Comparison of Simulated Soil Moisture in a Distributed Hydrological Model Using Direct Observations

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Overview

PSD has deployed seven soil moisture observing stations in the Russian River basin, located in northern California. The soil moisture observations have been compared with soil moisture gridded fields simulated using the National Water Center (NWC) Research Distributed Hydrological Model (RDHM).

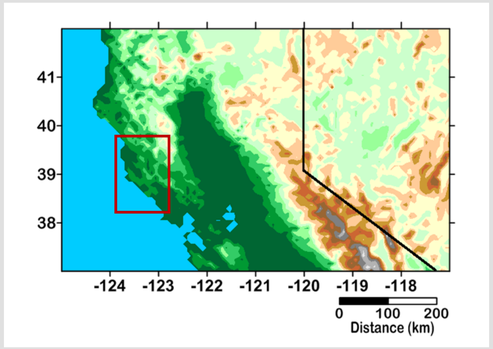
Objective

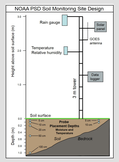
Improve NWS extreme event flood forecasting using in situ soil moisture observations

- Compare the PSD observations with NWC soil moisture simulations annually, seasonally, and during flood events
- Develop and test soil moisture data assimilation strategies using PSD observations than can be implemented operationally in the hydrological model
- Partner with the NWS California Nevada River Forecast Center (CNRFC), the NOAA Hydrometeorological Testbed program, and the California Department of Water Resources in the development of NWC-RDHM

Observations

Russian River Soil Moisture Network

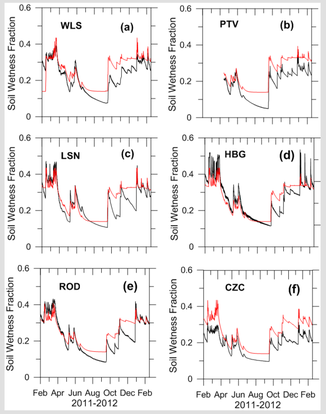




Hydrological Model

- Simulation period: 1 February 2011 – 12 March 2012
- Sacramento Model Heat Transfer version
- HRAP 4-km grid. NWC routing
- NWC supplied soil physical properties and calibration
- Forcing fields provided by the NWS CNRFC
- Time step 6-h

Results



- Soil physical properties are homogenous on sub-HRAP horizontal scales
- Best results in spring
- Wet bias in summer
- Model does not reproduce the observed late fall and early winter changes in soil moisture

Future Research

- Forecasts of winter flooding may be improved by assimilating the observations into the model
- Determine the impact of combined gauge and radar QPE on soil moisture simulations
- Examine soil moisture simulations that utilize 1-km horizontal grids and hourly time steps
- Implement NWC Heat Transfer Enhanced Evapotranspiration version of the hydrological model
- Assimilate soil moisture observations into the model using 4-D VAR and EnKF methods