Assessment of Land Surface Energy and Water Budgets Using NOAA GFS/GDAS and NASA LIS

J. Meng¹,², K. Mitchell¹, H. Wei¹, C. Lu¹, G. Gayno¹, C. Peters-Lidard², and P. Houser³

1. NOAA National Centers for Environmental Prediction, Camp Springs, Maryland; 2. NASA Goddard Space Flight Center, Greenbelt, Maryland; 3. Center for Research on Environment and Water, Beltsville, Maryland.

ABSTRACT
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 modeling team 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 IBM supercomputer where the operational GFS/GDAS are executed. This system will be configured identical to the operational and experimental GFS/GDAS including the same grid projection, resolution, land-sea mask, terrain height, and soil and vegetation specifications. A series of LIS/Noah simulations will be executed with various execution options. A control run will be executed using the NCEP Global Reanalysis 2 atmospheric forcing. New vegetation parameters, as opposing to that in the operational GFS, will be tested. Observation-based, both in situ and satellite driven, precipitation and solar radiation are used as alternative forcing for sensitivity tests. (Contact: Jesse.Meng@noaa.gov).

FORCING SENSITIVITY
Baseline atmospheric forcing: NCEP Global Reanalysis 2
Alternative satellite-based forcing: NCEP CPC CMAP precipitation
AFWA AGRMET solar radiation

PARAMETERS TUNING
LATENT HEAT FLUX
SENSIBLE HEAT FLUX

NOAH VEGETATION TYPES

LATENT HEAT FLUX
SENSIBLE HEAT FLUX

EVALUATION

FORCING SENSITIVITY
Baseline atmospheric forcing: NCEP Global Reanalysis 2
Alternative satellite-based forcing: NCEP CPC CMAP precipitation
AFWA AGRMET solar radiation

SNOW UPDATE

OBSERVATION

A “factor of two” approach