Launching Phase II of NLDAS: A Preliminary Result

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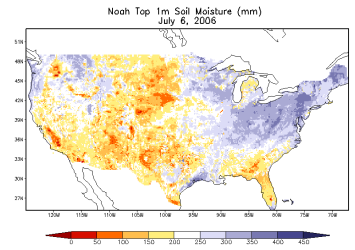
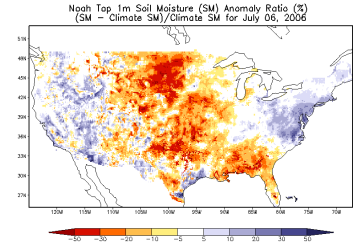
ABSTRACT

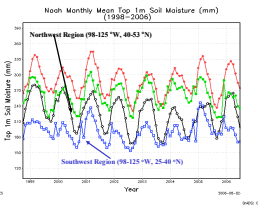
The North American Land Data Assimilation System (NLDAS) is multi-institutional and multi-models research project in an uncoupled mode. Its purpose is (1) to improve weather and seasonal climate prediction in the North America through providing reliable initial states, such as soil moisture, soil temperature, snowpack, and other reliable parameters such as albeo to regional weather and climate models, and (2) to provide water information (soil moisture, snowpack, runoff, streamflow) to government agencies for water resource management and uses such as drought monitoring, agricultural management, flood prediction etc. Phase I of the NLDAS project included a 3-year retrospective land data assimilation analysis by running four land surface models (NOAH, VIC, MOSAIC, SAC) using 3-year retrospective forcing data spanning October 1996 through September 1999, and a realtime land data assimilation analysis spanning April 1999 to present with one land model (Noah).
Phase II of the NLDAS has been launched recently via collaborations between NCEP/EMC, NWS/OHD, NASA/GSFC/HSB, NCEP/CPC, Princeton University, University of Washington, University of Maryland, and the other research institutions. It will include 1) a long-term 25-30 year NLDAS retrospective analysis using observed precipitation from CPC precipitation analysis and all other surface forcing form North American Regional Analysis (NARR), 2) a daily realtime update and 3) a seasonal predictive component. This seasonal predictive component consists of multi-model ensemble seasonal dynamical prediction products from global climate models, empirical seasonal prediction products from the CPC seasonal outlook, prediction from land surface models, and Bayes theory to use to weight different sources of predicted surface forcing. Here a preliminary result is given only. For long-term retrospective analysis, a 9-year land water and energy balance analysis was conducted using the NOAH model and a NLDAS dataset from October 1996 to June 2006. The results are employed to analyze temporal and spatial distributions for soil moisture, soil temperature, sensible heat flux, latent heat flux, and skin temperature and are compared with observations. In the near future, the other 3 land models will be run (VIC, MOSAIC, SAC). For the seasonal prediction component, we transition to and demonstrate of NCEP the VIC-based ensemble seasonal streamflow prediction system developed under CPPA-sponsorship at Princeton University using ensemble seasonal forecasts of surface forcing from NCEP's Climate Forecast System (CFS). In the near future, we will transition to NCEP the methodology of the CPPA-sponsored development at University of Washington, whereby the official seasonal forecasts of CPC are applied to generate additional ensemble member of seasonal predictions of land surface forcing for the purpose of deriving multiple land models. The multi-models and multi-ensembles seasonal streamflow prediction system using multi-models (including dynamical and empirical models) and multi-ensemble seasonal predictions products will be installed in the future.

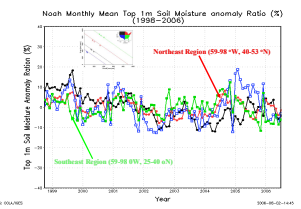
1.CURRENT NLDAS

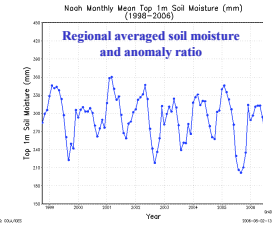
- Data covered from October 1996 to July 2006
- NLDAS characteristics: hourly atmospheric forcing variables including downward shortwave radiation, downward longwave radiation, 2m surface air temperature, 2m specific humidity, 10 m wind speed, surface precipitation, and surface air pressure, and hourly model output products consisting of energy fluxes, water fluxes, and state variables.
- Realtime and retrospective Noah model outputs.
- ftp site: ftp to nomad4.ncep.noaa.gov and Noah model output is in /pub/ldas1/nldas/noah

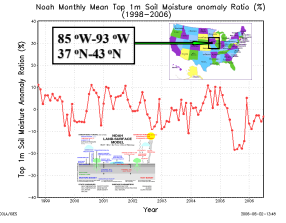






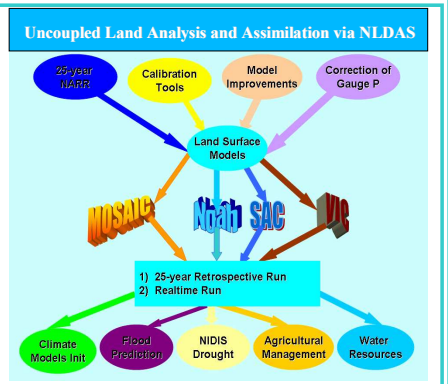






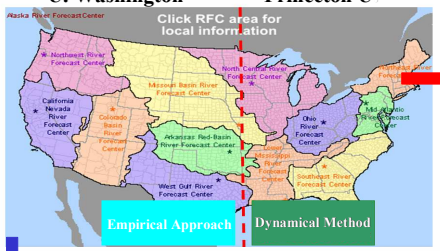
2. FUTURE NLDAS

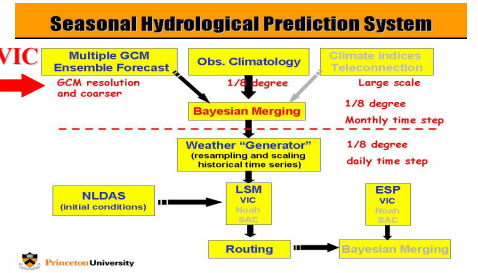
- Re-establish four land surface models (Mosaic, Noah, VIC, and SAC).
- 25 year retrospective run using North American Regional Reanalysis (NARR) land surface forcing.
- Realtime run for four land surface models
- Support of drought monitoring for NIDIS (National Integrated Drought Information System).
- Information for flood prediction, wild fire prediction, agriculture management, water resources management, initial condition of regional climate models etc.
- Application of calibration tools to land surface models.
- Correction of gauge precipitation observation.
- Improvement of land surface models (e.g., snow, vegetation dynamics, ground water model etc.).

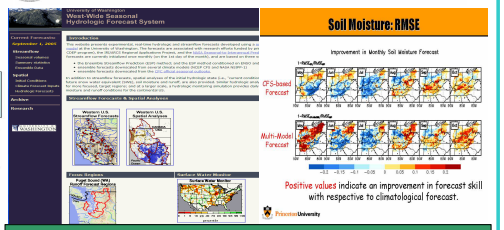


3. CURRENT SEASONAL PREDICTION COMPONENT

U. Washington Princeton U







These works are being transitioned to NCEP/EMC Land/Hydrology group and Climate Testbed

4. FUTURE SEASONAL PREDICTION COMPONENT

- Transition of dynamical approach (e.g., PU framework) to four land surface models for CONUS.
- Transition of empirical statistical approach (e.g., UW framework) to four land surface models for CONUS. The empirical methods include applications of conditional climatology, analogues, ENSO-indices, CPC seasonal outlooks etc.
- Test of merging techniques such as Bayesian merging, Bayesian weight, and ridge regression for weights of different forecasting sources.
- Test of different climate models including CFS, ECMWF, GFDL, and others.
- Establishment of realtime prototype.
- Service for NI DIS drought prediction.
- Service society's needs for water information.