The NASA Energy and Water-Cycle Study (NEWS) Global Water-Cycle Integration and Analysis (WIA)

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Summary

Satellite observations hold the most promise to advance comprehensive global water cycle monitoring and detection of variability and change, which ultimately support more confidence in predictions of seasonal to long-term hydro-climate variations and change. It is practical to expect satellite-based measurements to provide a substantial portion of our global information, particularly in areas where on-site measurements are sparse and/or problematic. Advances will require, in part, continuous evaluation of the consistency in key reservoirs and fluxes associated with the global water and energy cycles, including their spatial and temporal variability, through integration of all necessary observations and research tools. In this vain, NASA has established the NASA Energy and Water-Cycle Study (NEWS), whose long-term grand challenge is to document and enable improved, observationally-based, predictions of water and energy cycle consequences of Earth system variability and change. In the first phase of NEWS, a primary goal is an assessment of the degree to which satellite-based observational capabilities provide balanced and consistent characterizations of the global water and energy cycles, and the identification of critical gaps and areas in need of improvement. In this project, we will continually assess the capability of a global data compilation to faithfully depict global, water and energy fluxes, and the extent to which their mean state and spatiotemporal variations are consistent to each other and to complementary water and energy storage variations. The overarching goal of this effort is to enable NEWS expertise and resources to construct “state-of-the-art” global water and energy cycle data and information, and in doing so, facilitate the necessary analyses, integration and collaboration among NEWS PIs as well as to the scientific community at large. Below, we provide a summary of recent analyses conducted in support of this goal as well as directions for ongoing and future research.

Analyses

Discussion and Future Efforts

Overall, the analyses (Figs. 1-5 and Table 1) indicate substantial inconsistencies, trends, and imbalances among some of the more widely used “legacy” datasets of global water-cycle variables and fluxes. In the near term, subsequent analyses will include additional long-term data (i.e. Fig. 6) not considered in the Schlosser and Houser (2007) study shown here. Further analysis will also consider more recent retrieval estimates (Figure 6) to determine the extent to which their integration depicts a more (or less) consistent and balanced characterization of the global and regional water cycles. These data sets will draw from the expertise of the NEWS WIA scientists and will also actively seek cooperation and collaboration from the community at large. In conjunction with this water-cycle integration effort, a NEWS global energy-cycle study is also being undertaken (lead by Bing Lin) and further merged analyses of the water and energy budgets is planned to judge the degree of consistency between key fluxes, states, and storages.