Hydrological Land Surface Data and Services at NASA GES DISC

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

Open access to hydrological land surface data, including forcing variables, land surface states, stores, and flux fields from land surface models, and streamflow routing fields.

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Introduction

NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) is one of 12 NASA Earth Observing System (EOS) data centers that process, archive, document, and distribute EOS mission data. GES DISC hosts a wide range of remote sensing and model data, and provides reliable and robust data access and services to users worldwide. This presentation, focusing on hydrological land surface data, provides a summary table for the hydrological data holdings and a list of variables from the forcing and model outputs, along with discussions of recent updates to data and data services.

Variables

Type	Variable	Unit
Meteorological Forcing	Wind speed	m
	Total precipitation rate	kg/m^2/s
	Near surface air temperature	K
	Near specific humidity	kg/kg
	Surface pressure	Pa
	Downward short-wave radiation	W/m^2
	Downward long-wave radiation	W/m^2
Energy Balance (LSM Output)	Net short-wave radiation flux	W/m^2
	Net long-wave 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	Stream flow	m^3/s
	Flooded Fraction	~
	Flooded area	m^2
	Irrigated water rate	kg/m^2/s
	Terrestrial water storage	mm
	Ground water storage	mm

Hydrological Land Surface Data Products

Land Surface Model		Temporal								Spatial							
		Coverage		Resolution						Coverage			Resolution				
			Latency in days	Climatology	Anomaly	1-hour	3-hour	1 day	7 days	1 month	North America	Global Land	Africa	0.1 deg	0.125 deg	0.25 deg	1.0 deg
NLDAS-2	Forcing A	1979-01-01 ~ present	~4	X	X	X					X	X			X		
	Forcing B	1979-01-01 ~ present	~4	X		X					X	X			X		
	Noah	1979-01-02 ~ present	~4	X	X	X					X	X			X		
	Mosaic	1979-01-02 ~ present	~4	X		X					X	X			X		
	VIC	1979-01-02 ~ present	~4	X		X					X	X			X		
NLDAS-1	Forcing	1996-08-01 ~ 2007-12-31		X		X					X	X			X		
NCALDAS-2.0	Noah	1979-01-02 ~ 2016-12-31						X			X				X		
GLDAS-2.0	Noah	1948-01-01 ~ 2010-12-31					X			X		X				X	X
	Catchment	1948-01-01 ~ 2014-12-30						X				X				X	
	VIC	Coming soon					X					X					X
GLDAS-2.1	Noah	2000-01-01 ~ present	~45				X			X		X				X	X
	Catchment	Coming soon					X					X				X	
	VIC	Coming soon					X					X					X
GLDAS-1	CLM	1979-01-02 ~ present	~45				X			X		X					X
	Mosaic	1979-01-02 ~ present	~45				X			X		X					X
	Noah	1979-01-02 ~ present	~45				X			X		X					X
	VIC	1979-01-01 ~ present	~45				X			X		X					X
GRACEDADM-2.0	Catchment	2002-04-01 ~ 2017-09-03							X		X		X			X	
FLDAS-1	Noah	1982-01-01 ~ present	~1	X	X			X		X		X	X	X	X		
	VIC	1982-01-01 ~ present	~1					X		X			X			X	
SMERGE-2.0	Noah-CCI	1979-01-01 ~ 2016-12-31						X			X		X		0.125		
LPRM	AMSR2	2012-07-03 ~ present	~1					X				X		X			
	AMSRE	2002-06-19 ~ 2011-10-03						X				X			X		
	TMI	1997-12-07 ~ 2015-04-08						X				X			X		
	WINDSAT	2003-02-01 ~ 2012-08-01						X				X			X		

New and Reprocessed Data Products

NCALDAS_NOAH0125_D.2.0

The National Climate Assessment Land Data Assimilation System (NCA-LDAS) v2.0 is a reprocessed data product, with scientific improvements, including data assimilation of SMAP soil moisture, refinements to the data assimilation techniques and error co-variances, and modifications to the irrigation intensity scheme.

GRACEDADM_CLSM0125US_7D.2.0

GRACE-DA-DM v2.0 data are from the Catchment-LSM (CLSM) Fortuna V2.5 grid-to-grid basis simulation, using the latest gridded GRACE solutions at 0.5 degree resolution from the University of Texas at Austin. The simulation upgrades include fixes in the DA and increased bedrock depth by 3 meters to enhance the drought indicator calculations.

FLDAS_NOAH01_C_GL_M.001

This new 0.1x0.1 degree monthly global data product is from Famine Early Warning Systems Network (FEWS NET) Land Data Assimilation System (FLDAS) v001, simlated by the Noah v3.6.1 LSM and forced by the combination of MERRA-2 data and CHIRPS. The corresponding global monthly climatology and anomaly data are also available.

GLDAS_CLSM025_D.2.0

This new GLDAS-2.0 daily data product from Catchment Land Surface Model (CLSM), forced with the Global Meteorological Forcing Dataset from Princeton University, contains 33 variables at 0.25°, covering the period from 1948-01-01 to 2014-12-30. The CLSM uses topographically derived catchment as the land surface element, instead of a grid in traditional LSMs. Reprocessed GLDAS-2.0 Noah data products will be available soon.

GLDAS V2.1 Data Products

The main objective of GLDAS-2.1 is to provide up-to-date global LSM outputs, using observation based forcing, while preserving consistency of the long-term climatology (i.e., GLDAS-2.0) to the extent possible. GLDAS-2.1 addressed the issues found in GLDAS-1 data, mainly caused by the changes in the forcing data sources. Currently available GLDAS-2.1 data products include 3-hourly and monthly data products at 0.25° and 1.0° from Noah-LSM. The GLDAS-2.1 data from other LSMs are coming soon.

SMERGE_RZSM0_40CM.2.0

The SoilMERGE (SMERGE) product combines long-term (1979 – 2016) satellite-based soil moisture retrievals with NLDAS-2 Noah-LSM estimates to produce a 0.125° daily root-zone soil moisture (RZMS) product over the conterminous United States (CONUS). The main differences between SMERGE v2.0 and v1.0 are the addition of a new variable, "CCI derived soil moisture anomalies of 0 - 40 cm layer," and an additional year of data for 2016.

Subsetting Service

- A new and simple Subsetting Service is now available for most of the hydrology data products.
- Subsetting availability is indicated by the icon ⬇ Subset / Get Data in the data product search results page and each Data Set Landing page.
- Subsetting options are available, depending on the data product.
- Clicking on the Get Data button leads to a subsetting results page.
- Instructions for downloading are listed on the subsetting results page.
- More help information about subsetting services is available at https://disc.gsfc.nasa.gov/help#subsetting-data.

User Interface of Subsetting Service
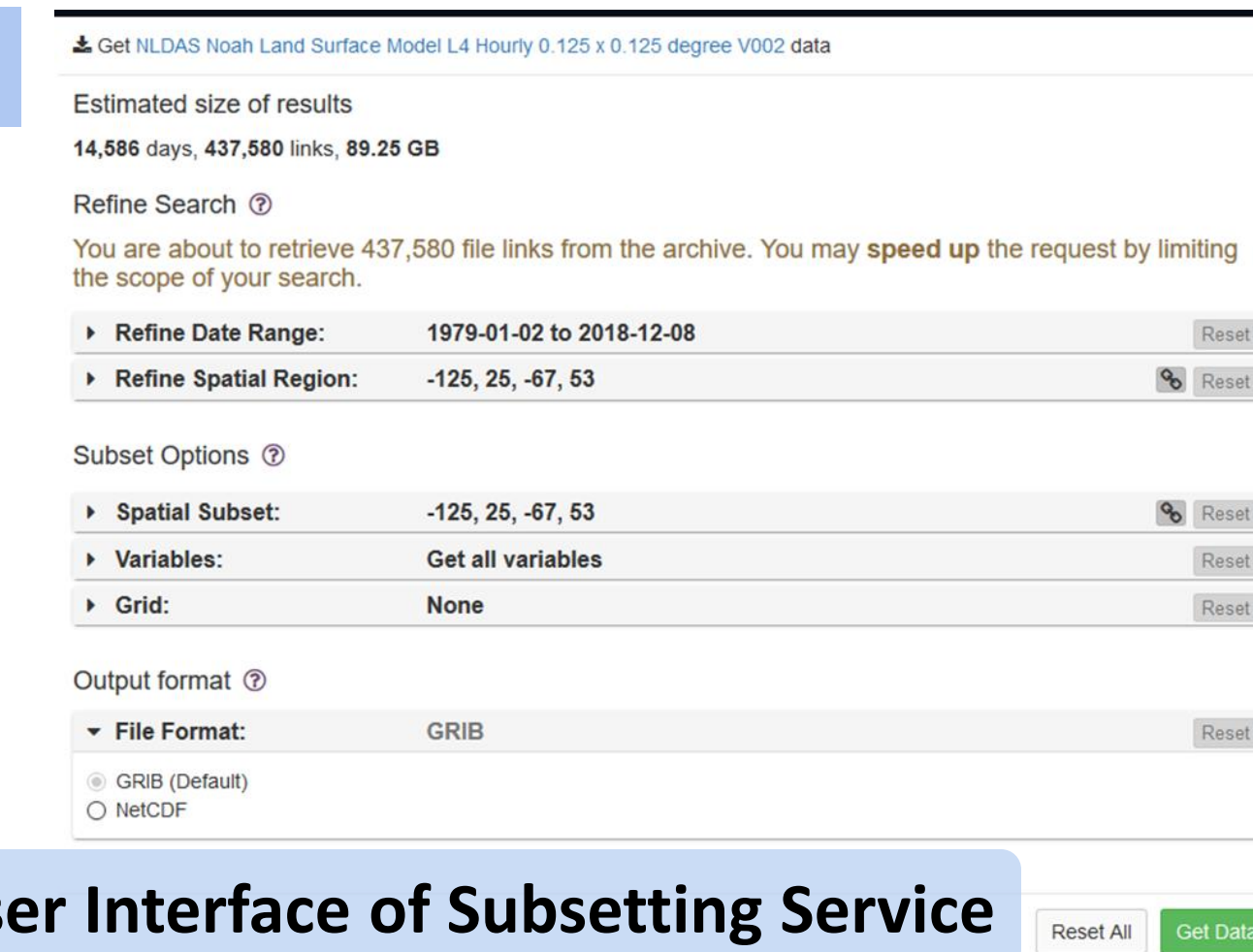
Data Access and Services

- **Data Set Landing** page provides detailed description of a data collection, product summary, data citation, access to official documentation, links to available services, and direct access to download the data.
- **Data Set Landing** pages for hydrology data products are listed in https://disc.gsfc.nasa.gov/datasets?keywords=Hydrology.

- **HTTPS:** Navigate by data product & date/time and download the data via HTTPS
- **EarthData Search:** Search for and retrieve data sets across multiple data centers
- **Subset:** Create variable and spatial subsets and download data in various data formats
- **OPeNDAP:** Search, subset, and download data via OPeNDAP
- **GDS:** Subset, analyze, and download data via GrADS Data Server (GDS)
- **Giovanni:** Web-based tool enabling users to interactively visualize and analyze data
- **Data Rods:** View and download long time series of a single data point

Data Application Examples

Various soil moisture layers can indicate different drought durations and events around the world. Soil moisture content anomalies of 40-100 cm layer (Fig. 1) show longer-term drought conditions. Notable areas of current drought conditions are located in east and southeast Australia, south India, and across Europe.
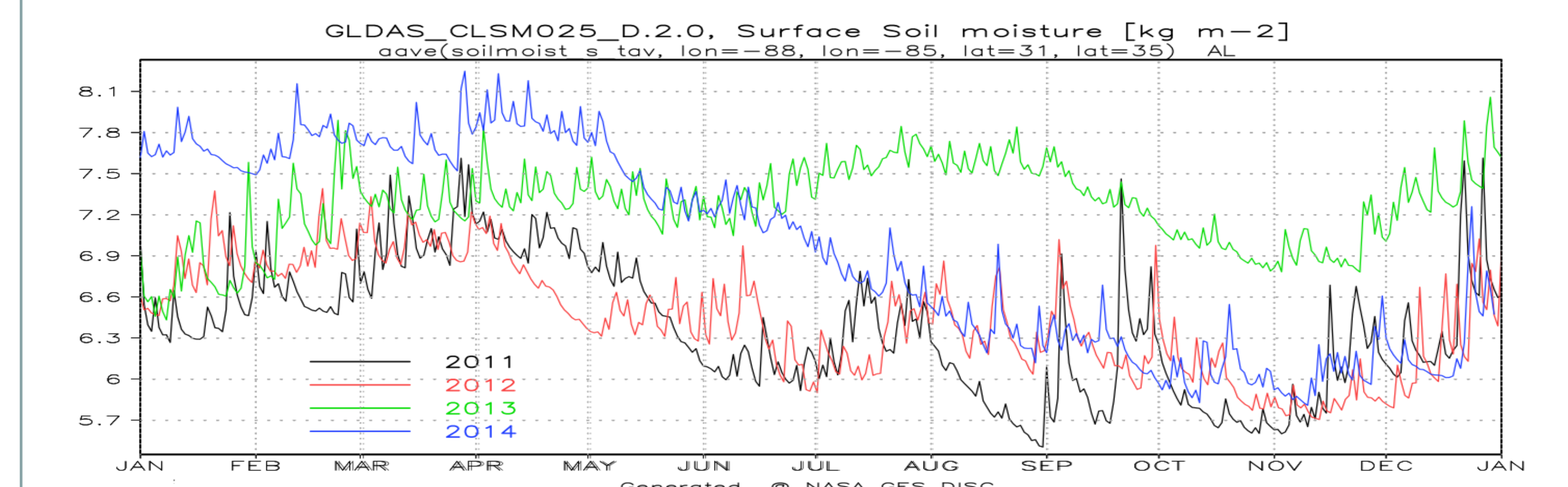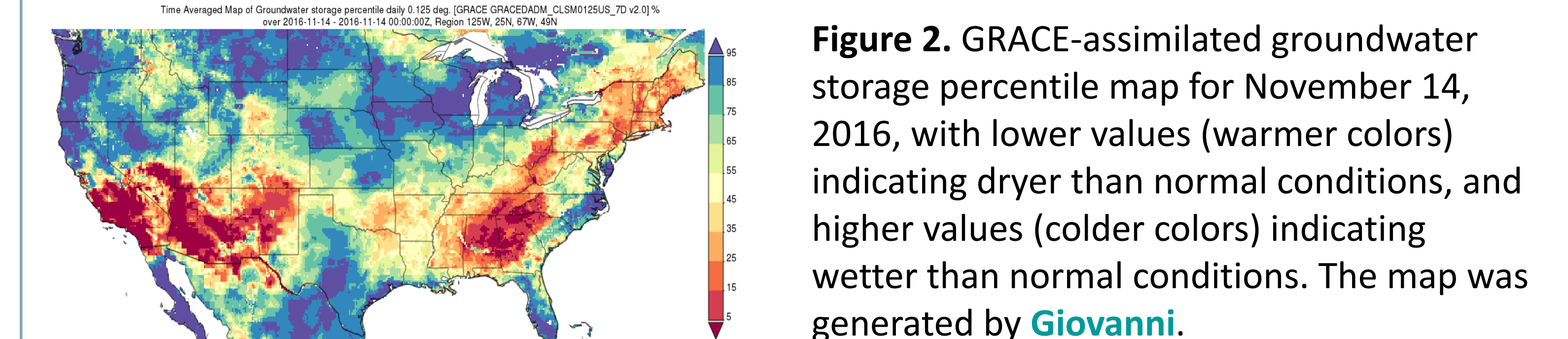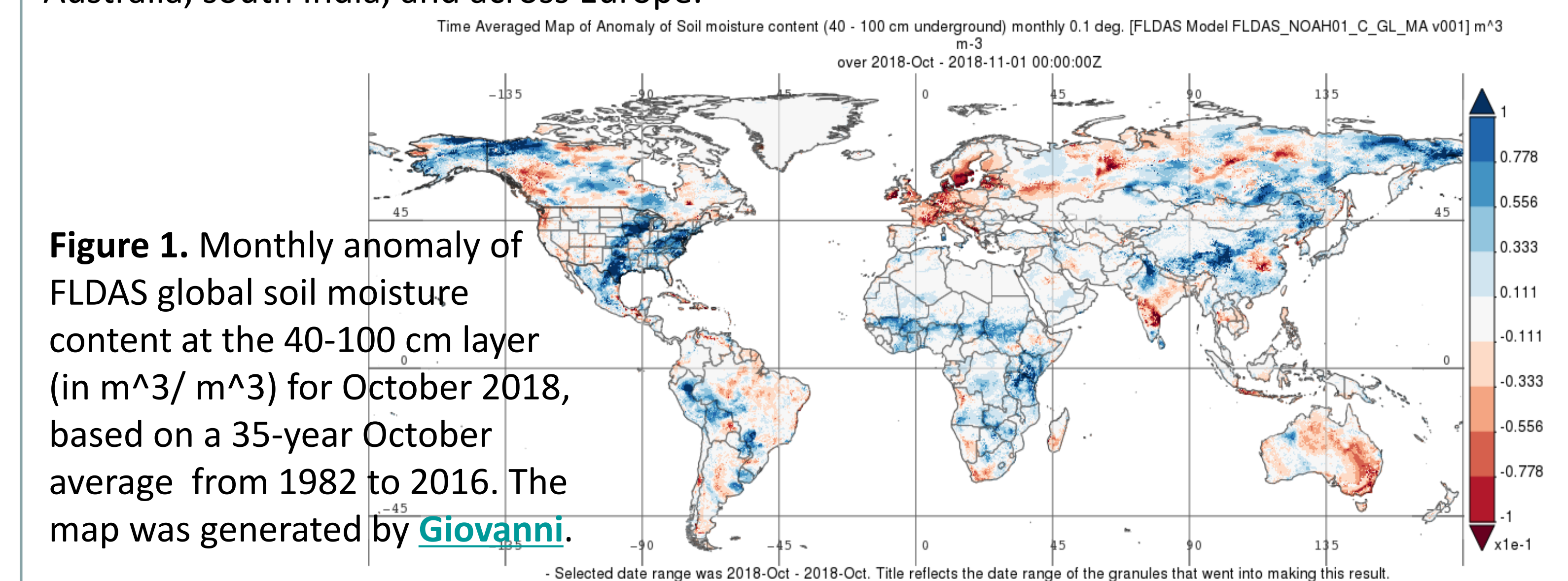

Figure 1. Monthly anomaly of FLDAS global soil moisture content at the 40-100 cm layer (in m^3/ m^3) for October 2018, based on a 35-year October average from 1982 to 2016. The map was generated by Giovanni.

Figure 2. GRACE-assimilated groundwater storage percentile map for November 14, 2016, with lower values (warmer colors) indicating dryer than normal conditions, and higher values (colder colors) indicating wetter than normal conditions. The map was generated by Giovanni.

Figure 3. Time series of surface soil moisture for an area in Alabama (31N, 85W, 35N, 88W) for the years 2011, 2012, 2013, and 2014, generated from the daily GLDAS-2.0 Catchment LSM data. These time series clearly show the interannual variation of surface soil moisture. The time series plot was generated by the Grid Analysis and Display System (GrADS).