Introductory Exercise to MODIS AEROSOL Products and Giovanni

Giovanni is a web-based application that allows easy and quick exploration of NASA satellite data. There are several "instances" of Giovanni each one offering access to a different set of satellite products.

This exercise has several purposes:

1) To give a first exposure to satellite aerosol data and it's interpretation.
2) To explore the features of the Giovanni tool remote sensing data.

Go to the home page for Giovanni:
http://giovanni.gsfc.nasa.gov

From the list of atmospheric portals and instances, select:
Terra and Aqua MODIS: Daily

PART 1 – MODIS Aerosol Optical Depth: Aerosols over the U.S.

http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=MODIS_DAILY_L3

In Part I we will only explore AOD. AOD stands for Aerosol Optical Depth. This is a unit-less quantity that gives a rough indication of the total amount of aerosol in the atmosphere. Values below 0.2 would be considered a clean atmosphere. Depending on location, time and other factors values above 0.5 – 0.6 would begin to produce a noticeable whiteness to the sky.

Under the "Parameters" section, just beneath the map there are two menus,
Terra products ("MOD08_D3.051") from collection 5.1
Aqua products ("MYD08_D3.051") from collection 5.1

Briefly scroll through one of the parameter windows and note the large number of available parameters.

NOTE:
Terra has a local daytime overpass at about **10:30 AM**.
Aqua has a local daytime overpass at about **1:30 PM.**

Generate Lat-Lon Plots

Use the directions below to enter the values in each of the control areas of the web page.

Spatial

Select the globe to draw the bounding box over our region.
Select the hand icon to the left of the map then click and drag the map so that it is *centered over the US.* Select the + icon then click on the map to zoom in.

1) Select the box icon to the left of the map and then drag and draw a box that covers the US.

or

2) Enter the following values into the boxes next to "Area of Interest" entire USW
West -130, North 50, South 25, East -60
Click Update Map

Parameter

In the MOD08_D3_051 box (this is Terra data) select Aerosol Optical Depth at 550 nm
In the MYD08_D3_051 box (this is Aqua data) select Aerosol Optical Depth at 550 nm.

Temporal

Begin Date = July 12, 2011
End Date= June 15, 2011

Select Visualization

Lat-Lon Map, Time Averaged.

What regions display high AOD values for this time period?

Submit refinements and zoom in to the region of high AOD.

Generate the lat, lon time-averaged visualization. Open the download tab and note the formats available.

Navigate back to the home tab above. What other visualization options may be useful?

What Giovanni instance and visualization option may be most appropriate to compare AOD values between years or seasons?

Feel free to explore the AOD values in a region and time period of interest to you and your work.

If you have time, explore the Giovanni 4 site.

Introductory Exercise to MODIS AEROSOL Products and Giovanni - 4

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3) To give a first exposure to satellite aerosol data and it's interpretation.
4) To explore the features of the Giovanni tool remote sensing data.

Go to the home page for Giovanni:
http://giovanni.gsfc.nasa.gov/giovanni/

From the list of atmospheric portals select:
Terra and Aqua MODIS: Daily

PART 1 – MODIS Aerosol Optical Depth: Aerosols over U.S.

Briefly scroll through one of the parameter windows and note the large number of available parameters.

Select Plot
Time Averaged. For this exercise leave the remaining plot types unselected.

Temporal, Select Date Range (UTC)
Begin Date = July 12, 2011
End Date= June 15, 2011

Spatial
Select the globe to draw the bounding box over our region.

Select the hand icon to the left of the map then click and drag the map so that it is *centered over the US.* Select the + icon then click on the map to zoom in.

Select Variables

This is where we can begin to narrow down the variable of interest to us.

Terra products ("MOD08 D3 v051") from collection 5.1
Aqua products ("MYD08 D3 v051") from collection 5.1

1) Select Total Aerosol Optical Depth (you will notice the number of matching variables in the list reducing as we further define our criteria).
2) Under Platform.Instrument, select MODIS-Aqua and MODIS-Terra
3) Select Wavelength of 550.0
4) Select Spatial Resolution of 1 degree
5) Select Temporal Resolution: daily

NOTE:
Terra has a local daytime overpass at about **10:30 AM**.
Aqua has a local daytime overpass at about **1:30 PM.**

Parameter
You should only have 4 variables available at this point.

Aerosol Optical Depth 550 nm (Dark Target) (MOD08_D3 v051) (these two are Terra)
Aerosol Optical Depth 550 nm (Deep Blue, Land-only) (MOD08_D3 v051)

Aerosol Optical Depth 550 nm (Dark Target) (MYD08_D3 v051) (these two are Aqua)
Aerosol Optical Depth 550 nm (Deep Blue, Land-only) (MYD08_D3 v051)

However, only two cover our date range. Select those.
Click "**Plot Data"** and take a minute to observe the results.

Notice the options available for the plot in the upper right hand corner. Change the color palette and turn on data smoothing. Re plot.

On the right of the page, under history, click downloads. What formats are available to download?

Questions

1) In general how do the AOD values for Terra and Aqua compare? (In addition to how the values compare look at the shapes of the contours and gradients of high and low values.)

2) Write down a specific lat-lon area where there are substantial differences in the values between Terra and Aqua and describe the difference.

3) Propose at least one (try for two) real world phenomenon which can explain the difference between the two sets of results.

If you have time, here are some additional exercises:

Generate animation plots

Giovanni can only generate an animation for one parameter at a time.
Go to the "home" tab above the visualizations.
Make sure you select only the single data parameter from the MOD08_D3_051 box: Aerosol Optical Depth at 550 nm
In the "Select visualization" menu select "Animation". Use the arrow buttons under the image window to run the animations forward, backward or to look at single day images one at a time. Use the + and – buttons to adjust the speed of the animation**.**

Repeat the steps above for Aqua (MYD08_D3_051).

Note that near the top of the page you can click on "Results 1" and "Results 2" to go back and forth between your different visualization results.

Questions

After looking at the two animations, answer the following:

1) *What do you think is the main reason for the difference in the time averaged plots of Terra and Aqua?*

2) *Do you have any way to tell how many days worth of data are represented in each 1 degree box of a time averaged plot? How could this impact the quality and reliability of your results?*

Learning More About Giovanni Data Products.

Above the display of your visualizations are three tabs:
Visualization Results, Download Data, Product Lineage

Product Lineage

Click on **"Product Lineage."**
This page gives information about how the data was processed.

From the Home Tab

Click on any one of the parameter names to find out more information.
On the side of the page that will open are links to the **Users Manual**.

PART 2 - MORE YOU CAN EXPLORE ON YOUR OWN (only if you have time)

3D Visualization on Google Earth and download of Giovanni GIF images and data files

1. At the top of the results page (the page that has the images) click on the "Download Data" tab.

2. To download a KMZ or other data files click on the items on the last column.

3. To view the image on Google Earth, click on the KMZ icon, then upload to Google Earth directly or you can choose to save the file, then open Google Earth, and then open the file after you start Google Earth.

4. To download a gif image click on the file name at the bottom of the first column