

REM 490/590 – SPRING 2008

Lab 4

Professor A. Huete

1. OBJECTIVES

For this lab, you will work with MODIS Vegetation Index time series data using the ORNL DAAC site for global subset data extractions. You are to extract the 2007 annual time series profiles of 4 distinct land cover types. This 1-year dataset consists of 23 MODIS NDVI and EVI data, at 16-day composite intervals, and 250 m spatial resolution. This data will be used to generate temporal (seasonal and phenology) profiles of the land surface.

The goals of this exercise will be to:

- Understand some basic concepts in time series analysis with remote sensing,
- Derive seasonal profiles of some land cover types,
- Derive some phenology metrics for various land cover types.

2. MODIS Subset Data Extraction

The 4 sites to be extracted are: (1) Alaska, Lat 69.31832 and Long. -159.52148; (2) Mexico wetland marsh (Lat. 32.007203, -114.879220); (3) Phoenix (you will find this); (4) Botswana (Lat. -24.16416667, 21.89277778)

1. Go to <http://daac.ornl.gov/>
2. Choose “MODIS Land Product Data”
3. Choose MODIS Collection 5 & Create Subset in Global Tool
4. Find Site 1 and place cursor in center (see Fig. 1a below).



Figure 1. Example of site selection in Alaska (Lat 69.31832 and Long. -159.52148)

- Choose MOD13Q1 Vegetation Indices and a window size of 2,2 (2km above, below, left and right = 4.25km x 4.25km, since the center pixel is 250m) (Fig 1b).
- Select start and end dates to extract all of 2007.
- Enter your email address, click continue, and verify your extraction window (Fig. 2).

Select Starting Date

Day 305 of the Year 2005	[Nov. 01,2005]
Day 321 of the Year 2005	[Nov. 17,2005]
Day 337 of the Year 2005	[Dec. 03,2005]
Day 353 of the Year 2005	[Dec. 19,2005]
Day 001 of the Year 2006	[Jan. 01,2006]
Day 017 of the Year 2006	[Jan. 17,2006]
Day 033 of the Year 2006	[Feb. 02,2006]
Day 049 of the Year 2006	[Feb. 18,2006]
Day 065 of the Year 2006	[Mar. 06,2006]
Day 001 of the Year 2007	[Jan. 01,2007]

Select Ending Date

Day 193 of the Year 2007	[Jul. 12,2007]
Day 209 of the Year 2007	[Jul. 28,2007]
Day 225 of the Year 2007	[Aug. 13,2007]
Day 241 of the Year 2007	[Aug. 29,2007]
Day 257 of the Year 2007	[Sep. 14,2007]
Day 273 of the Year 2007	[Sep. 30,2007]
Day 289 of the Year 2007	[Oct. 16,2007]
Day 305 of the Year 2007	[Nov. 01,2007]
Day 321 of the Year 2007	[Nov. 17,2007]
Day 337 of the Year 2007	[Dec. 03,2007]

[Pre-selected Dates Reflect ALL Available Dates for the Selected Product/Location]

[Historical acquisitions of MODIS data are being reprocessed. The reprocessing is expected to be complete Summer 2008. The gap in time series would be eventually filled when the reprocessing is complete.]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000			A	A	A	A	A	A	A	A	A	A
2001			A	A	A	A	A	A	A	A	A	A
2002	A	A	A	A	A	A	A	A	A	A	A	A
2003	A	A	A	A	A	A	A	A	A	A	A	A
2004	A	A	A	A	A	A	A	A	A	A	A	A
2005	A	A	A		A	A	A	A	A	A	A	A
2006	A	A	A			A	A	A	A	A	A	A
2007	A	A	A	A	A	A	A	A	A	A	A	A
2008	A	A	A									
2009												

Enter Your Email Address
[You will be notified via email when the data has been prepared]

REM_student@email.arizona.edu

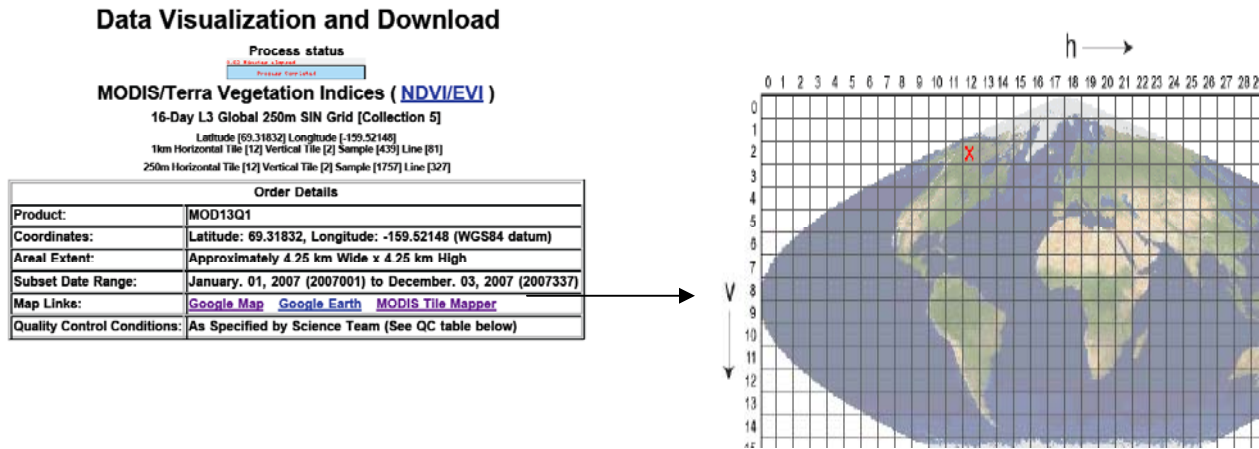
Fig. 2. Select temporal period, e.g., Jan 1, 2007 through Dec. 3, 2007.

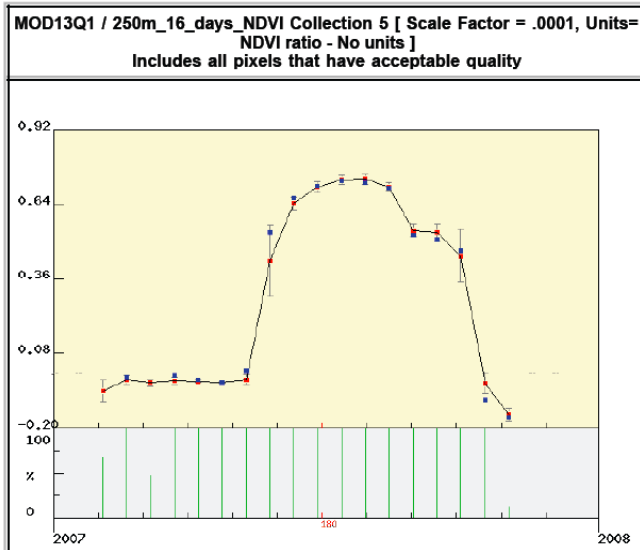
- The verify window will display an image of your site with bounding extract window, as in Fig. 1b. If your window is okay, click "Submit". You will get an email when your data is ready (a few minutes).
- Make a copy the map screen display of your extract site, including coordinates (you could print as pdf file).
- While you are waiting, restart the visualization and find Site 2 and repeat the above steps 4-8.
- Repeat steps 4-8 for Sites 3 and 4.

3. MODIS Subset Data Visualization

When datasets are ready, click on the email link you receive.

- i. Click on MODIS Time Mapper and report the Tile your site is in, e.g., in the above Alaska example, we are in Tile H12V02.
- ii. The NDVI and EVI Time Series for 2007 are next displayed. The difference between the right and left hand versions concern a Land Cover Filter. The right hand side averages all pixels with the same land cover type as your center pixel, while the left side averages all pixels in your window. Save the NDVI temporal profile for your report (either one). There are 23 temporal composites, at 16-day intervals, in 1 year of MODIS VI data. For example, day of year (DOY) 1 refers to days 1-16, and DOY17 includes 17-32, etc...
- iii. The ASCII download links are next displayed. Click on the last button (Statistical Data) to view a summary of your data. The other buttons are also useful to view all aspects of the original MODIS data.
- iv. The MODIS Land Cover Product is next displayed. Save this for your report.





Color Legend	
Red	Average of all Pixels in Grid having Valid Data
Blue	Site/Tower Pixel having Acceptable Quality
Green	Percent of Pixels having Acceptable Quality

Subset Data Download Details	
MODIS Land Product ASC	Help
GIS data in ASCII Grid for	Help
QC-Filtered Data and Sta	Help
Land Cover Data in ASCII	Help
Statistical Data of the su	Help

Figure 3. MODIS subset output file, showing tile mapper location, time series, and download options.

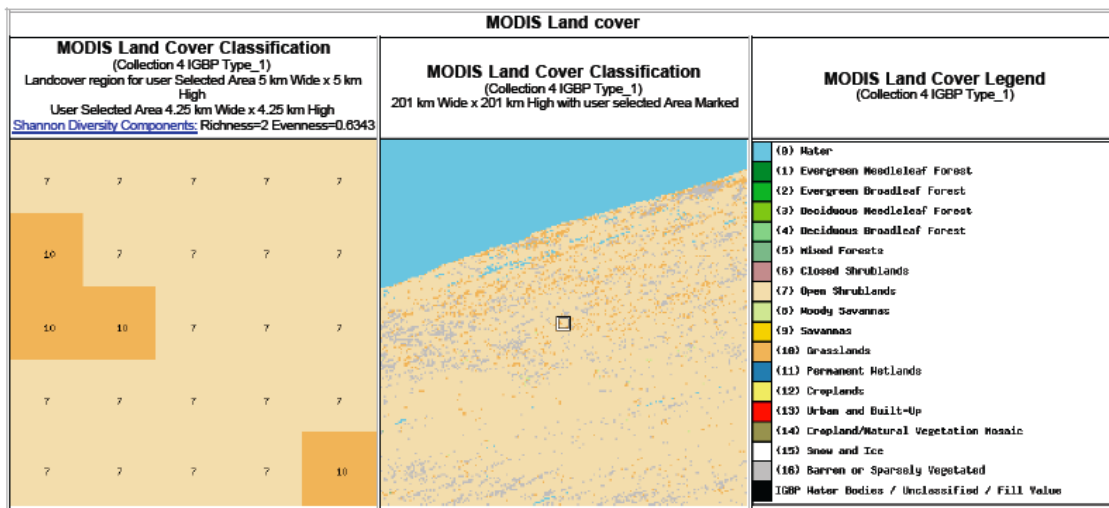


Figure 4. MODIS Land Cover Product classification of your extract window.

Your final extracted dataset (before going home) should consist of 23 temporal time periods of NDVI (16-days apart) over 4 unique sites.

Lab 4 Assignment
Due Date April 22, 2008 - 2:00 pm

1. Generate a table of your 4 sites, documenting site location, MODIS Tile, and Land Cover Type.
2. Generate another table (Table 2) that depicts the following phenology metrics; date of peak activity, peak NDVI value, onset date of the growing season and length of the growing season (using the half-max (50%) threshold rule). Explain why these sites have similar or differing phenology metric values.
3. Determine the cumulative (integrated) NDVI values for each of the 4 sites by summing the NDVI values across the entire year (this can be done with the ASCII 'statistical' download and adding all NDVI values across the year). Which sites have the highest and lowest cumulative NDVI? Explain what this depicts about the surface vegetation at your sites.
4. Which sites exhibited the greatest and least seasonal variation? What does this depict about the vegetation surface?
5. What problems did you notice or would expect in generating phenology metrics in an objective and consistent manner?
6. How can phenology metrics be used to monitor interannual climate variability? And which of your land cover sites might you think could be a sensitive indicator of climate (and possibly climate change). Explain your answer.