

# MY NASA DATA Lesson:

## Creating and Analyzing Graphs of Tropospheric Ozone

**Purpose:**

Students will create and analyze graphs using archived atmospheric data to compare the ozone levels of selected regions around the world.

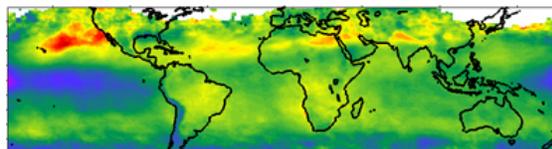


Image courtesy MY NASA DATA Live Access Server. Tropospheric Ozone Residual

**Grade Level:** 7 – 12

**Estimated Time for Completing Activity:**

1 to 2 45- 50 minute class period(s)

**Learning Outcomes:**

- Students will be able to locate and identify geographical regions using latitude and longitude.
- Students will be able to graph archived ozone data from the Live Access Server
- Students will be able to analyze graphs to compare ozone levels for selected geographical regions.

**Prerequisite**

- Familiarity with accessing websites on the Internet
- Familiarity with using longitude and latitude
- Familiarity with at least one method of graphing data

**Tools**

- Computer with internet access
- Graph paper or access to a computer graphing program

**AP Environmental Science Topics**

- Air pollution
- Atmospheric circulation
- Causes and effects of ozone depletion
- Primary and secondary sources of pollution
- Strategies for reducing ozone depletion

**Vocabulary:**

- [atmospheric column](#)
- [dobson unit](#)
- [ozone](#)
- [stratosphere](#)
- [troposphere](#)

**Lesson Links:**

- [Live Access Server \(Advanced Edition\)](#)

**Background:**

Ozone levels in the troposphere are an indicator of the quality of air. There is 'good' ozone and 'bad' ozone. The 'good' ozone, in the stratosphere, is what protects us from harmful UV rays reaching the Earth's surface. It is the layer of ozone in the troposphere, the 'bad' ozone, that we will be studying. This layer of ozone is an important greenhouse gas. It has a huge impact on both our crop production and health, and is considered a polluting factor.

**Procedure:**

To begin, click on the link to the Live Access Server (Advanced Edition) found in the lesson links section above. Click on the 'Choose Dataset' if you are not automatically prompted with the list. Then select, Atmosphere and Air Quality link. Check the box by the Monthly Tropospheric Ozone Residual (TOR)

You are now at a point where you will set parameters. First of all, choose 'Time series' from the list of options on the left side of the screen. Set the starting date to January 1999 and leave the ending dates the same.

You now have two choices for how to proceed:

Choice 1

Enter one set of latitude-longitude numbers from below. Click 'Update Plot'. A line graph will be produced.

Choice 2

Enter one set of latitude-longitude numbers from below. Set 'Save As' from the menu at the top. You will then need to select 'ASCII' from the drop down menu, verify your time range is correct and click 'Ok' to produce your text file. This will give you a list of data points. This list can either be downloaded to a graphing program, such as Excel, or can be graphed by hand on graph paper.

Once you have decided on a choice of graph production, repeat the procedure for each of these 4 locations.

Set 1 34 N 118.5 W

Set 2 34.2 S 58.3 W

Set 3 6.1 S 106.5 E

Set 4 1.0 S 15.0 E

### Questions:

1. Analyze each graph.
  - a. On a world map find the latitude-longitude region of each graph. Where is it?
  - b. For each location, what could be the cause of the ozone levels indicated? Do some research about that area, if needed.
2. Examine each graph individually.
  - a. Why might the ozone levels vary by month?
  - b. Why might the changes observed from year to year be apparent?
3. Compare the four graphs. Note differences between the graphs at different times

### Extensions:

All four sets of latitude-longitude pairs are for regions that are over land. Pick a region that is in the middle of an ocean and compare the ozone levels there to those in your four graphs. Draw some conclusions about the sources of ozone in the troposphere. Repeat this step for several ocean basins. Are your results consistent in each case? Are they consistent with the ozone sources you have identified?

*Lesson plan contributed by Kelen K. Panec, Cedar Falls, IA*

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