a measure of bias of an observing system relative to other contributing observing systems
Global Water Cycle Data Consistency and Uncertainty

• Utilizing satellite water cycle data products and reanalyses and land DA, evaluate the variations in global continental water cycle intensity

• Goal: To get at the “climate shift” apparent in data

• Likely, an integrated effort, involving many of the data developers, lead by Pete Robertson

• Next Steps: Evaluate the importance of water channels