

North American Land Data Assimilation System Phase 2 (NLDAS-2): Evaluation and Applications

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Abstract

Currently, NLDAS is a quasi-operational system that supports U.S. operational drought monitoring and seasonal hydrological prediction, in particular for the National Integrated Information System including U.S. Drought Monitor (USDM) and NCEP Climate Prediction Center Monthly Drought Briefing [1]. Detailed information about NLDAS can be found at NOAA (<http://www.emc.ncep.noaa.gov/mmb/nldas>) and NASA (<http://ldas.gsfc.nasa.gov/nldas/>) websites. NLDAS consists of four stages. The first stage is to establish NLDAS infrastructure (2000-2005) and test performance of the models, the second stage is to upgrade models and surface forcing to generate long-term NLDAS products (2006-2009), the third stage is to evaluate quality and reliability of these long-term products using as many as available in situ observations and satellite-retrieved data (2009-2011), and the fourth stage is to transition this system to NCEP operations and apply these products to U.S. drought analysis and monitor (2012-beyond).

This presentation gives an overview of our overall evaluation results performed during the last three years including evaluation tools, in-situ observations and satellite-retrieved data used in NLDAS-2, and the performance of the different land models [2]. The evaluated products include streamflow/total runoff, evapotranspiration, sensible and latent heat flux, ground heat flux, soil moisture, soil temperature, and land surface skin temperature. These evaluations cover different spatial scales, varying from basin to continental scale, and time scales varying from hourly to annually. After we summarize our evaluation results, we also show some preliminary results from recent efforts to further improve individual models and suggest some possible directions to improve different NLDAS-2 land surface models in future. Finally, we will also show how to use our NLDAS products to support U.S. operational drought monitoring and prediction activities.

We recognize that the current NLDAS is not an “actual” land data assimilation system because remotely-sensed estimates of land-surface states such as soil moisture and snowpack, and in-situ observations such as streamflow and soil moisture, are not yet assimilated into the current version of NLDAS. The NCEP/EMC NLDAS team is collaborating with the NASA Goddard Hydrological Sciences Laboratory to add their Land Information System to the current NLDAS system which would allow assimilation of remotely-sensed data and in-situ observations, e.g. via an ensemble Kalman filter approach.

References

[1] M.B. Ek, Y. Xia, E. Wood, J. Sheffield, L. Luo, D. Lettenmaier, B. Livneh, D. Mocko, B. Cosgrove, J. Meng, H. Wei, V. Koren, J. Schaake, K. Mo, Y. Fan, Q. Duan, and K. Mitchell. North American Land Data Assimilation System Phase 2 (NLDAS-2): Development and Applications, GEWEX Newsletter, Vol. 21, No.2, pp. 5-7, May 2011.

[2] Y. Xia, K. Mitchell, M. Ek, J. Sheffield, B. Cosgrove, E. Wood, L. Luo, C. Alonge, H. Wei, J. Meng, B. Livneh, D. Lettenmaier, V. Koren, Q. Duan, K. Mo, Y. Fan, and D. Mocko. Continental-scale water and energy flux analysis and validation for the North American Land data Assimilation System project phase 2 (NLDAS-2): 1. Intercomparison and application of model products, Journal of Geophysical Research, Vol. 117, D03109, doi:10.1029/2011JD016048, 2012.