Current capabilities and potential deficiencies of NASA Energy and Water cycle Study (NEWS) Product, Discovery and other water cycle related proposals

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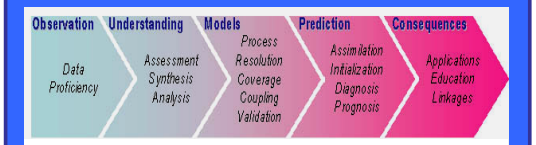
Requirements

- **Focus on water and energy processes and dynamics in the climate system**
- **Global scale objective**
- **Specific NEWS strategic elements: Observation, Understanding, Models, Predictions and Consequences**
- **Progress toward NEWS challenge**
- **End to end program**



Conceptual NEWS research path from observations to useful predictions and their consequences, highlighting required research elements

Discovery-driven NEWS investigations carried out by individuals or small groups of scientists to make advances in our understanding of key Earth-science processes

- Explore scientific energy and water cycle frontiers
- Examine cross-cutting boundaries

Product-driven NEWS investigations directly cooperate with NASA to produce a coordinated cross-discipline applied comprehensive science solution

- Combine and interpret past and current observation
- Derive global prediction tools and products

	Discovery-driven NEWS investigations	Product-driven NEWS investigations
Observation & Understanding	Improve observation capability, characterization and understanding of a single variable	Integrate multiple NASA observations to characterize and understand processes that link key parameters
Modeling	Develop a new or improved model component	Integrate well-proven model component(s) into NASA assimilation or prediction system
Prediction	Develop a new data assimilation method	Integrate observations into NASA prediction system to enable better prediction
Consequences	Develop a new capability with an application component (e.g. downscaled monitoring/prediction product)	Integrate existing prediction and decision-support systems to facilitate management and public-policy decisions

Overarching long-term NEWS grand challenge

Documenting and enabling improved, observationally-based, predictions of water and energy cycle consequences of Earth system variability and change

Aerosol effects on cold season orographic precipitation

Integrated A-train aerosol, cloud and radiation product

Validating and scaling remotely-sensed observation of the water cycle

Land-surface, boundary layer, cloud and radiative coupling processes

Using observation, data sets & reanalysis to close the water and energy budget

Latent heating distributions over global oceanic regions

Land atmosphere coupling & its impact on water & energy cycles

Merged A-train atmospheric water data set

Evaluation of NASA's global water cycle data; surface energy fluxes, top of atmosphere radiative fluxes and modes of variability

Integrated assessment of models and observations that control global water & energy budgets

Global precipitation analysis

Monitor water storage changes in Earth's major reservoirs

Products to study interactions between atmospheric hydrology and radiation budget

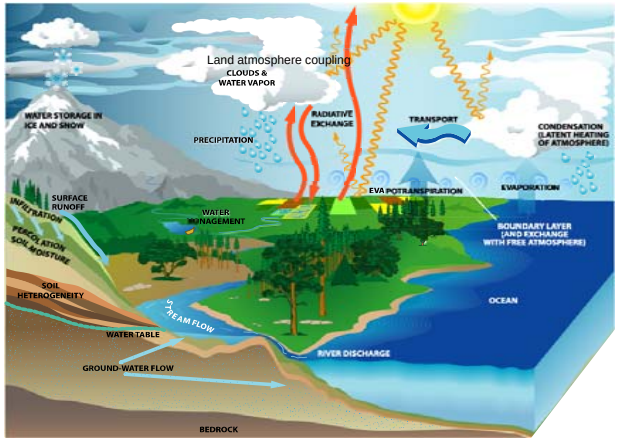
Global land surface modeling and assimilation system

Global analysis of ocean surface fluxes of heat and freshwater

Surface evaporation & moisture transport over global oceans

Multiscale vegetation modeling system

Causes and predictability of multi-year droughts



Current water & energy cycle capabilities covered by funded NEWS Product and Discovery and other related proposals

Graphic: C. A. Schlosser, MIT, P. Houser, GMU, & D. Belvedere, UMBC
Created at NASA/GSFC

Applied Sciences sponsored solutions network to organize scientists, managers, and stakeholders to harness NASA science results that address water cycle assessment, prediction and management challenges using decision support tools

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Visit the following websites for additional information:

NASA Energy and Water cycle Study (NEWS) : http://wec.gsfc.nasa.gov/
NASA Water and Energy Cycle: http://gwec.gsfc.nasa.gov/

Outcomes

Expected long-term outcomes of NEWS

Enhanced data sets documenting the global distribution and variability of key water and energy cycle parameters and improvements to the nation's *global water- and energy-cycle prediction systems* that can be used to quantify the hydrologic consequences of given climate change scenarios and produce seasonal and longer-range hydrologic predictions based on relevant initial value data from global observation systems.

NEXT Steps

There are large dependencies of NEWS on MAP (**M**odeling, **A**nalysis, and **P**rediction Climate Variability and Change), requiring explicit ties to be established

NEWS integration team has worked to identify gaps and recommendations for ROSES

NEWS integration team is working to identify potential partner links to fill gaps ***(NEWS could be the main interface between NASA water & energy cycle activities and the scientific community, i.e. GEWEX, NOAA, NCAR and others)***

Challenges for the Water & Energy focus area

Snowfall and mixed precipitation

Whole-system, global water & energy cycle balance & variability and quality assessments

Fine scale water & energy cycle assessments

New multivariate retrieval methods

Predictability analysis

Observationally-driven water & energy cycle model physics improvement

Developing high-resolution coupled cloud-radiation-hydrology models

Water & energy cycle coupled assimilation

Establish observation-based water &energy cycle prediction performance metrics

Identify currently available water & energy cycle data and analysis products