Results from Assimilating AMSR-E Soil Moisture Estimates into a Land Surface Model using an Ensemble Kalman Filter in the Land Information System (LIS)

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Statistical Results

- Significantly improved soil moisture estimates using an Ensemble Kalman Filter (EnKF) technique
- Sensitivity analysis of data assimilation experiments using a land surface model (LIS)
- Improved estimates of model parameters compared to observations

Objectives of Project

- We assimilate AMSR-E soil moisture observations using an Ensemble Kalman Filter in the Land Information System (LIS)
- Provide a new land surface model as an option in the Land Information System software

Data Assimilation Results – Simulation using 1.5 x Stage IV rainfall

- EnKF uses the spread of the ensemble to represent the forecast error covariance
- The LIS software includes the capability to perform EnKF data assimilation

Soil Temperature, Jan. – July 2003

- Soil temperature and moisture are measured hourly at 14 cm depths, including the 5 cm observation used here to validate model results

Future Research

- Highly customizable at run-time, facilitating modeling experiments & intercomparisons
- Can run coupled with the WRF meteorological model
- Allows several tiles per grid cell to represent subgrid variability of soil type
- Can run offline or coupled with meteorological model

SLEEP-LT

- Flexibly vertical layer configuration designed to facilitate microwave data assimilation
- Contains radiative transfer model for microwave applications

Soil Moisture Innovation (m3/m3)

- AMSR-E retrieved soil moisture for August 2, 2008 over the SE US

Acknowledgments


Promoted by the U.S. Department of Agriculture to test the assimilation of AMSR-E soil moisture observations into a land surface model (LIS). The dynamic range of AMSR-E observed soil moisture is small relative to that of the model. A correction (right) is applied to the observations into a model-equivalent value. A Cumulative Distribution Function (CDF)-matching technique is used here. This is similar in purpose to other correction usually applied to soil observations in NWP models. Simulations made with the model correction showed a strong bias.

The model assimilation results are generally over-estimate soil moisture compared to the benchmark LIS.Stage IV simulation and the Microwave in situ observations.