

Hydrological Data at the NASA GES DISC: Current Capabilities and New Opportunities



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

Hydrological land surface data at the NASA GES DISC is open access, including forcing variables, land surface states, stores, and flux fields from land surface models. The hydrological land surface data are also cloud-enabled accessible via direct S3 access (AWS us-west-2).

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Introduction

Goddard Earth Sciences Data and Information Services Center (GES DISC) is one of 12 Earth Observing System data centers that document, process, archive, and distribute data from Earth science missions and related projects. The GES DISC hosts many hydrological land surface data products and provides reliable, robust data access and services to users worldwide. This presentation, focusing on hydrological land surface data, provides a summary table of the hydrological data holdings and a list of variables from the forcing and model outputs, along with information about our data and services and our move to the AWS cloud.

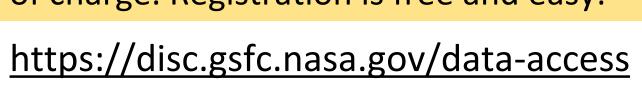
Variables

Ту	pe	Variable	Unit
Meteorological Forcing		Windspeed	m
		Total precipitation rate	kg/m^2/s
		Near surface air temperature	K
		Near surface specific humidity	kg/kg
		Surface pressure	Pa
		Downward shortwave radiation	W/m^2
		Downward longwave radiation	W/m^2
Land Surface Model (LSM) Output	Energy Balance	Net shortwave radiation flux	W/m^2
		Net longwave radiation flux	W/m^2
		Latent heat flux	W/m^2
		Sensible heat flux	W/m^2
		Ground heat flux	W/m^2
	Water Balance	Rain rate	kg/m^2/s
		Snow rate	kg/m^2/s
		Evaporation	kg/m^2/s
		Transpiration	kg/m^2/s
		Evapotranspiration	kg/m^2/s
		Surface runoff	kg/m^2/s
		Baseflow runoff	kg/m^2/s
		Snow melt	kg/m^2/s
	State	Surface temperature	K
		Albedo	~
		Snow depth water equivalent	kg/m^2
		Soil moisture	kg/m^2
		Soil temperature	K
	Others	Streamflow	m^3/s
		Flooded Fraction	~
		Flooded Area	m^2
		Irrigated water rate	kg/m^2/s
		Terrestrial water storage	mm
		Groundwater storage	mm

Table 1: Variables available from the hydrological model and observational datasets available from the GES DISC.

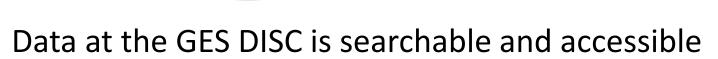
Earthdata Login system

Access to GES DISC data requires an Earthdata account. Data continue to be free of charge. Registration is free and easy:



Data Access and Services

Search / Access



- GES DISC webpage, https://disc.gsfc.nasa.gov/
- EarthData Search, https://search.earthdata.nasa.gov/search
- HTTPS: Navigate by data product & date/time
- OPeNDAP: Search, subset, and download data

GIOVANNI provides a simple way to

visualize, analyze, and access vast

having to download the data.

amounts of Earth science data without

Direct S3 Access

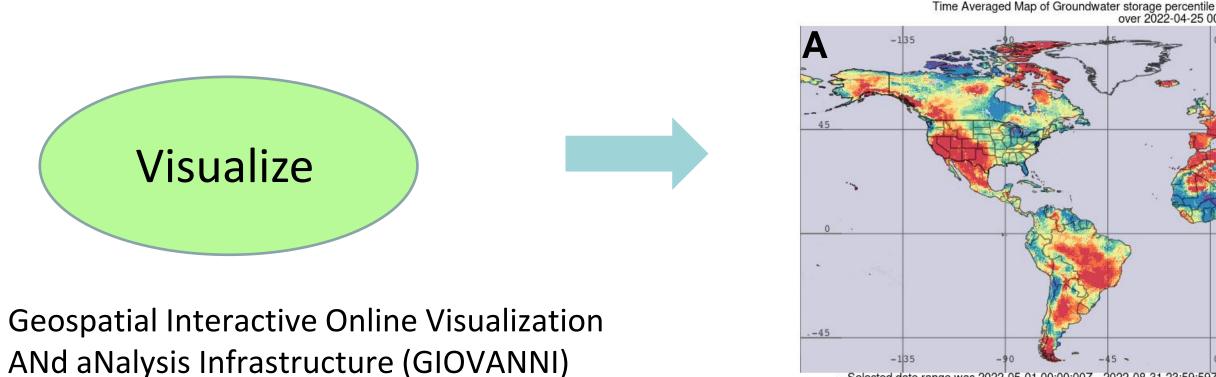
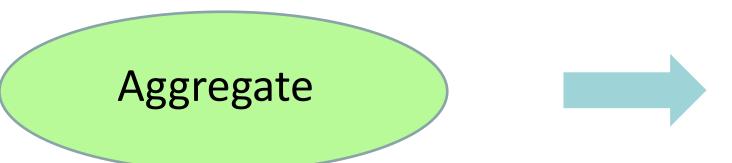


Figure A shows the average groundwater storage percentile for June, July, and August from Groundwater and Soil Moisture Conditions from the Gravity Recovery and Climate Experiment (GRACE) and GRACE-Follow On (GRACE-FO) Data Assimilation L4 7-days 0.25° x 0.25° Global V3.0, visualized using GIOVANNI.

Subset / Regrid

The GES DISC has tools to subset and regrid data GES DISC Subsetter: Create variable and spatial

- subsets, and download data in various data formats • GrADS Data Server (GDS): Subset, analyze, and download
- OPeNDAP



- Datarods/Timeseries: View and download long time series of a single latitude/longitude specified location.
- Thematic Real-time Environmental Distributed Data Services (THREDDS) Data Server (TDS)

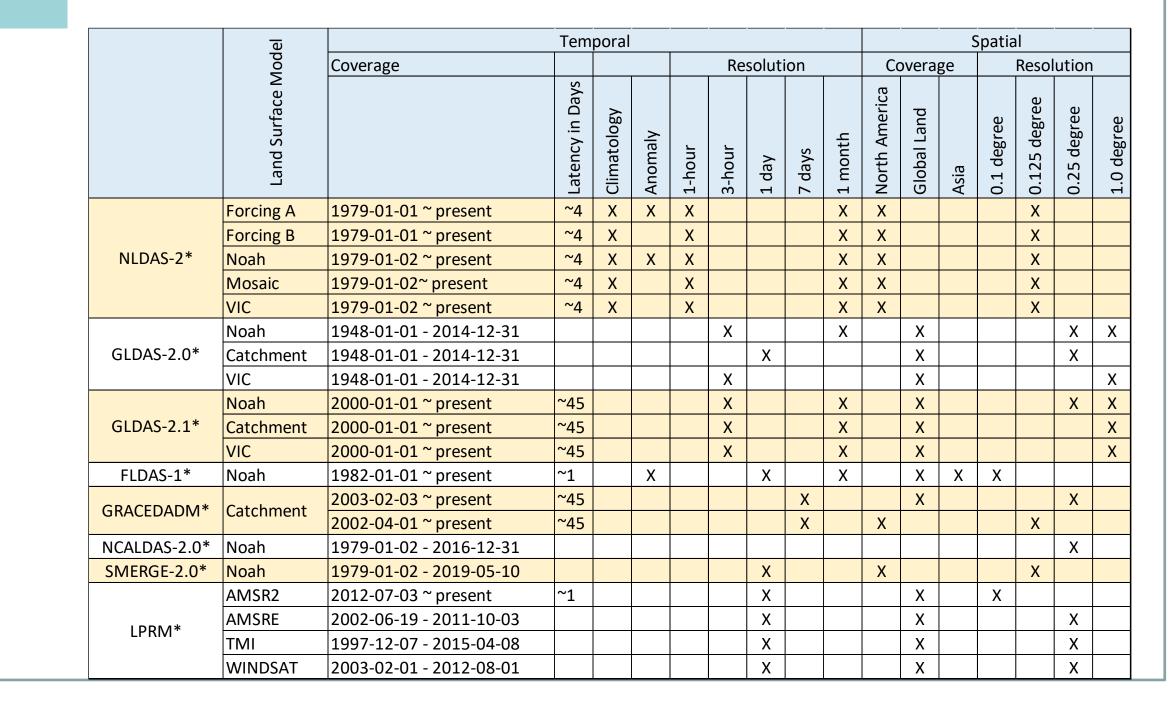
NLDAS_FORA0125_H.002_Precipitation_hourly_total [kg/m^2] @ (lon=-86.9375, lat=33.9375) elev=165.142 [m]

Figure B shows the time series for NLDAS_FORA0125_H.002 total hourly precipitation for January 2019 to December 2022.

Hydrology Data Products

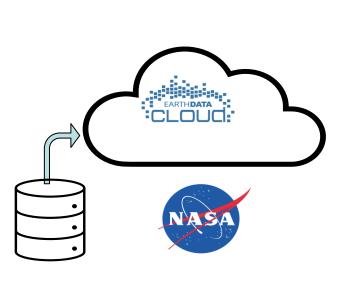
GES DISC maintains an archive of several hydrology datasets (Table 2)

- Global, North American, and Famine Early Warning System (FEWS) Land Data Assimilation System (GLDAS, NLDAS, FLDAS)
- Gravity Recovery and Climate Experiment (GRACE) Data Assimilation for Drought Monitoring (GRACE-DA-DM)
- Land Parameter Retrieval Model (LPRM)
- The temporal resolution of the data at the GES DISC ranges from hourly to monthly
- The spatial resolution ranges from 0.1° to



GES DISC Data and the Cloud





Migrating to the Cloud

NASA is currently in the process of migrating its data products and services to the cloud. The hydrological land surface datasets are cloud-enabled. More information can be found here:

https://disc.gsfc.nasa.gov/information/documents?title =Migrating%20to%20the%20Cloud

Direct S3 Access

Amazon's Simple Storage Service (S3) is an object storage service that offers scalability, data availability, security, and performance. GES DISC data is in the AWS us-west-2 region and can only be accessed if users are in that same region.

Sample GES DISC URL for S3 access:

s3://gesdisc-cumulus-prod-protected/NLDAS/NLDAS_NOAH0125_H.2.0/ s3://gesdisc-cumulus-prod-protected/FLDAS/FLDAS_NOAH01_C_GL_M.001/

Benefits from data and services available in the cloud include:

- Improved Performance
 Multidisciplinary data access
- Easy Access
- Multiple data access methods
- Analysis next to data
 - Improved scientific transparency

How To's, Help Desk, Other information

How-To's and FAQ's

- Examples with step-by-step instructions and screenshots
- GES DISC Documentation: Data Access
 How to Access GES DISC Data Using Python
- How to Access GES DISC Data Using Python
- Frequently asked questions about the data science content, algorithm, and data processing information, general data information, how to find, download, read and view data



- GES DISC Documentation: Migrating to the Cloud
- How to Perform Cross-DAAC S3 Bucket Access **Using Python**

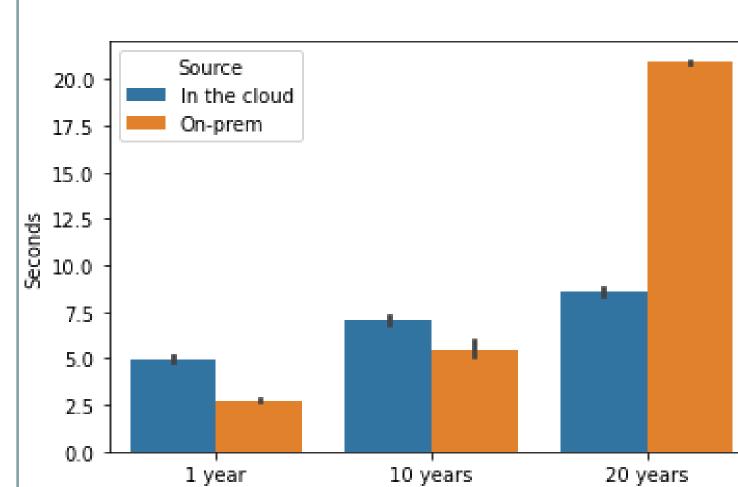




GES DISC Help Desk

Contact the GES DISC Help Desk at gsfc-dl-help-disc@mail.nasa.gov with any questions about our data and data access.

Time series Service (Data Rods)



Timeseries length

Hydrology Data Rods webpage https://disc.gsfc.nasa.gov/information



GLDAS Noah Land Surface Model L4 3-hourly 0.25° x V2.1 data on-prem vs. in the cloud time series retrieval speed comparison can be seen on the left.

- 1 year = 2920 timesteps
- 10 years = 29200 timesteps
- 20 years = 58400 timesteps

Time series access from the cloud is consistent for all ranges of timesteps. Accessing a longer time series from the cloud is faster than access from on-prem.

