# National Climate Assessment - Land Data Assimilation System (NCA-LDAS) Data and Services at NASA GES DISC

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NASA/Goddard EARTH SCIENCES DATA and INFORMATION SERVICES CENTER (GES DISC)

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***Open access to the NCA-LDAS Noah-3.3 data, including forcing variables, land surface states, stores and flux fields, and streamflow routing fields.***

## Introduction

The National Climate Assessment - Land Data Assimilation System, or NCA-LDAS, is an integrated terrestrial water analysis system created for sustained assessment, analysis, and dissemination of hydrologic indicators in support of the United States NCA activities. The core of NCA-LDAS is the multivariate assimilation of past and current satellite-based data records within the Noah Version 3.3 (Noah-3.3) land-surface model (LSM) at 1/8th degree resolution using NASA's Land Information System (LIS) software framework during the Earth observing satellite era.

The currently released NCA-LDAS daily data from the Noah 3.3 Land Surface Model (LSM) are archived and disseminated by the NASA GES DISC.

## NCA-LDAS Data Characteristics

| Table 1: Basic Characteristics of NCA-LDAS Data | |
|---|---|
| Latitude extent | 25° to 53° |
| Longitude extent | -125° to -67° |
| Spatial resolution | 1/8th degree |
| Temporal resolution | Daily |
| Temporal coverage | 1 January 1979 to 31 December 2015 |
| Dimension | 224 (lat) x 464 (lon) |
| Grid box center points | Lower left: 25.0625, -124.9375<br>Upper right: 52.9375, -67.0625 |
| Land surface models | Noah LSM Version 3.3 (Noah-3.3) |
| Format | NetCDF-4 |
| Forcing Data | NLDAS Phase 2 (NLDAS-2) Primary Forcing |

The NCA-LDAS daily data product contains 42 variables including land-surface fluxes (e.g., precipitation, radiation, and latent and sensible heat), stores (e.g. soil moisture and snow), states (e.g., surface temperature), and routing variables (e.g., runoff, streamflow, flooded area, etc.), driven by atmospheric forcing data from the North American Land Data Assimilation System Phase 2 (NLDAS-2). NCA-LDAS builds upon NLDAS through the addition of multivariate assimilation of Earth observations such as soil moisture, snow, and irrigation.

| Table 2. Satellite EDRs Assimilated into the NCA-LDAS | |
|---|---|
| Soil moisture and snow depth | SMMR, SSM/I, AMSR-E, ASCAT, AMSR-2 and SMOS |
| Irrigation intensity estimates | MODIS |
| Snow covered area | AVHRR and MODIS, and the multisensor IMS snow product |

**NASA HSL NCA-LDAS Project Site: http://ldas.gsfc.nasa.gov/NCA-LDAS/**

**NASA Land Information System (LIS): http://lis.gsfc.nasa.gov**

The LIS is a software framework for high performance terrestrial hydrology modeling and data assimilation.

**NASA LIS twitter feed: https://twitter.com/NASA_LIS**

**The development of NCA-LDAS Version 001 was supported by the NASA Earth Science Division**

## NCA-LDAS Data Access

**The NCA-LDAS data are archived at NASA GES DISC and can be accessed via:**

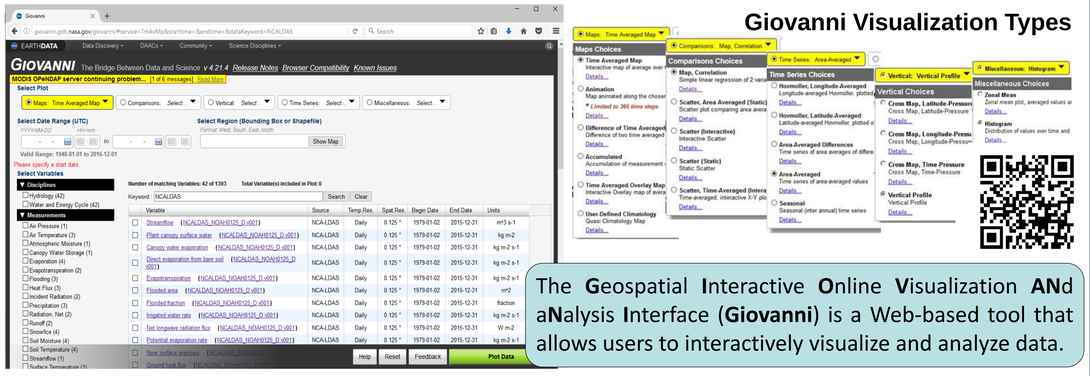
- HTTPS download: https://hydro1.gesdisc.eosdis.nasa.gov/data/NCALDAS/
- OPeNDAP download subsetted data: https://hydro1.gesdisc.eosdisc.nasa.gov/opendap/hyrax/NCALDAS/
- Mirador search and download: http://mirador.gsfc.nasa.gov/
- EarthData Search: https://search.earthdata.nasa.gov/search?q=NCALDAS_NOAH0125_D
- Giovanni Visualization and Analysis: https://giovanni.gsfc.nasa.gov/giovanni/#dataKeyword=NCALDAS

All access methods and more information about the data are included in the Data Product Landing Page at http://disc.sci.gsfc.nasa.gov/datacollection/NCALDAS_NOAH0125_D_001.html .

**Earthdata Login system**

Access to GES DISC data requires all users to be registered with the Earthdata Login system. Data continue to be free of charge. Detailed instructions on how to register and receive authorization to access GES DISC data are provided at **http://disc.sci.gsfc.nasa.gov/registration/registration-for-data-access**.

### NCA-LDAS Data Visualization and Analysis through NASA Giovanni




**Giovanni Visualization Types**




The **G**eospatial **I**nteractive **O**nline **V**isualization **AN**d a**N**alysis **I**nterface (**Giovanni**) is a Web-based tool that allows users to interactively visualize and analyze data.

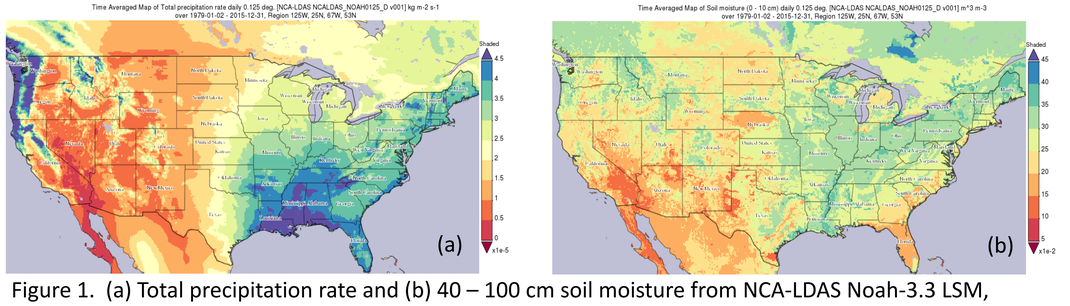



Figure 1. (a) Total precipitation rate and (b) 40 – 100 cm soil moisture from NCA-LDAS Noah-3.3 LSM, averaged over Jan 2, 1979 to Dec 31, 2015. The maps were generated by Giovanni.

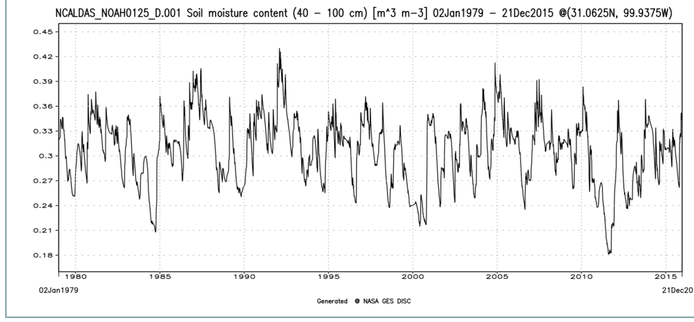



Figure 2. Time series of 40 – 100 cm soil moisture from NCA-LDAS Noah-3.3 LSM, at a location near the center of Texas (31.0625N, 99.9375W).

**Data Rods Capability (coming soon)**

The GES DISC will add a "data rods" capability, providing long-term time series at selected points, to better serve the hydrology community.

## NCA-LDAS Variables

| Table 3. The variables of NCA-LDAS Noah LSM | | |
|---|---|---|
| **Short Name** | **Long Name** | **Unit** |
| SWnet | Net shortwave radiation flux | W $m^{-2}$ |
| LWnet | Net longwave radiation flux | W $m^{-2}$ |
| Qle | Latent heat net flux | W $m^{-2}$ |
| Qh | Sensible heat net flux | W $m^{-2}$ |
| Qg | Heat flux | W $m^{-2}$ |
| Snowf | Snow precipitation rate | kg $m^{-2}$ $s^{-1}$ |
| Rainf | Rain precipitation rate | kg $m^{-2}$ $s^{-1}$ |
| Evap | Evapotranspiration | kg $m^{-2}$ $s^{-1}$ |
| Qs | Storm surface runoff | kg $m^{-2}$ $s^{-1}$ |
| Qsb | Baseflow-groundwater runoff | kg $m^{-2}$ $s^{-1}$ |
| Qsm | Snow melt | kg $m^{-2}$ $s^{-1}$ |
| RadT | Average radiative temperature | K |
| SWE | Snow depth water equivalent | kg $m^{-2}$ |
| SnowDepth | Snow depth | m |
| SnowFrac | Snow covered fraction | fraction |
| SoilMoist0_10cm | Soil moisture (0 - 10 cm) | $m^3$ $m^{-3}$ |
| SoilMoist10_40cm | Soil moisture (10 - 40 cm) | $m^3$ $m^{-3}$ |
| SoilMoist40_100cm | Soil moisture (40 - 100 cm) | $m^3$ $m^{-3}$ |
| SoilMoist100_200cm | Soil moisture (100 - 200 cm) | $m^3$ $m^{-3}$ |
| SoilTemp0_10cm | Soil temperature (0 -10 cm) | K |
| SoilTemp10_40cm | Soil temperature (10 - 40 cm) | K |
| SoilTemp40_100cm | Soil temperature (40 - 100 cm) | K |
| SoilTemp100_200cm | Soil temperature (100 -200 cm) | K |
| PotEvap | Potential evaporation rate | kg $m^{-2}$ $s^{-1}$ |
| ECanop | Canopy water evaporation rate | kg $m^{-2}$ $s^{-1}$ |
| TVeg | Transpiration rate | kg $m^{-2}$ $s^{-1}$ |
| ESoil | Direct evaporation from bare soil | kg $m^{-2}$ $s^{-1}$ |
| SubSnow | Snow sublimation rate | kg $m^{-2}$ $s^{-1}$ |
| CanopInt | Plant canopy surface water | kg $m^{-2}$ |
| Streamflow | Streamflow | $m^3$ $s^{-1}$ |
| FloodedFrac | Flooded fraction | fraction |
| FloodedArea | Flooded area | $m^2$ |
| IrrigatedWater | Irrigated water rate | kg $m^{-2}$ $s^{-1}$ |
| Wind_f | Wind speed | m $s^{-1}$ |
| Rainf_f | Total precipitation rate | kg $m^{-2}$ $s^{-1}$ |
| Tair_f | Temperature | K |
| Tair_f_min | Daily minimum temperature | K |
| Tair_f_max | Daily maximum temperature | K |
| Qair_f | Specific humidity | kg $kg^{-1}$ |
| Psurf_f | Pressure | Pa |
| SWdown_f | Downward shortwave radiation flux | W $m^{-2}$ |
| LWdown_f | Downward longwave radiation flux | W $m^{-2}$ |

## Summary

- NCA-LDAS is an integrated terrestrial water analysis system enabled by LIS, in support of NCA.
- NCA-LDAS data from the Noah-3.3 LSM have been released to the general public.
- The data can be accessed by various methods via NASA GES DISC's NCA-LDAS Data Product Landing Page.
- NCA-LDAS data are available through Giovanni for visualization and analysis.