

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 its 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 select:

Terra and Aqua MODIS: Daily

PART 1 – MODIS Aerosol Optical Depth: Aerosols over California

You should be here: 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 hand icon to the left of the map then click and drag the map so that it is *centered near northern California*. Select the + icon then click on the map to zoom in.

To define the spatial area, do one of the following.

1. Select the box icon to the left of the map and then drag and draw a box that extends from around 127W to 119W and 44N to 37N. Notice that at the top of the map there is a “Cursor Coordinates” display that shows you the Lat and Lon as you move the cursor.

2. Enter the following values into the boxes next to “Area of Interest”
 - a. West -127, North 44, South 37, East -119
 - b. 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 = June 15, 2008

End Date= June 30, 2008

Select Visualization

Lat-Lon Map, Time Averaged.

Click “**Generate Visualization**” and take a minute to observe the results.

Note: Although Giovanni allows you to create multiple visualizations from a single browser window and to navigate between them easily, for this exercise, you may wish to use side by side windows for ease of comparison. You can also work with a partner with each of you displaying one of the results.

If you wish to open a second browser window for side by side comparison do the following:

1. Open a second browser window, copy and paste the address to the Giovanni page.
2. Enter all of the selections listed above except this time:
In the MYD08_D3_051 box (this is Aqua data) select Aerosol Optical Depth at 550 nm.

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 that can explain the difference between the two sets of results.*

In order to understand Giovanni and the MODIS products more fully, repeat these visualization but use June 22, 2008 as the end date.

4) *What additional differences are now apparent between Terra and Aqua?*

Pause for Class Discussion

5) *What information would you need to determine if the differences are due to each one of the following:*

A) *Differences between sensors:*

B) *Sampling Error:*

C) *A Real World Difference in Aerosol Production (for example a diurnal cycle):*

6) *Look through the Giovanni parameters and visualizations. Suggest a method to determine if the differences between Terra and Aqua MODIS are due to B and/or C.*

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