

NASA Land Information System Multi-Model Ensemble Hydrological Predictions

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Overall Goal

- Multi-model ensemble streamflow prediction based on the Land Information System (LIS)
 - Noah (NOAA/NCEP)
 - SAC-distributed (NOAA/OHD)
 - Catchment-distributed (NASA/GSFC)
 - VIC (UW)

Specific Objectives

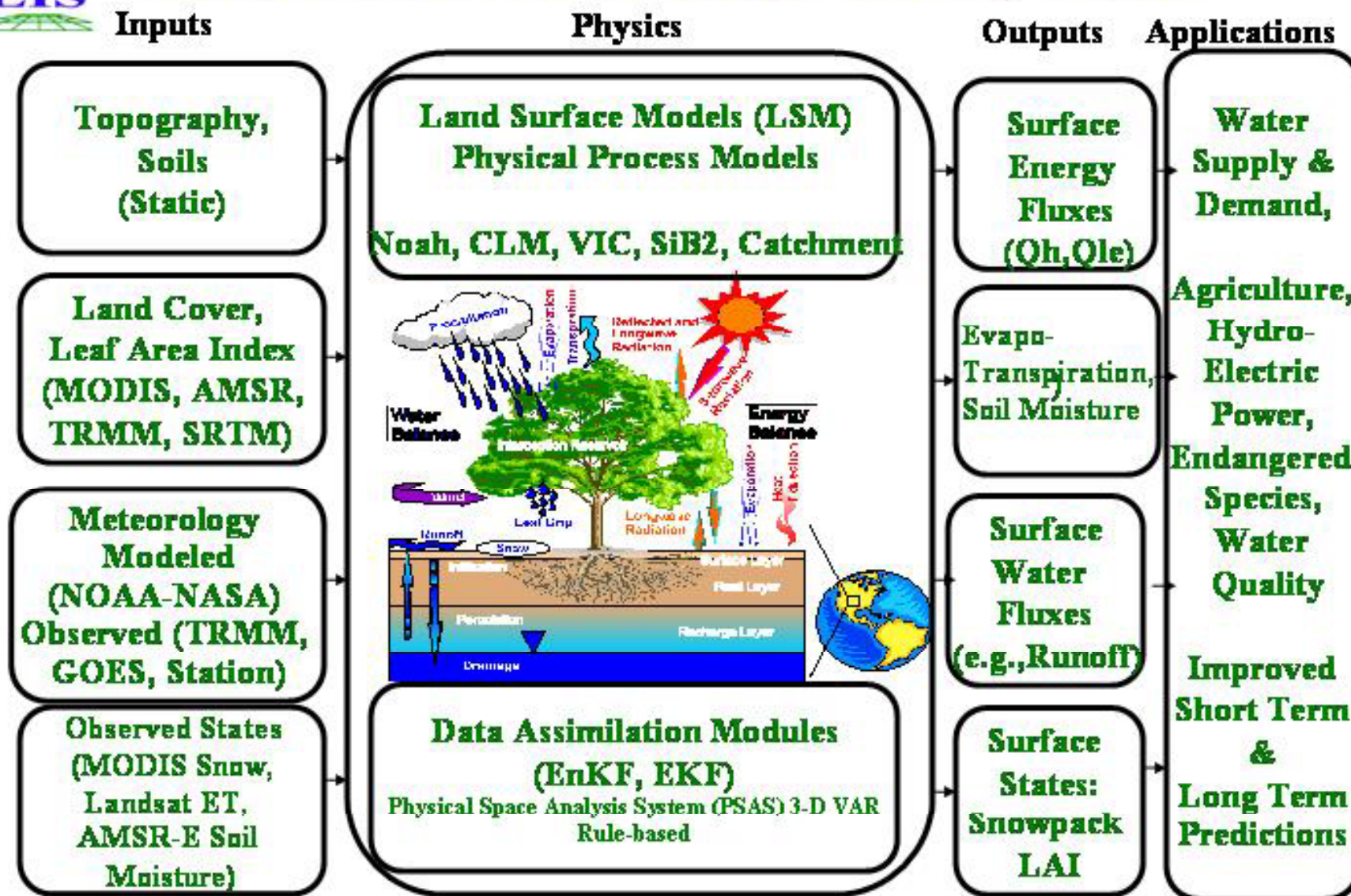
- Model evaluation and inter-comparison
 - In situ Soil moisture measurements
 - *Surface* heat measurements
- Multi-parameter model calibrations
- Assessment of AMSR-E soil moisture products and *LIS* data assimilation
- 14-day ensemble streamflow prediction
- To improve the LIS 'Test Bed' for NOAA applications

Related NASA Projects

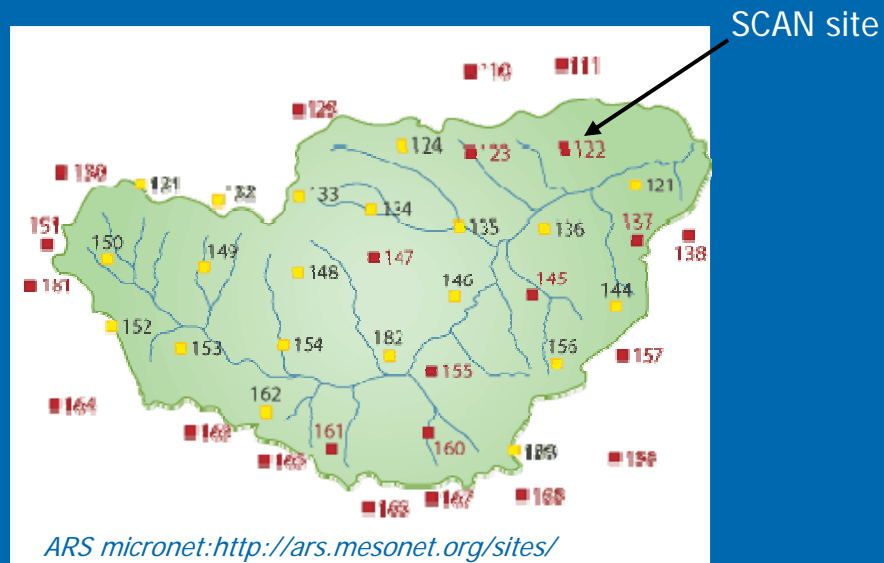
- NOAA/NWS River Forecasting Center Decision Support
 - NASA data (*i.e.*, MODIS snow and cloud cover) and LIS modeling to improve river forecasting
 - Implementation of SAC/SNOW-17 in LIS
 - NOAA/OHD streamflow router *in to LIS*
- NASA/BoR Middle Rio Grande Project
 - 7-day ET forecasting using GFS forcing
- NASA LIS *implementation* (e.g., NOAA NCEP, AFWA and new NOAA NOHRSC)



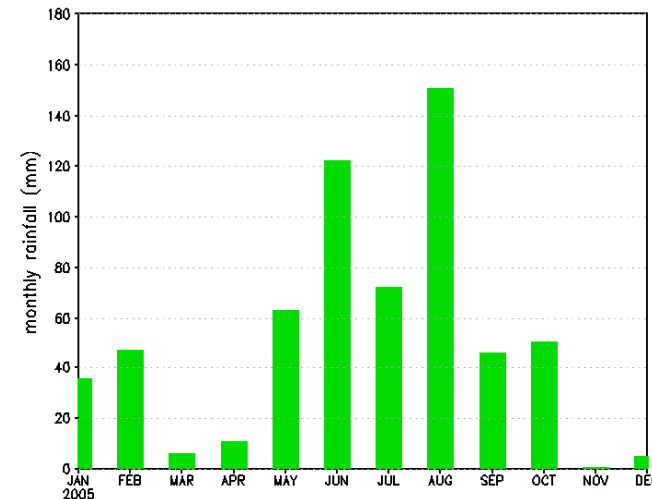
NASA Land Information System



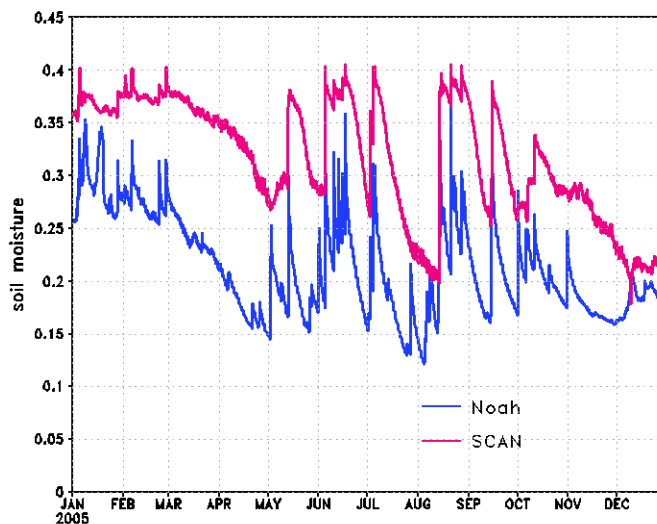
Model Evaluation: An example at Little Washita



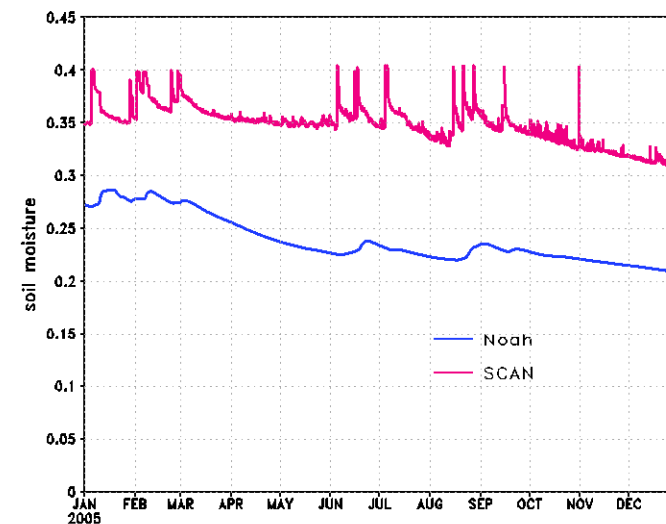
Monthly Rainfall (NLDAS) Amount (mm)



Comparison of Soil Moisture at 5 cm Depth

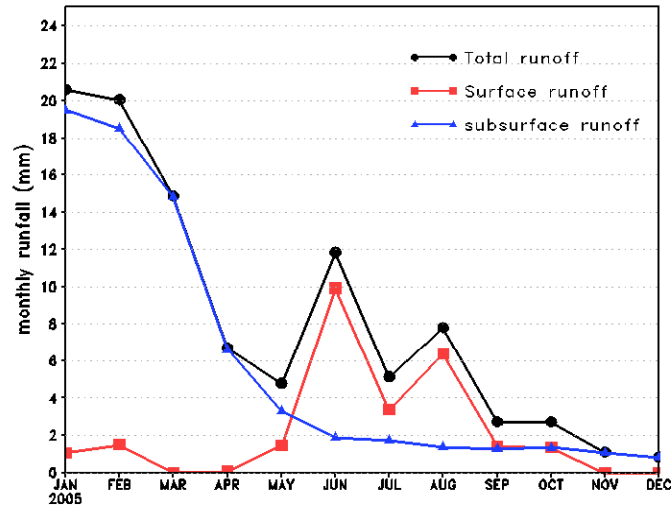


Comparison of Soil Moisture at 100 cm Depth

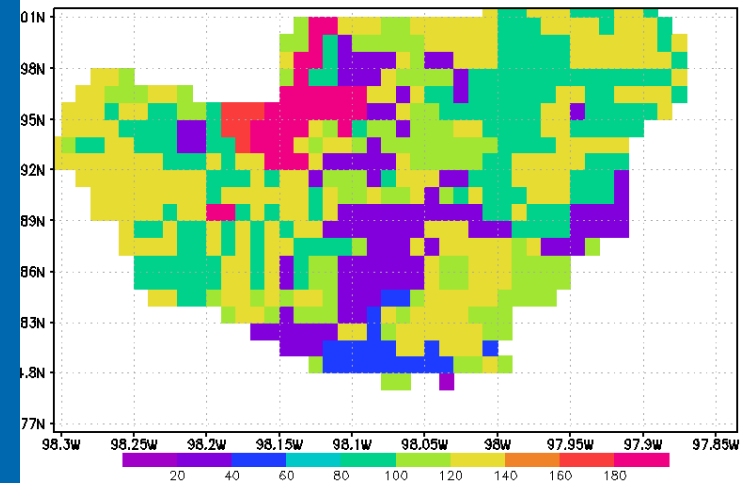


Model Evaluation: An Example at Little Washita

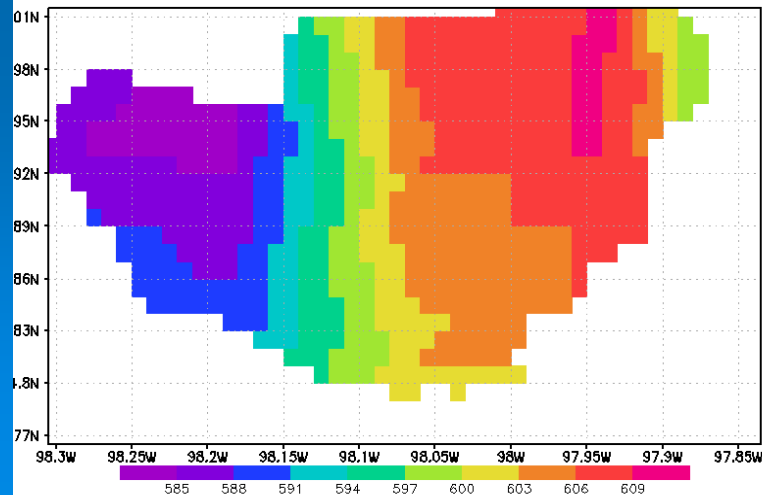
Simulated Monthly Runoffs at a grid point



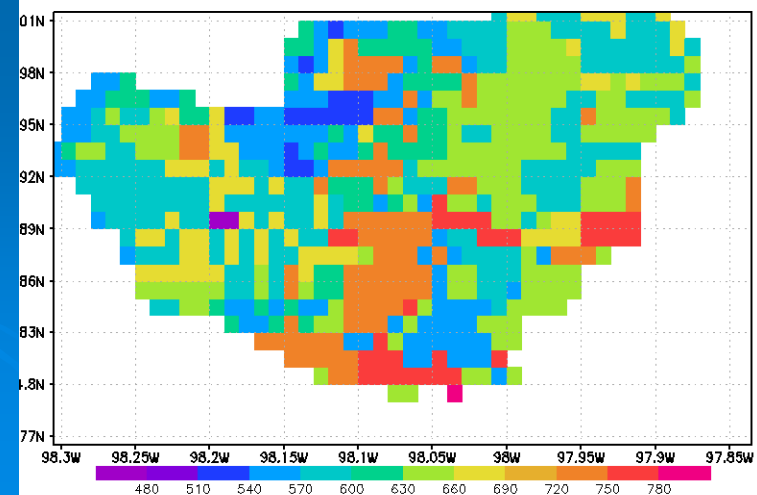
Simulated Annual Total Runoff (mm)



NLDAS Annual Rainfall (mm)

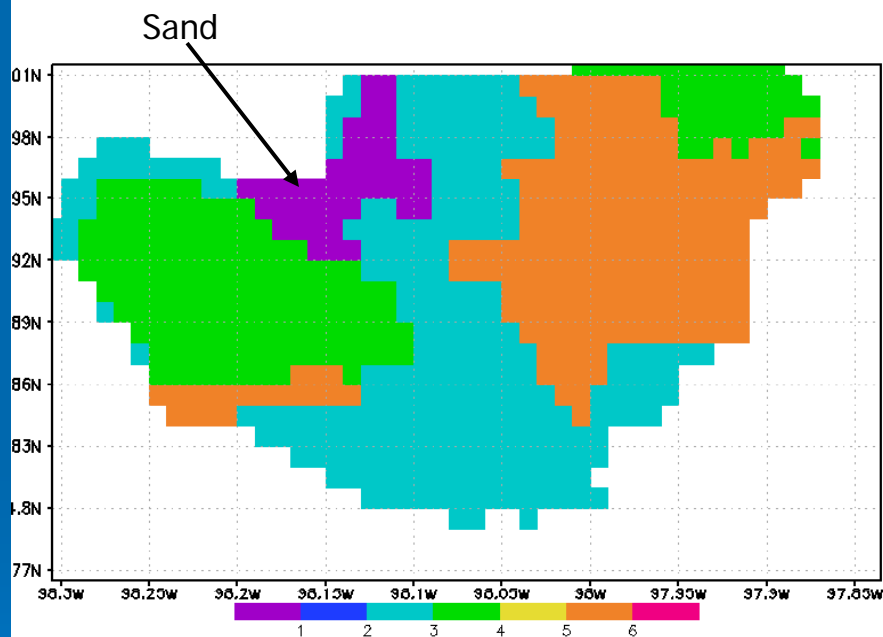


Simulated Annual Evaporation (mm)

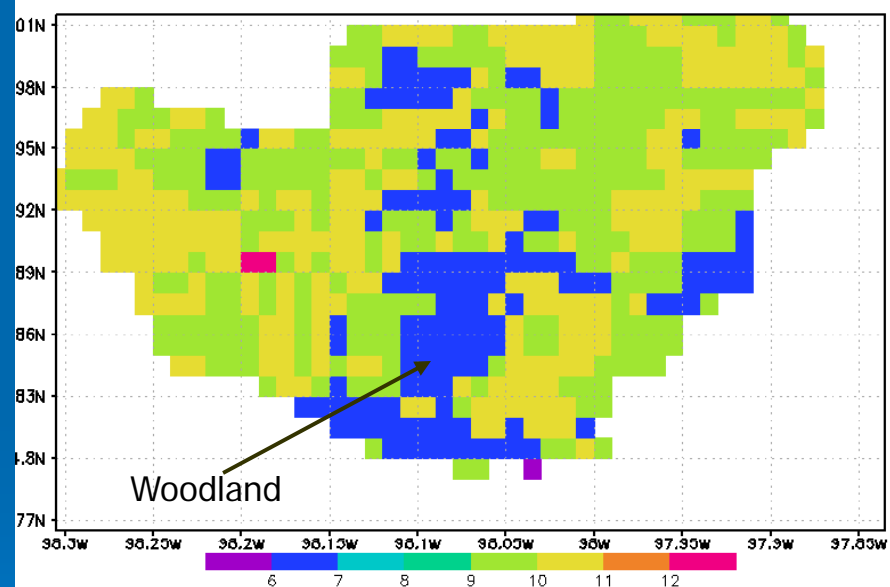


Model Evaluation: An example at Little Washita

STATSGO Soil Texture

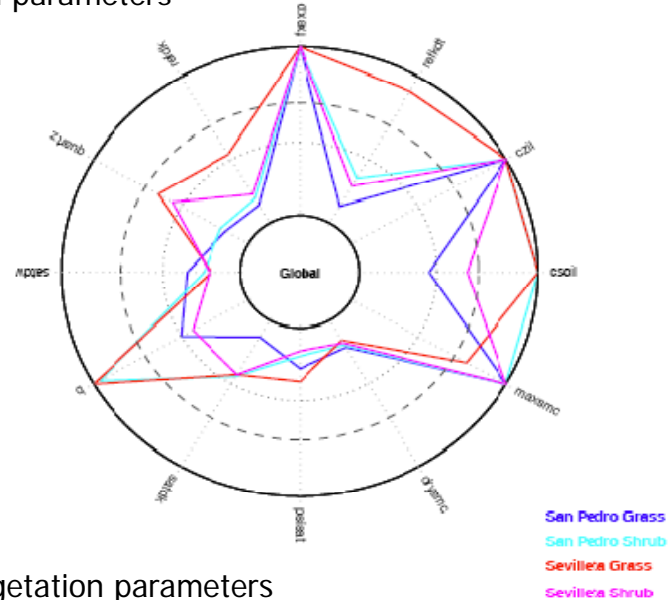


UMD 1KM Vegetation Type

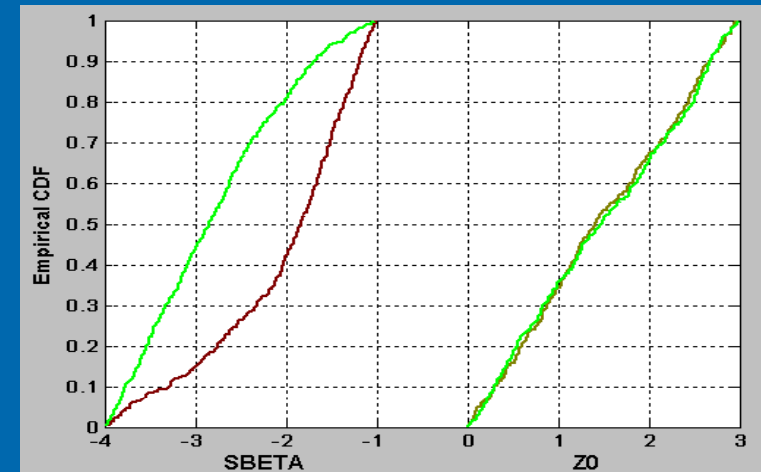
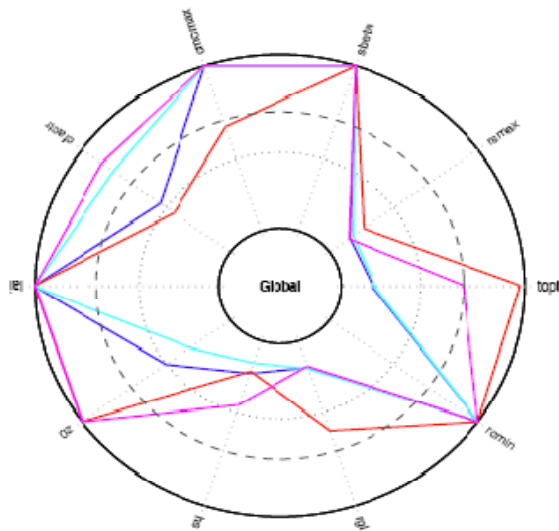


Multi-objective/Multi-parameter Model Calibration

soil parameters



vegetation parameters



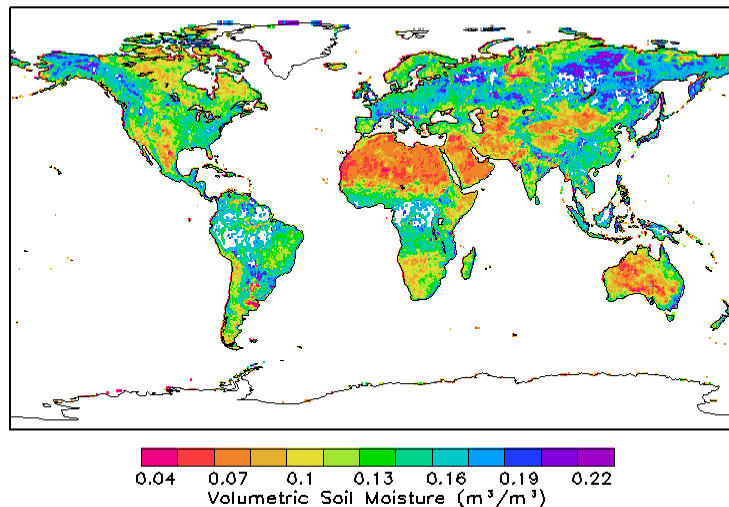
- ❑ Sensitivity analysis is performed using Monte Carlo simulation (MOGSA, *U. of Arizona*)
- ❑ Multi-objective/multi-parameter calibration
 - ❑ Calibration on Latent heat and sensible heat
 - ❑ Measured Soil moisture as initial condition
- ❑ MOSCEM (*U. of Arizona*) for model calibration

AMSR-E and LIS Data Assimilation

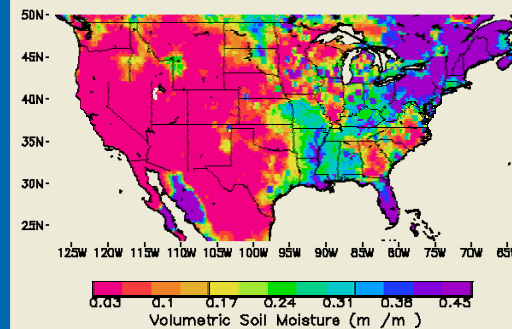
- ❑ The effect on soil moisture & streamflow
- ❑ Better versions of AMSR-E
- ❑ LIS data assimilation ability

AMSR-E Soil Moisture

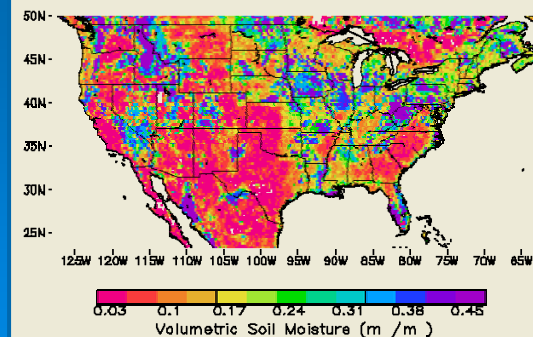
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USDA-FAS Soil Moisture

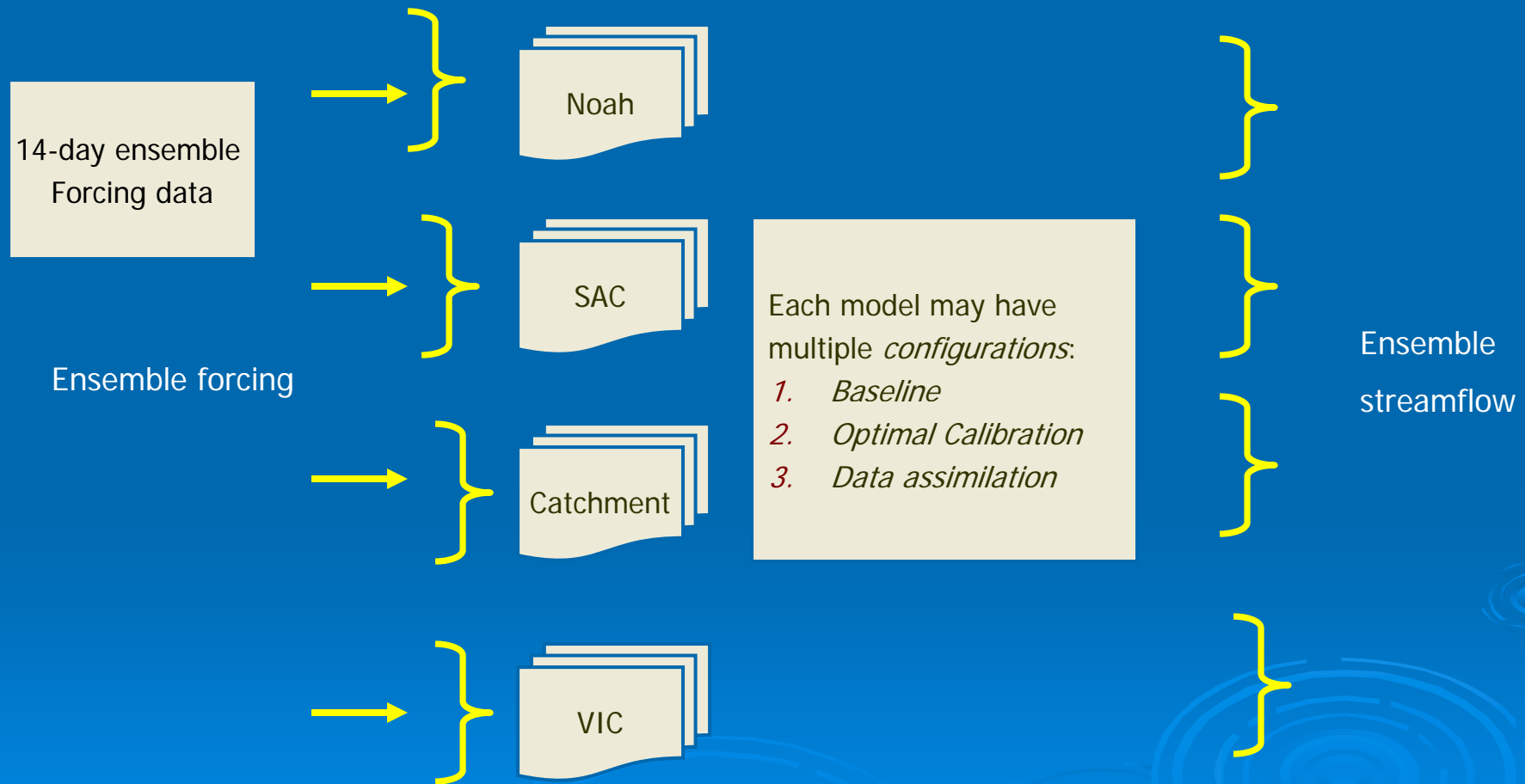


EnKF Soil Moisture Product

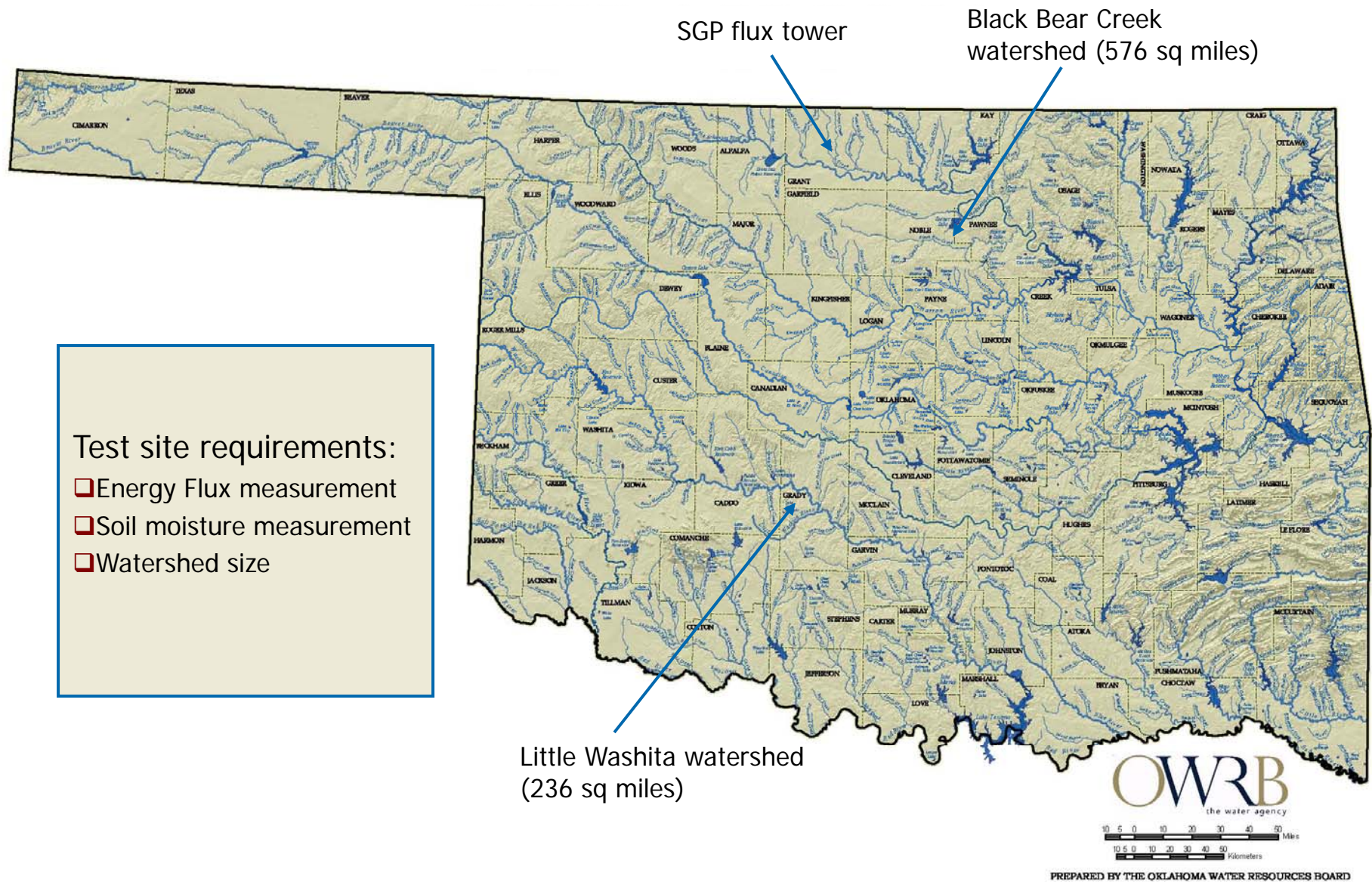


Courtesy: Bolten et al. (USDA-ARS)

Ensemble Streamflow Prediction



OK & DMIP Test Sites: Watersheds TBD



Thank you!

Comments/suggestions/questions?

