

# MY NASA DATA Lesson:

## Using MY NASA DATA to Determine Volcanic Activity

### Purpose:

To use NASA satellite data of optical depth as a tool to determine volcanic activity on Reunion Island during 2000-2001



**Grade Level:** 8-12

Image courtesy Vulcani and Vulcani Online

### Estimated Time for Completing Activity:

One 50 minute class period

### Learning Outcomes:

- Understand how aerosols are used in science to indicate volcanic activity
- Understand how biomass burning affects global aerosol activity
- Access data and import into MS Excel
- Use graphical data to make inferences and draw conclusions

### Prerequisite

- Familiarity with producing graphs in MS Excel
- Familiarity with locating places using atlases, globes and maps

### Tools

- Spreadsheet program
- Atlas or globe

### AP Environmental Science Topics

- Aerosols
- Atmospheric circulation

- Biomass as renewable energy
- Latitude and longitude
- Primary and secondary sources of air pollution
- Volcanism

**Vocabulary:**

- [aerosol](#)
- [optical depth](#)

**Lesson Links:**

- [Excel graph of Optical Depth](#)
- [Near-Surface Air Temperature](#)
- [Optical Depth Image](#)
- [Image Courtesy of Vulcani and Vulcani](#)
- [Microset for Reunion Island \(Text File\)](#)
- [Microset for Reunion Island \(Excel File\)](#)
- [Reunion Island Info I](#)
- [Reunion Island Info II](#)

**Background:**

In the above figure, the volcano on Reunion Island can be seen. This volcano is located at 21.23 S, 55.71 E and has a height of 8,632 ft. (2,631 m). The volcano is a shield volcano that has been built up by many years of eruptions. As the volcano erupts, it spills out hot magma that becomes lava when it reaches the surface. The lava then spills over the sides of the volcano and begins to cool. This causes the volcano to become bigger and bigger over many thousands of years. Reunion Island is actually made up of two volcanos named Piton des Neiges which covers the central part of the island and Piton de la Fournaise that is located on the eastern part of the island. For the purpose of this lab, it is important to know that minor eruptions were recorded on 5 July 2000 and 20 June 2001.

Humans have practiced the process of crop burning for thousands of years. At the end of a growing season, the leftover vegetative material is burned and allowed to seed for

the next year's crops. Through many innovations in agriculture, this process has been mostly abandoned in North America. In many other nations, such as Africa and South America, the process is used frequently. When the vegetative material burns, it expels many particles into the air which are known in science as aerosols. These aerosols are made up of solid carbon combustion products and gases which are harmful to the atmosphere. They reach the atmosphere and can contribute to the greenhouse effect and can cause global warming. NASA scientists have determined that 90 percent of the vegetative burning on earth is created by humans with only 10 percent being due to natural forest fires.

The data used in this lab was gathered by the NASA satellite Terra that was launched in 1999. Click on Optical Depth in the Lesson Links section. This image shows the optical depth of the area when the satellite passed over.

**Procedure:**

1. Open the microset in the links section.
2. Use MS Excel to create a graph that has optical depth as a function of time for the given latitudes.
3. Plot all three datasets on one graph (see Excel graph in Links section)

**Questions:**

1. What process could be occurring that causes the large spike in the graph for 32E in 2001? What time of year did this occur?
2. Which volcanic activity was greater according to your graph: the eruption on 5 July 2000 or 20 June 2001?
3. What processes or natural events could cause the small changes in optical depth for the latitude 65E?
4. Which process according to your graph causes a greater fluctuation in optical depth: the volcanic activity or biomass burning?
5. How do you think multiple biomass burnings across Africa could affect our climate in North America?

**Extensions:**

1. In the Lesson Links section open Near-Surface Temperature. Look at the image of temperature gathered from the Terra satellite. What can you conclude about the effect of volcanic activity on the temperature near the surface?

2. You are a member of a global team to reduce the effects of biomass burning on the atmosphere. You are to report to a world committee on a solution to the problem. Your task is to suggest alternatives to crop burning in a report. Remember that some countries may not have the resources to use machinery to solve the issue.

*Lesson plan contributed by Cameron Kerr, Land O Lakes, FL*

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