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A Satellite View of Global Water and Energy Cycling

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With their unprecedented new observation capacity combined with revolutions in modeling capability, satellite observations have great potential to make huge advances in water and energy cycle prediction. To realize this goal, we must develop a discipline of prediction and verification through the integration of water and energy cycle observations and models, and to verify model predictions against observed phenomena to ensure that research delivers reliable improvements in prediction skill. Accomplishing these goals will require, in part, an accurate accounting of the key reservoirs and fluxes associated with the global water and energy cycle, including their spatial and temporal variability, through integration of all necessary observations and research tools. To this end, 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. This presentation will feature an overview of the NEWS program, detail some of its central missions and projects, and lay out the plan for coordination with complementary international efforts.

To address the NEWS challenge, there is an unambiguous requirement for climate-quality, globally complete observations of the key water- and energy-cycle rates and storages. It is practical to expect satellite-based measurements to provide a substantial portion of the information, particularly in areas where on-site measurements are sparse or impractical. However, a key issue that remains is an assessment of the degree to which our satellite-based observational capabilities provide a balanced, consistent global water and energy cycle depiction. In this study, we assess the capability of a

global data compilation, largely satellite based, to faithfully depict global, water and energy fluxes, and the extent to which their spatiotemporal variations are consistent to each other and to complementary water and energy storage variations. Global satellite-based, in-situ, and modeled water and energy storages and fluxes are used to update and assess our ability to characterize the global water cycle and energy cycle mean state and variability.