

## Case Study Guide and Outline

In this exercise you will analyze an air quality event as a team making use of as many of the relevant resources presented in this course as possible and any other data you wish to include. Conceptually you can think of this as telling a story using images and data to reinforce the points you want to make. Your case study will be presented after lunch and can be made with Google Earth as a presentation/analysis tool, power point presentation or use the two tools together. Plan on 15 – 20 minutes for your presentation.

Here are the steps you should go through for this exercise.

1. Find a group of 3 – 4 people to work on your case study. Determine which dates and source and receptor regions you wish to examine. You can use as the basis of your case study the air quality events from June 26 – 27, 2012 or the dust even from August 7-8, 2013 that we have been discussing during the course or any case study of your choice.
2. Identify the resources you wish to use and list these in the **case study resource sheet**.
3. You should make use of any and all course materials (including instructors) to identify resources for each area listed on the resource sheet. There are some useful hints and tips in the rest of this guide that you can make use of so read through this document before proceeding to fill out the users guide.
4. You will probably want to have ready to use the following documents from the course:
  - a. Satellite Imagery Overview and/or Quick Guide to Satellite Imagery
  - b. Aerosol Terms Reference Sheet
  - c. Creating KML Files from Worldview
  - d. Online resources in a nutshell (for trace gases)
  - e. Online resources in the trace gas overview powerpoint presentation
  - f. The Smog Blog <http://alg.umbc.edu/usaq/> (no handout for this item)You may also want to use:
  - g. Handout on trace gas products
  - h. Aerosol product comparison chart
5. Once you have identified the resources begin assembling the data you will use. It will be more efficient to divide this task among the people in your group. It is strongly suggested that in this and the next step you begin to fill in the information on the **“Case Study Analysis Sheet”** to guide you in your presentation.
6. Organize the information you have gathered so that it can be presented using your platforms of choice and practice telling your story.
7. Give your presentation. You can select one ~~victim~~ person to make the presentation or you can have several people take turns each presenting one piece.

### **Some Additional Miscellaneous Suggestions, Hints, and Tips for Your Case Study:**

#### **Resources:**

It is suggested that your group first compile a list of resources that can be used including where to find this information. Since this is mostly a visual presentation consider sources that can provide visual context on GE as well as numerical values either in GE or from other sources.

See the separate “Case Study Resource Sheet” as well as some suggestions below for items that you may have missed or may not have been covered adequately during the course.

#### **Model Data:**

This is the download for the FLAMBE data from the Naval Research Lab.

To select a different date modify the month and month and day in the last two fields.

[http://www.nrlmry.navy.mil/aerosol/kml/older\\_flambe\\_world\\_kml/201109/20110913\\_fire\\_global.kml](http://www.nrlmry.navy.mil/aerosol/kml/older_flambe_world_kml/201109/20110913_fire_global.kml)

**Meteorology:** A suggested source: <http://wunderground.com> Enter the name of a city in your area of study in the search bar. Scroll down to the “History & Almanac” section and enter the date.

#### **Data Display and Analysis:**

It is often useful to have a central focus for a case study. When first learning to compile data, display and analyze a case study an AERONET location can serve as a useful focal point as well as a good source for data. You can use any site within a few hundred kilometers of your area of interest but check for data availability first.

Begin by visiting the AERONET site to obtain the KML file showing the location of all of the aeronet sites. If your case study is recent use a file with level 1.5 data. If your case study is two or more years older obtain the file with level 2 data. <http://aeronet.gsfc.nasa.gov/>

From the bottom left of the page select “All lists”

Next go to the Aeronet Synergy Tool Site: [http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas\\_interactive](http://aeronet.gsfc.nasa.gov/cgi-bin/bamgomas_interactive)

#### **Google Earth Notes:**

As you assemble and display materials in GE each item will appear in the “Temporary Places” folder. In order to assemble all of the parts in a single folder do the following:

Highlight “My Places” in the left hand panel of GE. Select Add → Folder

Name the folder with the name of your case study. As items are downloaded and displayed, drag and drop them into this folder.

**If there is an AERONET site anywhere within your study domain:**

From the synergy tool obtain and display a MODIS Terra and/or Aqua image in KMZ form. Display this in GE.

Also obtain and display from a source of your choice a KMZ image file that shows a much larger geographic area than the image you obtained from the synergy tool.

If you are not using the synergy tool there are many other sources of data for imagery that can be displayed in GE or as a simple image in a power point presentation.

It is often useful to have a high-resolution image of the area right around your event as well as a (lower quality) image of a wider area to provide context.

**Ground based aerosol data if you are using the synergy tool:**

In the synergy tool check the following boxes:

Under AERONET: AOD, SDA retrievals

Under Satellite Retrievals: MODIS Rapid Response, MODIS Daily, MISR Daily

Model Output: Back Trajectories (There may not be MISR data available.)

Make sure that under each display area on the left “1.5” is selected.

Use the display controls for the various plots and fill in the following information:

Average AOD 500 nm:

High AOD 500 nm:

Avg. Angstrom Exponent:

Avg. Fine AOD:

Avg. Coarse AOD:

Avg. Fine Mode Fraction:

Add this information to your GE display as follows:

Highlight your case study folder. Hold Control and then select “Get Info.”

You can now enter text in the large field at the bottom.

You can click on the folder to display the text in GE.

From the aeronet synergy tool page download and display in Google Earth:  
Terra-MODIS and/or Aqua-MODIS True Color 2000 M KMZ File  
Back Trajectory KMZ for 00 UTC or 12 UTC

Download and display one of the available KML fire products for this date and location. After using one of these sources of information look to see if there are fires producing aerosols that impact your area.

**If you wish to use the FLAMBE model.**

Display the fire data from FLAMBE. What potential fire source areas are identified by the FLAMBE fire detections? Do these differ significantly from the fires displayed by another source you may have used?

Display the NAAPS (FLAMBE) model information as both filled contours and simple line contours. Clicking on the lines will show the values of the contour lines.

There are several sources for obtaining and/or creating a KMZ file which will display MODIS AOD information. List at least 3 resources for obtaining/creating MODIS KMZ files.

- 1.
- 2.
- 3.

Display the MODIS AOD information at several resolutions. Which resolution did you find the most useful and why?

Compare the NAAPS model predictions with the satellite AOD data. (Note the Flambe AOD data may only be available for ocean.)

How does the MODIS AOD compare to the NAPS model information (available in the FLAMBE model product) compare with the satellite data? Are there areas that the model does not predict well? If so, where? Speculate as to the reasons for the poor performance

Are there other dates of fire and/or Flambe data might be useful to look at to analyze this event?

If you can identify other dates then download the appropriate FLAMBE file (change the date in the URL) and display the fires for this day(s). Did you identify any additional possible sources of aerosol?

Use any instance of Giovanni to create an animation of AOD from Terra or Aqua for the 10 day period preceding your event for the region around your selected site. Can you get a sense of aerosol movement from this animation? Why or why not?

**Aerosol height information:**

Obtain and display the CALIPSO KMZ file for your region. There may not be any data for your specific date. If so, you may want to use data from the day before or after your selected date. You can also use nighttime data.

Where and how is the aerosol distributed vertically? Does this distribution suggest that attempts to correlate AOD to ground level PM 2.5 should work well or not?

Go to the air quality instance of Giovanni display and download the KMZ files for the following parameters: Fine Particulate Matter - PM2.5 OMI – Aura NO2 Tropospheric Column and AIRS –Aqua Total Column CO\_ascending

How well does the pattern of high and low PM values match the pattern of AOD from the satellite products? If the match is poor why do you think this occurred?

Using the data from our exercises add the satellite measured AOD and ground level PM information to the GE folder.

**Trace gases:**

Add any relevant trace gas data to this case study.

Things to consider:

How well do the areas of high NO<sub>2</sub>, SO<sub>2</sub>, and/or CO correspond to the areas of high PM and high AOD?

What are the source areas for trace gases impacting your study area?