A satellite with large solar panels is shown in space, orbiting Earth. The satellite is positioned diagonally across the frame, with its solar panels extending from the top right towards the bottom left. The Earth's surface is visible below, showing a mix of blue oceans, white clouds, and brownish-green landmasses. The background is the dark void of space with some faint stars.

Time series analysis using MODIS subsets

NASA's Oak Ridge National Laboratory has developed a web-based application **MODIS Land Product Subsets**. This application generates time series of MODIS Land Products for user-specified limited-area sites. Output files contain pixel values of MODIS land products in text format and in GeoTIFF format. Data visualizations (time series plots and grids showing single composite periods) are available.

The screenshot shows the 'MODIS/VIIRS Subsets' web application. The header includes the NASA logo and 'EARTHDATA' branding. The main navigation bar contains links for 'Get Data', 'Documentation', 'Resources', 'Publications', 'Citation', and 'Sign in'. The 'Get Data' section is highlighted, and the page content is organized into three columns:

- Global Subsets Tool:** A map showing a region around Kalida, India, with a red polygon indicating a subset area. Below the map is a description: "Request a subset for any location on earth, provided as GeoTiff and text format, including interactive time-series plots and more. Users specify a site by entering the site's geographic coordinates and the area surrounding that site, from one pixel up to 201 x 201 km." A link for "Global Subsets Tool" and a "Read more" dropdown are provided.
- Fixed Sites Subsets Tool:** A world map showing numerous red dots representing fixed sites. Below the map is a description: "Download pre-processed subsets for 2000+ field and flux tower sites for validation of models and remote sensing products. The goal of the Fixed Sites Subsets Tool is to prepare summaries of selected data products for the community to characterize field sites." A link for "Download Fixed Sites Subsets" and a "Read more" dropdown are provided.
- Web Service:** A code snippet showing a REST API endpoint and a JSON response. Below the code is a description: "Retrieve subset data (in real-time) for any location(s), time period and area programmatically using a REST web service. Web service client and libraries are available in multiple programming languages, allowing integration of subsets into users' workflow." A link for "Use Web Service" and a "Read more" dropdown are provided.

The footer of the page includes the Oak Ridge National Laboratory logo and links for "Privacy Policy", "Feedback", and "Help". Social media icons for Twitter, YouTube, Facebook, and RSS are also present.

On the web:

<https://modis.ornl.gov/data.html>

click **“Global Subset Tool”** to begin

MODIS Land Product Subsets Features

- 14 MODIS land surface products derived from MODIS Terra and Aqua including
 - NDVI (Normalized Difference Vegetation Index)
 - EVI (Enhanced Vegetation Index)
 - Surface Temperature,
 - Leaf Area index, etc.
- Time range covered: Feb 2000 to now
- Land products are available at 16-days time interval
 - The best observation (taken at the “clearest” sky) is retained
- Order data in four easy steps

Steps to order data

1. Select location

The screenshot displays the 'Global Subsets Tool: MODIS/VIIRS Land Products' interface. At the top, there is a navigation bar with 'EARTHDATA', 'Other DAACs', 'Feedback', and a question mark icon. Below this is a header for 'MODIS/VIIRS Subsets' with the ORNL DAAC logo and a NASA logo. A secondary navigation bar includes 'Get Data', 'Documentation', 'Resources', 'Publications', 'Citation', and 'Sign in'. The main content area is titled 'Global Subsets Tool: MODIS/VIIRS Land Products' and features a step indicator '1. Specify the Location(s): 1 of maximum 30 locations'. A map of the world is shown with a red location marker over the eastern United States. A tooltip above the marker says 'Click and drag the marker to select location'. To the left of the map are zoom in (+) and zoom out (-) buttons. Below the map, a details panel shows 'ID: 1', 'Point', 'Location: 35.9625°, -84.295822°', and 'Subset Size: 3 km (N-S) x 3 km (E-W)'. At the bottom of the details panel are icons for edit, search, and delete. Below the details panel are two buttons: 'Sign in to Add Location' and 'Delete All'. A second step indicator at the bottom reads '2. Select the Product(s): 1 of 30 products selected'.

Click and drag the balloon to select location

Zoom in and out the map

Or enter latitude and longitude of the center pixel

MODIS/VIIRS Subsets

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



Get Data

Documentation

Resources

Publications

Citation

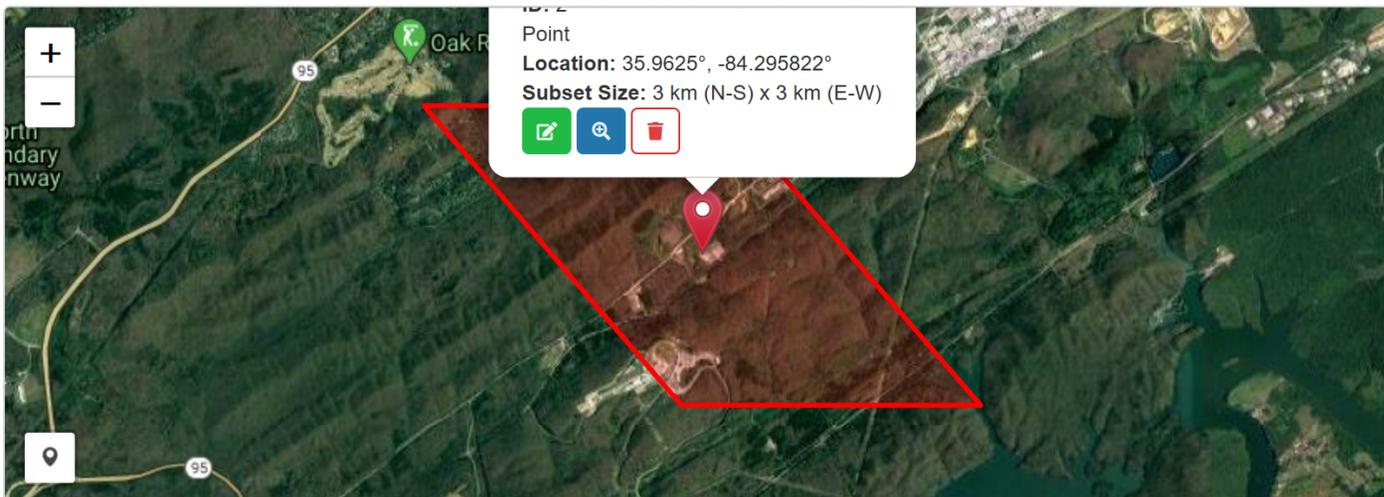
History

Sign out

Home > Get Data > Global Subsets Tool

Global Subsets Tool: MODIS/VIIRS Land Products

1. Specify the Location(s): 2 of maximum 30 locations



ID: 1

Point

Location: 51.46496°, 15.85011°

Subset Size: 3 km (N-S) x 3 km (E-W)



ID: 2

Point

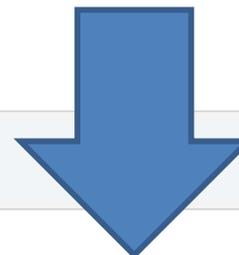
Location: 35.9625°, -84.295822°

Subset Size: 3 km (N-S) x 3 km (E-W)



+ Add Location

Delete All



2. Select the Product(s): 1 of 30 products selected

MOD13Q1 ✕

MOD13Q1 ⓘ Vegetation Indices (NDVI/EVI) (Terra), 16-Day, 250m ✕ Unselect	VNP13A1 ⓘ Vegetation Indices (NDVI/EVI) (S-NPP), 16-Day, 500m + Select	MYD13Q1 ⓘ Vegetation Indices (NDVI/EVI) (Aqua), 16-Day, 250m + Select	MOD44B ⓘ Vegetation Continuous Fields (VCF) (Terra), Yearly, 250m + Select
MOD14A2 ⓘ Thermal Anomalies and Fire (Terra), 8-Day, 1000m + Select	MYD14A2 ⓘ Thermal Anomalies and Fire (Aqua), 8-Day, 1000m + Select	MOD09A1 ⓘ Surface Reflectance (Terra), 8-Day, 500m + Select	VNP09H1 ⓘ Surface Reflectance (S-NPP), 8-Day, 500m + Select
VNP09A1 ⓘ Surface Reflectance (S-NPP), 8-Day, 1000m	MYD09A1 ⓘ Surface Reflectance (Aqua), 8-Day, 500m	MOD17A3H ⓘ Net Primary Production (NPP) (Terra), Yearly, 500m	MYD17A3H ⓘ Net Primary Production (NPP) (Aqua), Yearly, 500m

Filter Products by Sensor **Filter Products by Variable**

MODIS-Aqua ✕ Vegetation Indices ✕

3. Select the Dates

Start date

📅 January 1, 2001

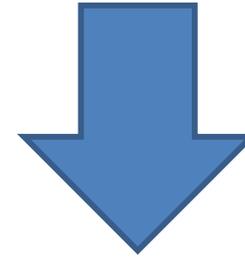
End date

📅 June 17, 2020

MYD13Q1

Vegetation Indices
(NDVI/EVI) (Aqua), 16-Day,
250m

+ Select



Filter Products by Sensor

MODIS-Aqua ✕

Filter Products by Variable

Vegetation Indices ✕

3. Select the Dates

Start date

📅 January 1, 2001

End date

📅 June 17, 2020

4. Additional Options

File Formats (Optional)

Generate Geotiffs?

Select Projection

MODIS Sinusoidal Projection

Geographic Lat/long

Submit Order

Tool Citation: ORNL DAAC. 2018. MODIS and VIIRS Land Products Global Subsetting and Visualization Tool. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1379>

[Citation Policy](#)

Home > Get Data > Global Subsets Tool

Global Subsets Tool: MODIS/VIIRS Land Products

Your order is submitted!

Thank you for submitting your order. You will receive email notification to tlakhankar@ccny.cuny.edu as your order completes.

Order Summary: Timeperiod: 2019-06-01 to 2020-06-17

Product: MOD13Q1

ID: 1 Point Location: 51.46496°, 15.85011° Subset Size: 3 km (N-S) x 3 km (E-W)	ID: 2 Point Location: 35.9625°, -84.295822° Subset Size: 3 km (N-S) x 3 km (E-W)
---	--

Track your order [Order History](#)

Start another order: [Global Subsets Tool](#)

 [Privacy Policy](#) | [Feedback](#) | [Help](#)     

Link to a web page containing generated datasets and charts will arrive in an email.

Typical waiting time is 5-6 hours.

Some time later you should receive an e-mail

[EXTERNAL] MODIS MOD13Q1 Col. 6 Subset Order (ORNL DAAC)



ORNL DAAC MODIS Subsets <MODIS_Subsets@daac.ornl.gov>
To: Tarendra Lakhankar

Reply Reply All Forward

Thu 6/25/2020 5:43 AM

If there are problems with how this message is displayed, click here to view it in a web browser.

Your ORNL DAAC MODIS/VIIRS Subset Order is Ready

Thank you for using the MODIS/VIIRS Land Products Global Subsetting Tool at the ORNL DAAC. Your order has been processed and is ready to download.

[Access Order](#)

Click to access your order, or copy and paste the following link into your browser:

https://modis.ornl.gov/subsetdata/24Jun2020_22:24:36_138635841151.46496115.85011525L25_MOD13Q1_1

Citations

[1] ORNL DAAC. 2018. MODIS and VIIRS Land Products Global Subsetting and Visualization Tool. ORNL DAAC, Oak Ridge, Tennessee, USA. Accessed June 24, 2020. Subset obtained for MOD13Q1 product at 51.4649N,15.8501E, time period: 2019-06-01 to 2020-06-17, and subset size: 6.25 x 6.25 km.
<https://doi.org/10.3334/ORNLDAAC/1379>

[2] K. Didan. 2015. MOD13Q1 MODIS/Terra Vegetation Indices 16-Day L3 Global 250m SIN Grid V006. NASA EOSDIS Land Processes DAAC. <https://doi.org/10.5067/MODIS/MOD13Q1.006>

Order Summary

Location Centered on Latitude [51.46496] Longitude [15.85011]

Product MOD13Q1

Date June 01, 2019 to June 17, 2020

Subset 6.25 Km wide X 6.25 Km high

This subset order will be deleted 30 days from the date of the order.

Visit [MODIS/VIIRS Tools](#) to create subsets and visualizations.

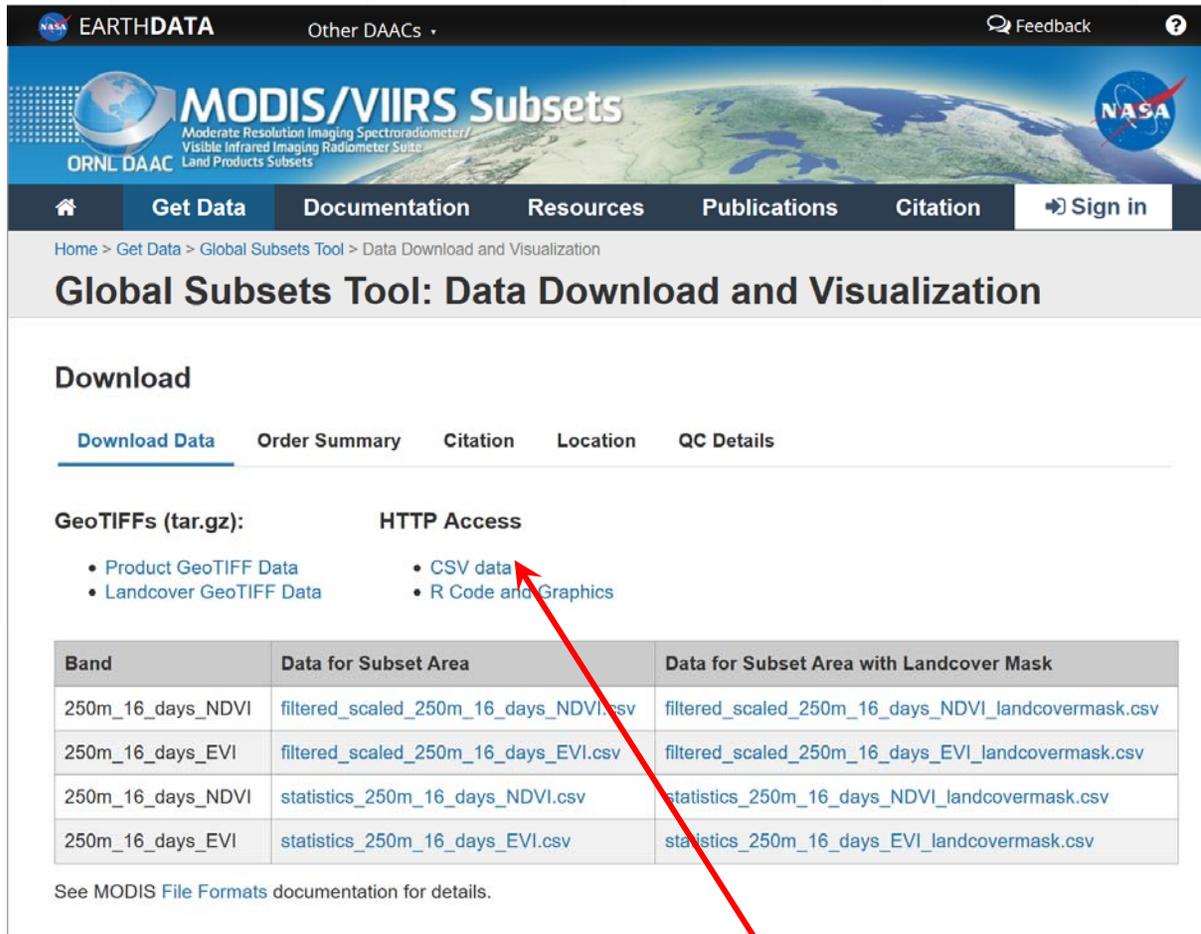
[MODIS/VIIRS Subsets at ORNL DAAC](#)

Click on the link provided



Land Product Subsets Output

1. Output information and access to ASCII data



The screenshot shows the NASA EarthData website for MODIS/VIIRS Subsets. The page title is "Global Subsets Tool: Data Download and Visualization". Under the "Download" section, there are tabs for "Download Data", "Order Summary", "Citation", "Location", and "QC Details". The "Download Data" tab is active. Below this, there are two columns of links: "GeoTIFFs (tar.gz):" and "HTTP Access". The "HTTP Access" column contains links for "CSV data" and "R Code and Graphics". A red arrow points from the "CSV data" link to a callout box at the bottom of the page.

Download

[Download Data](#) [Order Summary](#) [Citation](#) [Location](#) [QC Details](#)

GeoTIFFs (tar.gz):

- [Product GeoTIFF Data](#)
- [Landcover GeoTIFF Data](#)

HTTP Access

- [CSV data](#)
- [R Code and Graphics](#)

Band	Data for Subset Area	Data for Subset Area with Landcover Mask
250m_16_days_NDVI	filtered_scaled_250m_16_days_NDVI.csv	filtered_scaled_250m_16_days_NDVI_landcovermask.csv
250m_16_days_EVI	filtered_scaled_250m_16_days_EVI.csv	filtered_scaled_250m_16_days_EVI_landcovermask.csv
250m_16_days_NDVI	statistics_250m_16_days_NDVI.csv	statistics_250m_16_days_NDVI_landcovermask.csv
250m_16_days_EVI	statistics_250m_16_days_EVI.csv	statistics_250m_16_days_EVI_landcovermask.csv

See [MODIS File Formats](#) documentation for details.

Download ASCII
data

Land Product Subsets Output

1. Output information and access to ASCII data

Visualize

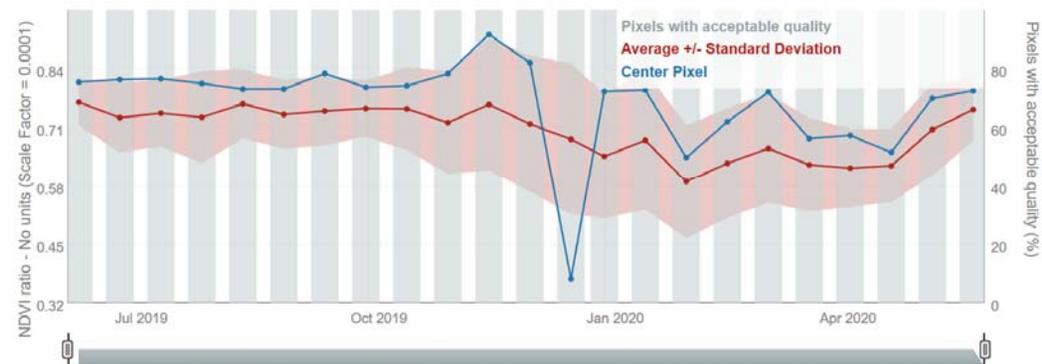
Date Range for time series 2019 - 2020

Stack by Year

Land Cover Filter

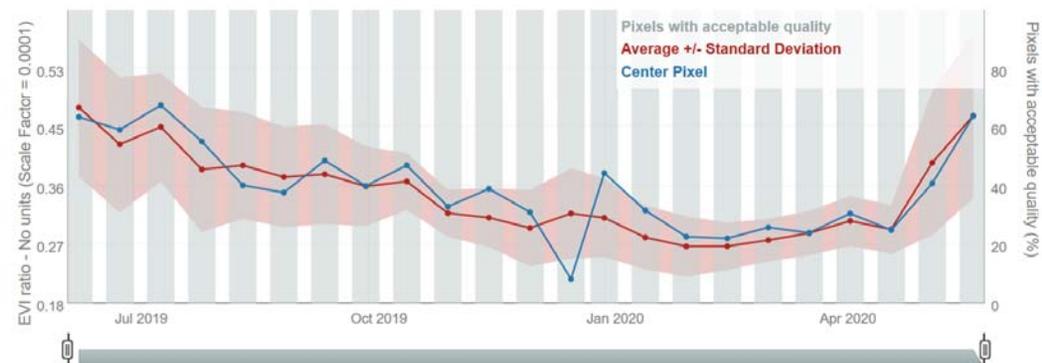
None

MOD13Q1 / 250m_16_days_NDVI (All acceptable pixels)



Includes all pixels that have acceptable quality

MOD13Q1 / 250m_16_days_EVI (All acceptable pixels)



Includes all pixels that have acceptable quality

Visualize maps for individual dates

Visualize Subset Area by Dates

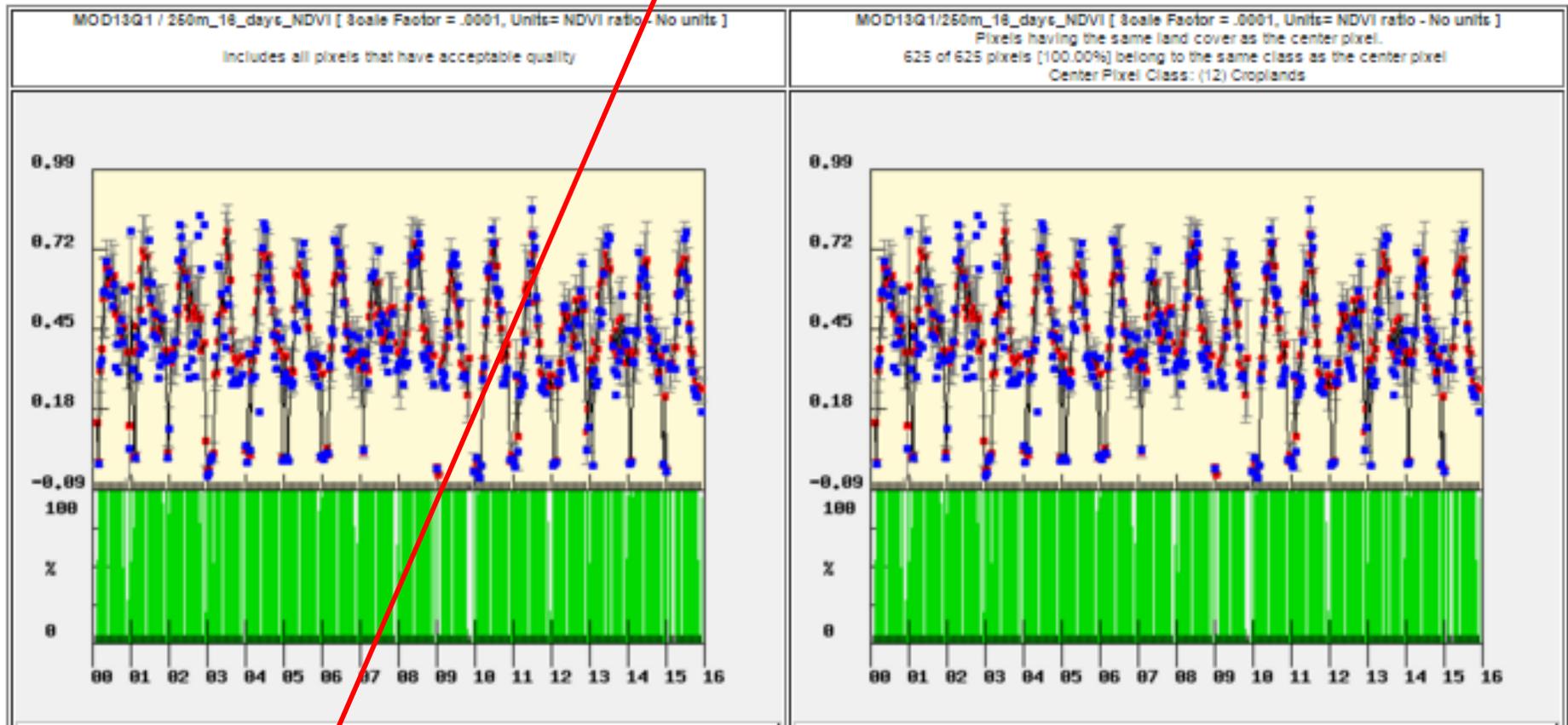
Land Product Subsets Output

2. Plots of times series

Date Range for time series: 2000 - 2015



Stack Time series



Select smaller time interval to plot the data

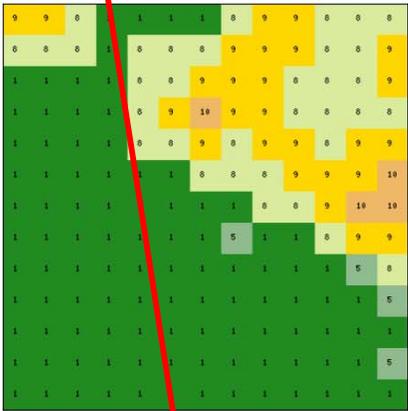
Land Product Subsets Output

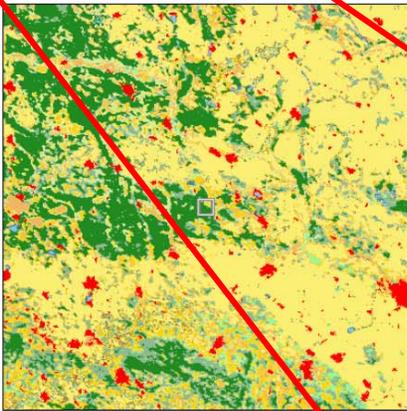
3. Information on the region selected and other statistics

Additional Information

[Land Cover](#) [Phenology](#) [R Code and Graphics](#)

MODIS Land Cover Classification	MODIS Land Cover Classification	MODIS Land Cover Legend
IGBP Type_1 2018	IGBP Type_1 2018	IGBP Type_1
User Selected Area	User Selected Area Marked	
6.5 km Wide x 6.5 km High	201 km Wide x 201 km High	
Shannon Diversity Components: Richness=5 Evenness=0.65		





- (1) Evergreen Needleleaf Forests
- (2) Evergreen Broadleaf Forests
- (3) Deciduous Needleleaf Forests
- (4) Deciduous Broadleaf Forests
- (5) Mixed Forests
- (6) Closed Shrublands
- (7) Open Shrublands
- (8) Woody Savannas
- (9) Savannas
- (10) Grasslands
- (11) Permanent Wetlands
- (12) Croplands
- (13) Urban and Built-up Lands
- (14) Cropland/Natural Vegetation Mosaics
- (15) Permanent Snow and Ice
- (16) Barren
- (17) Water Bodies
- Unclassified / Fill Value

[User Guide for the MODIS Land Cover Type Product \(MCD12Q1\)](#)

Land cover statistics for the area

Phenology data for the area

Various statistical plots

At Home

Get familiar with the application: <https://modis.ornl.gov/data.html>

Practice

- Selecting the region
- Selecting the parameter
- Ordering datasets
- Getting the output
- Examining the time series
- Examining other outputs (e.g., statistics)
- Determining the typical time your request is executed
- Check typical NDVI values for geographical locations you are familiar with

Assignment III

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

The Normalized Difference Vegetation Index (NDVI) is one of the principle remote-sensing-based indicators of the Earth's surface vegetation cover type and state. Considerable information on the vegetation cover phenology can be obtained from the analysis of the seasonal change of NDVI

In this assignment, you will examine seasonal change of NDVI for different land surface cover types and different types of vegetation cover. The goal is to understand some basic concepts in the time series analysis, derive seasonal profiles of NDVI for various land cover types and derive and examine some phenology metrics for various vegetation covers. Time series of NDVI values will be obtained with the ORNL DAAC MODIS Subset application.

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

Assignment:

In this lab you are going to extract annual time series profiles of at least two distinct natural land cover types. Each one year time series consists of 23 MODIS NDVI data, at 16-days composite interval and at 250 spatial resolution. Some data in the time series in high latitudes may be missing due to unavailability of day-time observations during certain period of the year (polar night conditions).

This data will be used to generate seasonal profiles of NDVI and estimate a number of vegetation phenology metrics. You will examine the metrics from different sites and compared them to understand the links of these metrics to the properties of particular vegetation cover types.

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

Assignment (cont'd)

Examples of natural land cover sites:

62.49079N 104.48500E : Boreal forest, North-eastern Siberia

12.62801N 3.45696E: Savannah, Africa

55.98229N 32.95920E: Mixed forest, Europe midlatitude

73.24534N 98.33952E: Tundra

You are more than welcome to select your own site including India. However you should avoid heavily cultivated area and focus on natural land surface cover types

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

Procedure to extract MODIS subsets:

1. Go to <https://modis.ornl.gov/data.html> and click on “use Subset tool” link
2. Find site and place the balloon there. You can also specify the exact latitude and longitude of the location.
3. Choose MOD13Q1 product: Vegetation Indices
4. Set the number of kilometers encompassing the center location. The default value is 3 by 3 km.
5. Select all dates (from year 2000 to year 2015)
6. Enter your email address.
7. Click “Review order and then click “Create subset on the next page

While waiting for the order to be processed repeat steps 2-7 for other sites you selected

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

Data processing, analysis and reporting

I. Visualization of subset data:

1. In the email you receive click on the link to the datasets
2. NDVI and EVI time series will be displayed along with other information
3. Focus on NDVI only !
4. Check the time series and identify the year when NDVI time series were generally smooth with not many dropouts.
5. Produce a graph of NDVI for the selected year and save it (you can use screen capture for that). Except of sites in the far north where NDVI retrievals are not available for some winter dates due to polar night you should have 23 data points.
6. Also copy and save information on the land cover types within the site you selected: it is available in the last panel of the output web page.
6. Click on the “download data” button in the table above the time series graph and get the file statistics_250m_16_days_NDVI.asc file in the ASCII format
7. Load the dataset to MS Excel and cut the portion of the data for the year you have selected. Use only mean values of NDVI in the further analysis.

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

II. Estimating Phenology Metrics

Select NDVI ASCII data for any one year. Import your yearly dataset into MS

Excel and make a plot of the yearly time series. Using the plot estimate

- Date of the beginning and the end of the growing season
- Length of the growing season
- Date of peak activity (corresponding to max NDVI) and peak NDVI value,
- Cumulative (integrated) NDVI. Calculate it by summing NDVI values across the whole year. Disregard negative NDVI values if any.

Repeat the procedure for all selected sites. Assemble the results in a table

III. Examining Derived Phenology Metrics

Examine the metrics and answer the following questions:

1. Which sites have the highest and the lowest cumulative NDVI ? What this may tell about the vegetation cover type
2. Which sites exhibit the largest and the smallest seasonal variation. Why ?
3. Which site has the longest and the shortest growing season. Why ?
4. Does any site have two distinct NDVI peaks indicating double-cropping agriculture ?

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

IV. Reporting of the results

Generate a report as a PowerPoint presentation, 3 slides on each site and 1-2 slides for analysis and conclusions

Materials on each site should include

- Brief characterization of the site (climate, vegetation cover type). Find a picture illustrating vegetation type that may be most inherent to the selected site and attach. You may also include a higher resolution image of the site from Google.
- Annual time series of NDVI (graph). Indicate on the graph the beginning, the end of the growing season, the length and the time of the maximum NDVI
- Table of the main phenology metrics (date of the beginning of the growing season, date of the end of the growing season, the length of the growing season, time of maximum NDVI and the value of maximum NDVI, Cumulative NDVI value.

Conclusions are expected to address

- Differences in the metrics you observed at selected sites
- Possible reasons for these differences

Examining vegetation phenology in different climate zones using NDVI time series generated with MODIS Subsets application

V. Presentation

Reports will be presented orally on the next day.

Plan to spend 2-3 min per site and for conclusions (10 min + 1-2 min answering questions)