NASA Giovanni Workshop
Environmental Science Applicant Visit Day 2018

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We're going to use the online Giovanni tool (https://giovanni.gsfc.nasa.gov/giovanni/) to explore whether air pollution over Europe has changed from 2005 to 2015.

Follow these individual steps to use Giovanni to answer this question:
First, we will download and map satellite observations of NO_2 for June-August 2005. The satellite observations are from the Ozone Monitoring Instrument (OMI) onboard NASA's Aura satellite that has been in space since October 2004. It passes overhead each day at about 1:30pm.

Instructions guide:
Arrows (→) indicate an action.
Text in red is a description of the result.

→ Go to https://giovanni.gsfc.nasa.gov/giovanni/ by either entering this address directly or by entering "NASA Giovanni" in Google. The first search result should take you to the tool.

→ Under "Select Date Range (UTC)" choose the range 2005 June 1 to 2005 August 31 by clicking on the blue calendar icon ( ). If the date you enter doesn't appear in the *YYYY-MM-DD* box enter the date manually in the format Year-Month-Day.

→ Under "Select Region (Bounding Box or Shape)" click the blue folded page icon ( ). A map will appear. Select western Europe (including the UK). No need to be precise with your selection. Close the box by clicking the arrow at the top right of the box.

The date and region boxes should now no longer be empty.

→ On the left side of the screen under "Disciplines" select "Atmospheric Chemistry (92)".

The screen will refresh with options relevant to this Discipline.

→ Under "Measurements" select "NO2 (2)".

This will display 2 options in the table of variables right of the selection menu. This entry tells you the name of the data, the units, the instrument (Source), how it is averaged in time (Temp. Res.) and space (Spat. Res.), and the start of the end date of the full record (not just the portion of the record you selected).

→ In the Variables table select the second option: NO2 Tropospheric Column (30% Cloud Screened) (OMNO2d_v003)

→ Click on the green "Plot Data" button on the bottom right of the page.

You will be redirected to a new page with a progress bar to track the progress of processing your data. Once complete it will generate a map of the data you selected. The map uses a colour bar that is washed out (doesn't show all the features clearly). Giovanni includes options to change how the data is displayed.

→ Click "Layers" on the top right of the map to display options to change the colour scale and range of data shown on your map.

→ Click "Options" to make changes to the colour bar. For this example change Maximum to 1e+16. Leave Minimum as 0. Then select "View All Palettes" to choose a different colour bar. Select the first option: "Air Quality Index (Cust), 8" and then click "Add Palette". Once done click "Re-Plot" to apply your changes.

→ Click "Layers" to minimize this screen.

Once you're satisfied with the way the data is plotted, go ahead and download the data.

→ Click "Download" right of the "Layers" tab. Choose PNG. A file will download with some default filename. Rename this file so that you can identify it again later. A suitable filename might be "OMI_NO2_JJA_2005.png" for the data for year 2005.

→ Click "Back to Data Selection" to return to the Data Selection page to now generate a plot for June-August 2015.

→ Follow the same procedure as above to generate a plot for June-August 2015.

Notice that on the plot page all your previous searches are stored in the browse history.

→ Once you have the 2 maps place them side by side (in Powerpoint or a similar programme) and compare the output.

<u>Now we can ask a few questions about the observations:</u>

- Can you spot large cities in the map for 2005?
- Why are concentrations in cities higher than surrounding areas?
- What is the difference between 2005 and 2015?
- What do you think is causing these differences?
- Which year has worse air quality (air pollution)?
- Do you think pollution controls are working in Europe?