

Open access to all NCA-LDAS components, including input data, output fields, and indicator data

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Introduction

As part of NASA's active participation in the Interagency National Climate Assessment (NCA) program, the Goddard Space Flight Center's Hydrological Sciences Laboratory (HSL) is supporting an Integrated Terrestrial Water Analysis, by using NASA's Land Information System (LIS) and Land Data Assimilation System (LDAS) capabilities.

To maximize the benefit of the NCA-LDAS, on completion of planned model runs and uncertainty analysis, NASA will provide open access to all NCA-LDAS components, including input data, output fields, and indicator data, to other NCA-teams and the general public.

The NCA-LDAS data will be archived at the NASA GES DISC (Goddard Earth Sciences Data and Information Services Center) and can be accessed via direct ftp, THREDDS, Mirador search and download, and Giovanni visualization and analysis system.

NCA-LDAS Data Characteristics

Table 1: Basic Characteristics of NCA-LDAS Data

Contents	Land-Surface Model (LSM) Output and Routing
Latitude extent	25° to 53°
Longitude extent	-125° to -67°
Spatial resolution	1/8 th degree
Temporal resolution	Daily
Temporal coverage	1 January 1979 to 31 December 2012
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) Catchment LSM Version Fortuna-2.5 (CLSM-2.5)
Format	NetCDF
Forcing Data	NLDAS Phase 2 (NLDAS-2) Primary Forcing
Parameters	Default NLDAS-2 parameters (UMD land cover, STATSGO soils, GTOPO30 elevation, monthly AVHRR greenness, and greenness climatologies)

NCA-LDAS

- Open-loop and data assimilation runs
- Upgraded LSMs: Noah-3.3, CLSM-2.5
- Daily, 1979 – 2012
- NetCDF, self-describing, machine-independent.

NLDAS-2

- Open-loop runs (no data assimilation)
- LSMs: Noah-2.8, Mosaic, Sacramento (SAC/SNOW-17), and VIC-4.0.3
- Hourly & monthly, 1979 ~ present
- GRIB (GRIBed Binary)

Table 2: Satellite-based Water Availability EDRs Assimilated in NCA-LDAS

Variable	Satellite Sensor
Snow covered area (SCA)	AVHRR, Terra/Aqua MODIS
Snow water equivalent (SWE)	SMMR, SSM/I, Aqua AMSR-E
Terrestrial water storage	GRACE
Soil moisture (SM)	SMMR, SSM/I, TMI, Aqua AMSRE, AMI_WS, ASCAT
Irrigated area (IA)	Terra/Aqua MODIS

EDRs: Environmental Data Records

Table 3: Reserved DOI for NCA-LDAS Data Sets

Data Set Name	Digital Object Identifier (DOI)
NCALDAS_CLSM0125_D	10.5067/ME3DWIVE12T6
NCALDAS_NOAH0125_D	10.5067/ZQ7R3NHX28IO
NCALDAS_CLSMROUT0125_D	10.5067/AO1VDA1DX6LH
NCALDAS_NOAHROUT0125_D	10.5067/ITMVTTVN18AD

NCA-LDAS Variables

Table 4: Variables in NCA-LDAS Model Output

CLSM	NOAH	Short Name	Long Name
✓	✓	Swnet	Net downward shortwave radiation
✓	✓	Lwnet	Net downward longwave radiation
✓	✓	Qle	Latent heat flux
✓	✓	Qh	Sensible heat flux
✓	✓	Qg	Soil heat flux
✓	✓	Snowf	Snowfall rate
✓	✓	Rainf	Total precipitation
✓	✓	TotalPrecip	Precipitation amount
✓	✓	Evap	Total evapotranspiration
✓	✓	Qs	Surface runoff
✓	✓	Qsb	Subsurface runoff amount
✓	✓	Qsm	Snowmelt
✓	✓	Qst	Snow throughfall
✓	✓	AvgSurfT	Surface temperature
✓	✓	Albedo	Surface albedo
✓	✓	SWE	Snow water equivalent
✓	✓	SoilMoist	Soil moisture content
✓	✓	SoilTemp	Soil temperature
✓	✓	SoilWet	Total soil wetness
✓	✓	PotEvap	Potential evapotranspiration
✓	✓	Ecanop	Interception evaporation
✓	✓	Tveg	Vegetation transpiration
✓	✓	Esoil	Bare soil evaporation
✓	✓	CanopInt	Total canopy water storage
✓	✓	EvapSnow	Snow evaporation

*Check mark "✓" indicates if a model contains the variable.

Table 5: NCA-LDAS Routing Variables

CLSM	NOAH	Short Name	Long Name
✓	✓	Streamflow	Streamflow
✓	✓	RiverStor	River Water Storage
✓	✓	RiverDepth	River Depth
✓	✓	RiverFlowVelocity	River Flow Velocity
✓	✓	FloodQ	Floodplain Water Discharge
✓	✓	FloodStor	Floodplain Water Storage
✓	✓	FloodDepth	Floodplain Depth
✓	✓	FloodVelocity	Floodplain Flow Velocity
✓	✓	FloodedFrac	Flooded Fraction
✓	✓	FloodedArea	Flooded Area
✓	✓	SurfElev	Surface Water Elevation
✓	✓	RunoffStor	Runoff Reservoir Storage
✓	✓	BaseflowStor	Baseflow Reservoir Storage

Indicators derived from NCA-LDAS data

- Water Budget Indicators (precipitation, evapotranspiration, stream flow, storage etc.)
- Sub-hierarchical Indicators (min, max, length of season, etc.)

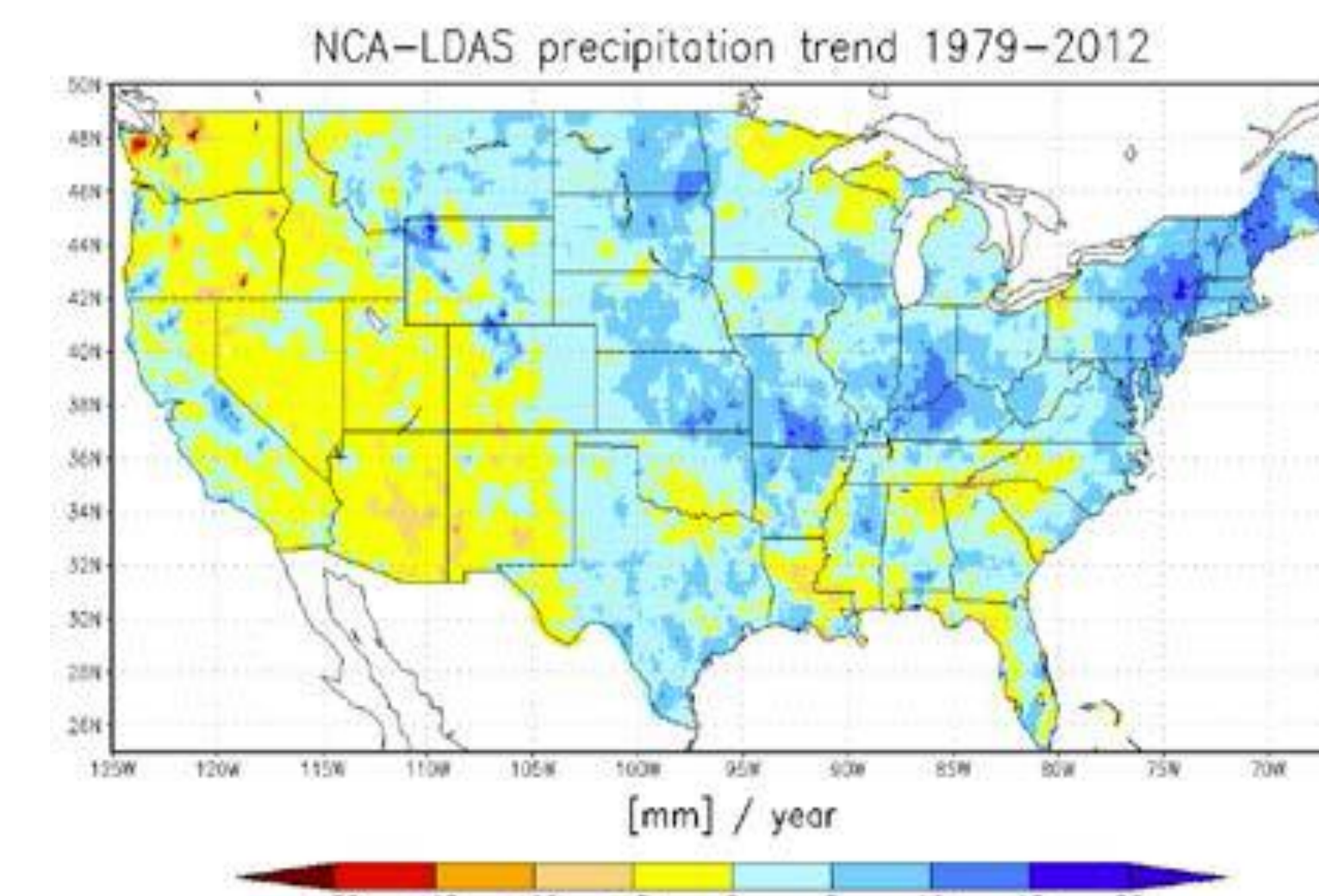
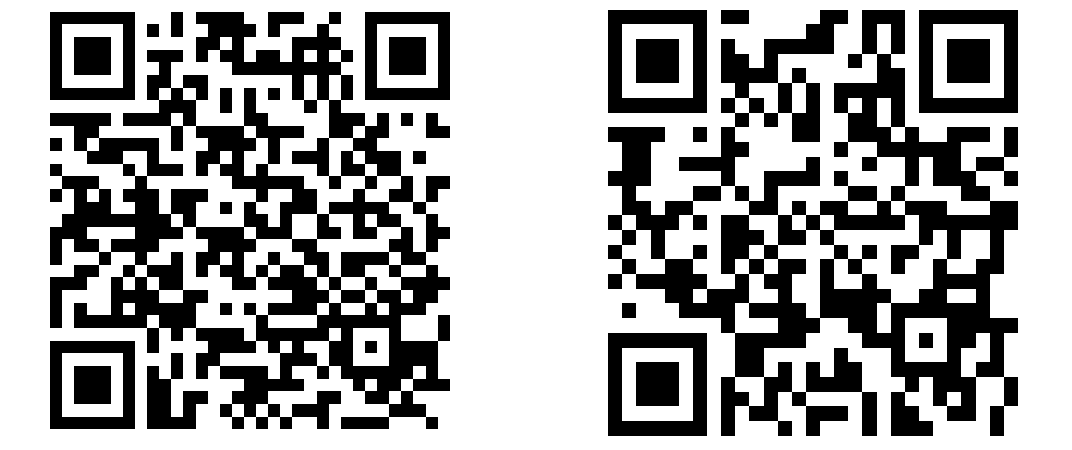


Fig 1. A sample indicator image. Trends from NCA-LDAS precipitation indicate higher precipitation in the NE, with lower precipitation over much of the West, consistent with other reanalysis studies.

NCA-LDAS Data Access

The NCA-LDAS data will be archived at NASA GES DISC and accessed via:

- Direct ftp: <ftp://hydro1.sci.gsfc.nasa.gov/data/s4pa/>
- THREDDS: <http://hydro1.sci.gsfc.nasa.gov/thredds/catalog.html>
- Mirador search and download: <http://mirador.gsfc.nasa.gov/>
- Simple Subset Wizard: <http://disc.gsfc.nasa.gov/SSW/>
- Giovanni Visualization and Analysis: <http://giovanni.gsfc.nasa.gov/giovanni/>



GES DISC Hydrology HSL LDAS

The NCA-LDAS data will be available through NASA Giovanni, along with NLDAS-2 data and other water cycle related data, for online visualization, analysis, and inter-comparison by end-users.

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.

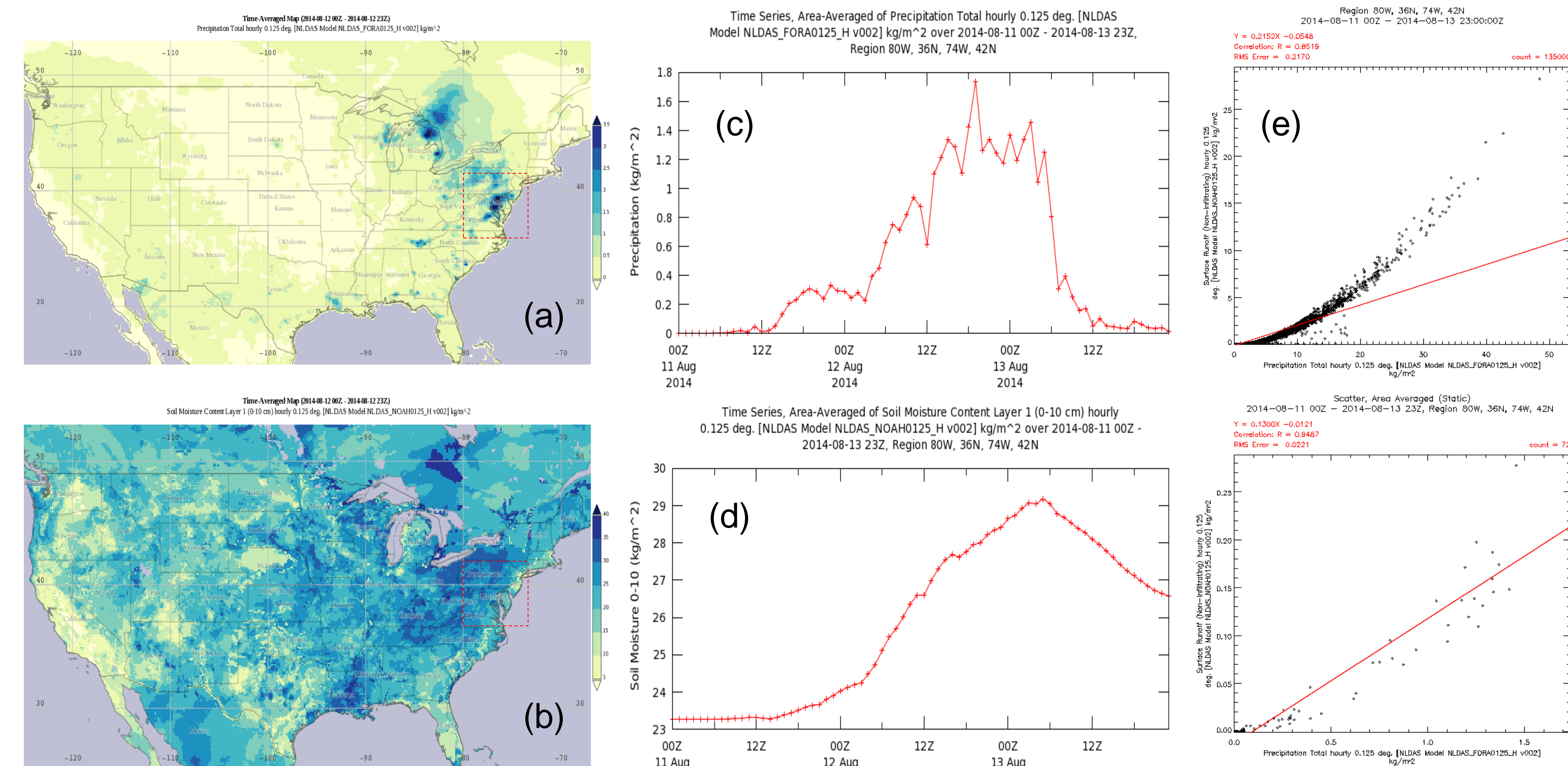


Fig 2. Sample plots from NLDAS-2 data generated by Giovanni.

- (a) and (b) are daily-averaged precipitation from NCA-LDAS Forcing (same as NLDAS-2 Primary Forcing) and 0-10 cm soil moisture from NLDAS-2 Noah model, respectively, for Aug. 12, 2014. The heavy rainfall caused severe flooding across Washington DC.
- (c) and (d) are time series of precipitation and 0-10cm soil moisture, respectively, over Washington DC area (36-42N, 80-74W) for Aug. 12 ~ 14, 2014. The time series show high soil moisture peak corresponding with rainfall peaks, with the characteristic slight time lags.
- (e) and (f) are both scatter plots of precipitation and surface runoff (NLDAS-2 Noah) for Aug. 12 ~ 14, 2014. Scatter plot (e) is of all data values and shows a good non-linear correlation ($R \sim 0.85$) between rainfall and surface runoff; the area-averaged scatter plot (f) shows a better linear correlation ($R \sim 0.95$).



Giovanni :
The Bridge
Between Data and
Science