

Activity 4

Clouds Over Your Head

Level 1

Objectives:

- Students will become familiar with the four main types of clouds: stratus, cirrus, cumulus, and cumulonimbus and their characteristics.
- Students will learn the weather map symbols for cloudy, clear or no clouds, and partly cloudy.

National Science Standards: All students should develop an understanding of: properties of earth materials, and changes in earth and sky.

Engage:

1. Let's see what part of the United States is cloudy today.
2. On the activity website, <http://www.uni.edu/storm/activities/level1/>, access the United States satellite map.
3. Discuss with students where it is cloudy in the United States.
4. Have students shade in the U.S. outline map to show where it is cloudy.

Explore:

1. At this point, remind them of the four types of clouds by displaying pictures or computer images showing cloud-type characteristics to each student.

Cumulus	Cumulonimbus	Stratus	Cirrus
Puffycotton balls	gray, dark	low -lying	high
Flat bottom	anvil shaped	sheets, blanket-like	thin, wispy
Billowing mounds	enormous	flat	thread-like

1. Practice observing clouds by looking outside and identifying the clouds you see. (This is an activity that should be done each day. Sometimes it can be done more than once a day.)

Explain:

1. Have students practice drawing the four types of clouds.
2. Access the US Sky Cover map. Have students look at the weather symbols. Ask students what they think the circles represent, and why they think so.
3. Explain that the circles represent the locations of several cities in each state. Discuss how the circle is shaded in according to the amount of cloud cover in an area. An empty circle means clear skies and a shaded circle means total cloud cover/no sun. When the circle is not totally filled in it indicates degrees of partial cloud cover. If the circle contains an M then the cloud cover data for that location is not currently available.
 - a. Have students find a place that is clear, $\frac{1}{4}$ cloud cover, $\frac{1}{2}$ cloud cover, $\frac{3}{4}$ cloud cover, and completely cloud covered. (Depending on math skills, you might wish to have students write down the decimal and percentage equivalents for the above fractions.

- b. Compare the station model indications of cloud cover to the satellite cloud cover map.
- c. If a circle has an 'M' in it, that means the data for that recording station is missing.

Extend:

1. Construct a cloud mobile (or book) of the four types of clouds. Use cotton balls for a 3 – D look.
 - a. On the back of each shape write a different type of poem using the information about the clouds. Poem types could be acrostic, couplet, verse, and haiku.

Evaluate:

1. Collect student cloud cover USA maps, monitor discussions, and collect the extend project.

For Further Inquiry:

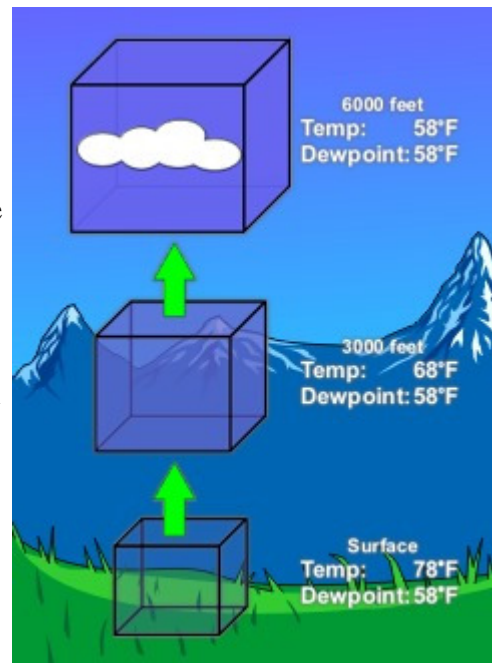
Have students keep a record of how local cloud cover changes over a one-week period. Or have them design an activity to answer any other question they might have about local or national cloud cover.

Teacher Background:

Clouds

Clouds form when air is cooled to its *dew point* or when the air reaches saturation. Air can reach saturation in a number of ways. The most common way is through lifting. As a bubble or parcel of air rises it moves into an area of lower pressure (pressure decreases with height). As this occurs the parcel expands. This requires energy, or work, which takes heat away from the parcel. So as air rises it cools. This is called an adiabatic process.

Since cold air can hold less water vapor than warm air, some of the vapor will condense onto tiny clay and salt particles called condensation nuclei. The reverse is also true. As a parcel of air sinks, it encounters increasing pressure and is squeezed inward. This adds heat to the parcel so it warms as it sinks. Warm air can hold more water vapor than cold air, so clouds tend to evaporate as air sinks.



Types of Clouds

There are four basic cloud categories observed in our atmosphere:



Cirro-form

High-level clouds form above 20,000 feet (6,000 m) and are usually composed of ice crystals. High-level clouds are typically thin and white in appearance, but can create an array of colors when the sun is low on the horizon. Cirrus generally occur in fair weather and point in the direction of air movement at their elevation.



Nimbo-form

Nimbus comes from the Latin word meaning "**rain**". These clouds typically form between 7,000 and 15,000 feet (2,100 to 4,600 m) and bring steady precipitation. As the clouds thicken and precipitation begins to fall, the bases of the clouds tend to lower toward the ground.



Cumulo-form

Clouds look like white fluffy cotton balls or **heaps** and show the vertical motion or thermal uplift of air taking place in the atmosphere. The level at which condensation and cloud formation begins is indicated by a flat cloud base, and its height will depend upon the humidity of the rising air. The more humid the air, the lower the cloud base. The tops of these clouds can reach over 60,000 feet (18,000 m).



Strato-form

"Stratus" is Latin for **layer** or blanket. The clouds consist of a featureless low layer that can cover the entire sky like a blanket, bringing generally gray and dull weather. The cloud bases are usually only a few hundred feet above the ground. Over hills and mountains they can reach ground level when they may be called fog. Also, as fog "lifts" off the ground due to daytime heating, the fog forms a layer of low stratus clouds.

A question you might hear a lot is, "What is the difference between partly cloudy and partly sunny?" The National Weather Service often uses the terms "partly cloudy" and "partly sunny" in the wording of a public forecast. While these terms may appear somewhat vague, many of the National Weather Service Offices use a particular set of criteria based upon the sky condition or cloud coverage when preparing the public forecast text. The following descriptions are used in public forecasts:

SKY CONDITION (from NWS, *Media Guide to National Weather Service Terminology*, 1996)

Sky Condition	Cloud Coverage
Cloudy	9/10 to 10/10 of the sky covered by clouds
Mostly cloudy, <i>or</i> Considerable cloudiness	7/10 to 8/10
Partly cloudy <i>or</i> Partly sunny	3/10 to 6/10
Mostly clear <i>or</i> Mostly sunny	1/10 to 3/10
Fair	Less than 4/10 cloud cover, no precipitation Generally pleasant weather conditions

When communicating with other meteorologists and with the aviation industry, a slightly different code is used. This code is used in plotting of the station model on the surface weather maps. According to observational practice, the following terminology and codes are used to report the cloud cover.

SKY COVER CODE

CLR Clear	0/8 of sky covered by clouds
FEW Few	1/8 through 2/8 of sky covered by clouds
SCT Scattered	3/8 through 4/8 of sky is covered by clouds
BKN Broken	5/8 through 7/8 of sky is cloud covered
OVC Overcast	8/8 of sky is cloud covered

