

CONTINENTAL AND GLOBAL-SCALE TERRESTRIAL WATER AND ENERGY BUDGETS USING REMOTE SENSING OBSERVATIONS.

Eric F Wood¹, Justin Sheffield¹, Craig Ferguson¹, Raghuveer Vinukollu¹, Tara Troy¹, Huilin Gao²

¹Department of Civil and Environmental Engineering, Princeton University, Princeton, NJ USA 08540

²Department of Civil and Environmental Engineering, University of Washington, Seattle, WA

Documenting the global water and energy cycle through modeling and observations is fundamental to achieving the goals of the World Climate Research Programme's Global Energy and Water Cycle Experiment (GEWEX), and similar national programs like NASA's Energy and Water Cycle Study (NEWS) that support GEWEX research. This documentation is needed to acquire enhanced knowledge of Earth's climate, including characterizing the memories, pathways and feedbacks between key water, energy and biogeochemical cycles through observations, and so address the outstanding NEWS and GEWEX goal "*to document and enable improved, observationally-based, predictions of (the) energy and water cycles..*". To date, some components of the terrestrial water and energy budgets have been estimated. For example, there are a number of precipitation estimates based on polar orbiting passive microwave sensors from both experimental (e.g. AMSR-E on board NASA's Aqua Earth Observing platform) and operational platforms (e.g. the polar orbiting SSM/I sensors). Surface hydrologic soil moisture states are available using TRMM Microwave Imager or AMSR-E X-band (~10.7 GHz) measurements. Furthermore, variations in land water storage can be derived from GRACE gravimetric measurements that aggregate changes in snowpack, soil moisture and ground water. More recently, large scale evapotranspiration products are becoming available that, for example, use NASA EOS radiation, surface temperature and land characteristics within energy balance algorithms or Penman type equations. Multi-decadal terrestrial heat fluxes are central to the water budget, and their estimation of a focus of the GEWEX Radiation Panel's LandFlux initiative. In this presentation, the terrestrial water and energy budgets are computed over two continental domains: The United States and Northern Eurasia. The water budget is computed for recent years using remote sensing measurements for all components except for river discharge. Over the Mississippi River basin (within the United States domain), the remotely sensed estimates are compared to land surface model based terrestrial budgets and North American Regional Reanalysis (NARR) model outputs, and over northern Eurasia similar comparisons but using the new ECMWF Interim Reanalysis (ERA-INT). We also use atmospheric water budgets from remote sensing and NARR/ERA-INT as a further constraint on the terrestrial budgets. Analyses of the seasonal cycle and non-closure of the remote sensing based budgets provide indications of the consistency of the budget estimates. The talk will also offer a strategy for a global budget analysis, and examples of initial global remote sensing products will be provided.