



Most of the earth's weather occurs in the **troposphere** (TROH-poh-sfeer). In Activity 58, "The Causes of Climate," you learned that the ocean has currents that move warm and cold water from one place to another. The troposphere has currents as well. **Air currents move air from one place to another.**

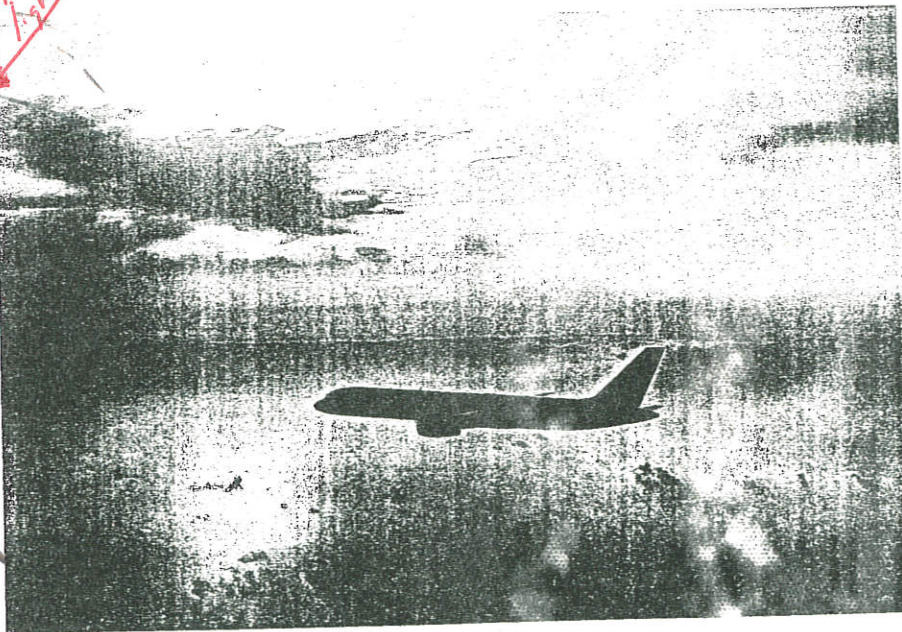
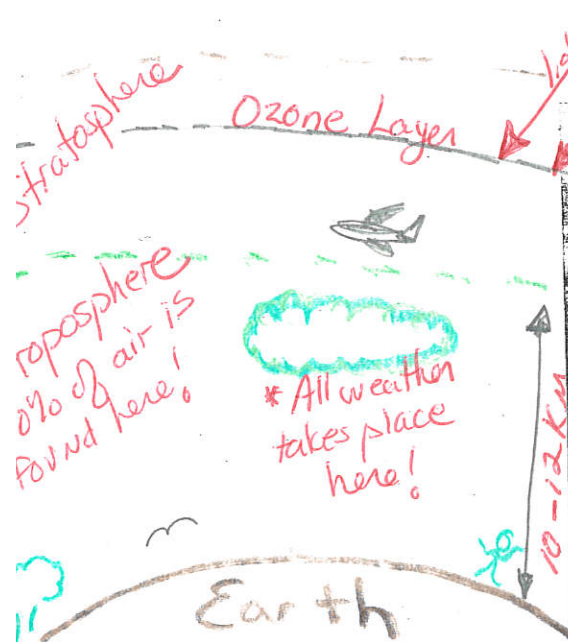
CHALLENGE

What role does the atmosphere play in weather and climate?

MATERIALS

For each student

- 1 completed Student Sheet 64.1, "Data from Air Samples"
- 1 completed "Mean Atmospheric Values" data table from Activity 64, "Earth's Atmosphere"



READING

Use the "Listen, Stop, and Write" strategy to help you with this reading. Listen as your teacher reads aloud. Whenever he or she stops reading, close your book. Write down the main ideas you just heard.

Earth's Atmosphere

The atmosphere is the layer of gases that surrounds the earth. The main gases are nitrogen (78%) and oxygen (21%), with the remaining 1% made up of other gases including carbon dioxide, water vapor, and argon. Atmospheric scientists divide the atmosphere into five layers based on temperature differences (see the table below). Compared to the radius of the earth (6,370 km), the atmosphere is a very thin 262–382 km.

Earth's Atmospheric Layers		
Atmospheric Layer	Approximate height above earth's surface	What happens in this layer?
Exosphere	120 km+	The earth's atmosphere merges into space.
Thermosphere	80–120 km	The space shuttle orbits the earth.
Mesosphere	50–80 km	Meteors usually burn up.
Stratosphere	12–50 km	Ozone layer absorbs some the sun's harmful ultraviolet radiation before it strikes the earth's surface.
Troposphere	0–12 km	Most weather occurs. Cruising altitude of most commercial aircraft.

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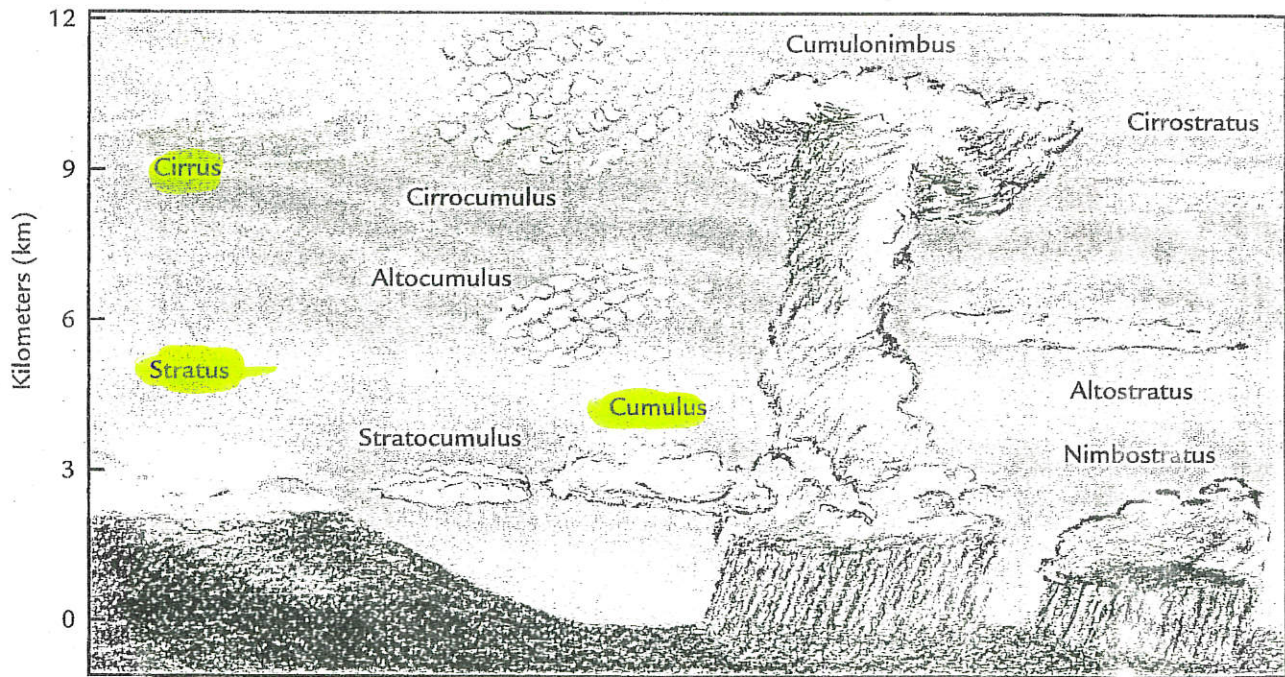
Atmosphere and Weather

Weather occurs in the troposphere. Air in the troposphere is heated ground up. The surface of the earth absorbs the sun's energy is up. The heat then heats up the air above it. Since parts of the earth heat up faster than others, this causes changes in air temperature and pressure, resulting in wind.

the horizontal movement of air

the sky. The fastest wind speed recorded to date is 513 km/hr (318 mi/hr) during a 1999 tornado in Oklahoma. In general, wind speeds tend to be higher in the daytime when there are greater differences in air temperature and pressure.

Heat is spread through the troposphere because air is slightly unstable. Unstable air can cause the moisture in the atmosphere to condense and clouds to form. On average, clouds cover 40-50% of the earth at any given time. Clouds and storms form when pockets of air rise and cool. They are carried through the atmosphere by wind. The more unstable the atmosphere is, the more likely you are to see clouds and more severe weather, such as storms.



Clouds are described by their height in the atmosphere and their shape.

Atmosphere and Climate

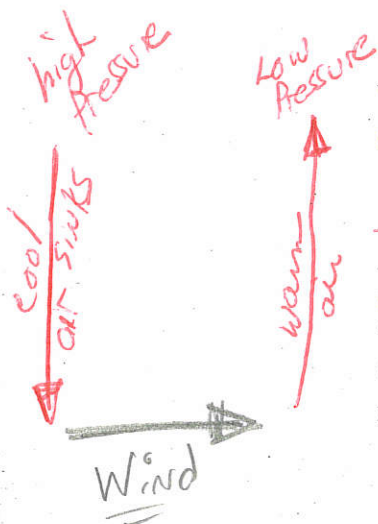
The way the earth's atmosphere interacts with the sun's energy and the oceans helps determine the earth's average temperatures and its different climate zones. Air heated at the equator eventually moves north or south to other climates. Some of the sun's energy reflects off the earth's surface and would be lost to space if there were no atmosphere. By trapping some of the sun's energy, the atmosphere helps maintain the different climates on earth.

The constant movement of air in the earth's atmosphere also ensures a steady environment for living organisms. Almost all living organisms require gases found in the atmosphere for survival. The interaction between living organisms and the environment means that the earth's atmosphere supports life and that living organisms continue to produce gases that become part of the atmosphere.

* Atmosphere and Weather

- Weather occurs in the troposphere. Air in the troposphere is heated from the ground up. The surface of the earth absorbs the sun's energy and heats up. The heated earth then heats up the air above it. Since some parts of the earth's surface heat up faster than others, this causes differences in air temperature and pressure, resulting in wind.

Wind is the horizontal movement of air. Air moves from areas of high pressure to areas of low pressure and can result in winds of different speeds. When there is very little or no difference between pressure in two neighboring regions, the air is calm and there is no wind. When there is a lot of difference in air pressure between two neighboring regions, strong winds can blow leaves off trees and push clouds across



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ANALYSIS

1. What is the relationship between the earth's atmosphere and its weather and climate?
2. As an atmospheric scientist, you are asked to write an encyclopedia entry about the atmosphere. Use your work from Activity 64, "Earth's Atmosphere," and your knowledge about the atmosphere from Activities 65 and 66 to write a paragraph explaining the atmosphere and its layers. Be sure to describe significant similarities and differences among the different layers.
3. **Reflection:** In the past three activities, you have learned a lot about the earth's atmosphere. If you were an atmospheric scientist, what aspect of the earth's atmosphere would you most like to study? Why?