

Meteorology: Clouds in the Sky



MAIN IDEA

Head outside and observe the sky to identify different types of clouds. Then create your own 3D model of your favorite cloud with common materials. This is a great activity for children five and under also!

SCIENCE BACKGROUND

Clouds are made up of tiny water droplets and/or ice crystals that are so small, they can float in the air. Clouds form when warmer air made up of water vapor, the gaseous form of water, rises from the surface due to evaporation, the transformation of a liquid into a gas, or oceans, lakes and rivers. As the air rises it cools and then condenses, when a gas transforms into a liquid, to form little water droplets. Usually this occurs when small particles, such as dust or pollen, are in the air as well providing the surrounding water vapor a surface to condense on when it cools. These particles are known as cloud condensation nuclei.

There are several types of clouds that are named primarily based on their shape and height in the sky. Flatter clouds have names that include “strato” and vertical clouds have names that include “cumulo.” Clouds that produce rain include “nimbo” in their name.

High level clouds (above 20,000 ft) are composed of ice crystals and have names that begin with “cirro,” including cirrus, cirrocumulus, and cirrostratus. Mid-level clouds (6,500 to 20,000 ft) are composed of both ice crystals and water droplets and have names that begin with “alto,” including altostratus and altocumulus. Low level clouds (below 6,500 ft) are composed of water droplets and have all kinds of names including stratus, nimbostratus, stratocumulus, and cumulus.

One common cloud type in Florida are cumulonimbus clouds. These are tall rain clouds that can reach heights of up to 60,000 ft, and due to the combination of ice crystals, water droplets, and extreme vertical motion, can end up producing lightning if the conditions are right.



MATERIALS

Cloud guide from NASA/NOAA (see page 4)

Construction paper (color of your choice)

Cotton balls (or pompoms and other paper products)

Glue

Optional: Markers

Optional: Sheet or blanket

ACTIVITY PROCEDURE

STEP 1: Grab your cloud guide and head outside to look up at the sky.

STEP 2: Lay on the ground (feel free to use a sheet or blanket if you prefer), and look up at the sky. As clouds pass by, try to identify what kind of cloud they are by using your cloud guide.

Pro tip: If it is raining, you can still identify the clouds using the cloud guide from inside your house!

STEP 3: After sky watching for as long as you'd like, come back inside to create your own 3D cloud model.

STEP 4: Using the cloud guide, and your own observations, pick what kind of cloud model you would like to create.

- ✔ What kind of clouds did you identify?
- ✔ What kind of cloud did you choose?

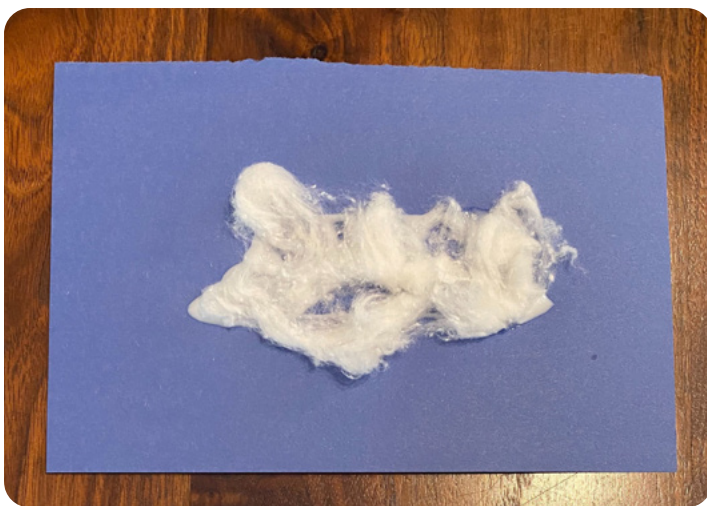
STEP 5: Use the cotton balls to build your model. For flatter clouds (such as cirrus), you will need to pull on the cotton ball to spread it out. For taller clouds (such as cumulus), you will need to glue several cotton balls together to make it big and fluffy.

- ✔ How do you think you will need to change the cotton balls to build your cloud?
- ✔ Will you need many cotton balls or just one? What about for a different kind of cloud?

STEP 6: Glue the cloud to your construction paper sky to share.

Optional: Use the markers to decorate your sky before gluing the cloud to the paper sky.

Then, for extra fun, take your cloud model outside to compare with the clouds in the sky!



EDUCATIONAL STANDARDS

Kindergarten

Big Idea 1: The Practice of Science

SC.K.N.1.2 - Make observations of the natural world and know that they are descriptors collected using the five senses.

SC.K.N.1.4 - Observe and create a visual representation of an object which includes its major features.

Grade 1

Big Idea 1: The Practice of Science

SC.1.N.1.2 – Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color and motion, and compare their observations with others.

Grade 2

Big Idea 7: Earth Systems and Patterns

SC.2.E.7.1 - Compare and describe changing patterns in nature that repeat themselves, such as weather conditions including temperature and precipitation, day to day and season to season.

Grade 5

Big Idea 7: Earth Systems and Patterns

SC.5.E.7.3 - Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.

Grade 6

Big Idea 7: Earth Systems and Patterns

SC.6.E.7.2 - Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.

ADDITIONAL RESOURCES

UCAR Center for Science Education – Clouds

<https://scied.ucar.edu/clouds>

UCAR Center for Science Education - Field Guide to Clouds Mobile App

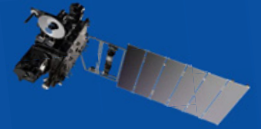
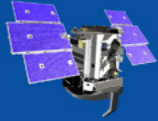
<https://scied.ucar.edu/apps/cloud-guide>

NASA Space Place – Clouds

<https://spaceplace.nasa.gov/search/clouds/>



Wild World of Clouds



Studying Clouds from Space

Satellites in orbit above Earth provide images and other information about the atmosphere and enable weather forecasters and climatologists to do their jobs.

CloudSat, a NASA Earth-observing satellite, uses radar to see inside the clouds from top to bottom. CloudSat measures their thickness, their altitude at top and bottom, their reflective properties, and their water and ice content. Data from CloudSat is used to improve our ability to accurately forecast the weather and improve long-term global climate predictions.

GOES-R is a new satellite, the first one planned for launch in 2016. Geostationary Operational Environmental Satellites (GOES) orbit 22,300 miles (35,888 kilometers) above Earth's equator. They orbit once per day as Earth rotates. Thus the GOES look down upon the same part of Earth all the time. One GOES primarily watches the east coast of the U.S. and one GOES watches the west coast. They observe weather developments, including ocean temperatures, and help forecasters warn people of developing storms, such as hurricanes. The new GOES-R will replace the current GOES. GOES-R will be able to do everything the GOES do, and more. GOES-R will gather more detailed, accurate images and other data faster than ever. It will be able to map where lightning strikes are occurring, even in the daytime.

Up to 60,000 ft (18,000m)

Reading the Clouds

Clouds, which are collections of water droplets, are beautiful and fun to watch. If we learn to "read" them, we can know what is happening at different levels of the atmosphere and what kind of weather may be on the way. Clouds are classified by their shape or appearance and their height above the ground.

High clouds start above around 20,000 feet (6,000 meters). They often look thin and patchy or feathery. Their names start with "cirro," which means "curl of hair" in Latin.

Cirrus clouds look like delicate strands or hooks. They are made mostly of ice crystals.

Cirrocumulus are thin, patchy clouds that may have rippled or wavelike patterns.

Cirrostratus are thin, sheet-like clouds that cover most of the sky.

Mid-level clouds form from 6,500 feet (2,000 meters) to 20,000 feet (6,000 meters). They usually look rather flat and layered, because the air at these altitudes doesn't move very much vertically. Their names always start with "alto".

Altostratus are white or gray puffy, patchy clouds with spaces between them. They may appear to be lined up in rows.

Altostratus form a gray or bluish-gray uniform-looking layer that covers much or most of the sky.

Low-level clouds are found below about 6,500 feet (2,000 meters). They are either flat and layered or rounded on top, with flat bases:

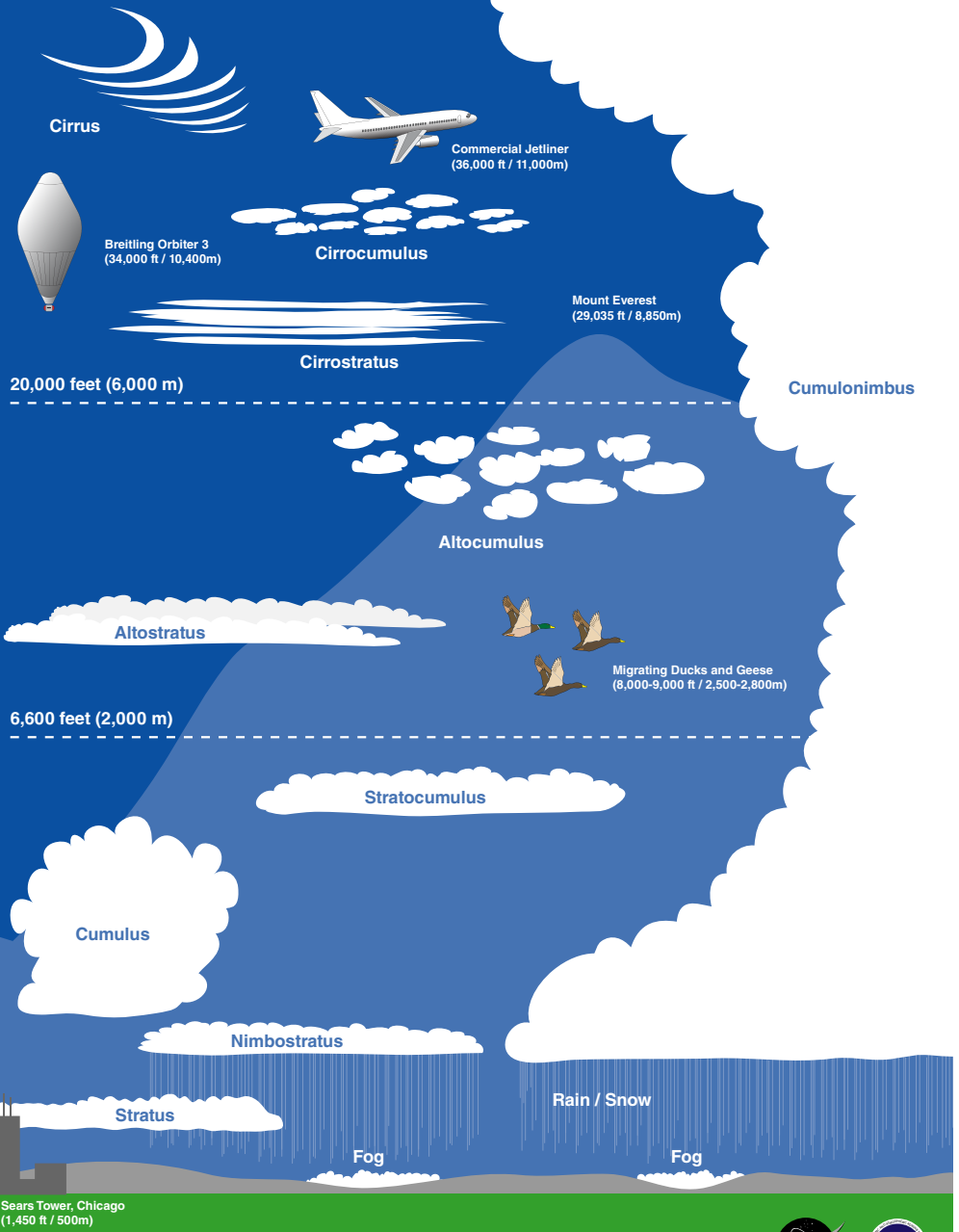
Stratocumulus have distinct gray or whitish rounded patches. They may look rolling or puffy, but are often merged together into layers with no spaces between them.

Cumulus clouds are fluffy and cauliflower-like, with rounded white tops and flat grayish bases.

Stratus form a flat, thin, uniform cloud layer. They usually contain insufficient water to produce significant rain or snow. Stratus clouds that reach down to the ground we call fog.

Nimbostratus are dark, gray clouds that are dropping rain or snow. They usually cover the entire sky. Sometimes nimbostratus are found higher in the atmosphere, in the mid-altitudes.

Cumulonimbus clouds are the kings of all clouds, rising from low altitudes to more than 60,000 feet (20,000 meters) above ground level. They grow due to rising air currents called updrafts, with their tops flattening out into an anvil shape. Cumulonimbus are a sure sign of severe weather, with heavy rain and possibly hail.



Sears Tower, Chicago (1,450 ft / 500m)

