Accessing Essential Biodiversity Variables (EBVs) from ORNL DAAC

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ORNL Distributed Active Archive Center

NASA Biodiversity and Ecological Forecasting Team Meeting
May 22, 2019

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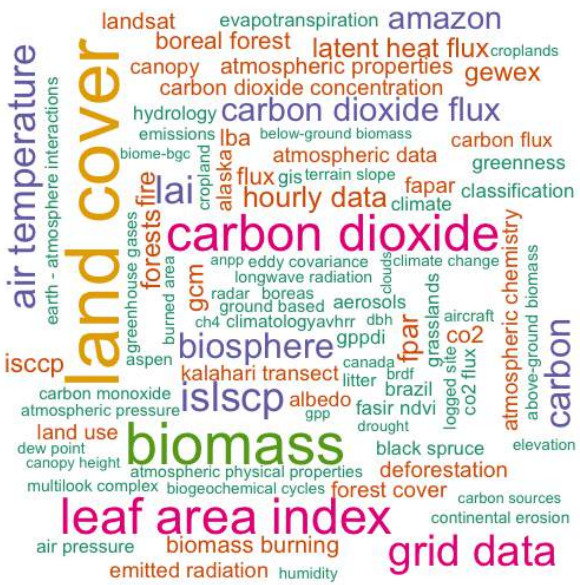
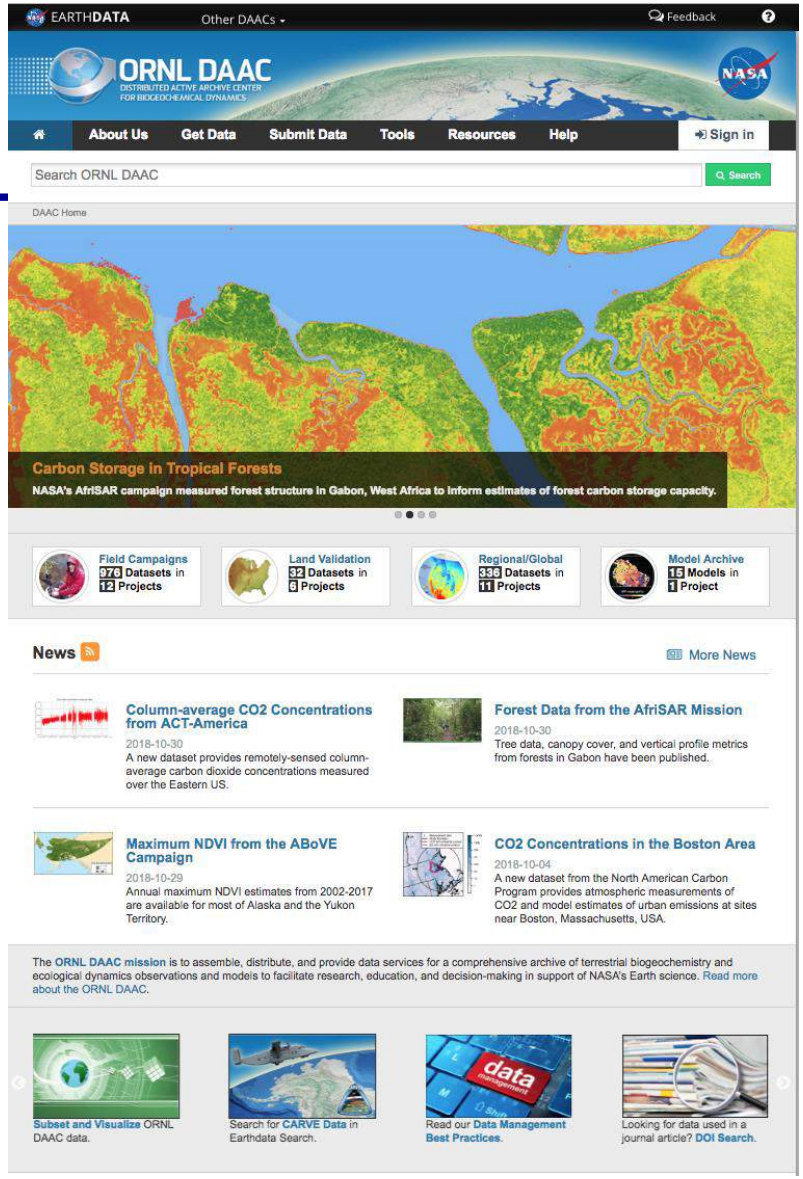
Questions I want to answer today:

1. What is the ORNL DAAC?
2. What sorts of data do you have?
3. How can I publish my data at ORNL DAAC?
4. How do I search for data?
5. How do I get satellite data at my study site(s)?

About ORNL DAAC

The Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC) archives data produced by NASA's Terrestrial Ecology Program in support of NASA's Carbon Cycle and Ecosystems Focus Area.





http://daac.ornl.gov

Projects Supported

GEDI
ECOSYSTEM LIDAR

ABoVE
ARCTIC BOREAL VULNERABILITY EXPERIMENT

NASA AirMOSS EV-1
Airborne Microwave Observatory of Subcanopy and Subsurface Project

FLUXNET
A Global Network

BOREAS

Fluxes
Sources
Sinks
CO_2 & CH_4 Concentration
Atmospheric Carbon & Transport
Transport

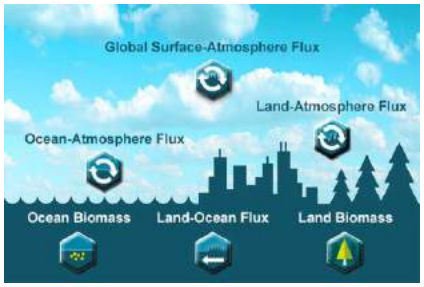
NASA ATOM EVS-2
ATMOSPHERIC TOMOGRAPHY MISSION

CARVE
CARBON IN ARCTIC RESERVOIRS VULNERABILITY EXPERIMENT

ISLSCP

Safari 2000
A Southern African Regional Science Initiative

A Core Element of the U.S. Global Change Research Program
NORTH AMERICAN CARBON PROGRAM
CONTINENTAL CARBON BUDGETS • PROCESSES • MANAGEMENT

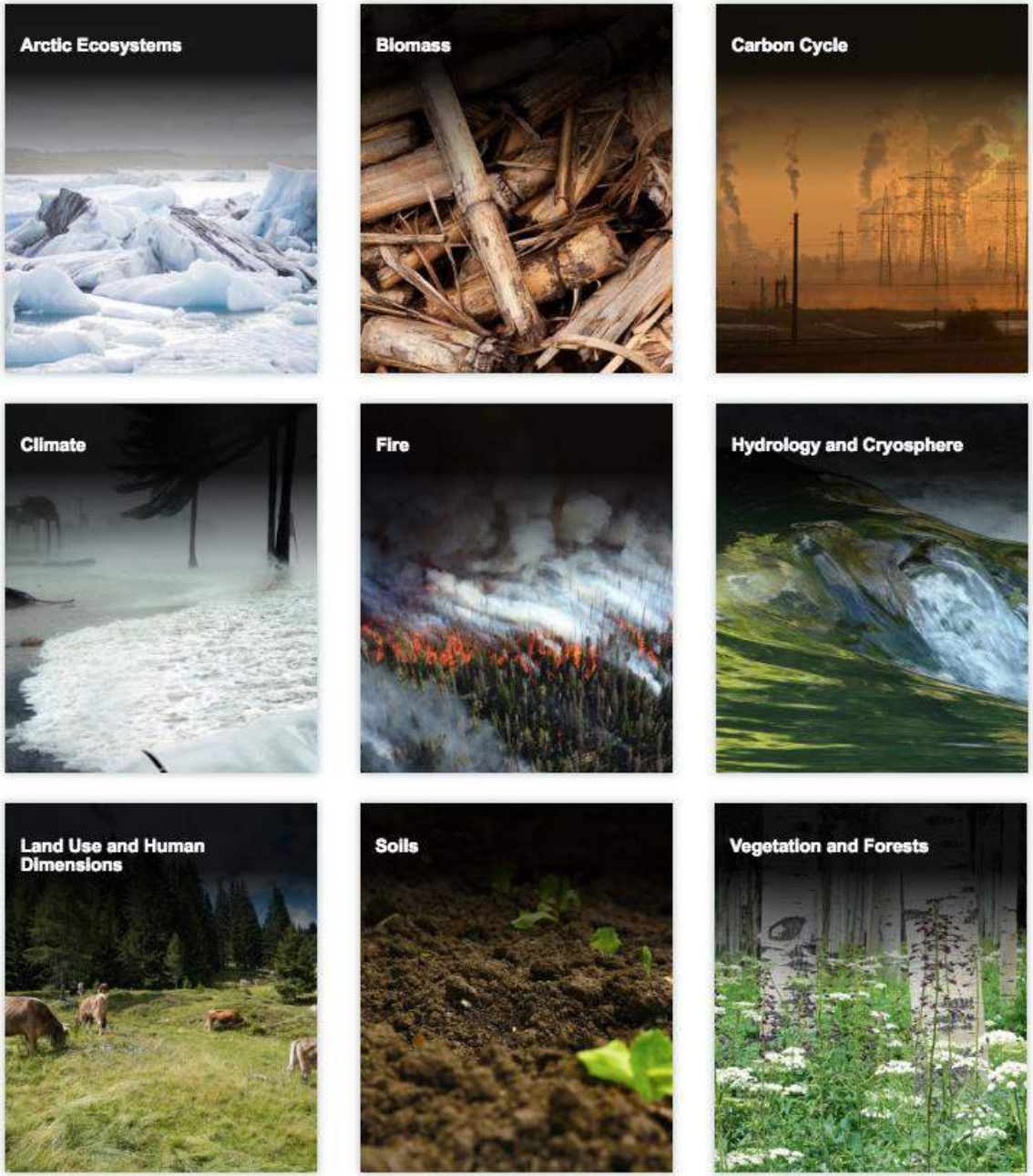


FIRST ISLSCP FIELD EXPERIMENT
FIFE

LBA
THE LARGE SCALE BIOSPHERE-ATMOSPHERE EXPERIMENT IN AMAZONIA - LBA

BigFoot

Data Themes


Arctic Ecosystems
Biomass
Carbon Cycle
Climate
Fire
Hydrology and Cryosphere
Land Use and Human Dimensions
Soils
Vegetation and Forests

Some example EBVs

Ecosystem Structure

- Forest cover
- Land cover
- Vegetation height
- Above-ground biomass
- Ecosystem distribution

Ecosystem Function

- NPP
- Leaf area index
- Vegetation phenology
- Soil moisture
- Fire

Climate

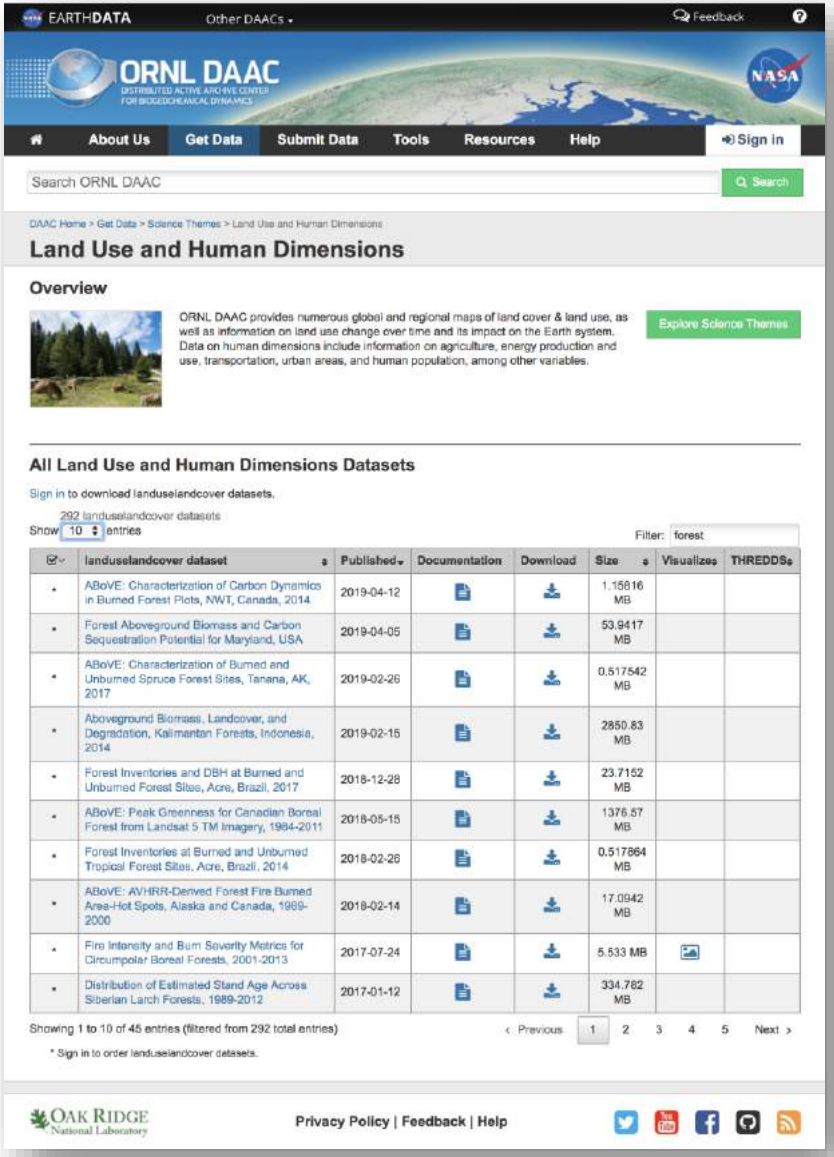
- Temperature
- Precipitation
- Snow
- Solar radiation
- Daylength

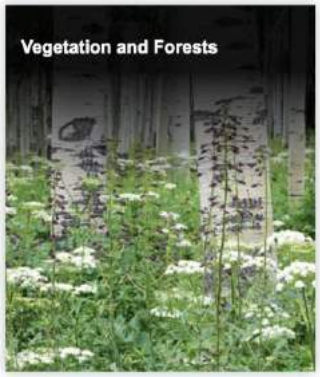
Community Composition

- Hyperspectral reflectance
- Vegetation and forest inventories

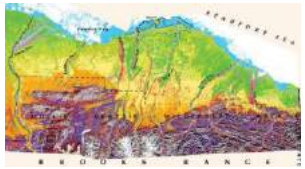
Ecosystem Structure Data

- Forest cover
- Land cover
- Vegetation height
- Above-ground biomass
- Ecosystem distribution

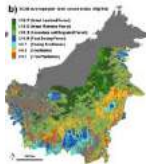




Ecosystem Structure Data: Examples

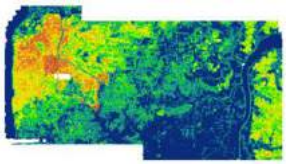


Land Cover and Vegetation Map, Arctic National Wildlife Refuge. https://doi.org/10.3334/ORNLDAAC/1384



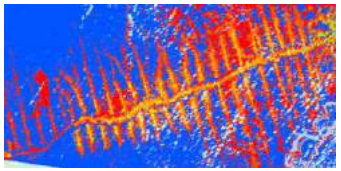
Aboveground Biomass, Landcover, and Degradation, Kalimantan Forests, Indonesia. https://doi.org/10.3334/ORNLDAAC/1645

Land Use and Land Cover Classifications across India, 1985, 1995, 2005. http://doi.org/10.3334/ORNLDAAC/1336



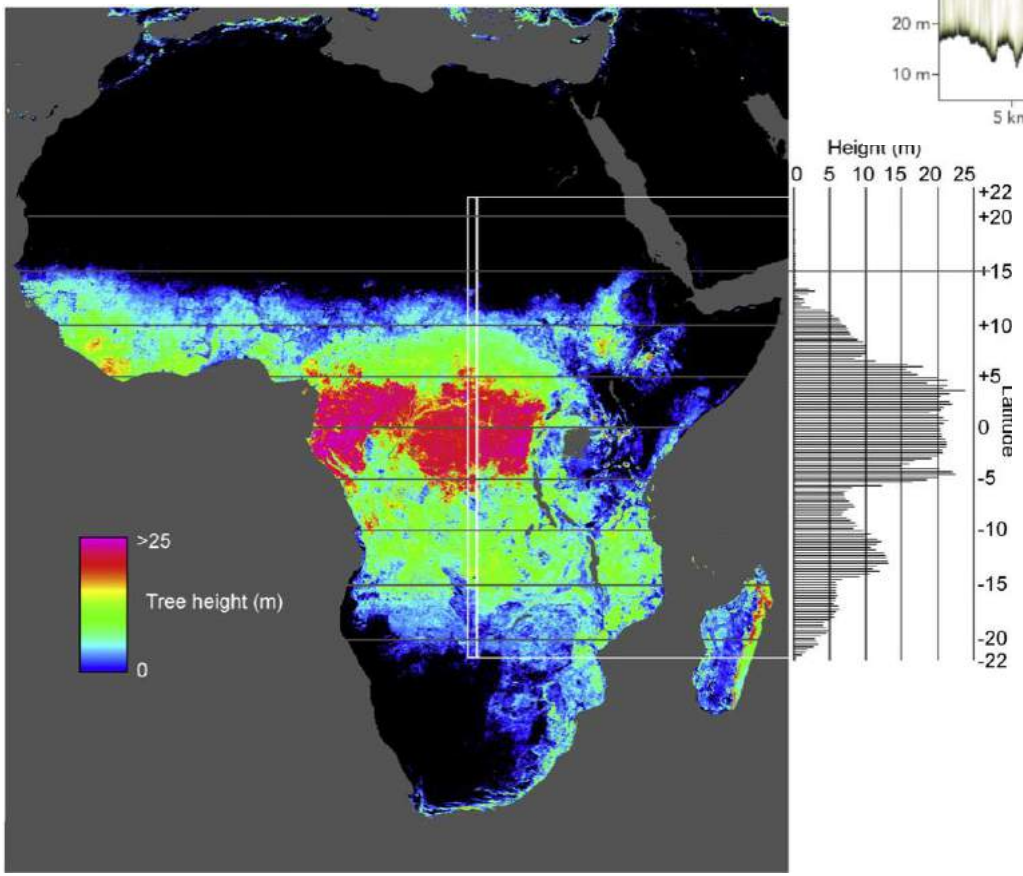
Aboveground Biomass for Lope, Mabounie, Mondah, and Rabi Sites, Gabon. https://doi.org/10.3334/ORNLDAAC/1681

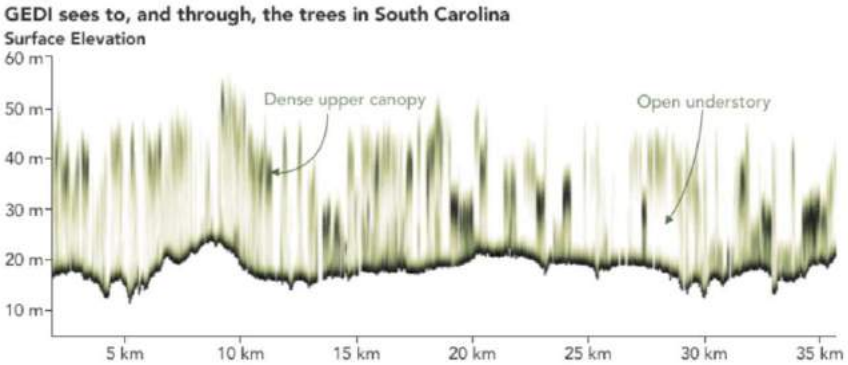
Ecosystem Functional Type Distribution Map for the Conterminous USA. https://doi.org/10.3334/ORNLDAAC/1659



Land Cover Transitions Maps for Study Sites in Para, Brazil: 1970-2001. https://doi.org/10.3334/ORNLDAAC/1098

GEDI to measure global forest structure



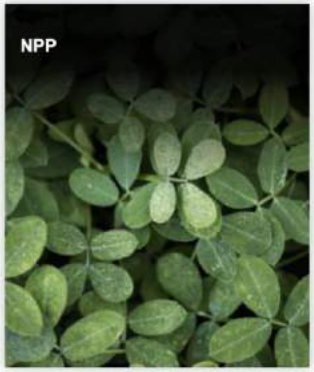


ORNL DAAC to distribute:

- L3 gridded canopy height metrics and variability
- L4 footprint and gridded aboveground carbon estimates
- Expected in Spring 2020

Ecosystem Function Data

NPP
Leaf area index
Vegetation phenology
Soil moisture
Fire



Curated collection of field measurements of biomass and estimated NPP for >100 terrestrial study sites worldwide.

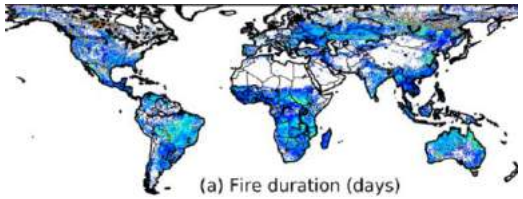
Net Carbon Dioxide and Water Fluxes of Global Terrestrial Ecosystems, 1969-1998.
https://doi.org/10.3334/ORNLDAAC/662

PhenoCam Dataset v1.0: Vegetation Phenology from Digital Camera Imagery, 2000-2015.
https://doi.org/10.3334/ORNLDAAC/1511

Fire Data

NPP
Leaf area index
Vegetation phenology
Soil moisture
Fire

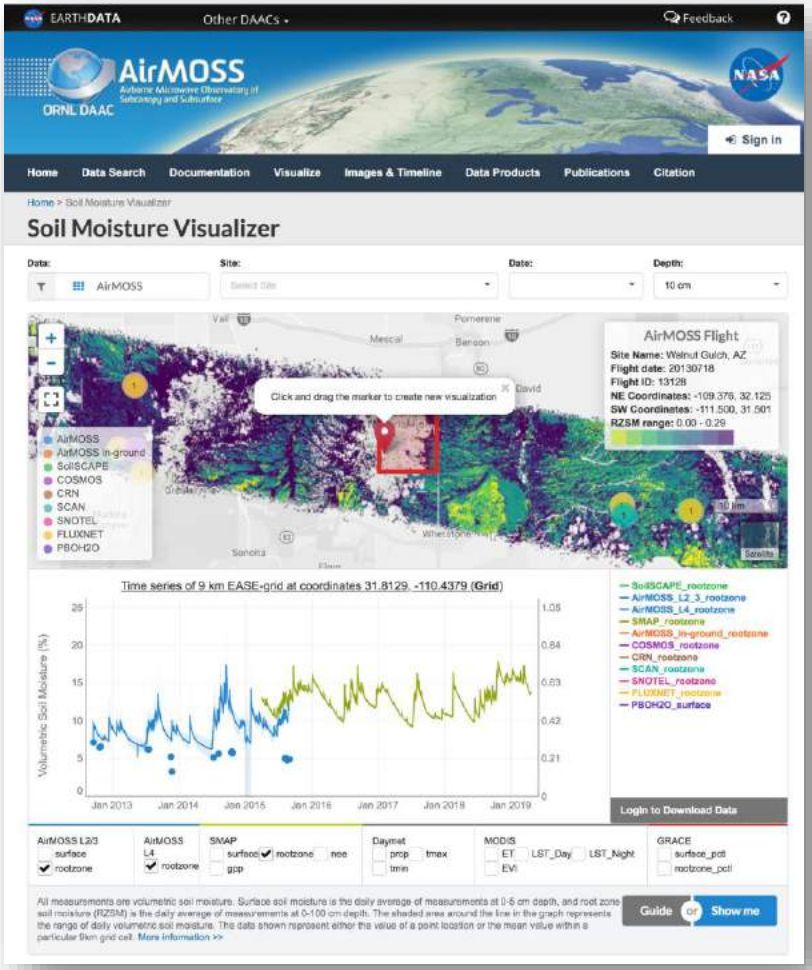
Collection of >50 fire occurrence, severity, and emissions datasets.



Global Fire Atlas with Characteristics of Individual Fires, 2003-2016.
https://doi.org/10.3334/ORNLDAAC/1642

AVHRR Derived Fire Occurrence, 5-km Resolution, Amazonia: 2001.
https://doi.org/10.3334/ORNLDAAC/882

Soil Moisture Data



Provides surface and root-zone soil moisture from:

- Soil Moisture Active Passive satellite
- GRACE
- GPS satellites
- in-ground soil moisture from networks across North America

Seamlessly integrate precipitation, temperature, evapotranspiration, EVI, and GPP data.

https://daac.ornl.gov/soilmoisture/

Get easy to use in-ground and satellite soil moisture data together in one place.

Community Composition Data

Hyperspectral
Vegetation and forest surveys

Hyperspectral Imagery from AVIRIS-NG, Alaskan and Canadian Arctic, 2017-2018. https://doi.org/10.3334/ORNLDAAC/1569

AfriSAR: Mondah Forest Tree Species, Biophysical, and Biomass Data, Gabon, 2016. https://doi.org/10.3334/ORNLDAAC/1580

Forest Inventories and DBH at Burned and Unburned Forest Sites, Acre, Brazil, 2017. https://doi.org/10.3334/ORNLDAAC/1654

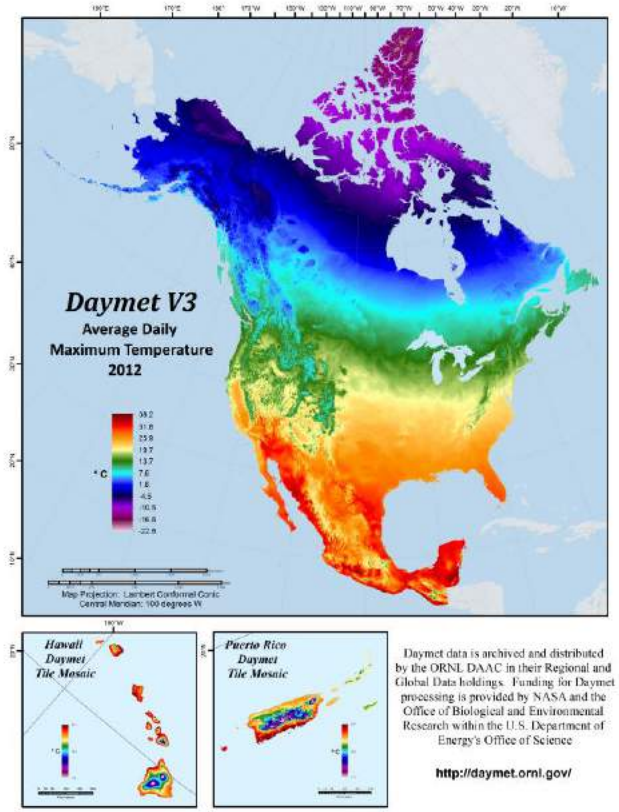
Woody Vegetation Characteristics of Kalahari and Skukuza Sites, Botswana and South Africa. https://doi.org/10.3334/ORNLDAAC/777

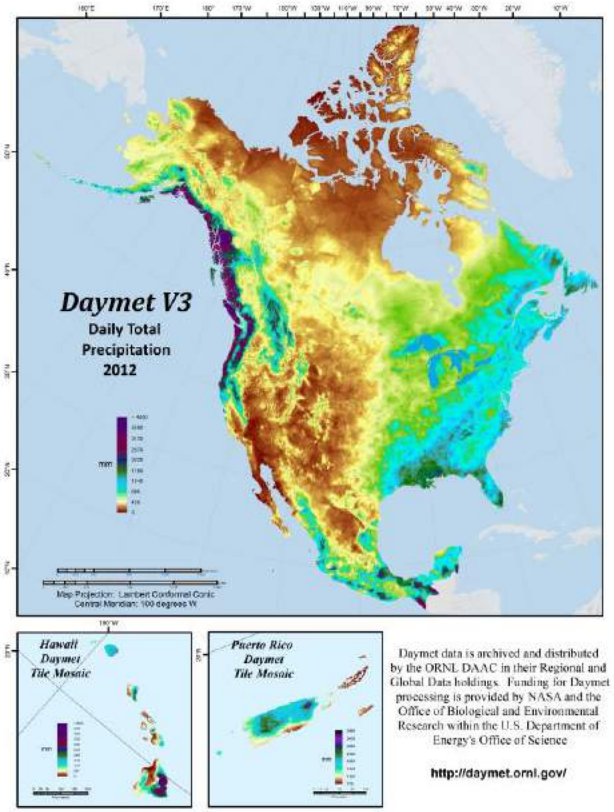
Superior National Forest: Forest Cover by Species/Strata. https://doi.org/10.3334/ORNLDAAC/179

Arctic Vegetation Plots in NPS Arctic Network Parks, Alaska. https://doi.org/10.3334/ORNLDAAC/1542

Climate Data

Daymet provides gridded estimates of daily weather parameters for North America.
Annual and Monthly climatologies from 1980 – 2018.
Access via web tools, WebGIS, and API. https://daymet.ornl.gov/web_services





Data Characteristics

Spatial Resolution ….. 1km x 1 km
Temporal Resolution ….. Daily
Years Available ….. 1980 – 2018
Spatial Region ….. North America

Daymet Data Products	
Variable	Units
maximum temperature	°C
minimum temperature	°C
shortwave radiation	W/m^2
vapor pressure	Pa
snow water equivalent	kg/m^2
precipitation	mm/day
day length	s/day

https://daymet.ornl.gov/

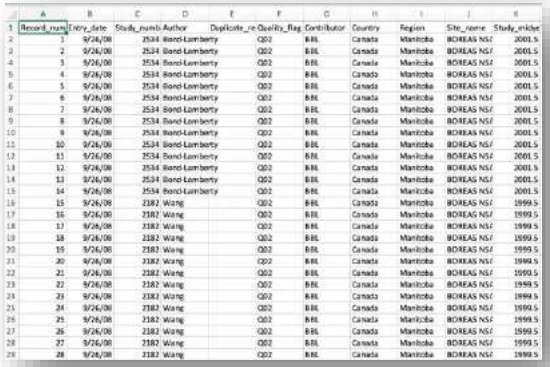
Interested in publishing your data with us?

Investigators

- Collect
- Document
- QA / QC
- Analyze
- Publish

DAAC

- QA Review
- Standards & Metadata
- Document
- Archive
- Distribute
- User Support



	A	B	C	D	E	F	G	H	I	J	K
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2	1	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
3	2	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
4	3	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
5	4	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
6	5	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
7	6	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
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9	8	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
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13	12	9/26/08	2534	Band-Lamberty		Q02	BBL	Canada	Manitoba	BOREAS NSA	2001.5
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16	15	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
17	16	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
18	17	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
19	18	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
20	19	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
21	20	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
22	21	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
23	22	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
24	23	9/26/08	2182	Wang		Q02	BBL	Canada	Manitoba	BOREAS NSA	1999.5
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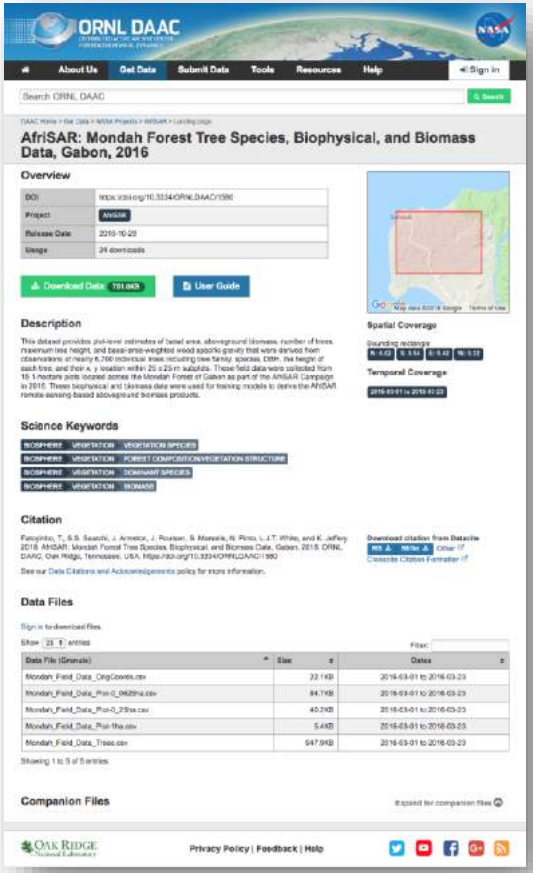
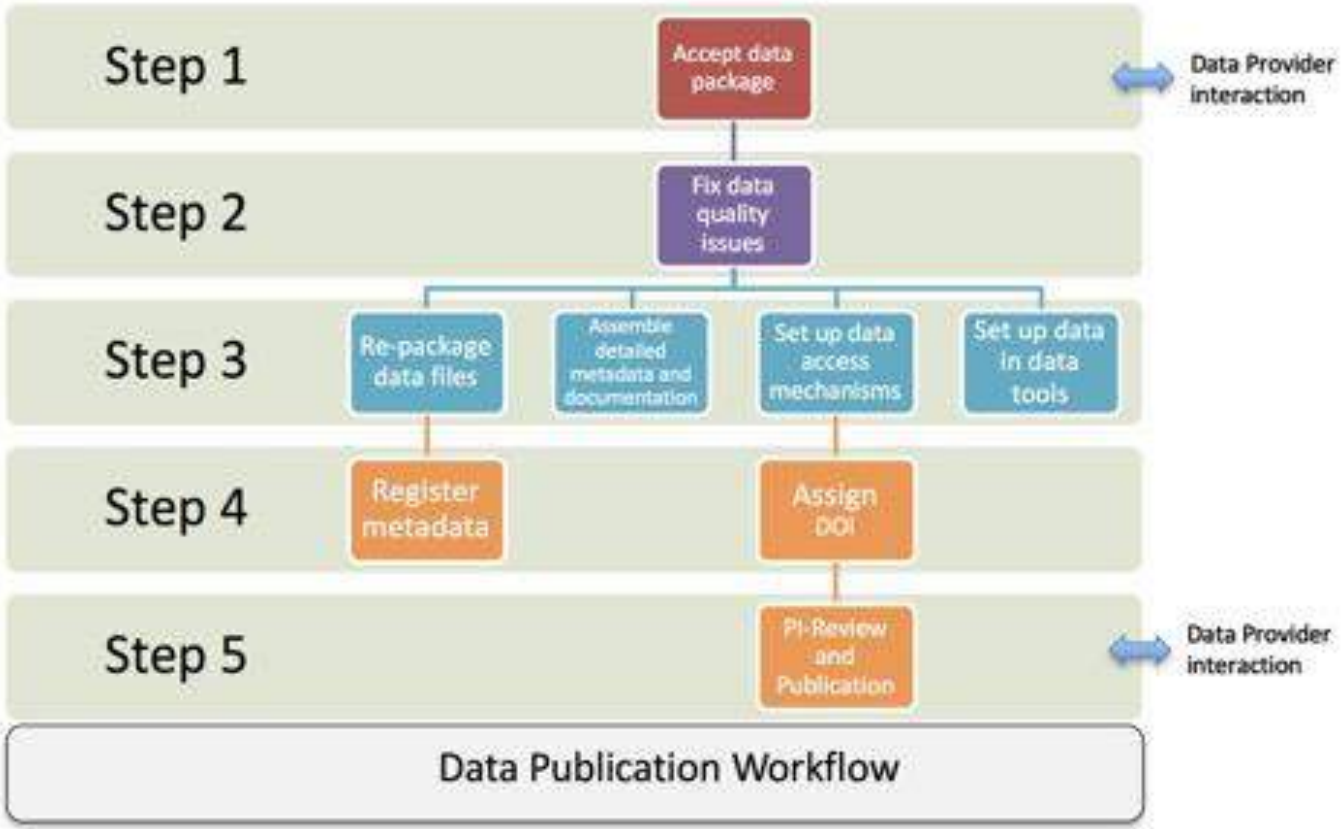


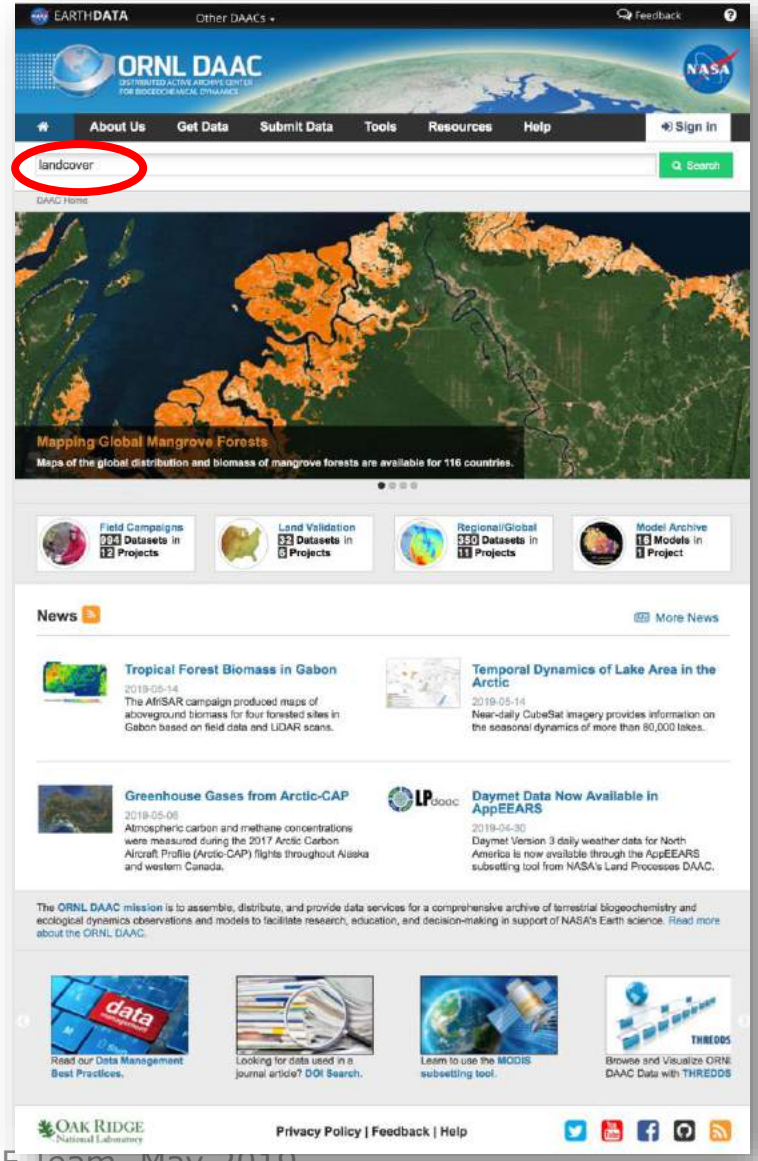
Data Publication Process

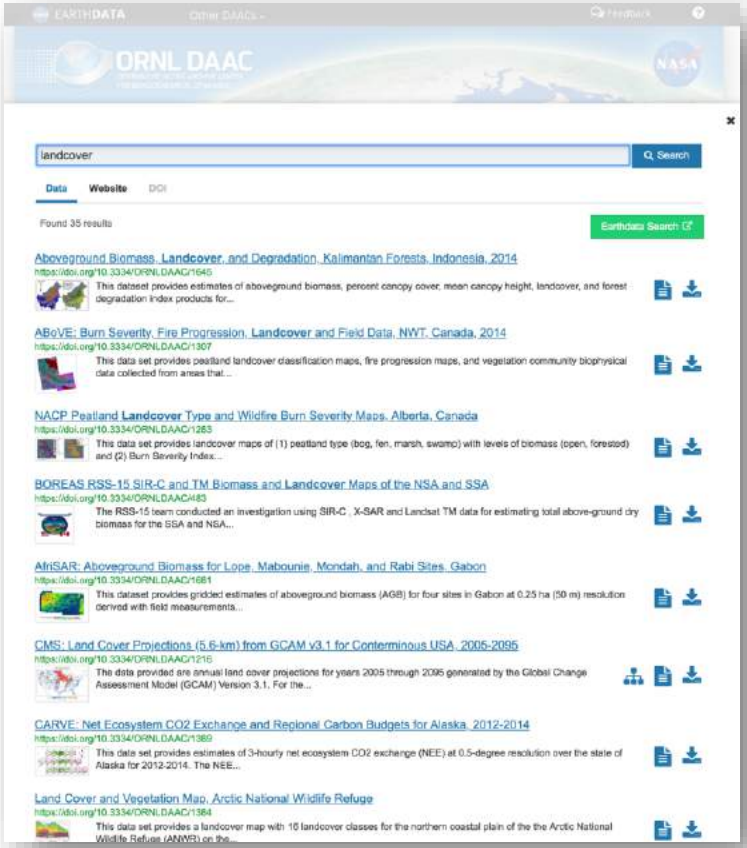


Note: ORNL DAAC data acceptance policy based on:

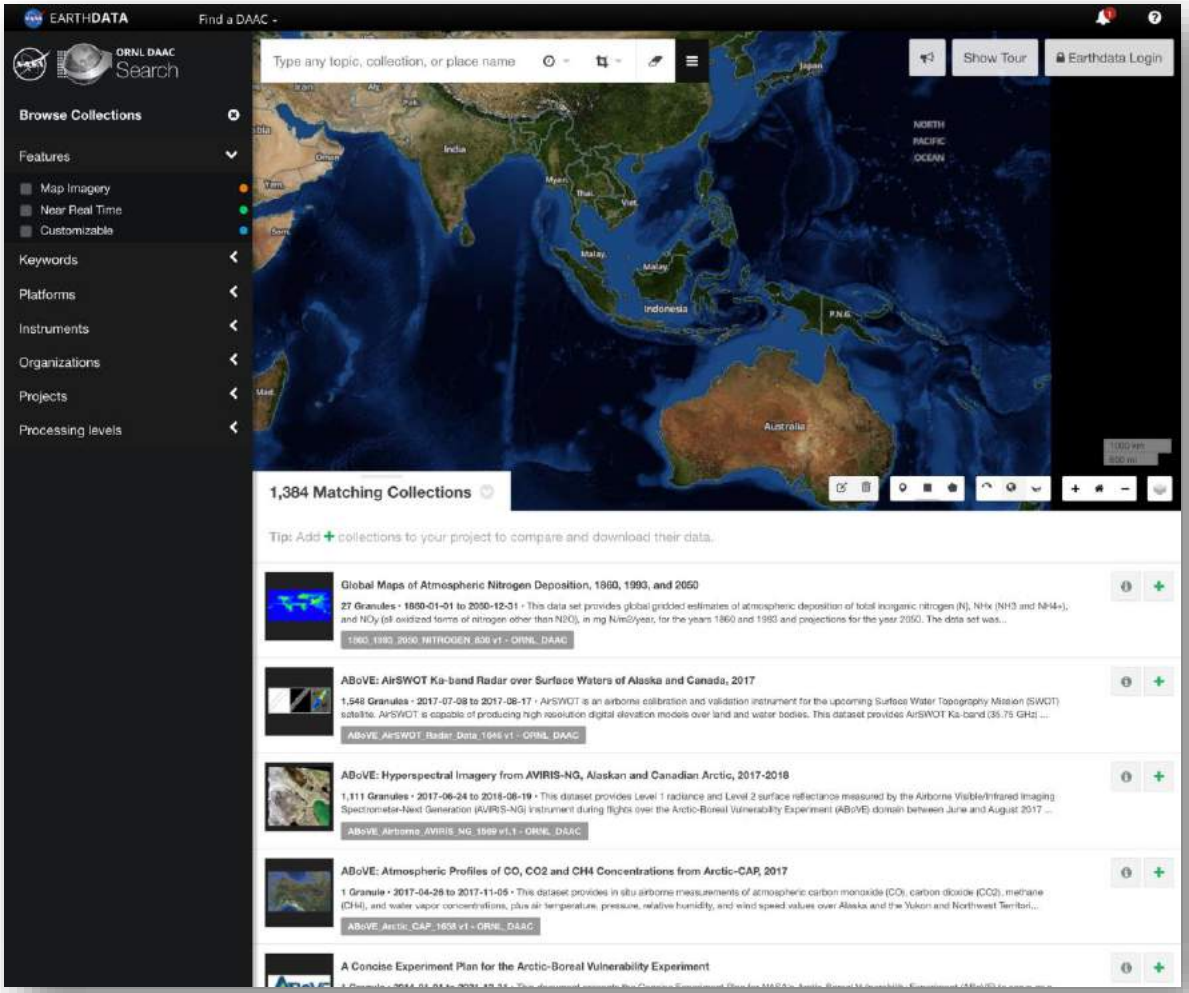
1. NASA approval
2. Community interest and potential applications

Searching for Data at ORNL DAAC





Spatial and Temporal Search: https://search.earthdata.nasa.gov



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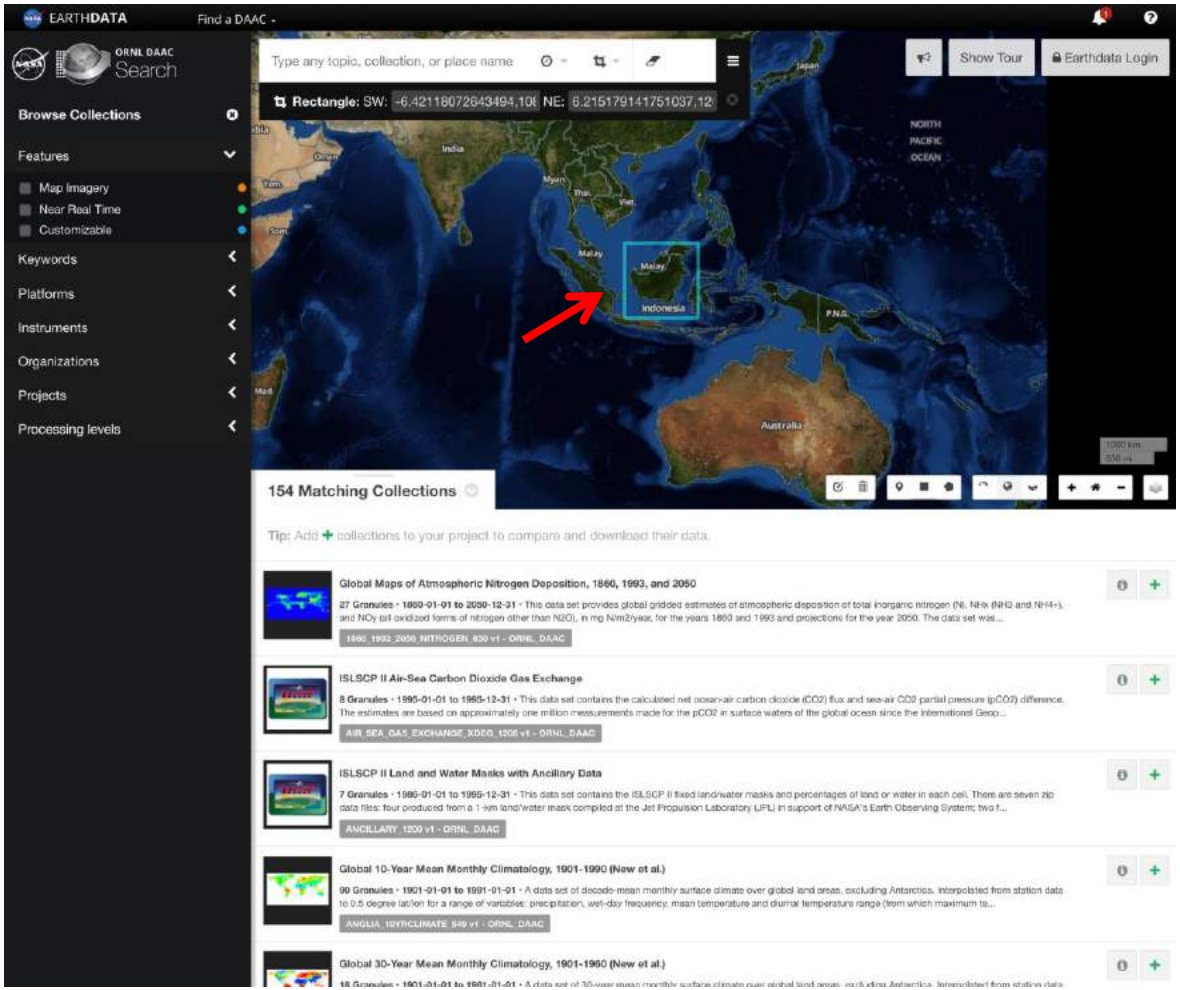

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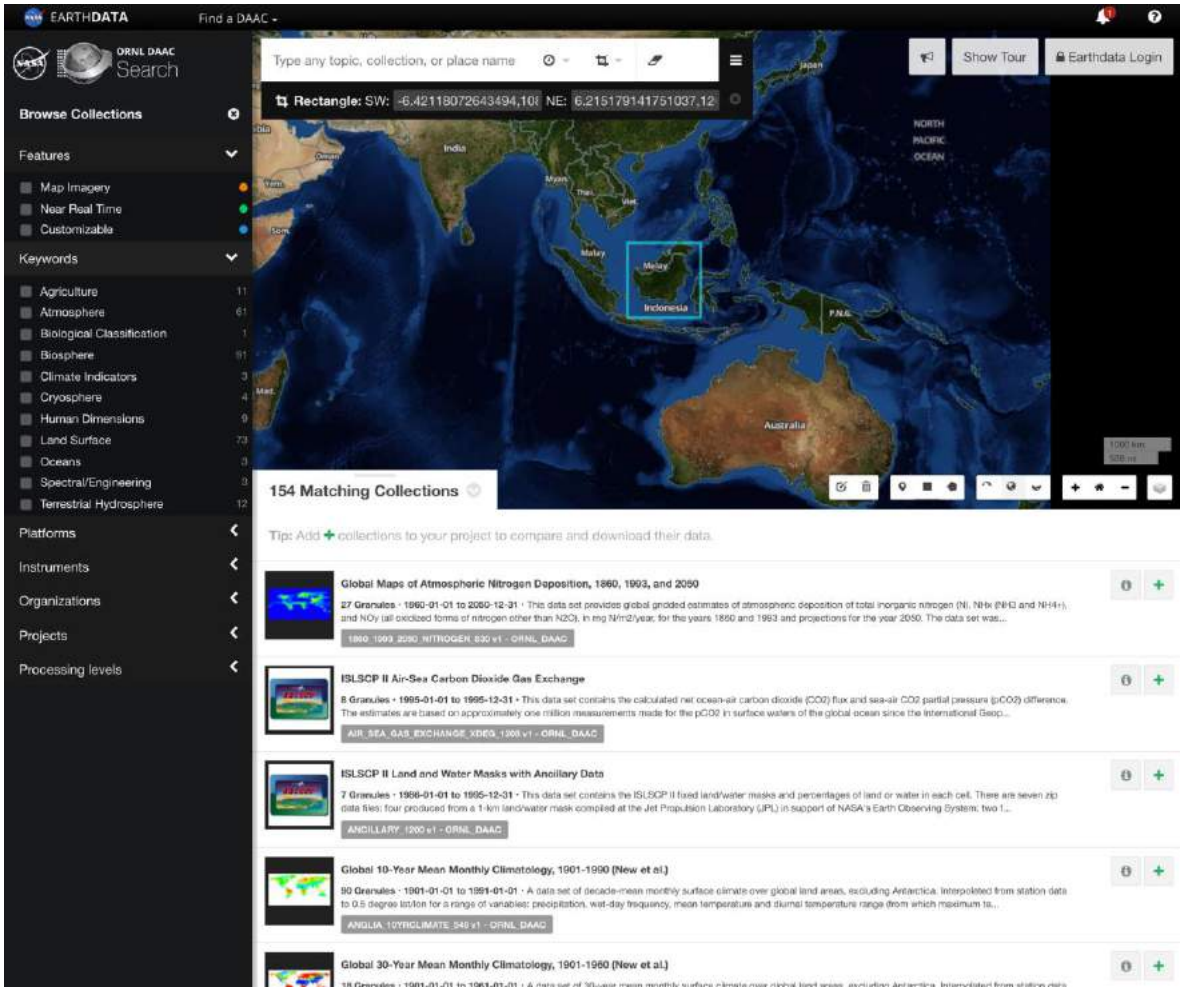

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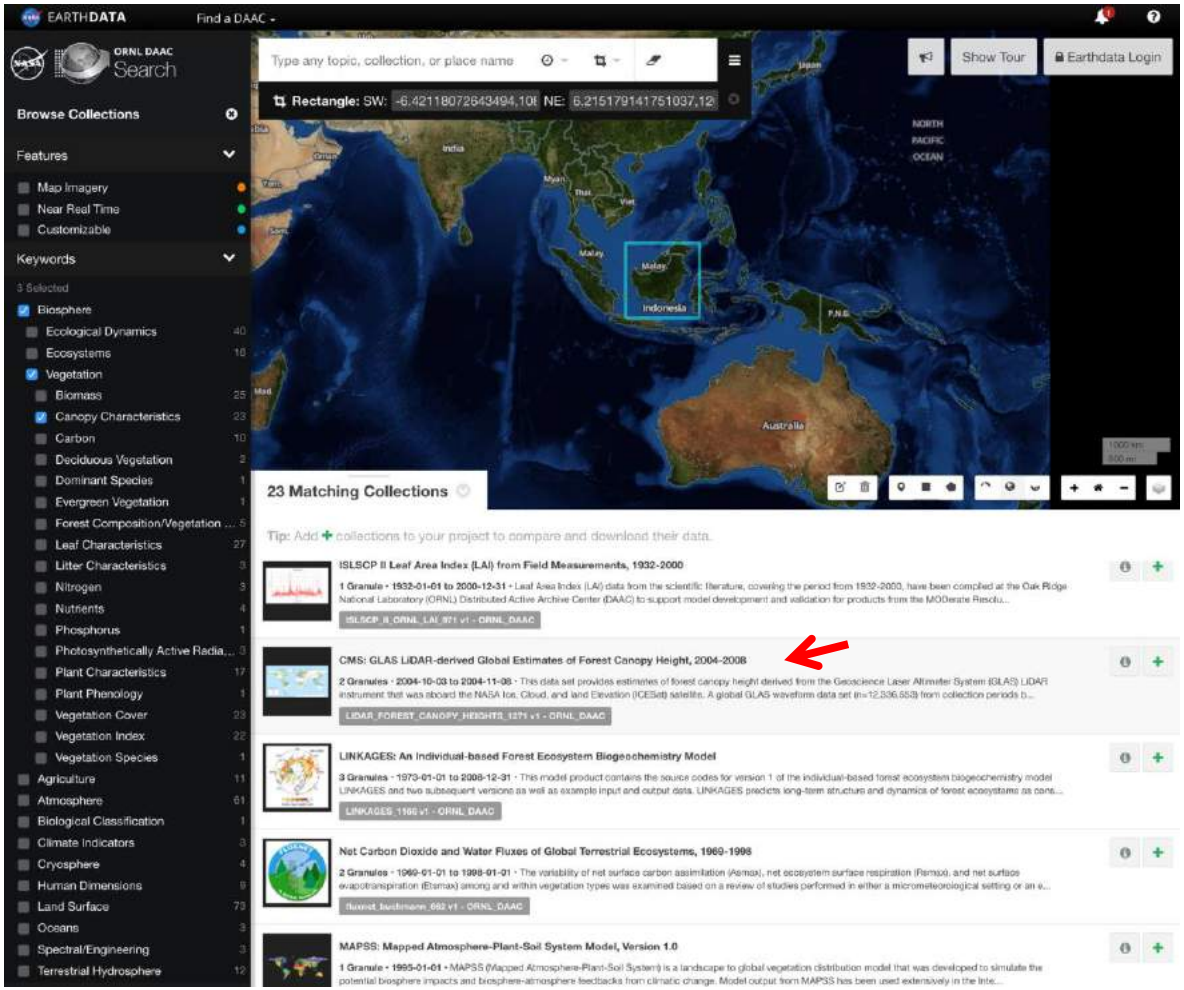

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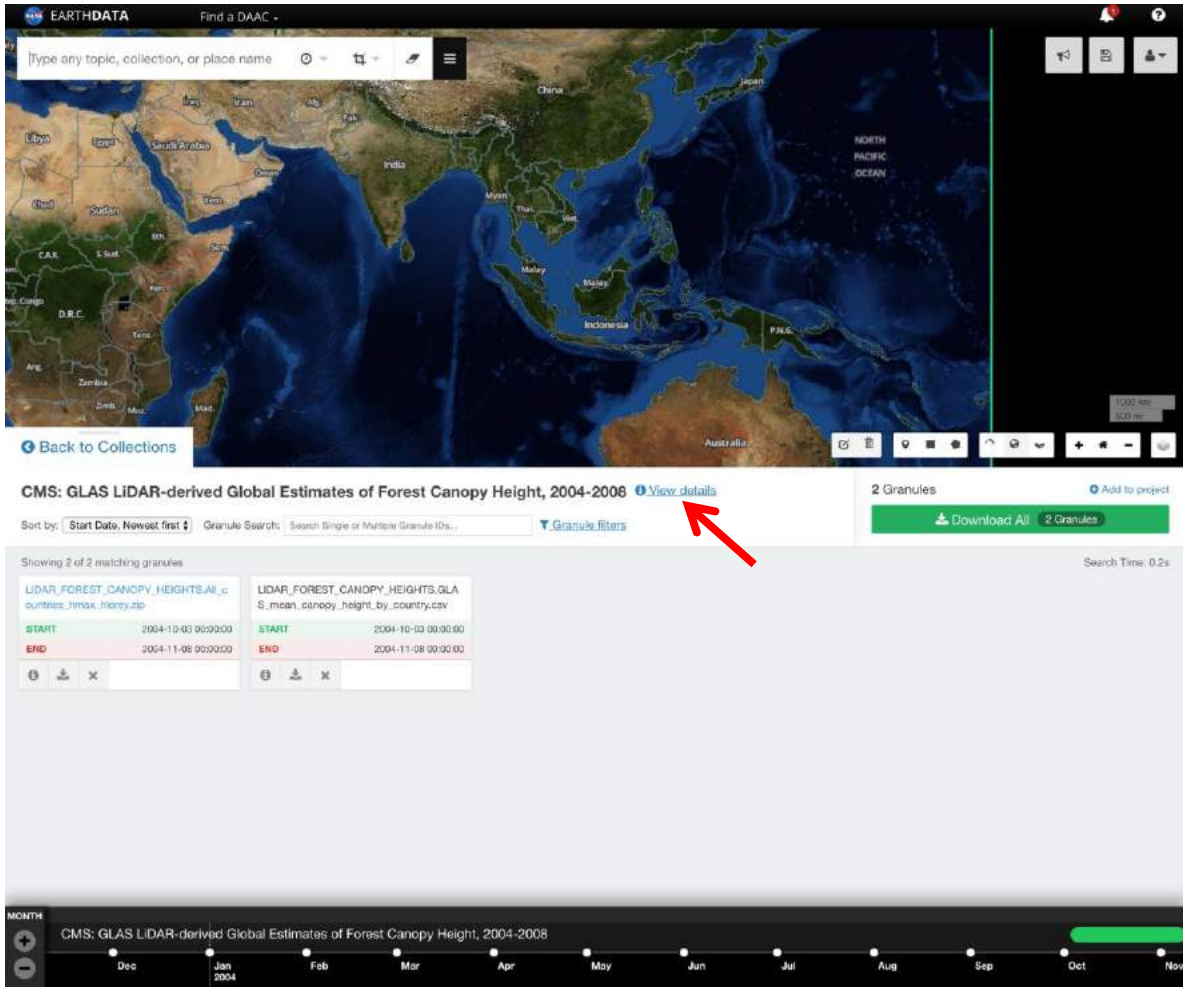

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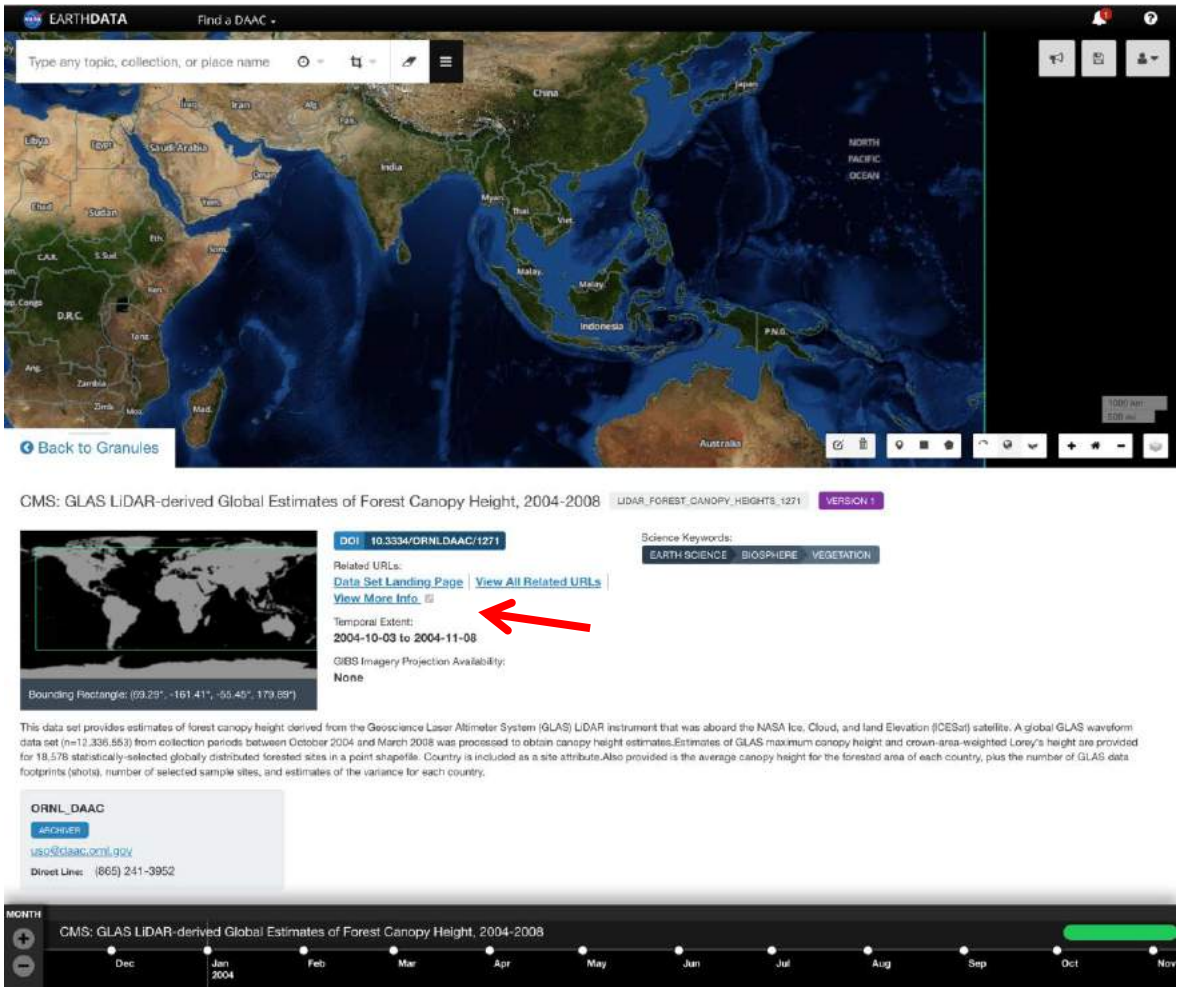
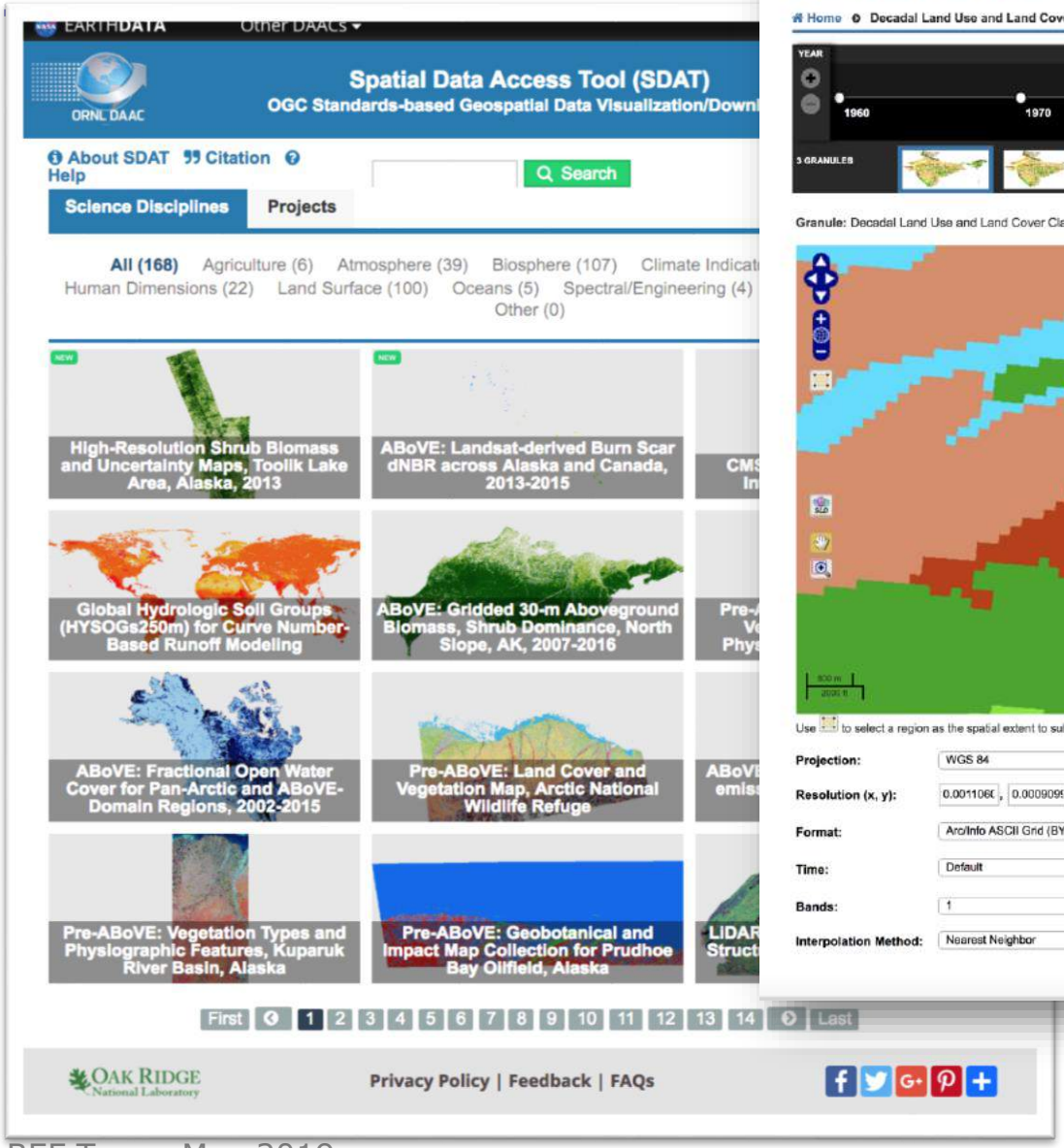
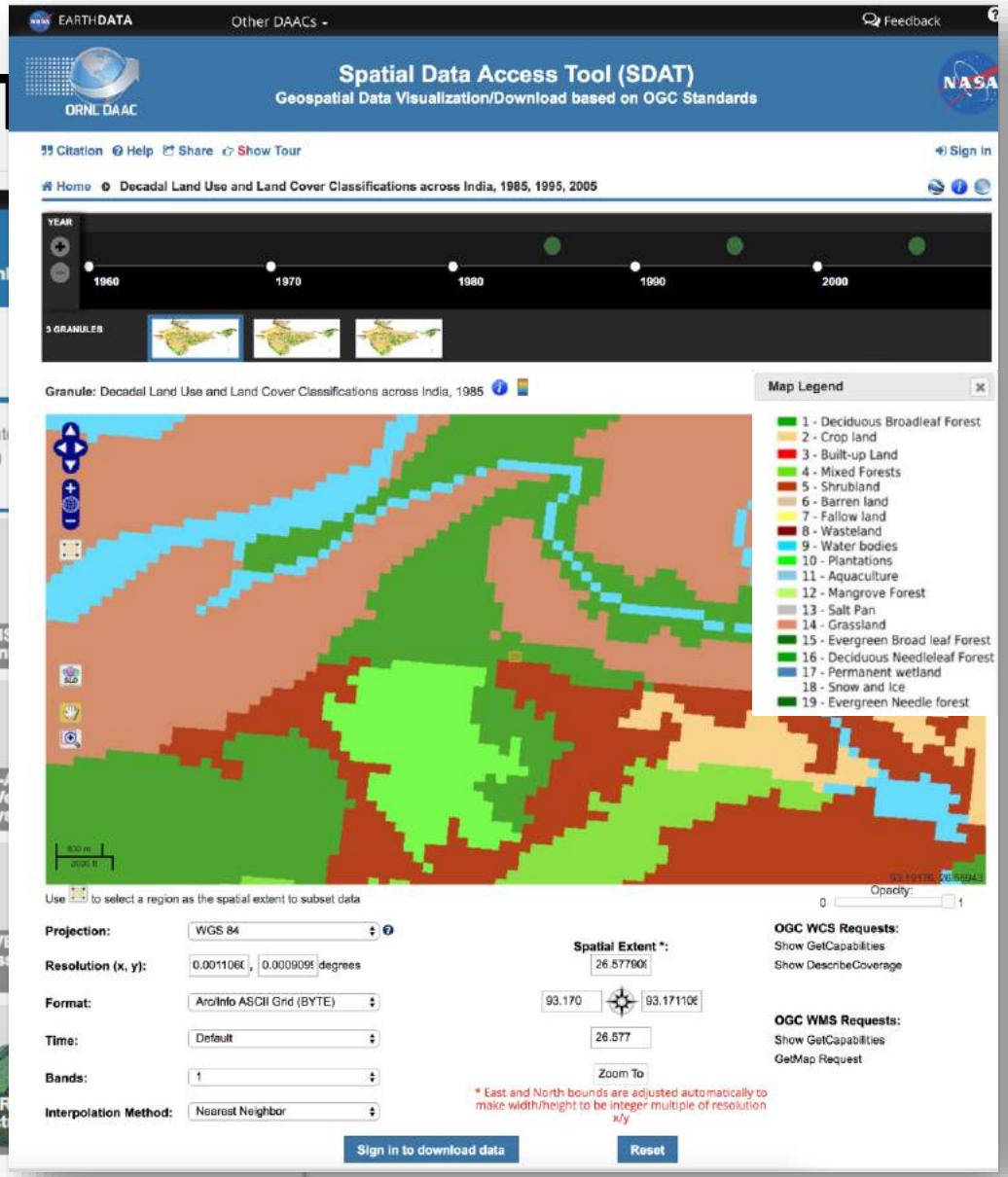


Spatial Data Access Tool

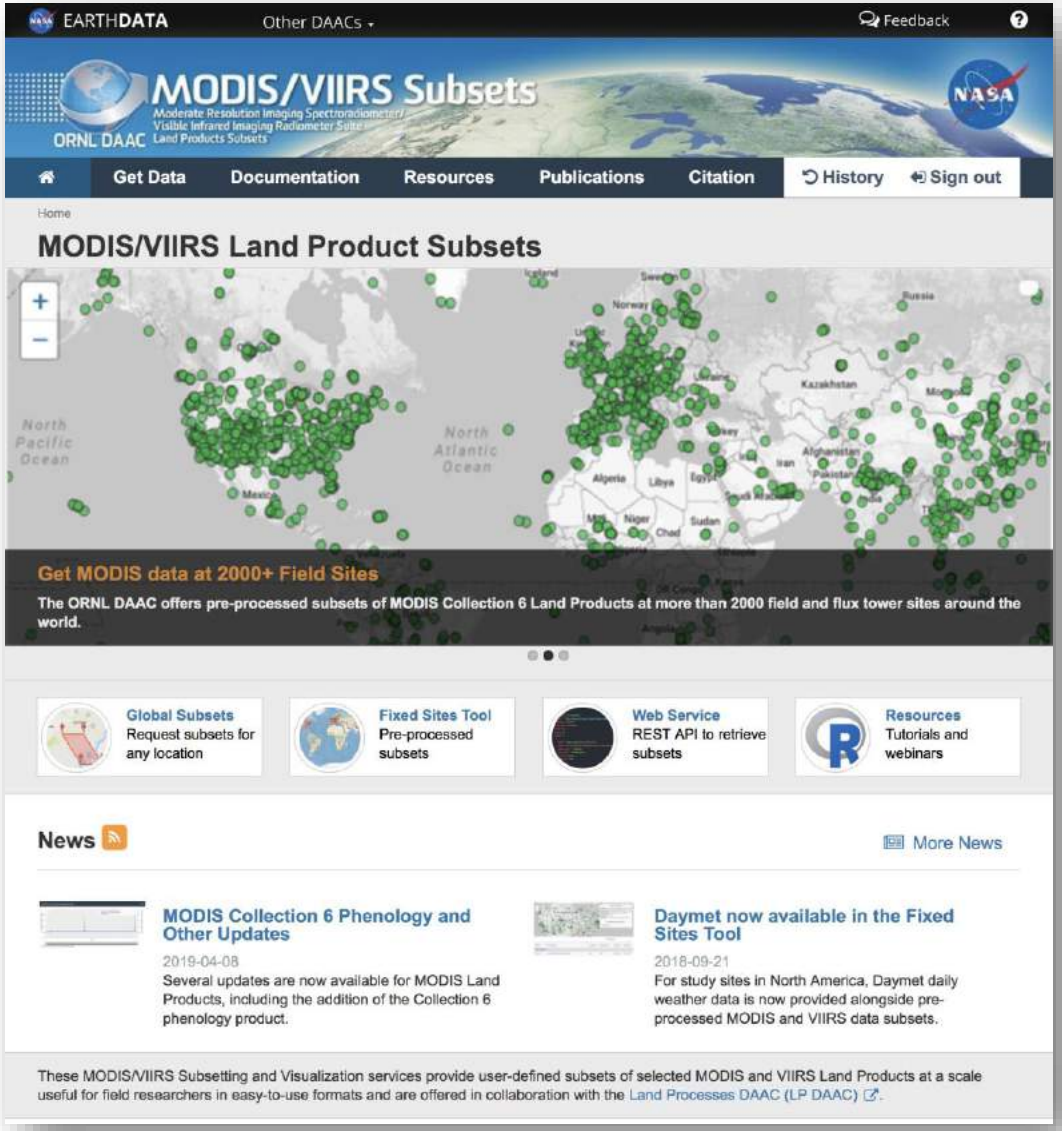
https://webmap.ornl.gov/ogc

Spatial Data Access T





EBV Data from MODIS and VIIRS satellite instruments



Product	Frequency	Resolution
Land Cover	Annual	500 m
Phenology	Annual	500 m
LAI & fPAR	8 day	500 m
Burned area	Monthly	500 m
NDVI & EVI	16 day	250 m
ET	8 day	500 m
GPP	8 day	500 m
NPP	Annual	500 m

Go To: https://modis.ornl.gov/

EARTHDATA Other DAACs Feedback

MODIS/VIIRS Subsets

Moderate Resolution Imaging Spectroradiometer/ Visible Infrared Imaging Radiometer Suite Land Products Subsets

ORNL DAAC

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Fixed Sites Subsets Tool

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48 NETWORKS

125 COUNTRIES

2802 SITES

The Fixed Sites Subsets Tool provides customized subsets and visualizations of several MODIS/VIIRS land products and Daymet daily surface weather data for selected field and flux tower sites around the world.Spatial subsets of the land products are available for predefined areas of about 8 X 8-km centered on the selected sites. The site-specific data can be downloaded in both comma separated value (*.csv) and JSON formats. The data are in the native projection system.

Citation: ORNL DAAC. 2018. Fixed Sites Subsetting and Visualization Tool. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1567

API or Documentation

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MODIS/VIIRS Subsets

Moderate Resolution Imaging Spectroradiometer/ Visible Infrared Imaging Radiometer Suite Land Products Subsets

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48	125	2802
NETWORKS	COUNTRIES	SITES

The Fixed Sites Subsets Tool provides customized subsets and visualizations of several MODIS/VIIRS land products and Daymet daily surface weather data for selected field and flux tower sites around the world.Spatial subsets of the land products are available for predefined areas of about 8 X 8-km centered on the selected sites. The site-specific data can be downloaded in both comma separated value (*.csv) and JSON formats. The data are in the native projection system.

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Moderate Resolution Imaging Spectroradiometer/ Visible Infrared Imaging Radiometer Suite Land Products Subsets

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Home > Get Data > Fixed Sites Subsets Tool > Sarawak Lambir Hills National Park

Fixed Sites Subsets Tool : Sarawak Lambir Hills National Park

Search Sites... List

Site Information

Site ID	my_sarawak_lambir_hills_national_park
Coordinates	114.0333 E, 4.2000 N
Network	ASIAFLUX FORESTGEO
Country	Malaysia

Subset Data & Visualizations

Network Information

ASIAFLUX	LHP

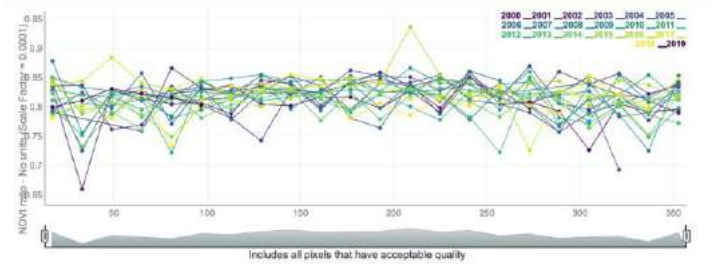
Filter products:

Product	Product Name	Frequency	Resolution (m)	Start Date	End Date
MODIS Collection 6					
MCD15A2H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2002-07-04	2019-04-23
MCD15A3H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	4-Day	500	2002-07-04	2019-04-27
MOD09A1	MODIS/Terra Surface Reflectance (SREF)	8-Day	500	2000-02-18	2019-04-23
MOD11A2	MODIS/Terra Land Surface Temperature and Emissivity (LST)	8-Day	1000	2000-02-18	2019-04-23
MOD13Q1	MODIS/Terra Vegetation Indices (NDVI/EVI)	16-Day	250	2000-02-18	2019-04-07
MOD15A2H	MODIS/Terra Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2000-02-26	2019-04-23
MOD16A2	MODIS/Terra Net Evapotranspiration (ET)	8-Day	500	2001-01-01	2019-04-15
MOD17A2H	MODIS/Terra Gross Primary Productivity (GPP)	8-Day	500	2000-02-26	2019-04-15
MOD17A3H	MODIS/Terra Net Primary Production (NPP)	Yearly	500	2000-01-01	2014-01-01
MOD44B	MODIS/Terra Vegetation Continuous Fields (VCF)	Yearly	250	2000-03-05	2017-03-06
MYD09A1	MODIS/Aqua Surface Reflectance (SREF)	8-Day	500	2002-07-04	2019-04-15
MYD11A2	MODIS/Aqua Land Surface Temperature and Emissivity (LST)	8-Day	1000	2002-07-04	2019-04-15

Timeseries View

Stack by Year

MOD13Q1 / 250m_16_days_NDVI (All acceptable pixels)



MOD13Q1 / 250m_16_days_EVI (All acceptable pixels)

Gridded View

Additional Information

Land Cover | Phenology

MODIS Landcover IGBP Classification Scheme (Type_1 MCD12Q1 2016)

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Fixed Sites Subsets Tool : Network - NEON

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125 COUNTRIES

2802 SITES

Show 20 entries

Filter sites:

Network_ID	Network	Country	Latitude	Longitude
ABBY	NEON	United States of America	45.7624 N	122.3303 W
ARIK	NEON	United States of America	39.7582 N	102.4471 W
BARC	NEON	United States of America	29.6765 N	82.0091 W
BARR	NEON	United States of America	71.2824 N	156.6194 W
BART	NEON	United States of America	44.0639 N	71.2873 W
BIGC	NEON	United States of America	37.0580 N	119.2560 W
BLAN	NEON	United States of America	39.0603 N	78.0716 W
BLDE	NEON	United States of America	44.9501 N	110.5871 W
BLUE	NEON	United States of America	34.4442 N	96.6242 W
BLWA	NEON	United States of America	32.5415 N	87.7982 W

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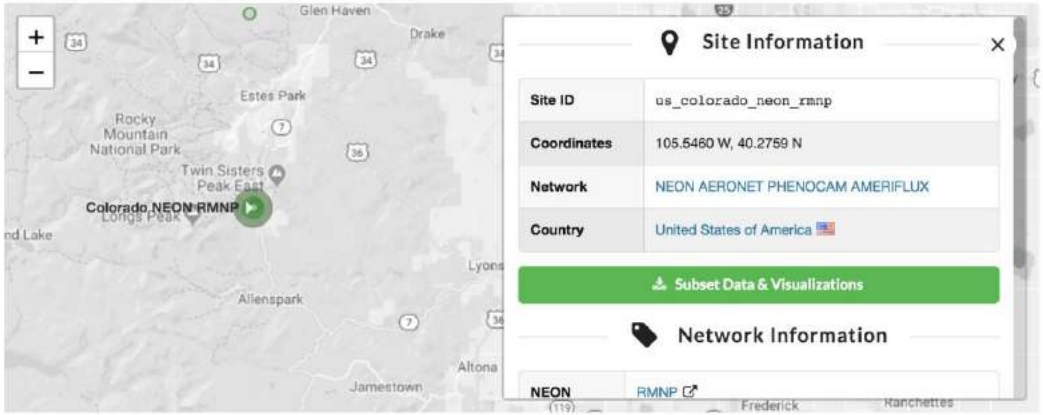

Site Information

Site ID	us_colorado_neon_rmnp
Coordinates	105.5460 W, 40.2759 N
Network	NEON AERONET PHENOCAM AMERIFLUX
Country	United States of America

Subset Data & Visualizations

Network Information

NEON	RMNP

Filter products:

Product	Product Name	Frequency	Resolution (m)	Start Date	End Date
MODIS Collection 6					
MCD15A2H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2002-07-04	2019-04-23
MCD15A3H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	4-Day	500	2002-07-04	2019-04-27
MOD09A1	MODIS/Terra Surface Reflectance (SREF)	8-Day	500	2000-02-18	2019-04-23
MOD11A2	MODIS/Terra Land Surface Temperature and Emissivity (LST)	8-Day	1000	2000-02-18	2019-04-23
MOD13Q1	MODIS/Terra Vegetation Indices (NDVI/EVI)	16-Day	250	2000-02-18	2019-04-07
MOD15A2H	MODIS/Terra Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2000-02-18	2019-04-23
MOD16A2	MODIS/Terra Net Evapotranspiration (ET)	8-Day	500	2001-01-01	2019-04-15
MOD17A2H	MODIS/Terra Gross Primary Productivity (GPP)	8-Day	500	2000-02-18	2019-04-15
MOD17A3H	MODIS/Terra Net Primary Production (NPP)	Yearly	500	2000-01-01	2014-01-01

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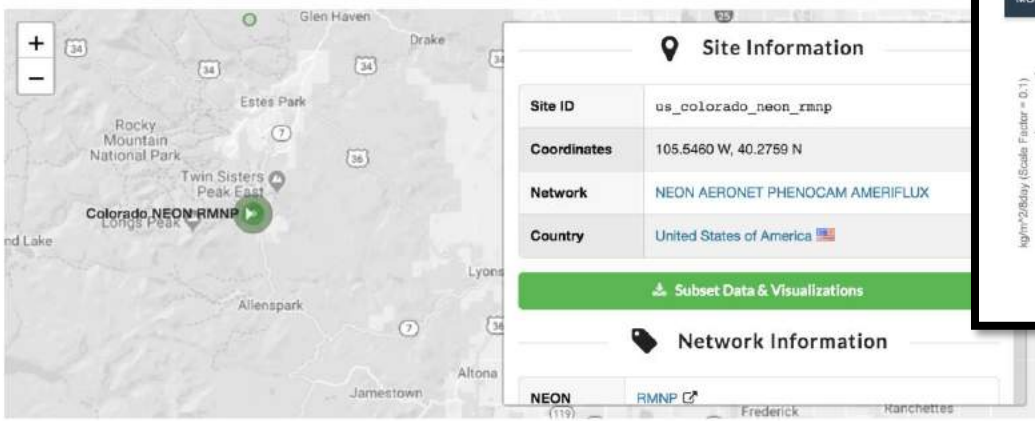

Site Information

Site ID	us_colorado_neon_rmnp
Coordinates	105.5460 W, 40.2759 N
Network	NEON AERONET PHENOCAM AMERIFLUX
Country	United States of America

Subset Data & Visualizations

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NEON	RMNP

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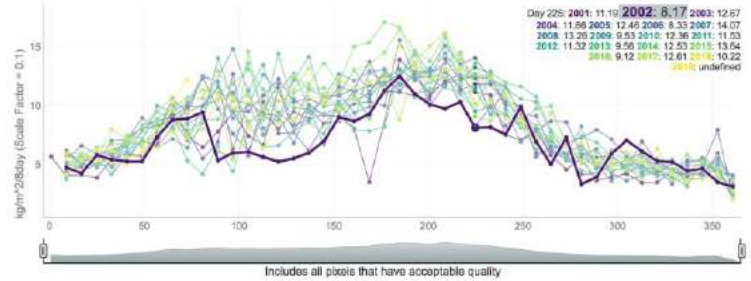
MCD15A3H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	4-Day	500	2002-07-04	2019-04-27
MOD09A1	MODIS/Terra Surface Reflectance (SREF)	8-Day	500	2000-02-18	2019-04-23
MOD11A2	MODIS/Terra Land Surface Temperature and Emissivity (LST)	8-Day	1000	2000-02-18	2019-04-23
MOD13Q1	MODIS/Terra Vegetation Indices (NDVI/EVI)	16-Day	250	2000-02-18	2019-04-07
MOD15A2H	MODIS/Terra Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2000-02-18	2019-04-23
MOD16A2	MODIS/Terra Net Evapotranspiration (ET)	8-Day	500	2001-01-01	2019-04-15
MOD17A2H	MODIS/Terra Gross Primary Productivity (GPP)	8-Day	500	2000-02-18	2019-04-15
MOD17A3H	MODIS/Terra Net Primary Production (NPP)	Yearly	500	2000-01-01	2014-01-01

Timeseries View

Stack by Year

MOD16A2 / ET_500m (All acceptable pixels)



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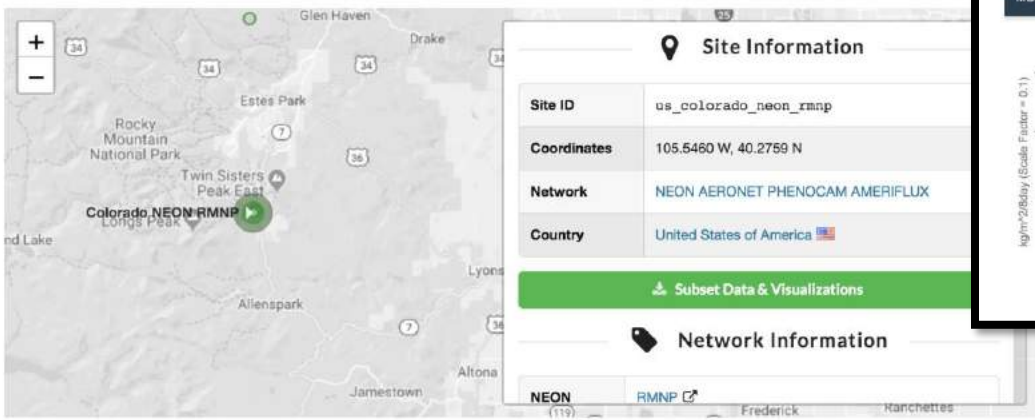


Site Information

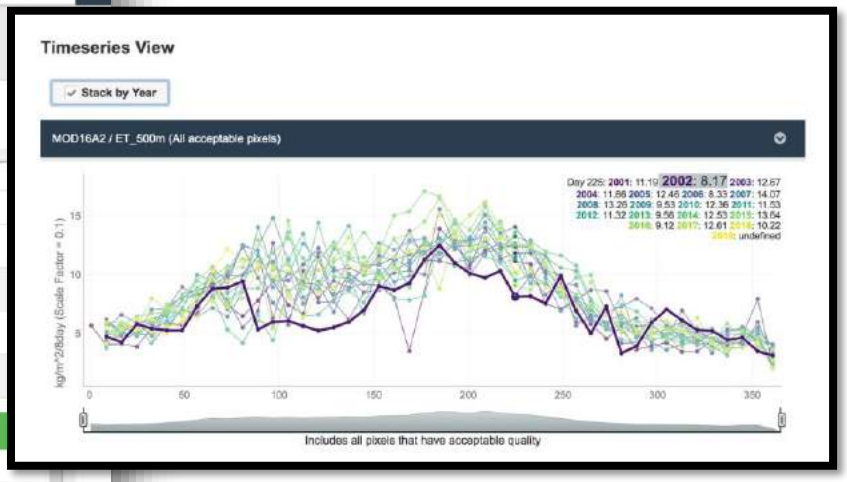
Site ID	us_colorado_neon_rmnp
Coordinates	105.5460 W, 40.2759 N
Network	NEON AERONET PHENOCAM AMERIFLUX
Country	United States of America

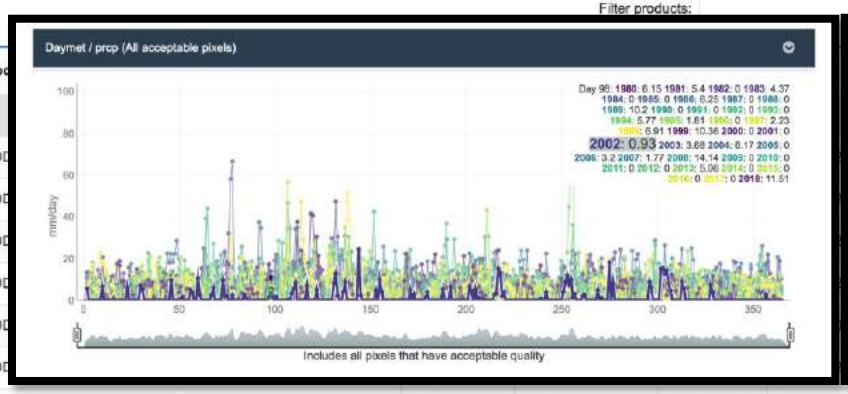
Subset Data & Visualizations

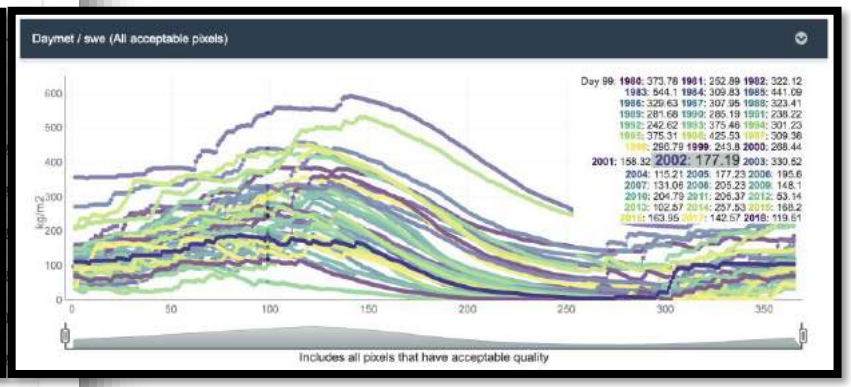
Network Information

NEON	RMNP

Filter products:







Product	Prod				
MODIS Collection 6					
MCD15A2H	MOD				
MCD15A3H	MOD				
MOD09A1	MOD				
MOD11A2	MOD				
MOD13Q1	MOD				
MOD15A2H	MOD				
MOD16A2	MODIS/Terra Net Evapotranspiration (ET)	8-Day	500	2001-01-01	2019-04-15
MOD17A2H	MODIS/Terra Gross Primary Productivity (GPP)	8-Day	500	2000-02-18	2019-04-15
MOD17A3H	MODIS/Terra Net Primary Production (NPP)	Yearly	500	2000-01-01	2014-01-01

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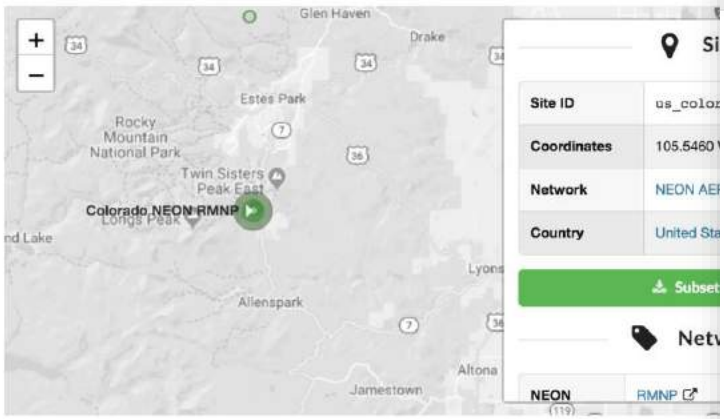

Site ID	us_colo
Coordinates	105.5460
Network	NEON AE
Country	United Sta

Subset

Netw

NEON RMNP

Product	Product Name	Frequency	Resolution (m)	Start Date	End Date
MODIS Collection 6					
MCD15A2H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2002-07-04	2019-04-23
MCD15A3H	MODIS/Terra+Aqua Leaf Area Index/FPAR (LAI/FPAR)	4-Day	500	2002-07-04	2019-04-27
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MOD11A2	MODIS/Terra Land Surface Temperature and Emissivity (LST)	8-Day	1000	2000-02-18	2019-04-23
MOD13Q1	MODIS/Terra Vegetation Indices (NDVI/EVI)	16-Day	250	2000-02-18	2019-04-07
MOD15A2H	MODIS/Terra Leaf Area Index/FPAR (LAI/FPAR)	8-Day	500	2000-02-18	2019-04-23
MOD16A2	MODIS/Terra Net Evapotranspiration (ET)	8-Day	500	2001-01-01	2019-04-15
MOD17A2H	MODIS/Terra Gross Primary Productivity (GPP)	8-Day	500	2000-02-18	2019-04-15
MOD17A3H	MODIS/Terra Net Primary Production (NPP)	Yearly	500	2000-01-01	2014-01-01

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MODIS/Terra Net Evapotranspiration (ET) at Colorado NEON RMNP

Download

Download Data | Subset Summary | Citation | Location | QC Details

Band	Description	Data Bands	Quality Filtered and Scaled	Summary Data
ET_500m	Evapotranspiration	csv, json	csv, json	csv, json
LE_500m	Latent heat flux	csv, json	csv, json	csv, json
PET_500m	Potential evapotranspiration	csv, json	csv, json	csv, json
PLE_500m	Potential latent heat flux	csv, json	csv, json	csv, json
ET_QC_500m	QC for ET/LE	csv, json		
All Bands		csv, json	csv, json	csv, json

See File Formats documentation for details. Pixel Numbering Scheme

Hands-on Demos

1. Explore spatial data at ORNL DAAC and download custom subsets and maps. https://webmap.ornl.gov/ogc

2. Download and analyze Daymet climate data, MODIS NDVI, and tree mortality data in Python using by calling three ORNL DAAC webservices. http://bit.ly/ornldaac-usfs-ws

Access many more guides and tutorials on ORNL DAAC's Resources page at https://daac.ornl.gov/resources/learning/

I would love to help you find the data you need!

Alison Boyer – boyerag@ornl.gov