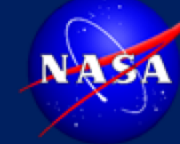


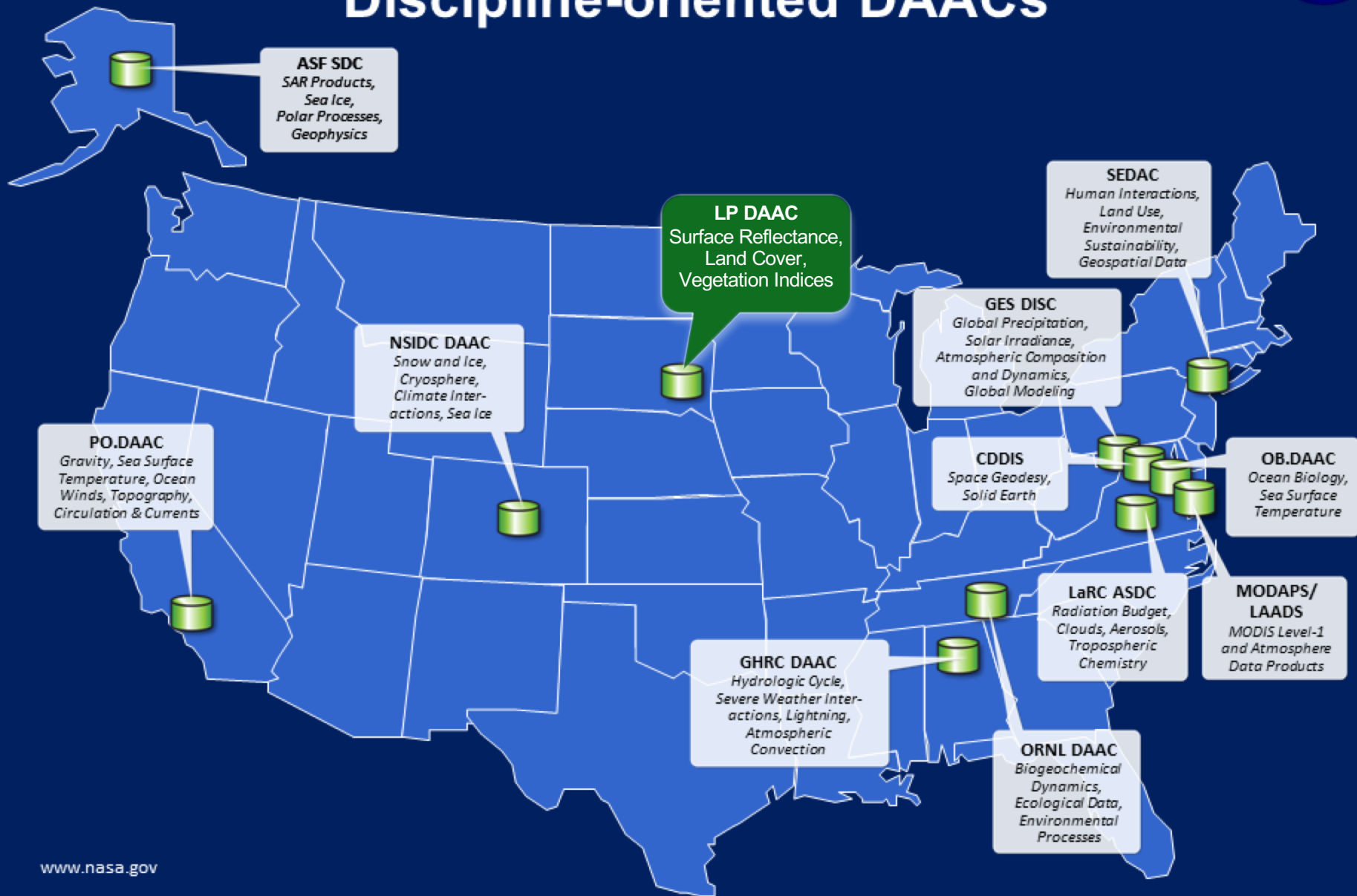
1. MODIS Snow Cover

2. Application for Extracting and Exploring Analysis-Ready Samples (AppEEARS)

Tom Maiersperger
Geographer, USGS
NASA LP DAAC Project Scientist
USGS EROS Center
Sioux Falls, South Dakota
tmaiersperger@usgs.gov



Discipline-oriented DAACs



LP DAAC

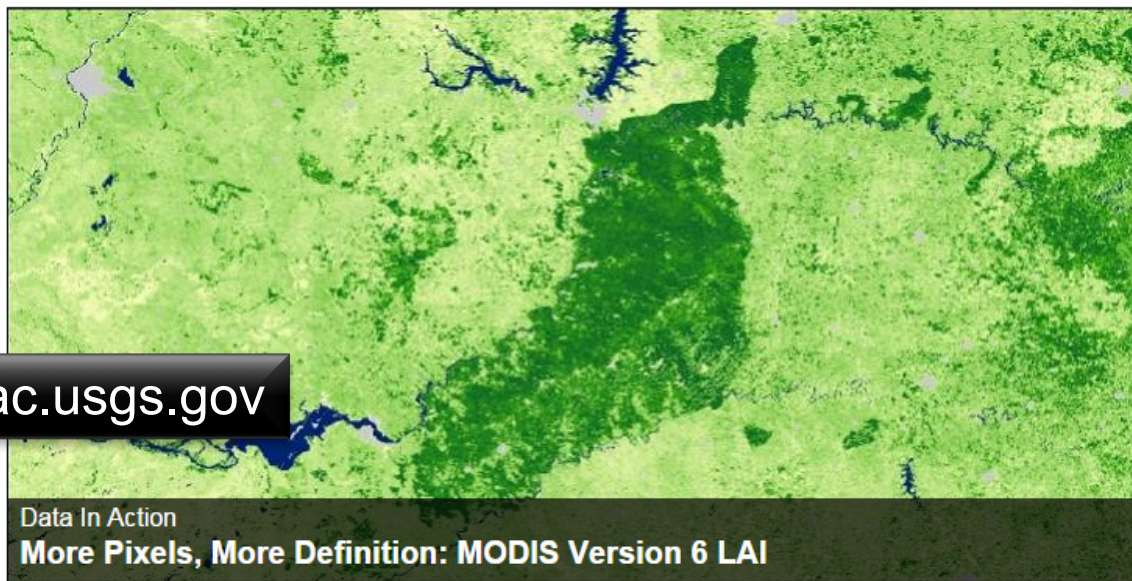
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Site ▾

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The LP DAAC website has recently been updated. Please check your bookmarks for outdated or broken links.



Data In Action

More Pixels, More Definition: MODIS Version 6 LAI[View more](#)

<https://lpdaac.usgs.gov>

NASA and USGS Partnership



The Land Processes Distributed Active Archive Center (LP DAAC) is one of several discipline-specific data centers within the NASA Earth Observing System Data and Information System (EOSDIS). The LP DAAC is located at the USGS Earth Resources Observation and Science (EROS) Center in Sioux Falls, South Dakota.

News

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02/17/2016

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Home > Dataset Discovery > Vegetation Indices

Product

- Vegetation Indices
- Temperature and Emissivity (8)
- Elevation (8)

Dataset

- Aqua MODIS (12)
- Terra MODIS (12)
- ASTER GED (8)

Dataset Version

- 3 (8)
- 5 (12)
- 6 (12)

Temporal Granularity

- Composites (16)
- Monthly (8)
- Static (8)

Pixel Size

- 100 (4)
- 250 (4)
- 500 (4)
- 1000 (12)
- 5600 (8)

✦ Spatial Extent

✦ Data Access

✦ Temporal Range

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About ▾ Dataset Discovery ▾ Citing Our Data

Home > Dataset Discovery > Vegetation Indices

Product

Vegetation Indices

Temperature and Emissivity (8)

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Dataset

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Pixel Size

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5600 (8)

Spatial Extent

Data Access

Temporal Range

MOD13A3

MODIS/Terra Vegetation Indices Monthly L3 Global 1km Grid SIN

Vegetation Indices

Terra MODIS

Dataset Version: 6

Temporal Granularity: Monthly

Pixel Size: 1000

Spatial Extent: Global

Data Access: Data Pool, EarthExplorer, GloVis, MRTWeb, Reverb, Earthdata Search Client



MOD13A3

Name: MODIS/Terra Vegetation Indices Monthly L3 Global 1km Grid SIN

Product: Vegetation Indices

Dataset: Terra MODIS

Dataset Version: 6

Temporal Granularity: Monthly

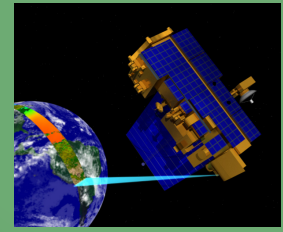
Pixel Size: 1000

Spatial Extent: Global

Data Access: Data Pool, EarthExplorer, GloVis, MRTWeb, Reverb, Earthdata Search Client

https://lpdaac.usgs.gov/dataset_discovery/

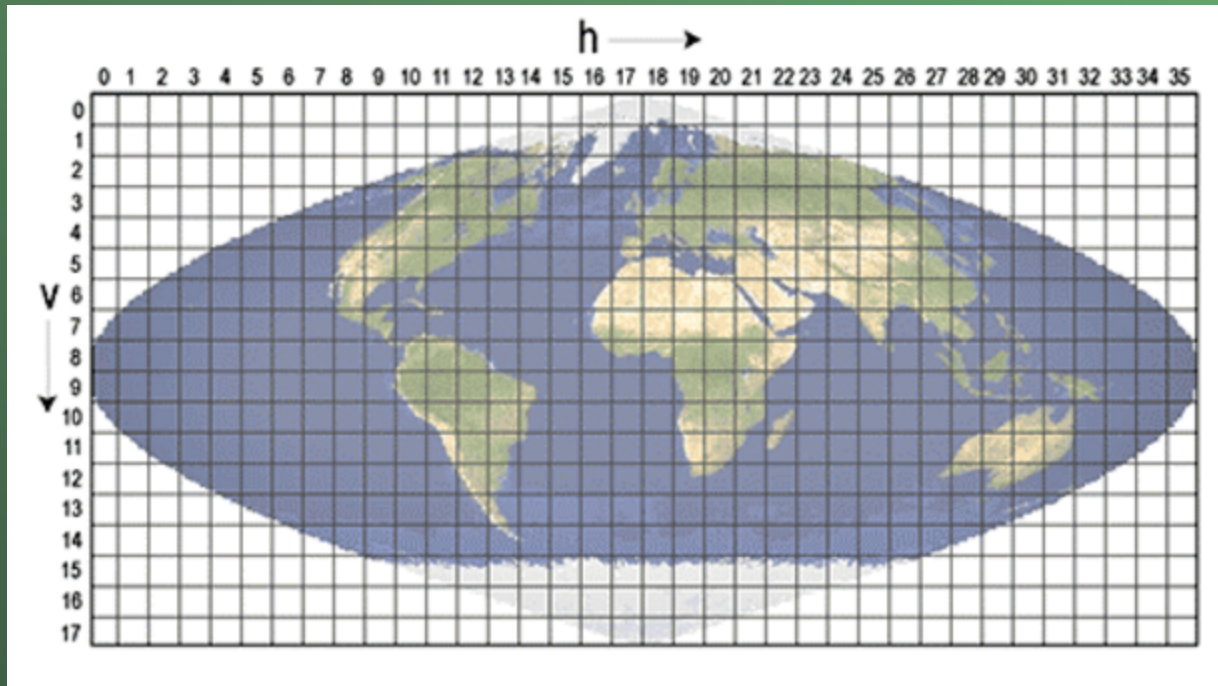
MODIS Quick Facts



- Moderate Resolution Imaging Spectroradiometer (MODIS)
- On board NASA's Terra (10:30 am) and Aqua (1:30 pm) satellites

Temporal Extent	2000 (Terra), 2002 (Aqua) - Present
Temporal Resolution	Near-daily
Geographic Extent	Global
Spatial Resolution	250 m, 500 m, 1,000 m, 5,600 m
Versioning	Currently in v6 (v5 will be retired)

MODIS L2G Data Structure



MODIS Sinusoidal
Tile Grid.
Tiles cover
 $10^{\circ} \times 10^{\circ}$ at the
equator or
approximately
1200 km by 1200
km.

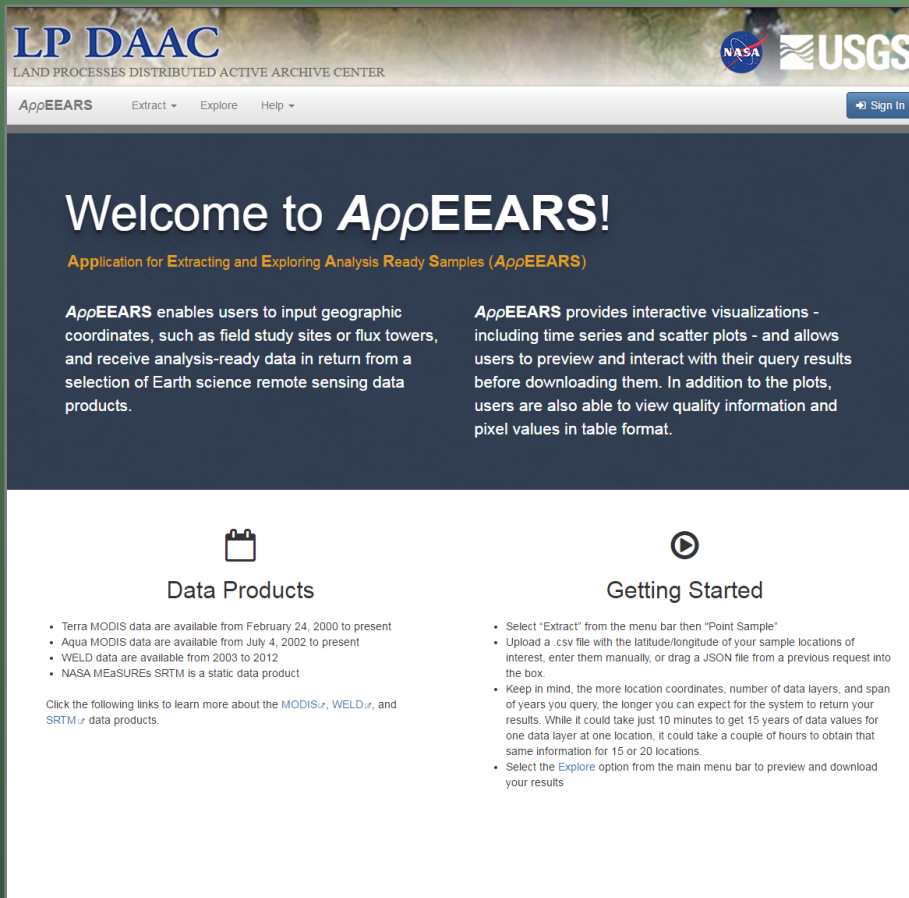
Tiles are archived in Hierarchical Data Format (HDF)

MODIS Snow Data at NSIDC DAAC*

ID	Title	Spatial Resolution	Temporal Resolution	Parameters
MYD10A1	<u>MODIS/Aqua Snow Cover Daily L3 Global 500m Grid, Version 6</u>	500 m	1 day	Albedo, Snow Cover
MOD10A1	<u>MODIS/Terra Snow Cover Daily L3 Global 500m Grid, Version 6</u>	500 m	1 day	Albedo, Snow Cover
MYD10A2	<u>MODIS/Aqua Snow Cover 8-Day L3 Global 500m Grid, Version 6</u>	500 m	8 day	Snow Extent
MOD10A2	<u>MODIS/Terra Snow Cover 8-Day L3 Global 500m Grid, Version 6</u>	500 m	8 day	Snow Extent

* Selected datasets; full list at https://nsidc.org/data/modis/data_summaries

AppEEARS Fast Facts



The screenshot shows the AppEEARS website interface. At the top left is the LP DAAC logo (Land Processes Distributed Active Archive Center) with NASA and USGS logos to its right. A navigation bar includes 'AppEEARS', 'Extract', 'Explore', 'Help', and a 'Sign In' button. The main content area has a dark blue header with the text 'Welcome to AppEEARS!' and a sub-header 'Application for Extracting and Exploring Analysis Ready Samples (AppEEARS)'. Below this are two columns of text: the left column describes how users can input geographic coordinates to receive analysis-ready data, and the right column describes interactive visualizations like time series and scatter plots. At the bottom, there are two sections: 'Data Products' with a calendar icon and a list of data sources (Terra MODIS, Aqua MODIS, WELD, NASA MEASURES SRTM), and 'Getting Started' with a play button icon and a list of steps for using the application.

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AppEEARS Extract Explore Help Sign In

Welcome to AppEEARS!

Application for Extracting and Exploring Analysis Ready Samples (AppEEARS)

AppEEARS enables users to input geographic coordinates, such as field study sites or flux towers, and receive analysis-ready data in return from a selection of Earth science remote sensing data products.

AppEEARS provides interactive visualizations - including time series and scatter plots - and allows users to preview and interact with their query results before downloading them. In addition to the plots, users are also able to view quality information and pixel values in table format.

Data Products

- Terra MODIS data are available from February 24, 2000 to present
- Aqua MODIS data are available from July 4, 2002 to present
- WELD data are available from 2003 to 2012
- NASA MEASURES SRTM is a static data product

Click the following links to learn more about the MODIS, WELD, and SRTM data products.

Getting Started

- Select "Extract" from the menu bar then "Point Sample"
- Upload a .csv file with the latitude/longitude of your sample locations of interest, enter them manually, or drag a JSON file from a previous request into the box.
- Keep in mind, the more location coordinates, number of data layers, and span of years you query, the longer you can expect for the system to return your results. While it could take just 10 minutes to get 15 years of data values for one data layer at one location, it could take a couple of hours to obtain that same information for 15 or 20 locations.
- Select the Explore option from the main menu bar to preview and download your results

Application for Extracting and Exploring Analysis-Ready Samples

Led by the NASA Land Processes Distributed Active Archive Center (LP DAAC), but also leverages other federal archive partnerships to extend the capability across a larger network of source data

AppEEARS Value

- ✓ *Significantly reducing data volumes, at-archive, based on user-defined space-time-variable subsets*
 - ✓ *Promoting interoperability across a wide variety of datasets via format and coordinate reference system harmonization*
 - ✓ *Increasing the velocity of data analysis by providing harmonized data bundles and of data insight by allowing interactive exploration of extracted datasets*
 - ✓ *Ensuring the veracity of data by making quality measures more apparent and usable, by generating standards-based metadata, and by providing data and processing provenance*
-

AppEEARS Datasets

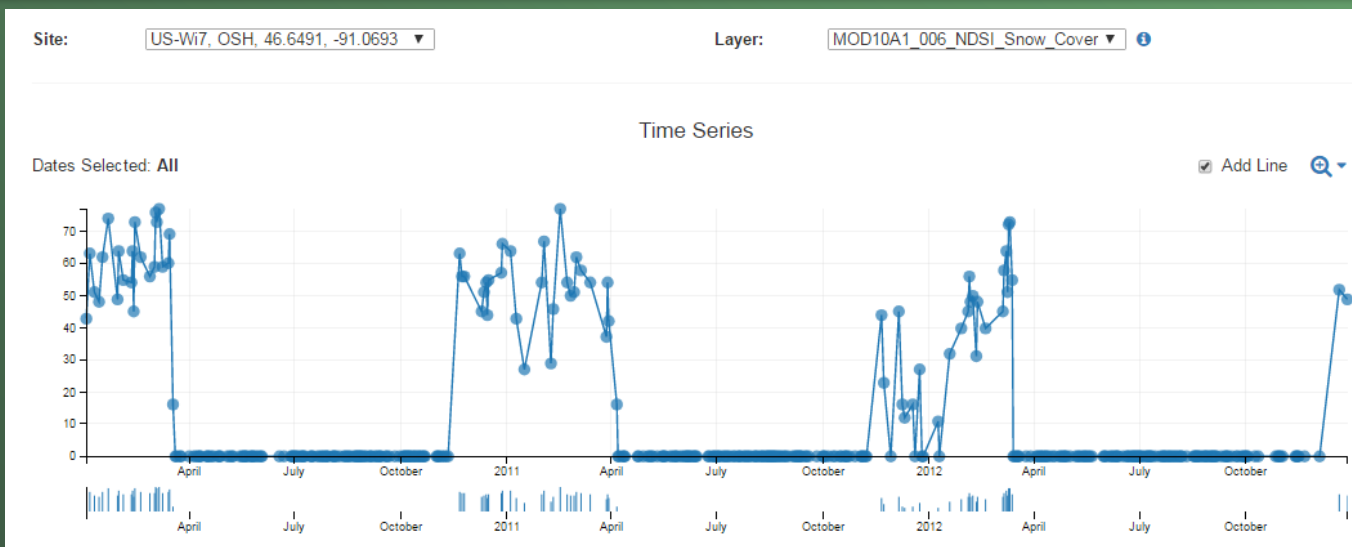
- **Current: Over 100 unique datasets from MODIS, SRTM, and Landsat WELD**
- **In Progress:**
 - **DAYMET (source archive: ORNL)**
 - **Gridded Population of the World (SEDAC)**
 - **NASA VIIRS Land Datasets (LP DAAC)**
 - **Landsat Level-2 Surface Reflectance (USGS)**
- **Potential Future: NLCD (USGS), SMAP (NSIDC)...**

Example Request: **EXTRACTING** and **EXPLORING** a **POINT-BASED SAMPLE**

- **Variables of Interest:**
 - MODIS Daily Snow Cover (MOD10A1.006)
 - MODIS 4-Day FPAR (MCD15A3H.006)
- **Points of Interest: 40 AmeriFlux tower locations within the MCI**
- **Date Range of Interest: 2010 – 2012**
- **Output File Format: CSV**
- **Set-up Time: < 10 minutes; Total Processing Time at-Archive: ~6 hours**
- **Data Volume Reduction: ~90,000x (~26 GB of input processed to ~320 KB of output)**
- **Number of Archives Queried: 2 (LP DAAC, NSIDC)**

Example Results: EXTRACTING and EXPLORING a POINT-BASED SAMPLE

1	Category	ID	Latitude	Longitude	Date	MCD15 A3H_00 6_Fpar_ 500m	MCD15 A3H_00 6_FparL ai_QC	MCD15A3H_ 006_FparLai _QC_MODL AND_Descri	MCD15A3 H_006_Fp arLai_QC_ Sensor_De	MCD15A3H_006_FparLai_QC_CloudStat _e_Description	MCD15A3H_006_FparLai_QC_SCF_QC_Description
218	DBF	US-MMS	39.3232	-86.4131	1/21/2010	0.01	107	Other Quality Aqua		Significant clouds WERE present	Main (RT) method failed due to problems other than geometry, empirical algorithm used
219	DBF	US-MOz	38.7441	-92.2	1/21/2010	0.34	2	Good quality Aqua		Significant clouds NOT present (clear)	Main (RT) method used, best result possible (no saturation)
220	DBF	US-WCr	45.8059	-90.0799	1/21/2010	0.02	113	Other Quality Terra		Mixed cloud present in pixel	Main (RT) method failed due to problems other than geometry, empirical algorithm used
221	DBF	US-Wi1	46.7305	-91.2329	1/21/2010	0.03	97	Other Quality Terra		Significant clouds NOT present (clear)	Main (RT) method failed due to problems other than geometry, empirical algorithm used
222	DBF	US-Wi3	46.6347	-91.0987	1/21/2010	0.03	97	Other Quality Terra		Significant clouds NOT present (clear)	Main (RT) method failed due to problems other than geometry, empirical algorithm used
223	DBF	US-Wi8	46.7223	-91.2524	1/21/2010	0.04	97	Other Quality Terra		Significant clouds NOT present (clear)	Main (RT) method failed due to problems other than geometry, empirical algorithm used
224	ENF	US-Wi0	46.6188	-91.0814	1/21/2010	0.42	0	Good quality Terra		Significant clouds NOT present (clear)	Main (RT) method used, best result possible (no saturation)
225	ENF	US-Wi2	46.6869	-91.1528	1/21/2010	0.15	97	Other Quality Terra		Significant clouds NOT present (clear)	Main (RT) method failed due to problems other than geometry, empirical algorithm used
226	ENF	US-Wi4	46.7393	-91.1663	1/21/2010	0.2	18	Good quality Aqua		Mixed cloud present in pixel	Main (RT) method used, best result possible (no saturation)

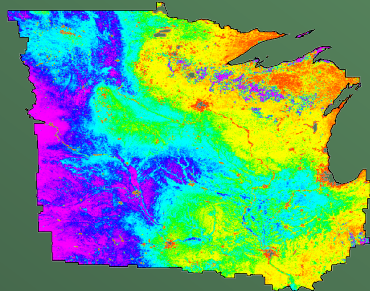


Example Request: **EXTRACTING** and **EXPLORING** a **POLYGON-BASED SAMPLE**

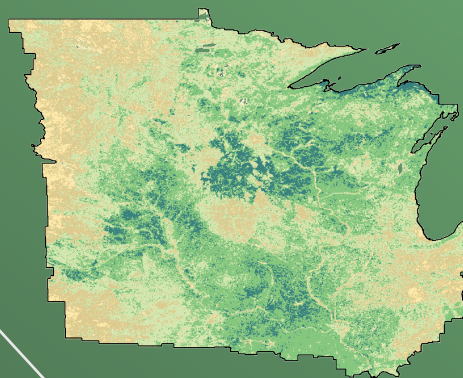
- **Variables of Interest:**
 - SRTM Elevation (MOD10A1.006)
 - MODIS 16-Day EVI (MOD13A1.006)
 - MODIS Annual NPP (MOD17A3H.006)
 - Landsat Annual NDVI (WELDUSYR.001)
- **Area of Interest: NACP Mid-Continent Intensive**
- **Date Range of Interest: 2010 – 2012**
- **Output Projection: Geographic**
- **Output File Format: GeoTIFF**
- **Set-up Time: < 10 minutes; Total Processing Time at-Archive: ~7 hours**
- **Data Volume Reduction: ~6x (~100 GB of input processed to ~17 GB of output)**
- **Interoperability: 3 tiling schemes, 3 projections, and 2 formats**

harmonized to area of interest mosaic in single projection and format

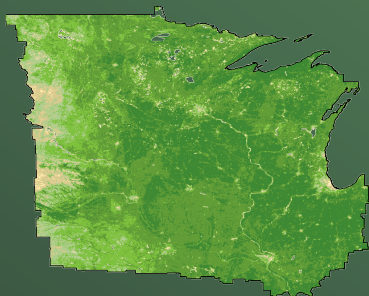
Example Results: EXTRACTING and EXPLORING a POLYGON-BASED SAMPLE



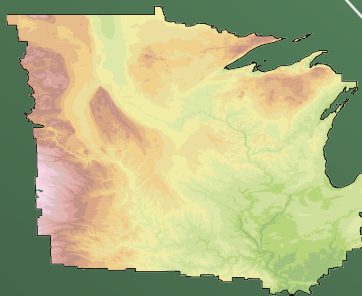
MODIS Annual NPP(x3)



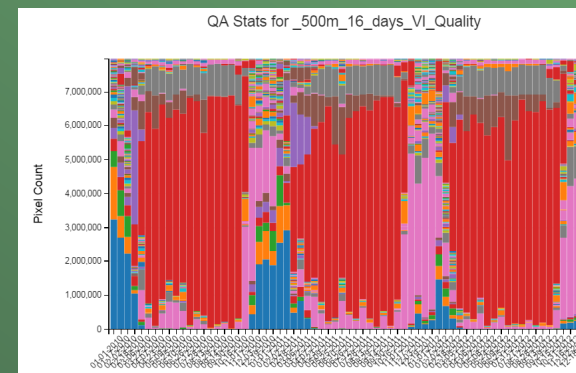
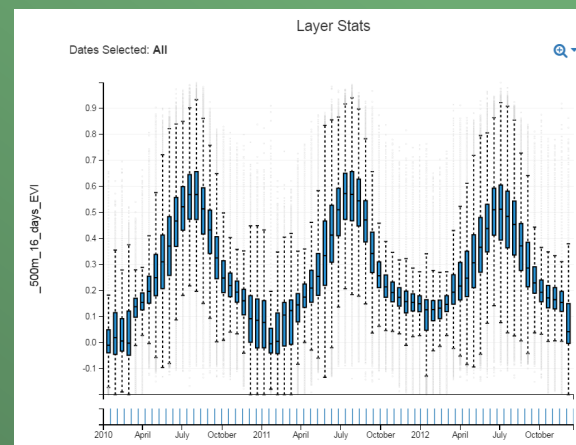
MODIS 16-Day EVI (x69)



Landsat Annual NDVI (x3)



SRTM Elevation (static)



AppEEARS Demo

<https://lpdaacsvc.cr.usgs.gov/appeears/>

Point (operational)

Polygon (alpha – publicly available
~ May 2017)