New and Improved GLDAS data sets and data services at NASA GES DISC

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Introduction

The goal of a Land Data Assimilation System (LDAS) is to ingest satellite- and ground-based observational data products, using advanced land surface modeling and data assimilation techniques, in order to generate optimal fields of land surface states and fluxes and, thereby, facilitate hydrology and climate research, modeling, and forecast.

With the motivation of creating more climatologically consistent data sets, NASA GSFC’s Hydrological Sciences Laboratory has generated more than 60 years (Jan. 1948 – Dec. 2008) of Global LDAS Version 2 (GLDAS-2) data, by using the Princeton Forecing Data Set (Sheffield et al., 2006) and upgraded versions of Land Surface Models (LSMs). GLDAS data and data services are provided at NASA GES DISC Hydrology Data and Information Services Center (HIDISC), in collaboration with HSL and LDAS.

GLDAS Version 2 (GLDAS-2) Data

GLDAS-2 Noah Experiment 1-month and 3-hourly 1° x 1° data sets (1948-2008) have been released to the public by the NASA GES DISC.

While GLDAS-2 data are becoming available incrementally, more than 30 years (Jan. 1979-present) of GLDAS Version 1 (GLDAS-1) data, simulated by CLM, Noah, VIC, and HIC models, remain publicly available and are still growing.

GLDAS Basic Characteristics

- **Content**: Water and energy budget driving forcing data
  - **Spatial coverage**: Data over the globe
  - **Temporal coverage**: January 6th, 1948 to December 31st, 2008
  - **Resolution**: 0.25° and 1.0°

- **Output format**: Grided Binary (GRIB)

- **Elevation definition**: GTOPO 30

- **Vegetation definition**: University of Maryland, 1 km


The portal lists all GLDAS and NLDDA data sets along with links for accessing the data via Mirador, GDS, ftp, Giovanni, and README document.

GLDAS Version 2 (GLDAS-2) Data

**Recent updates of Princeton Forcing Data**

Princeton Forcing data set (Sheffield et al., 2006) provides near-surface meteorological data for driving land surface models and other terrestrial modeling systems. Since its creation in 2006, the data set has been updated and improved several times. The latest update includes correction in downward Shortwave Radiation, Humidity, and Temperature fields. [http://hydrlogy.princeton.edu/datapool/1_0ds/3 hourly/Readme_3hourly.txt](http://hydrlogy.princeton.edu/datapool/1_0ds/3 hourly/Readme_3hourly.txt)

**GLDAS-2 data will be generated by using:**

- Updated models (Noah, Catchment, CLM, and VIC)
- Updated land cover, mask, and other vegetation maps based on MODIS data
- Experiment 1 (1948 – present): Updated Princeton Forcing Data
- Experiment 2 (2001 – present): Observation based forcing data

**GLDAS-2 NOAH Model Data:**

Combined GLDAS-2 Noah model data (v2.71) Experiment 1 Data (1°x1° monthly and 3-hourly) will be updated by regenerating the data with updated Noah model (Noah3). The updated Princeton Forcing Data, and the updated land surface parameters.

0.25°x0.25° monthly and 3-hourly data are coming soon in winter 2012.

**GLDAS-2 Catchment Model Data:**

- Catchment model was developed by Randy Koster et al at GSFC (the same group who developed Noah).
- 1°x1° monthly and 3-hourly Experiment 1 Data are coming soon in summer 2012.

- Similar to Noah model data, Catchment model data contain 20 variable fields.
- However, unlike most LSMs, the soil water prognostic variables are not strictly associated with soil layers. [http://nisp.gsfc.nasa.gov/research/landcatch.html](http://nisp.gsfc.nasa.gov/research/landcatch.html)

**GLDAS-2 CLM and VIC Model Data will also be forthcoming**


**Improvements in GLDAS-2 Data**

- In GLDAS-1, source of forcing data was changed several times during the 30-year data record. As a result, model output data show some discontinuities corresponding to dates of forcing data changes.
- GLDAS-2, using the improved forcing data from Princeton, has generated 61 years of improved and climatologically consistent data, using updated LSMs.
- The global mean time series of Total Precipitation (rainfall + snowfall, right-upper) and Surface Incident Shortwave Radiation (right-middle) show 61-year temporally consistent data.
- Global mean time series of Total ET (right-lower) shows the improvement of the 61-year consistent intensity and annual cycles.
- Other variables (not shown here) of GLDAS-2 model outputs also show improved data consistency.

**References**


Giovanni Portal for GLDAS Data


Giovanni is a web-based application developed by NASA GES DISC that provides a simple and intuitive way to visualize, analyze, and access vast amounts of Earth science remote sensing data without having to download the data.

Giovanni Monthly Portal provides online visualization, analysis, and intercomparison for monthly 1x1 GLDAS-1 and GLDAS-2 data from CLM, Noah, and VIC models.

Giovanni Sample Plot:


NLDAS Data at NASA GES DISC


- NLDAS-1 data set is 0.125° x 0.125° monthly data. Monthly data will be coming soon.

- NLDAS Phase 2 (NLDAS-2) Noah model data have been released to public recently.

- NLDAS data from SAC and VIC will also become available soon.


Summary

- To date, GLDAS and NLDAS have generated more than 60 years (1948 – present) and 30 years (1979 – present) of data, respectively. These quality-controlled, spatially and temporally consistent terrestrial hydrological data plays an important role in characterizing the spatial and temporal variability of water and energy cycles and supporting climate research.

- All data are accessible at NASA GES DISC Hydrology Data Holdings via Mirador, ftp, GDS, or Giovanni (http://disc.sci.gsfc.nasa.gov/hydrology/data-holdings/)

- Giovanni GLDAS and NLDAS portals further facilitate access and use of the data. The portals provide a simple and intuitive way to visualize, analyze and access the data without having to download the data.

- GLDAS-2 Experiment 1 data (1948-2008) will be generated by using updated Princeton Forcing Data, updated LSMs, and updated land surface data. Current existing GLDAS-2 Experiment 1 Noah data will be regenerated.

- GLDAS-2 Experiment 2 data (2001 – present) will be generated by using observation based forcing data, with a latency of around a month.

GLDAS is supported by the NASA Energy and Water cycle Study (NEWS). More information about GLDAS and NLDAS can be found at [https://data.sci.gsfc.nasa.gov](https://data.sci.gsfc.nasa.gov).

NLDAS is a collaboration project among several groups (NOAA/NCEP/EMC, NASA/GSFC, Princeton University, University of Washington, NOAA/OHD, and NOAA/NCEP/CPC) and is a core project of NOAA/MAP.