

Assessment of land surface energy and water budgets using NOAA Global Forecast System and NASA Land Information System

J. Meng^{1,2}, K. Mitchell¹, H. Wei¹, C. Lu¹, G. Gayno¹, C. Peters-Lidard², and P. Houser³

1. Environmental Modeling Branch, National Centers for Environmental Prediction, NOAA

2. Hydrological Sciences Branch, Goddard Space Flight Center, NASA

3. Center for Research on Environment and Water, Beltsville, Maryland

Accurate assessment of the land surface energy and water budgets at local, regional, and global scales requires a land surface modeling system that includes comprehensive land physics, well-calibrated land soil and vegetation parameters, and high quality atmospheric forcing data. The variability and uncertainty of land parameters and forcing data have critical impacts on the estimated land surface energy and water fluxes. It is practically expensive to use a fully coupled land-atmosphere modeling system to quantify the impact of each parameter and forcing variable at regional and global scales. Uncoupled land modeling, calibrating, and assimilating approaches are generally accepted to estimate the uncertainty and the consequent responses of the Earth's climate system. The land research group at NOAA NCEP has selected the NASA Land Information System (LIS, <http://lis.gsfc.nasa.gov>) as the infrastructure to perform off-line uncoupled executions of the Noah land surface model for investigating the land and atmosphere interactions. The objective is to compare the uncoupled executions with the operational coupled NCEP Global Forecast System (GFS/Noah) output and seeking strategy to improve the GFS prediction of regional and global energy and water budgets. A LIS infrastructure has been built on the NCEP supercomputer where the operational GFS is executed. This system will be configured identical to the operational GFS including the same grid projection, resolution, land-sea mask, terrain height, and soil and vegetation specifications. A baseline GFS simulation will be executed as the control run also providing the baseline atmospheric forcing. A series of LIS/Noah simulations will be executed with various execution options. Observation based, both in situ and satellite driven, precipitation and surface radiation are used as alternative forcing. New vegetation parameters, as opposing to that in the operational GFS, will be tested. The simulated land states and fluxes will be compared with the corresponding baseline GFS fields. The translation from the perturbation in the forcing and parameters to that in the resulting land states will be quantified. Selected observations from the Coordinated Enhanced Observing Period (CEOP) reference sites will be used for evaluation.