

Data Access, Visualization, Analysis and Usage of Terrestrial Hydrological Data From NASA's Hydrology Data and Information Services Center (HDISC)

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A series of land surface state (e.g., soil moisture and surface temperature) and flux (e.g., evaporation and sensible heat flux) products simulated by land surface models (CLM, Mosaic, Noah, SAC and VIC) from the North America and Global Global Land Data Assimilation System (NLDAS and GLDAS) are now accessible at the Hydrology Data and Information Services Center (HDISC), a component of NASA Goddard Earth Sciences Data and Information Services Center (GES DISC).

Hydrology Data and Information Services Center (HDISC)

The Hydrology DISC currently supports the North America and Global Land Data Assimilation System (NLDAS and GLDAS) data products generated by GSFC's Hydrological Sciences Branch. HDISC has the capability to support more hydrology data products and provide more advanced data access and visualization tools. The goal is to develop HDISC as a data and services portal that supports weather and climate forecast, and water and energy cycle research (http://disc.gsfc.nasa.gov/hydrology).

North America (NLDAS) and Global Land Data Assimilation System (GLDAS)

NLDAS and GLDAS systems integrate data from multiple space-based Earth observing systems using advanced land surface modeling and assimilation techniques. These products support weather and climate forecast experiments, water resources applications, and water and energy cycle research

	NLDAS	GLDAS
Content	Water and energy budget data, forcing data	
Spatial extent	Conterminous US, parts of southern Canada and northern Mexico	All land north of 60 degree south
Spatial resolution	1/8 degree	1 degree and 0.25 degree
Time period	Jan 1, 1979 to present for NLDAS-2 Oct 1, 1996 to Dec 31, 2007 for NLDAS-1	Jan 1, 1979 to present for the 1.0° data Feb 24, 2000 to present for the 0.25° data
Temporal resolution	Hourly and monthly	3-hourly and monthly
Forcing	Multiple data sets derived from satellite measurements, radar estimation, precipitation gauges, and atmospheric analyses	Multiple data sets derived from satellite measurements and atmospheric analyses
Land surface models	Mosaic, Noah, SAC and VIC	CLM, Mosaic, Noah, VIC
Output format	GRIdded Binary (GRIB)	
Elevation definition	GTOPO 30	
Vegetation definition	University of Maryland, 1 km	

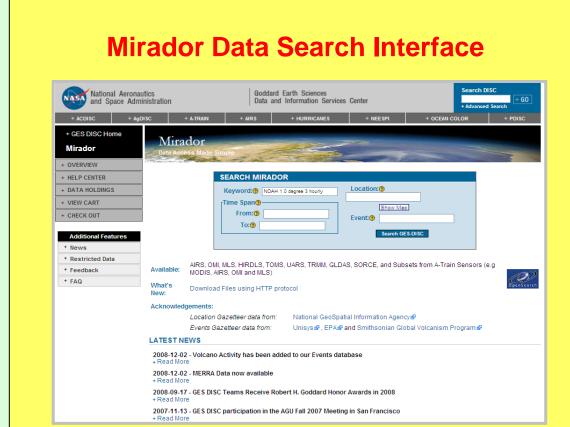
Parameters for GLDAS (L), NLDAS-2 Forcing (M) and NLDAS-2 Mosaic output (R)

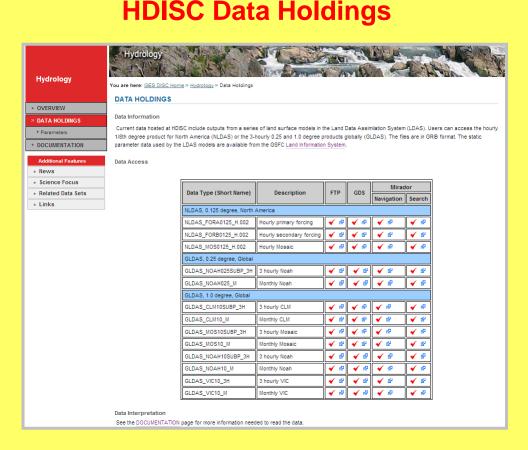
PDS IDs	Full Name	Unit	PDS IDs	Full Name	Unit
001	Surface pressure	Pa	NLDAS-2	2 Primary Forcing Data	
011	Near surface air temperature	K	61	Precipitation hourly total	kg/m^
032	Near surface wind magnitude	m/s	157	180-0 mb above ground Convective	J/kg
051	Near surface specific humidity	kg/kg	152	Available Potential Energy Energy	:41
057	Total evapotranspiration	kg/m^2/s	153	Fraction of total precipitation that is convective	unitles
065	Snow water equivalent	kg/m^2	205	LW radiation flux downwards (surface)*	W/m^
071	Total canopy water storage	kg/m^2	$\frac{204}{204}$	SW radiation flux downwards (surface)	W/m^
085	Average layer soil temperature	K	228	Potential evaporation	kg/m^
086	Average layer soil moisture	kg/m^2	1	Surface pressure*	Pa
099	Snowmelt	kg/m^2/s	51	2-m above ground Specific humidity*	kg/kg
111	Net shortwave radiation	W/m^2	11	2-m above ground Temperature*	K
112	Net longwave radiation	W/m^2	33	10-m above ground Zonal wind speed	m/s
121	Latent heat flux	W/m^2	34	10-m above ground Meridional wind speed	m/s
122	Sensible heat flux	W/m^2	NLDAS-2	2 Secondary Forcing Data	1
131	Snowfall rate	kg/m^2/s	179	Aerodynamic conductance	m/s
132	Rainfall rate	kg/m^2/s	63	Convective precipitation hourly total	kg/m^
		Kg/m 2/3	61	Precipitation hourly total	kg/m^
138	Average surface temperature		204	SW radiation flux downwards (surface)	W/m^2
155	Ground heat flux	W/m^2	7	NARR hybrid level Geopotential height	gpm
204	Surface incident shortwave		1	NARR hybrid level Pressure	Pa
	radiation	W/m^2	51	NARR hybrid level Specific humidity	kg/kg
205	Surface incident longwave radiation	W/m^2	11	NARR hybrid level Temperature	K
234	Subsurface runoff	kg/m^2/s	33	NARR hybrid level Zonal wind speed	m/s
235	Surface runoff	kg/m^2/s	34	NARR hybrid level Meridional wind speed	m/s

PDS IDs	Full Name	Unit
179	Aerodynamic conductance	m/s
84	Albedo	%
162	Rainfall (unfrozen precipitation)	kg/m^2
161	Snowfall (frozen precipitation)	kg/m^2
148	Average surface skin temperature	K
234	Subsurface runoff (baseflow)	kg/m^2
181	Canopy conductance	m/s
223	Plant canopy surface water	kg/m^2
205	LW radiation flux downwards (surface)	W/m^2
204	SW radiation flux downwards (surface)	W/m^2
199	Direct evaporation from bare soil	W/m^2
200	Canopy water evaporation	W/m^2
57	Evaporation	kg/m^2
155	Ground heat flux	W/m^2
182	Leaf Area Index (0-9)	unitless
121	Latent heat flux	W/m^2
207	0-40 cm root zone Moisture availability	%
207	0-200 cm total column Moisture availability	%
112	LW radiation flux net (surface)	W/m^2
111	SW radiation flux net (surface)	W/m^2
198	Sublimation (evaporation from snow)	W/m^2
122	Sensible heat flux	W/m^2
66	Snow depth	m
229	Snow phase-change heat flux	W/m^2
99	Snow melt	kg/m^2
238	Snow cover	%
86	0-10 cm layer 1 Soil moisture content	kg/m^2
86	0-40 cm root zone Soil moisture content	kg/m^2
86	0-100 cm top 1 meter Soil moisture content	kg/m^2
86	0-200 cm total column Soil moisture content	kg/m^2
86	10-40 cm layer 2 Soil moisture content	kg/m^2
86	40-200 cm layer 3 Soil moisture content	kg/m^2
235	Surface runoff (non-infiltrating)	kg/m^2
210	Transpiration	W/m^2
85	Deep soil temperature	K
87	Vegetation	%
65	Accumulated snow water-equivalent	kg/m^2
	1	

Access HDISC Data

□ Anonymous http and ftp data downloading
□ Mirador - that provides discovery of, and access to, a
Google-like search and download tool based on keywords





GrADS Data Server (GDS)

GDS provides subsetting and analysis services across the internet. GDS supports any operation that can be expressed in a single GrADS expression.

GES DISC GDS for NLDAS products

GES DISC GrADS Data Server - NLDAS products - directory for / - Mozilla Firefox

GILLE Edit View History Bookmarks Tools Help

The Company of the Company

GES DISC GrADS Data Server - NLDAS products - top level

GES DISC GrADS Data Server - NLDAS products - directory for /: 4 entries

1: NLDAS_FORA0125_H.002: 0.125 Degree Hourly Primary Forcing Data for NLDAS-2 info dds das

2: NLDAS_FORB0125_H.002: 0.125 Degree Hourly Secondary Forcing Data for NLDAS-2 info dds das

3: NLDAS_MOS0125_H.002: 0.125 Degree Hourly Data from the NLDAS-2 Mosaic Model info dds das

back to parent directory

GrADS Data Server 2.0 (help using this server). This page last updated 06Z 23 Nov 2009.

GES DISC GDS for GLDAS products GES DISC GrADS Data Server - GLDAS products - directory for / - Mozilla Firefox File Edit View History Bookmarks Tools Help

GES DISC GrADS Data Server - GLDAS products - directory for /: 11 entries

1: GLDAS_CLM10SUBP_3H: 1.0 Degree 3-Hourly Data From the CLM Model info dds das

2: GLDAS_CLM10_M: 1.0 Degree Monthly Data From the CLM Model info dds das

3: GLDAS_MOS10SUBP_3H: 1.0 Degree 3-Hourly Data From the Mosaic Model info dds das

4: GLDAS_MOS10_M: 1.0 Degree Monthly Data From the Mosaic Model info dds das

5: GLDAS_NOAH025SUBP_3H: 0.25 Degree 3-Hourly Data From the Noah Model info dds das

6: GLDAS_NOAH025SUBP_3H: 0.25 Degree Monthly Data From the Noah Model info dds das

7: GLDAS_NOAH10SUBP_3H: 1.0 Degree 3-Hourly Data From the Noah Model info dds das

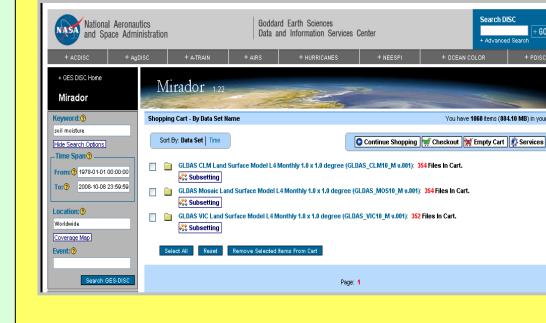
8: GLDAS_NOAH10SUBP_3H: 1.0 Degree Monthly Data From the Noah Model info dds das

9: GLDAS_VIC10_3H: 1.0 Degree Monthly Data from the VIC Model info dds das

10: GLDAS_VIC10_3H: 1.0 Degree Monthly Data from the VIC model info dds das

On-The-Fly Spatial and Parameter Subset

A. User selects data sets of interest



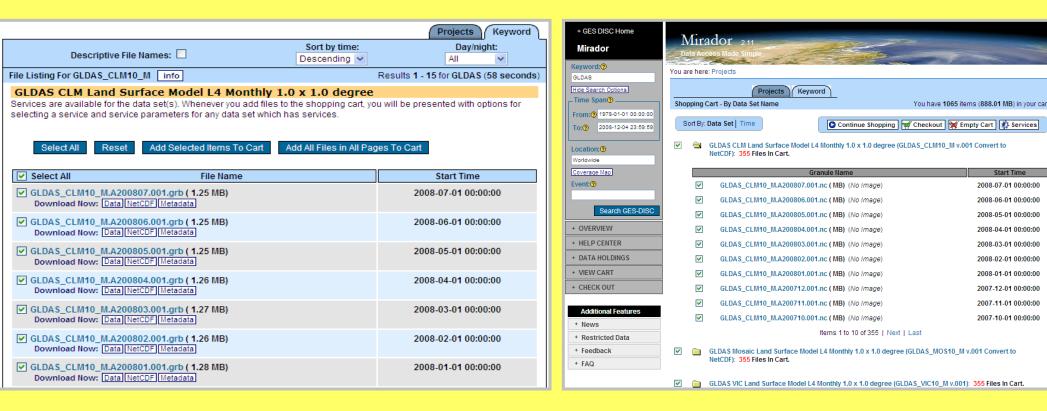
B. User selects OTF subset options: spatial and/or parameter

OLDAS Hide Search Options	Color Control of Charles Boundary Control of Charles Control of Charle				
Time Span®	Select	Select subsetting criteria (Channels/Parameters/Bounding box) for the collection(s): Run Subset			
From: (*)		South 30 West -120			
1978-01-01 00:00:00 To: (9)		North 50 East -80			
2008-12-03-23-89-89			GLDAS VIC10 M.001		
Location: ①	GLDAS_CLM10_M.001	GLDAS_MOS10_M.001			
Worldwide	Parameter Names Select All Energy Bala	ance Parameter Names Select All Energy Balance	Parameter Names Select All Energy Bala		
Coverage Map	Surface_pressure	Surface_pressure	Surface_pressure		
Event: 10	Near_surface_air_temperature	✓ Near_surface_air_temperature	Near_surface_air_temperature		
Search NA SA GE S-DISC	Near_surface_wind_magnitude	✓ Near_surface_wind_magnitude	Near_surface_wind_magnitude		
OVERVIEW	Near_surface_specific_humidity	Near_surface_specific_humidity	✓ Near_surface_specific_humidity		
HELP CENTER	▼ Total_evapotranspiration	Total_evapotranspiration	✓ Total_evapotranspiration		
DATA HOLDINGS	Snow_water_equivalent	Snow_water_equivalent	Snow_water_equivalent		
EVV CART	▼ Total_canopy_water_storage	Total_canopy_water_storage	Total_canopy_water_storage		
HECK OUT	Average_layer_soil_temperature	Average_layer_soil_temperature	Average_layer_soil_moisture		
	Average_layer_soil_moisture	Average_layer_soil_moisture	✓ Snowmelt		
dditional Features	Snowmelt	Snowmelt	Snowfall_rate		
Restricted Data	Net_shortwave_radiation	Net_shortwave_radiation	Rainfall_rate		
Feedback	Net_longwave_radiation	Net_longwave_radiation	Surface_incident_shortwave_radiation		
FAQ	Latent_heat_flux	Latent_heat_flux	Surface_incident_longwave_radiation		
	Sensible_heat_flux	Sensible_heat_flux	Subsurface_runoff		
	✓ Snowfall_rate	Snowfall_rate	Surface_runoff		
	✓ Rainfall_rate	Rainfall_rate			
	Average_surface_temperature	Average_surface_temperature			
	Ground_heat_flux	Ground_heat_flux			
	Surface_incident_shortwave_radiation	✓ Surface_incident_shortwave_radiation			
	Surface_incident_longwave_radiation	✓ Surface_incident_longwave_radiation			
	Subsurface_runoff	Subsurface_runoff			
	Surface_runoff	Surface_runoff			

On-The-Fly Conversion to netCDF

A. Convert-to-netCDF service available for GLDAS data sets

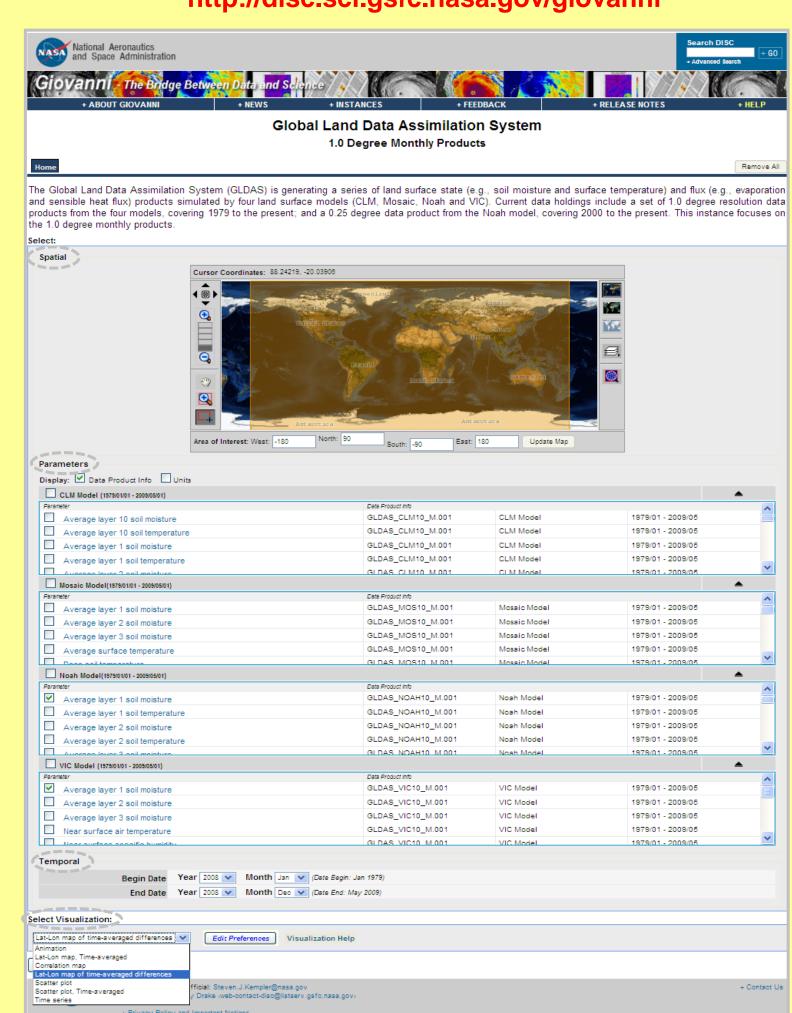
B. Run conversion and download netCDF files



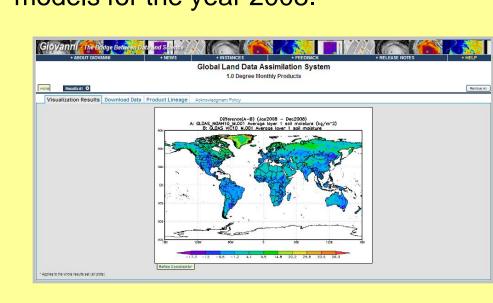
Online Visualization and Analysis (Giovanni)

Giovanni is a simple and intuitive way to visualize, analyze, and access Earth science remote sensing data online.

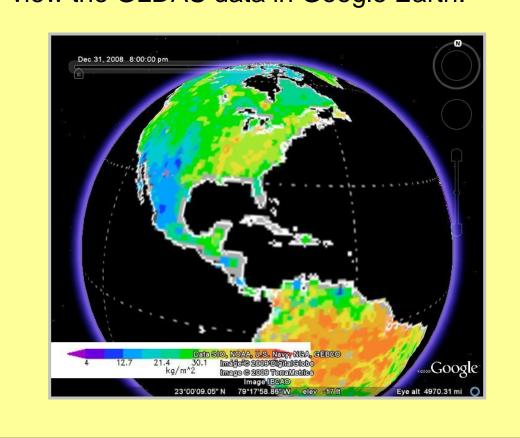
http://disc.sci.gsfc.nasa.gov/giovanni



GLDAS Giovanni users simply select one or more parameters, spatial and temporal ranges, and the visualization function. The example below shows the difference in soil moisture estimates from the Noah and VIC models for the year 2008.



Output from the visualization and analysis is available in HDF, netCDF and ASCII formats. The KMZ file option allows users to view the GLDAS data in Google Earth.

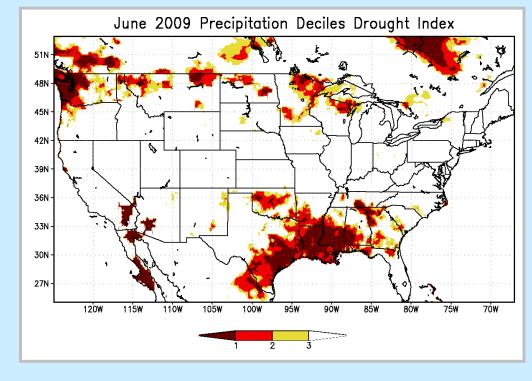


Drought Monitoring With NLDAS Data

The NLDAS-2 data are used in various combinations in a post-processor to generate different drought indices. The three main types of droughts to be investigated are:

- Meteorological (primarily from precipitation deficit)
 Hydrological (primarily from streamflow/runoff)
- Hydrological (primarily from streamflow/runoff deficit)
- Agricultural (primarily from soil moisture deficit)
 The different drought indices and output from the separate LSMs will be evaluated against historical and current drought observations.

Precipitation deciles drought index from the NLDAS forcing data



Further Development

- □ Support additional NLDAS products and monthly products.
- □ Advanced Giovanni services for GLDAS and NLDAS products.
- □ Support GLDAS new processing with improved forcing dataset.

Mitchell, K.E., D. Lohmann, P.R. Houser, E.F. Wood, J.C. Schaake, A. Robock, B.A. Cosgrove, J. Sheffield, Q. Duan, L. Luo, R.W. Higgins, R.T. Pinker, J.D. Tarpley, D.P. Lettenmaier, C.H. Marshall, J.K. Entin, M. Pan, W. Shi, V. Koren, J. Meng, B.H. Ramsay, and A.A. Bailey, 2004: The multi-institution North American Land Data Assimilation System (NLDAS): Utilizing multiple GCIP products and partners in a continental distributed hydrological modeling system. *J. Geophys. Res.*, 109, D07S90, doi:10.1029/2003JD003823.

Rodell, M., P. R. Houser, U. Jambor, J. Gottschalck, K. Mitchell, C.-J. Meng, K. Arsenault, B. Cosgrove, J. Radakovich, M. Bosilovich, J. K. Entin, J. P. Walker, D. Lohmann, and D. Toll, 2004. The Global Land Data Assimilation System. *Bull. Amer. Meteor. Soc.*, **85**(3): 381-394.