Introduction

The North American Land Data Assimilation System (NLDAS) is a collaborative project between NASA GSFC, NOAA, Princeton University, and the University of Washington. NLDAS has created surface meteorological forcing data sets using the best-available observations and reanalyses. The forcing data sets are used to drive four separate land-surface models (LSMs), Mosaic, Noah, VIC, and SAC, to produce data sets of soil moisture, snow, runoff, and surface fluxes.

NLDAS hourly data, accessible from the NASA GES DISC Hydrology Data Holdings Portal, are widely used by various user communities in modeling, research, and applications, such as drought and flood monitoring, watershed and water quality management, and case studies of extreme events. More information is available at http://ldas.gsfc.nasa.gov.

To further facilitate analysis of water and energy budgets and trends, NLDAS monthly data sets have been recently released by NASA GES DISC.

NLDAS Data Characteristics

Table 1. NLDAS Data Basic Characteristics

<table>
<thead>
<tr>
<th>Content</th>
<th>Spatial coverage</th>
<th>Spatial resolution</th>
<th>Temporal coverage</th>
<th>Temporal resolution</th>
<th>Forcing</th>
<th>Land surface models</th>
<th>Output format</th>
<th>Elevation definition</th>
<th>Vegetation definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and energy budget data</td>
<td>Conterminous U.S., parts of southern Canada and northern Mexico (21N - 50N, 125W - 67W)</td>
<td>2x2.5°</td>
<td>Phases 1-2, Aug. 1, 1996 - Dec. 31, 2007;  Phase 3: Jan 1, 1979 - present</td>
<td>Hourly and Monthly</td>
<td>Multiple data sets derived from satellite measurements, radar estimation, precipitation gauges, and atmospheric analyses</td>
<td>Mosaic, Noah, SAC, VIC</td>
<td>Grided Binary (GRIB)</td>
<td>GTOP 30</td>
<td>University of Maryland, 1 km</td>
</tr>
</tbody>
</table>

Table 2. Major Variables of NLDAS Forcing Data Sets and Model Outputs

<table>
<thead>
<tr>
<th>Energy Balance</th>
<th>Water Balance</th>
<th>Surface and subsurface State</th>
</tr>
</thead>
<tbody>
<tr>
<td>P = Q + E + AS</td>
<td>P = Precipitation</td>
<td>Average layer soil moisture</td>
</tr>
<tr>
<td>Q = Runoff</td>
<td>Q = Runoff</td>
<td>Average layer soil temperature</td>
</tr>
<tr>
<td>E = Evapotranspiration</td>
<td>E = Snowfall (frozen precipitation)</td>
<td>Sensible heat flux</td>
</tr>
<tr>
<td>AS = Water Storage Change</td>
<td>AS = Soil moisture</td>
<td>Snow cover</td>
</tr>
</tbody>
</table>

NLDAS Data Access and Services

All NLDAS data sets available from the NASA GES DISC can be accessed from the Hydrology Data Holdings Portal, http://disc.gsfc.nasa.gov/hydrology/data-holdings, via the following access methods:

- Direct link: simple, fast, and navigation
- Mirador: keyword search, navigation, subsetting, and format conversion
- NASA ODS Server (GDS): data aggregation and retrieving data in ASCII
- Giovanni: visualization, analysis, and data download
- Simple Subset Wizard (SSW): keyword search, subsetting, and format conversion

Both Mirador and SOW provide parameter and spatial subsetting and format conversion (GRIB to NetCDF), currently for all hourly data sets and, in the future, for all monthly data.

NLDAS Water and Energy Variables

- Energy Balance
  - P = Q + E + AS
  - Q = Runoff
  - E = Evapotranspiration
  - AS = Water Storage Change

- Water Balance
  - P = Precipitation
  - P = Precipitation
  - E = Snowfall (frozen precipitation)
  - AS = Soil moisture

- Surface and subsurface State
  - Average layer soil moisture
  - Average layer soil temperature
  - Sensible heat flux
  - Snow cover
  - Snow depth

How are the NLDAS monthly data generated?

- NLDAS monthly data are generated from their corresponding hourly data by monthly accumulation for some water-related variables and monthly average for the others.
- Time period for each month is from 00Z at the start of the month to 23:59Z at the end of the month, except for the first month (Jan. 1979). The period for Jan. 1979 is dependent on data set starting date and time (more details available in NLDAS README documents).
- NLDAS-1 Monthly Forcing Data Set:
  - Monthly accumulation for precipitation variables (ACPfcd, APcfd, PEDASfc, and PRDASfc) and monthly average for others.
- Two new variables for NLDAS-1 monthly forcing data set:
  - Convective precipitation monthly total (CONVPCPfd)
  - Shortwave radiation flux downwards (surface) blended from EDAS and GOES-UMD Pinker (RSWRFd).fsc
- NLDAS-2 Monthly Forcing Data Set:
  - Monthly accumulation for precipitation and convective precipitation and monthly average for other.
- NLDAS-2 Monthly Secondary Forcing Data Set:
  - Monthly accumulation for convective precipitation and convective precipitation and monthly average for other.
- NLDAS-2 Monthly Mosaic and Noah Model Data Sets:
  - Monthly accumulation for rainfall, snowfall, subsurface runoff, surface runoff, total evapotranspiration, and snow melt, and monthly average for others.

For the complete list of NLDAS variables, please go to NLDAS README Documents.

NLDAS provides more than 33 years of data for these major water balance and energy balance variables, and the data can be used for studying water and energy budgets and trends.

Summary

- NLDAS monthly hourly data, accessible from NASA GES DISC, are widely used by various user communities in modeling, research, and applications, such as drought and flood monitoring, watershed and water quality management, and case studies of extreme events.
- To further facilitate analysis of water and energy budgets and trends, NLDAS monthly data products have been recently released by NASA GES DISC.
- NLDAS monthly data are generated from their corresponding hourly data by monthly accumulation for some water-related variables and monthly average for others.
- NLDAS provides major water balance and energy balance variables and can be used for studying water and energy budgets and trends.
- NLDAS monthly Climatology data will be released in Jan. 2013 and will facilitate analysis of trends and anomalies.

New Data Services

- NLDAS-1 & 2 Monthly climatology (Jan. 2013)
- NLDAS-1 & 2 monthly and seasonal SAC data model (Spring 2013)
- NLDAS-2 monthly and VIC model data (Summer 2013)

Upcoming New Data and Services

How are the NLDAS monthly data generated?

- Time period for each month is from 00Z at the start of the month to 23:59Z at the end of the month, except for the first month (Jan. 1979). The period for Jan. 1979 is dependent on data set starting date and time (more details available in NLDAS README documents).
- Two new variables for NLDAS-1 monthly forcing data set:
  - Convective precipitation monthly total (CONVPCPfd)
  - Shortwave radiation flux downwards (surface) blended from EDAS and GOES-UMD Pinker (RSWRFd).fsc
- NLDAS-2 Monthly Forcing Data Set:
  - Monthly accumulation for total precipitation, convective precipitation, and potential evaporation, and monthly average for other variables.
- NLDAS-2 Monthly Secondary Forcing Data Set:
  - Monthly accumulation for convective precipitation and convective precipitation and monthly average for other.
- NLDAS-2 Monthly Mosaic and Noah Model Data Sets:
  - Monthly accumulation for rainfall, snowfall, subsurface runoff, surface runoff, total evapotranspiration, and snow melt, and monthly average for others.

More detailed information is available in the NLDAS README Documents, located at http://disc.gsfc.nasa.gov/hydrology/documentation.