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

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

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

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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 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.eosdis.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.
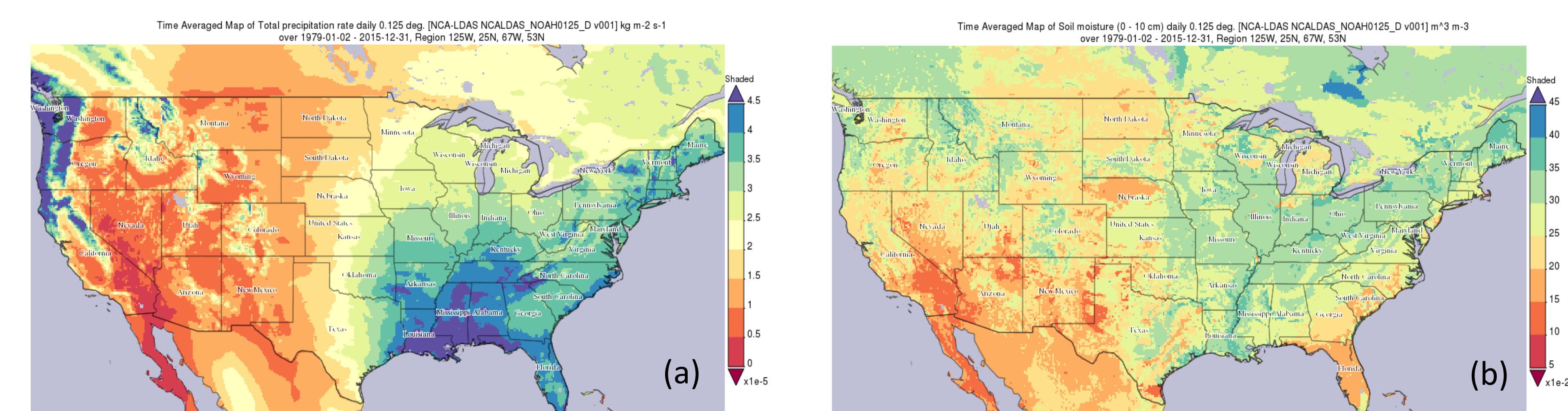

Figure 1. (a) Total precipitation rate and (b) 40 – 100 cm soil moisture from NCA-LDAS Noah-3.3 LSM, averaged over Jan 2, 1979 to Dec 31, 2015. The maps were generated by Giovanni.
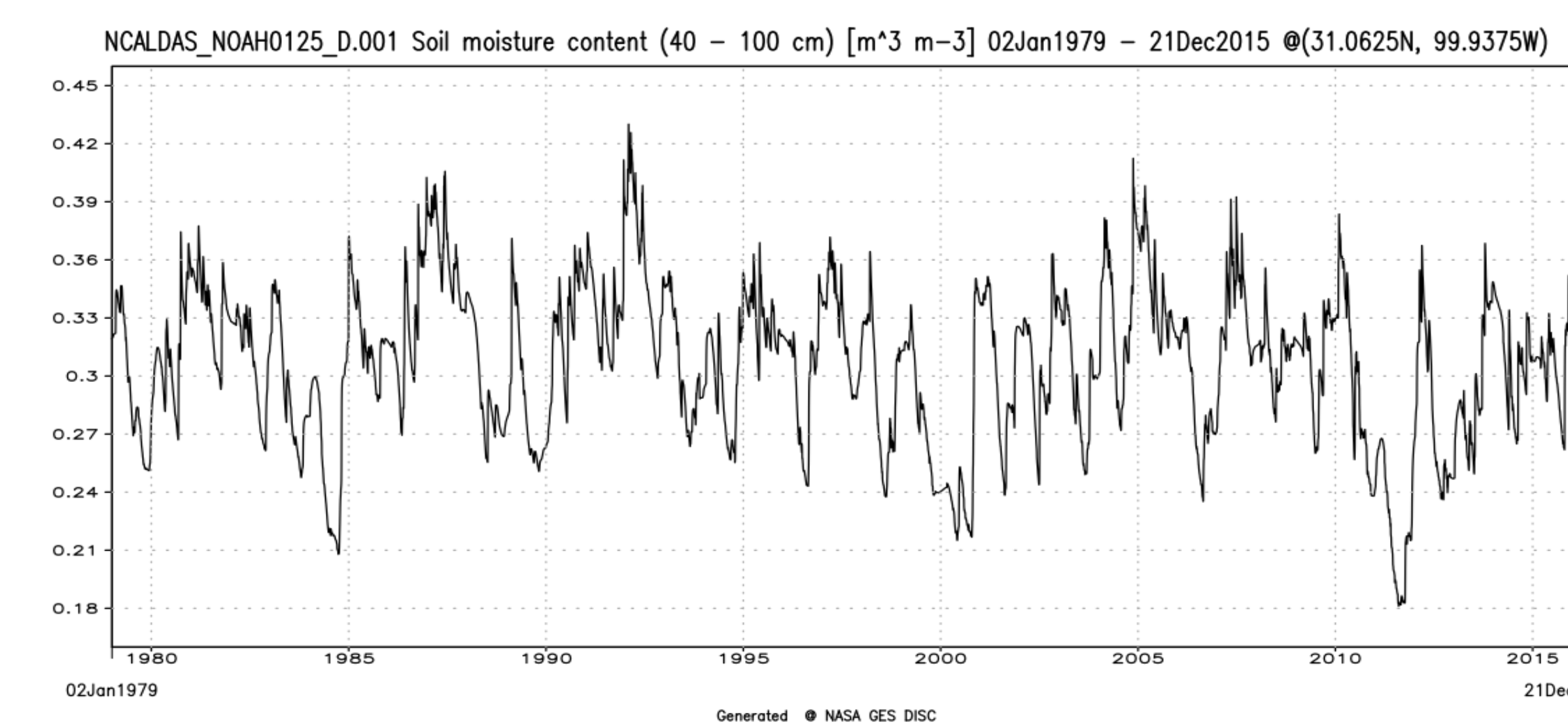

Figure 2. Time series of 40 – 100 cm soil moisture from NCA-LDAS Noah-3.3 LSM, at a location near the center of Texas (31.0625N, 99.9375W).

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.