Session: C22 Poster: T239B

Evaluation of the observation influence on transport in reanalysis regional water cycles

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Regional water cycles of reanalyses do not follow theoretical assumptions applicable to pure simulated budgets. The data analysis changes the wind, temperature and moisture, perturbing the theoretical balance. Of course, the analysis is correcting the model forecast error, so that the state fields should be more aligned with observations. Recently, it has been reported that the moisture convergence over continental regions, even those with significant quantities of radiosonde profiles present, can produce long term values not consistent with theoretical bounds. Specifically, long averages over continents produce some regions of moisture divergence. This implies that the observational analysis leads to a source of water in the region. One such region is the Unite States Great Plains, which many radiosonde and lidar wind observations are assimilated. We will utilize a new ancillary data set from the MERRA reanalysis called the Gridded Innovations and Observations (GIO) which provides the assimilated observations on MERRA's native grid allowing more thorough consideration of their impact on regional and global climatology. Included with the GIO data are the observation minus forecast (OmF) and observation minus analysis (OmA). Using OmF and OmA, we can identify the bias of the analysis against each observing system and gain a better understanding of the observations that are controlling the regional analysis. In this study we will focus on the wind and moisture assimilation.