
2002 IEEE International Geoscience and
Remote Sensing Symposium and the
24th Canadian Symposium
on Remote Sensing
REMOTE SENSING:
Integrating Our
View of the Planet
IGARSS
2002
IEEE
June 24-28, 2002
Toronto Canada

Remotely Sensed Forcing Data and the Global Land Data Assimilation System

U. Jambor[1], P. R. Houser[2], M. Rodell[2], J. Gottschalck[1], C.-J. Meng[1,3], B. Cosgrove[4], and J. K. Entin[5]

[1]*Goddard Earth Science and Technology Center, University of Maryland, Baltimore County / NASA GSFC Hydrological Sciences Branch, Greenbelt, MD 20771*
[2] *NASA GSFC Hydrological Sciences Branch, Greenbelt, MD 20771*
[3]*NOAA National Centers for Environmental Prediction, Camp Springs, MD 20746*
[4]*SAIC / NASA GSFC Hydrological Sciences Branch, Greenbelt, MD 20771*
[5]*Now at NASA Headquarters, Washington, DC 20546*

***Abstract*—A high-resolution, near-real-time Global Land Data Assimilation System (GLDAS) that integrates information from relevant satellite- and ground-based observations within a land data assimilation framework is being developed at NASA's Goddard Space Flight Center and NOAA's National Centers for Environmental Prediction (NCEP). The GLDAS framework enables it to serve as a powerful tool for various types of research and applications. Here, we examine the impact of replacing model-based forcing fields with observation-derived fields on Mosaic land surface model (LSM) simulations. Due to a paucity of recent land surface state observations over large domains, GLDAS-forced Mosaic LSM simulations will be evaluated against finer-resolution North American LDAS-forced results.**

I. INTRODUCTION

Accurate initialization of land surface moisture and energy stores is critical in weather and climate prediction because of their regulation of surface water and energy fluxes between the surface and atmosphere over a variety of time scales. Since these are integrated states, errors in land surface forcing and parameterization accumulate in land stores, leading to incorrect surface water and energy partitioning. The purpose of the Global Land Data Assimilation System (GLDAS) is to integrate satellite- and ground-based observational data products, using advanced land surface modeling and data assimilation techniques, in order to produce optimal fields of land surface states and fluxes [1]. GLDAS drives multiple land surface models (LSMs) globally at 0.25° and lower spatial resolutions on a sub-hourly timestep. A vegetation-based "tiling" approach is used to simulate sub-grid scale variability, with a 1 km global vegetation dataset as its basis. Soil and elevation parameters are based on high-resolution global information. The system runs in near-real time using a combination of observation-based precipitation and radiation fields and the best available global coupled weather forecast model output (Fig. 1). The global land surface fields that GLDAS provides will be used for initialization of coupled weather and climate prediction models and subsequent research and applications. Furthermore, the 2001-forward GLDAS archive of modeled and observed, global, surface meteorological data will be unparalleled in scope.

The GLDAS project has its basis in the North American Land Data Assimilation System (NLDAS) project [2]. The study region for the NLDAS encompasses the continental United States and parts of Mexico and Canada, and LSMs are run at 0.125° resolution. By choosing to compare the GLDAS forcing and output fields with those of the NLDAS over a concurrent, common domain, the underlying assumption is that the NLDAS simulation is a better representation of the true atmospheric and land surface states. This study is a step towards understanding the GLDAS product over the global domain by first focusing on a region that is heavily observed and modeled.

II. METHODOLOGY

Three types of operational Mosaic LSM [3] runs were performed over July 2001. The two GLDAS simulations were run at 0.25° resolution, with each vegetation-based tile included per grid cell accounting for at least 10% of the grid cell area. The NLDAS simulation was run at 0.125° resolution, allowing for up to 10 vegetation-based tiles per grid cell, each accounting for at least 5% of the grid area.

For both GLDAS experiments the baseline forcing was 1° global grid output from the Goddard Earth Observing System Data Assimilation System (GEOS) model [4]. The second

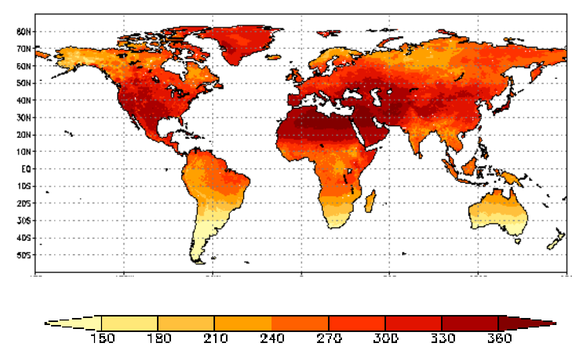

Fig. 1. Mean downward shortwave flux (W m^{-2}) for July 2001. This forcing field was assembled by GLDAS, using satellite-derived radiation data to replace baseline model forcing values whenever possible.

IV. CONCLUSION

Accurate representation of atmospheric forcing inputs in land surface simulations is fundamental. As such, it is important to identify which types of forcing data are most appropriate for such use, and the limitations associated with them. The GLDAS and NLDAS frameworks are well suited to perform such evaluations.

Recognizing the differences in model resolution, land surface parameters, and initial conditions among these discussed GLDAS and NLDAS simulations, we plan to minimize their effect on an LSM outcome by constraining such differences in future experiments.