



Center for the Environment at Catawba College

Campaign for Clean Air

Clean Air in the Classroom

## Stage 1 Activity 2

## Layers of the Atmosphere

### Overview

A large component of the seventh grade standard course of study in science requires the students understanding of the layers of the atmosphere and many details about them. This lesson is provided to help meet that objective.

This lesson was created using ideas from both Marcia Krech (who promotes the use of her ideas at: <http://scienceteachingideas.blogspot.com/2009/02/teaching-layers-of-atmosphere.html>) and the website [http://www.ucar.edu/learn/1\\_1\\_2\\_2t.htm](http://www.ucar.edu/learn/1_1_2_2t.htm).

### North Carolina Standard Course of Study

This lesson meets seventh grade science competency goal 3.01.

### Learning Objectives

Students Will Be Able To explain the composition, properties and structure of the atmosphere.

SWBAT create a representation of the layers of the atmosphere on paper including the names of the layers, the temperature gradient, and the change in pressure as a function of altitude.

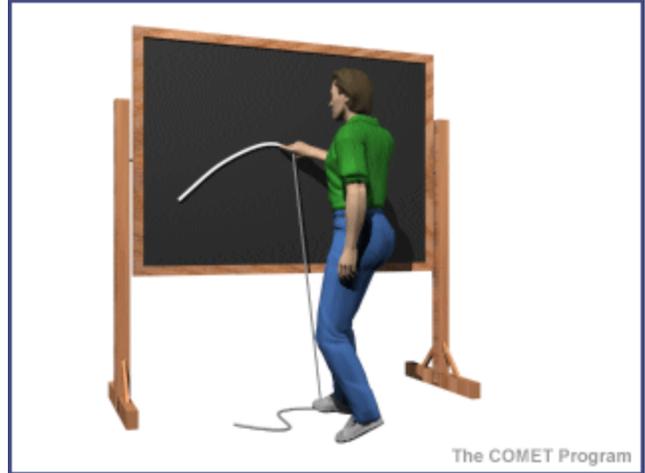
### Materials

- chalk or white board for a demonstration
- marker or chalk
- string about 4 feet long
- apple (optional)
- 1000 mL graduated cylinder
- four colors of sand, pebbles, or other fine material
- Layers Activity Sheet
- Layers Foldable Sheet
- Layers Mania Trivia Game

# Procedures

## Part 1 from ucar.edu

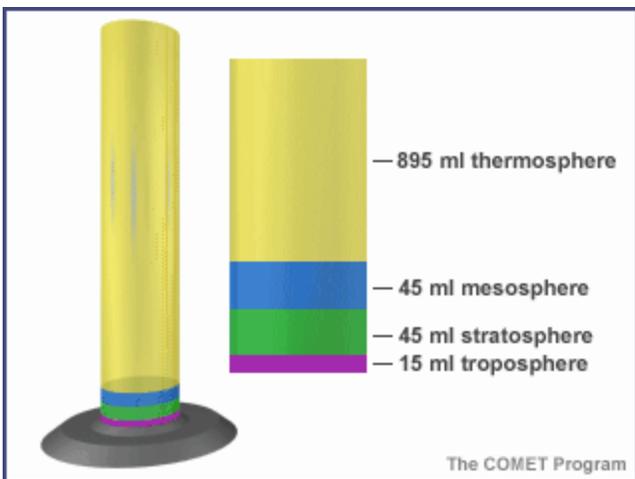
1. Tie a piece of chalk to one end of the string. Standing next to the chalkboard, place your foot on the free end of the string and draw an arc on the board with a radius of about 4 feet. Your foot represents the center of the earth. The arc represents the surface of the earth.
2. Ask students to suggest how far the earth's atmosphere would extend above the surface in this drawing. Mark their suggestions on the board above the chalk line.
3. Tell the students that scientists have found that over 90% of the earth's atmosphere is within about seven miles (12 km) of the earth's surface. The distance from the center of the earth to its surface equals about 4,000 miles. The scale of the chalkboard drawing is about 1 foot = 1,000 miles (1610 km). So, on this scale, seven miles is a little less than 1/8th of an inch (about as thick as the chalk line), and 90% of the earth's atmosphere lies within the thickness of the chalk line used to draw the surface of the earth.
4. Another way of understanding how far out the atmosphere extends is to imagine that the earth has shrunk to the size of an apple. At that scale, the atmosphere is only the thickness of the skin of the apple. Use an apple for a demonstration.



## Part 2 from ucar.edu

Build a model of the structure of the atmospheric layers to show your students the relative extent of the four layers of the atmosphere (troposphere, stratosphere, mesosphere, thermosphere).

Use a 1000 ml graduated cylinder and represent the layers by using the following amounts of fish gravel or colored sand.



Atmospheric Layer	Color Code	Thickness	Top of Layer
<b>Troposphere</b>	Color 1	15 ml	15
<b>Stratosphere</b>	Color 2	45 ml	60
<b>Mesosphere</b>	Color 3	45 ml	105
<b>Thermosphere</b>	Color 4	895 ml	1000

Keep in mind these are relative proportions and not exact points of departure for the different layers.

## **Observations and Questions** *from ucar.edu*

1. What atmospheric layers are represented by the different colors?
2. How much thicker is the stratosphere compared to the troposphere?
3. How much thicker is the thermosphere compared to all the other layers combined?
4. Where in this model would you expect to find clouds?
5. Where in this model would you expect to find Mt. Everest?
6. Where in this model would you expect to find a satellite?
7. Where in this model would you expect to find the space shuttle?

## **Part 3** *from Maria Krech*

1. Using the “Layers Activity” on the website, have the students paste the labels for each layer of the atmosphere on the diagram, add the pictures at the correct altitude, and use red and blue to color the temperature of each layer.
2. It is also a good idea to play the video available on the website while the students are working.
3. Use the “Layers Foldable” in this lesson or use it later as a review.
4. The “Layers Mania” is trivia game that can also be used in the lesson or as a review.

## **Assessment**

1. Use the apple question suggested in the procedure (Part 1) and have students respond in writing or with a picture instead of simply orally in class.
2. Have students make a labeled diagram on a small notecard illustrating the most important point of the lesson.
3. Ask students to imagine that they're in orbit around a planet one half the size and mass of the earth, but otherwise identical. They should explain how they would expect the atmosphere of the new planet to be different from ours.
4. Have the students replicate the layers of the atmosphere in detail with their notes, take home to study, and then have a quiz at a later date.