Geophysical Research Abstracts
Vol. 12, EGU2010-12771, 2010
EGU General Assembly 2010

Using satellite and multi-modeling for improving soil moisture and streamflow forecasting

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Work for this project is towards improving the stream flow forecasts for the NOAA River Forecast Centers (RFC) throughout the U.S. using multi-model capability primarily from the NASA Land Information System and remote sensing data provided by AMSR-E for soil moisture. The RFCs address a range of issues, including peak and low flow predictions as well as river floods and flash floods. The NASA Land Information System (LIS) provides a data integration framework for combining a range of ancillary and satellite data with state of the art data assimilation capabilities. We are currently including: 1) the Noah land surface model (LSM) simulates soil moisture (both liquid and frozen), soil temperature, skin temperature, snowpack water equivalent, snowpack density, canopy water content, and the traditional energy flux and water flux terms of the surface energy and surface water balance; 2) the Sacramento Distributed model is based on the lumped 'SAC-SMA' model used for hydrological simulations; and 3) the Catchment land surface model that is distinctive in the way land surface elements are depicted as hydrological catchments. Results from assimilating AMSR-E (Advances Microwave Sounding Radiometer) soil moisture with the Noah LSM using ensemble Kalman filter data assimilation. Results for a test site in Oklahoma, US show significant improvement for soil moisture estimation assimilating AMSR-E data. We used a conservation of mass procedure within a soil column to provide a more physically based approach to transfer observed soil moisture state to the lower soil moisture profiles. Overall the AMSR-e results shows improvement for improving the true spatial mean of soil moisture improvements. Noah LSM comparisons to determine if AMSR-E contributed to an improved streamflow showed inconclusive results. More accurate hydrologic improvements are expected from the new SMOS (Soil Moisture Ocean Salinity) and the future SMAP (Soil Moisture Active Passive). Future work will compare Noah LSM results along with Catchment and Sacramento derived soil moisture and streamflow data.