

Observing Clouds

Fluffy, puffy white clouds in a bright blue sky. This is one of the first memories of clouds that many of us have. You might remember a peaceful time lying on your back looking at the sky above, imagining shapes coming to life in the clouds.

Ducks, people, trucks, houses, and horses might have paraded by as the puffs of bright cloud slowly changed.

You've already learned that clouds form when water vapor condenses on tiny particles of smoke, salt, and other

condensation nuclei. But why do some clouds appear puffy and white and others grow to towering mountains? And what about those clouds that cover the sky as a gray, gloomy mass? Why are some clouds close to the ground and others faint streaks high above?

Clouds appear as one of two basic types—**cumuliform** and **stratiform**. *Cumuliform* describes the puffy, sometimes fast-moving and rapidly growing kind of cloud. *Cumulus* comes from the Latin word that means "heap." To grow a cumuliform cloud, air

must be moving upward. As air rises, it cools. If water vapor and condensation nuclei are present, you've got the ingredients for a cumuliform cloud. When you see cumuliform clouds, you can infer that the

weather conditions are unstable, and change may be in the works.

Stratiform clouds are flat and layered. *Stratus* is a Latin word meaning "layer." Stratiform clouds form when weather conditions are fairly stable. They result from the lifting of a large, moist air mass.



Meteorologists also observe where in the troposphere clouds form. High-level clouds form above 5000 meters (m) and are given the *cirro-* prefix. Middle-level clouds form between 2000 and 5000 m and are given the *alto-* prefix. Low-level clouds form below 2000 m. There is no special prefix for low-level clouds.

Some clouds may extend from low to high levels. They are nimbus clouds. *Nimbus* means "rain-bearing."





Luke Howard, the Cloud Father?

Luke Howard is sometimes called the godfather of the clouds.

Howard was never trained as a scientist, but he loved nature, especially weather, from an early age. For more than 30 years of his life, he kept a record of his weather observations. He presented his first system for classifying clouds in 1802. It is the same system meteorologists all over the world use today.

Howard also discovered that the air over cities is warmer at night than air over the countryside. We call this an urban heat island today.

You can describe just about any cloud you observe by its shape and altitude. For example,

- An altostratus cloud is a middle-level-layer cloud.
- A cirrocumulus cloud is a high-level puffy cloud.
- A cumulonimbus cloud is a heaped cloud growing from low to high levels, bringing rain.

Some low-level clouds have no prefix and are just known as stratus or cumulus clouds.

The words that describe clouds are very useful when you're recording weather observations and want to tell someone else what you have observed. Knowing why different clouds form gives you a good idea of weather conditions in your area.

That which no hand can reach, no hand can clasp.

A description of clouds in a poem
by Johann Wolfgang von Goethe (1749–1832)

HIGH-LEVEL CLOUDS

8000 m

cirrocumulus

6000 m

cumulonimbus

MIDDLE-LEVEL CLOUDS

4000 m

altocumulus

2000 m

LOW-LEVEL CLOUDS

stratus

LOW-LEVEL CLOUDS

Stratus

The base of stratus clouds is often around 600 m. Stratus clouds form in stable air. They appear flat and layered, with no lumps or bumps.

STRATUS



Stratocumulus

Stratocumulus clouds form when warm, moist air mixes with drier, cooler air. When this mixture moves beneath warmer, lighter air, it starts to form rolls or waves. It looks thick. It may bring drizzle or light precipitation.

STRATOCUMULUS



Cumulus

Puffy white clouds at low levels are called cumulus clouds. When they are small and scattered, it means good weather. These are sometimes called fair-weather cumulus.

CUMULUS



Cumulonimbus

Cumulonimbus clouds form on hot summer days. The sky may start clear, with little wind. Air heated by the ground rises. Convection cells form. Warm air rises through the cell center; cooler air sinks down the sides. A cumulonimbus cloud forms. It is taller than a cumulus cloud, with a base between 300 and 1500 m. Rain starts to fall. Thunderstorms may develop.

CUMULONIMBUS



MEDIUM-LEVEL CLOUDS

Nimbostratus

Nimbostratus clouds are sheet clouds carrying rain. Rain or snow falls almost continuously. There is usually little turbulence.

Altostratus

Altostratus clouds appear white or slightly blue. They can form a continuous sheet or look fibrous. They form between 2000 and 5000 m. Rain or snow may fall. Sometimes you can see the Sun through an altostratus cloud.

Alto cumulus

Alto cumulus clouds form between 2500 and 5500 m. They look like small, loose cotton balls floating across the sky.

Alto cumulus mammatus

Alto cumulus mammatus clouds look threatening, but actually indicate that the rainy weather is almost over. The clouds droop because the air is cooling and sinking.

Alto cumulus lenticularis

Alto cumulus lenticularis clouds are lens-shaped. Sometimes they look like flying saucers. They form at the top of a wave of air flowing over a mountain peak or ridge.

NIMBOSTRATUS



ALTOSTRATUS



ALTOCUMULUS



ALTOCUMULUS
MAMMATUS



ALTOCUMULUS
LENTICULARIS



HIGH-LEVEL CLOUDS

Cirrus

Cirrus clouds are made of falling ice crystals. The wind blows them into fine strands. The longer the strands, the stronger the wind. Cirrus clouds indicate that the air is dry. Good weather should continue.

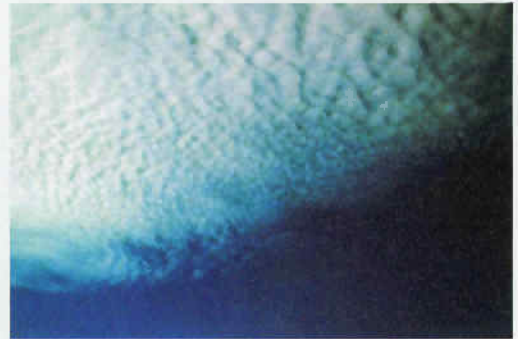
CIRRUS



Cirrocumulus

Clouds composed of many smaller clouds at a high level are called cirrocumulus. Some people think these clouds look like fish scales. It is sometimes known as a mackerel sky. It may mean that unsettled weather is on its way.

CIRROCUMULUS



Cirrostratus

Cirrostratus clouds are high-level clouds that cover the sky. The cloud is thin and transparent. You can see the Sun or the Moon through cirrostratus clouds.

CIRROSTRATUS



Jet Contrail

This jet is flying among some cirrus clouds. This could be called a human-made cloud. The jet's contrail is formed by condensation of water vapor from its exhaust.

JET CONTRAIL



Think Questions

1. Look at the weather observations your class has recorded on the class weather chart.
 - If you included cloud observations, what were the most common types of clouds?
 - Try to identify any relationships between the types of clouds and other weather observations. For example, when air pressure decreased, did a certain kind of cloud appear?
2. If stratus clouds fill the sky for several days, what does that tell you about the stability of the air? What kind of weather might you expect?
3. Cumulonimbus clouds often form in the afternoon. What weather and land conditions might contribute to their forming later in the day? (Hint: Think about solar heating of Earth and heat transfer.)
4. Read the quote by Goethe on page 38. What do you think he means?
5. Write and illustrate a short poem about clouds.

