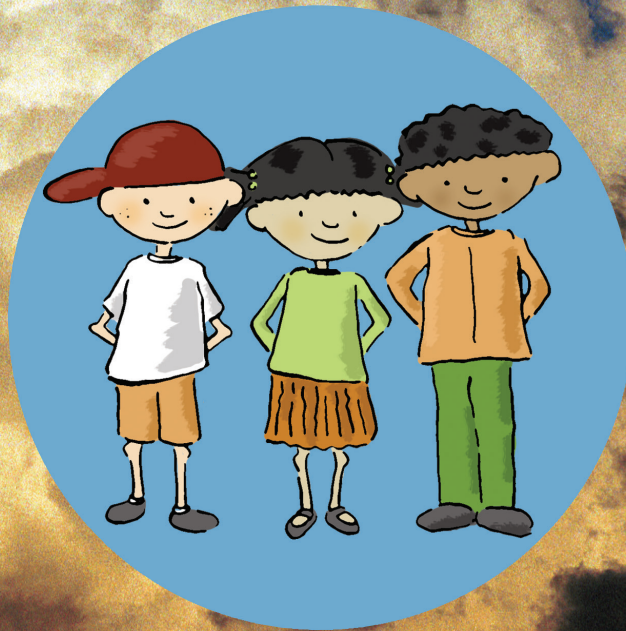


Do You Know That Clouds Have Names?



Text by
Becca Hatheway, Kerry Zarlengo,
and Peggy LeMone

Illustrations by
Lisa Gardiner

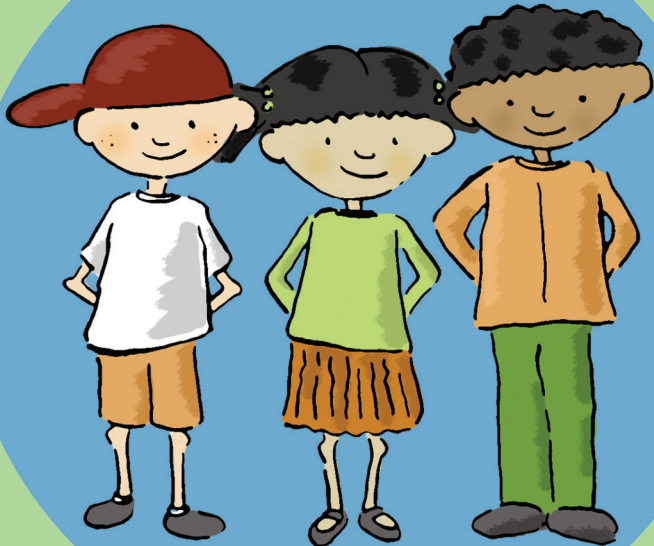
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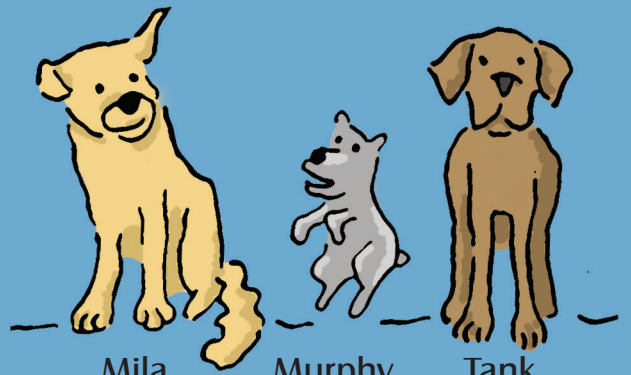




Simon

Anita

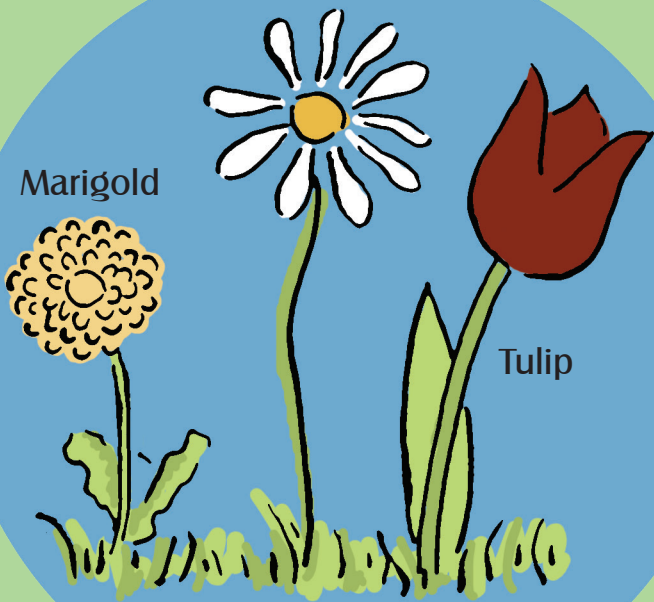
Dennis



Mila

Murphy

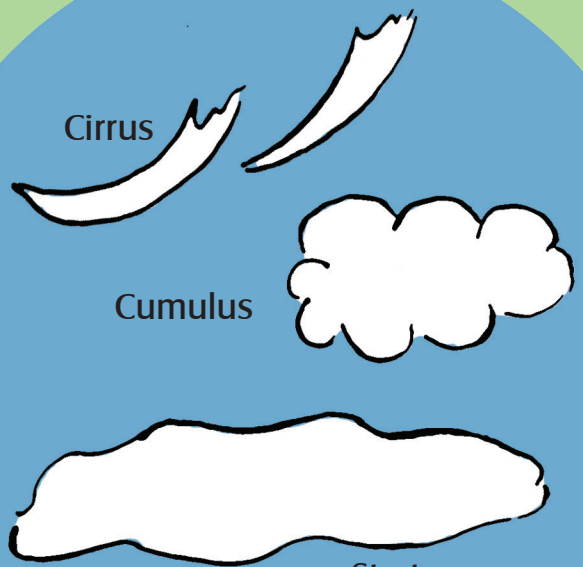
Tank



Marigold

Daisy

Tulip



Cirrus

Cumulus

Stratus

Do you know that kids have names like Simon, Anita, or Dennis?

Do you know that dogs have names like Mila, Murphy, or Tank?

Do you know that flowers have names like marigold, daisy, or tulip?

Well, clouds have names, too! Some cloud names are cirrus, cumulus, and stratus.



Teachers:

Explain to your students the use of the words “names” and “groups” here. “Names” can be for individual things or for groups of things (e.g., a cirrus cloud may be one individual cloud or it may refer to that group of cloud types. And when something is in a group, you can also use the word “category.”

When reading this page to your class, you can replace the names listed above with names of students in your class, their pets’ names, and plants you have in or near your classroom!



Do you know that clouds get their names from their shape, how high they are in the sky, and if they produce precipitation?

On different days and in different places, when you look up in the sky, you might see different types of clouds.

Let's get started and learn the names of the different types of clouds you might see the next time you go outside. In this book, we will use some words we already know to help us learn the names and types of clouds.

Teachers:

The chart below shows the cloud types that are described in this book and whether they are found at low, middle, or high levels in the atmosphere. Use this as a reference and organizer as you introduce students to the various types of clouds.

Altitude	HIGH	Cirrostratus Clouds (pages 17-18)	Cirrus Clouds (pages 15-16)	Contrails (pages 21-22)	Cirrocumulus Clouds (pages 19-20)	RAINMAKERS CLOUDS Cumulonimbus Clouds (pages 25-26) Nimbostratus Clouds (pages 23-24)
	MIDDLE	Altostratus Clouds (pages 11-12)		Alto cumulus Clouds (pages 13-14)		
	LOW	Stratus Clouds (pages 7-8)	Stratocumulus Clouds (pages 9-10)	Cumulus Clouds (pages 5-6)		

Remember that there is a range within each cloud type and that the clouds you see in the sky may not look exactly like the photographs in this book. Additionally, talk to your students about size and scale, and about how the clouds they see in the sky and in photographs have a scale relative to each other. See the *Teacher's Notes* at the end of this book (pages 29-30) for more information on scale and relative size. Also, remember that there can be more than one kind of cloud in the sky at a given time! **Precipitation** is water in solid or liquid form that falls to Earth's surface from the atmosphere (rain, sleet, hail, snow, etc.).



Do you know that some clouds are low in the sky? They are found where blimps, helicopters, and small planes fly. Other clouds are high in the sky, as high as jet planes fly!

One type of low cloud looks like big puffy cotton balls or cauliflower. This is a **cumulus** cloud.

It's fun to lie on the ground and look up at **cumulus** clouds to see what shapes you can find in them. You should try it!

**Teachers:**

Cumulus clouds are puffy and sometimes look like pieces of floating cotton. Cumulus clouds are made of water, have sharp outlines, and the base of each cloud is often flat. The top of the cloud has rounded towers. Cumulus clouds can be associated with good or bad weather. Some show up on warm summer days and are associated with fair weather. These clouds are below 2,000 m high. They are usually not very tall and they are separated from each other with lots of blue sky in between.



Do you know what kind of cloud looks like a gray blanket covering the sky? These are **stratus** clouds and they are found low in the sky. Sometimes you can almost see the Sun shining through **stratus** clouds.

**Teachers:**

Stratus clouds are uniform clouds that often cover the entire sky. They resemble fog that does not reach the ground. Usually precipitation doesn't fall from stratus clouds, but sometimes they may produce drizzle. Stratus clouds can be found from Earth's surface up to 2,000 m high. Stratus clouds are made of water, not ice, so when you see the Sun's disk through them the edges look sharp.



Do you know what kind of cloud looks soft like cotton candy or pillow stuffing? It is a **stratocumulus** cloud. These are low, gray, puffy clouds that can cover lots of the sky.

**Teachers:**

Stratocumulus clouds consist of water droplets and belong to the low cloud (surface to 2,000 m) group. These clouds are low, lumpy, and gray. Some form in rows with blue sky visible in between. Precipitation rarely occurs with stratocumulus clouds. To distinguish between a stratocumulus and an altocumulus cloud, point your hand at arm's length toward the cloud. If the cloud is about the size of your fist or larger, then it is stratocumulus.



Do you know that some clouds are higher in the sky? One of the types of clouds you can see at middle altitudes are **altostratus** clouds. These clouds look smooth and uniform, like a blank wall or the frosting on a cake.

**Teachers:**

Altostratus clouds are gray or blue-gray middle level clouds (2,000-7,000 m up*) composed of ice crystals or water droplets. These clouds usually cover the entire sky. In the thinner areas of the cloud, the Sun may appear to be behind heavily frosted glass or dimly visible as a fuzzy round disk. Altostratus clouds often form ahead of storms that may produce continuous precipitation.

(* The altitude of middle and high clouds varies depending on latitude. Please see the *Teacher's Notes* on pages 29-30 for more information about the altitude of clouds at your latitude.)



Do you know which clouds look like fish scales or a flock of sheep? These are **altocumulus** clouds and they are puffy and patchy. They are the other type of middle level cloud and they might trick you because they look similar to cumulus clouds. But they are farther away so they look smaller!

**Teachers:**

Altocumulus clouds are middle level clouds (2,000-7,000 m up) made of water droplets or ice crystals and appear as white to gray, puffy masses, sometimes in parallel waves or bands. They usually occur in groups. The appearance of these clouds on a warm, humid summer morning often means thunderstorms may occur by late afternoon. You can distinguish an altocumulus cloud from a stratocumulus cloud by pointing your hand at arm's length toward the cloud. If the cloud is about the size of your thumb, then it is altocumulus.

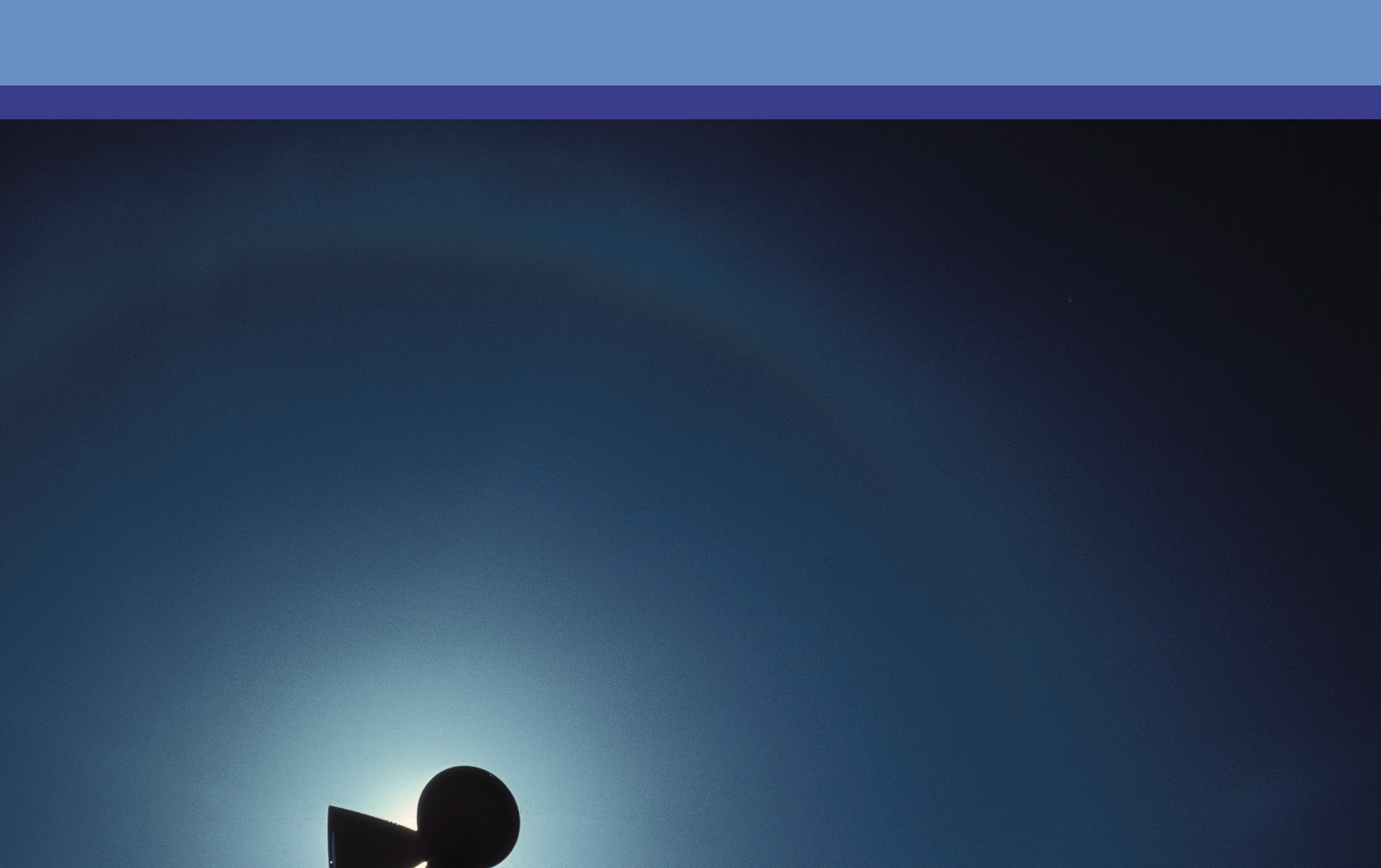


Do you know what kind of clouds are higher than any other type? **Cirrus** clouds are way up high. They are feathery, like the soft downy feathers baby chicks have, or like horse tails floating in the sky.

**Teachers:**

Cirrus clouds are thin, wispy clouds spread horizontally into long, thin streamers. They are made of ice crystals and are considered “high clouds,” forming above 5,000 m. They generally indicate fair to pleasant weather.

Cirrus clouds are commonly known as “mares’ tails” because of their appearance. The reason for the long tail is primarily due to the wind. In the upper troposphere, the winds travel at very high speeds, carrying the cirrus clouds with them.



Do you know what type of cloud looks like a thin veil that covers most of the sky? This is a **cirrostratus** cloud and it is one of the two other types of high cirrus clouds. You usually can see the Sun or the moon through them. Sometimes there appears to be a big halo or circle around the Sun through the cirrostratus cloud.

**Teachers:**


Cirrostratus clouds consist almost entirely of ice crystals and belong to the high cloud (5,000-13,000 m) group. They are thin, sheet-like clouds that usually cover the entire sky. The Sun or moon can shine through cirrostratus clouds. Sometimes a halo will appear around the Sun or moon when in the presence of cirrostratus because the cloud's ice crystals bend the light. The distance from the sun to the halo is about the width of an outstretched hand held at arm's length. Cirrostratus clouds usually come 12-24 hours before a rain or snowstorm. You can distinguish a cirrostratus from an altostratus cloud by looking for your shadow on the ground. If you can see your shadow, then the cloud is cirrostratus.




Do you know the name of high clouds that look like ripples on the water? They are **cirrocumulus** clouds. They often have a rippled pattern like a lake or bay has on a windy day, or like the pattern on these fish.

**Teachers:**


Cirrocumulus clouds are small, rounded puffs or long, parallel bands that are made up of ice crystals and usually appear in long rows. They are usually white. Cirrocumulus clouds are found above 5,000 m. The individual cloud elements are the size of your littlest finger or smaller. If the cirrocumulus ripples (or bands) cover most of the sky, it is called a “mackerel sky” because the sky looks like the scales of a mackerel fish. Cirrocumulus clouds are usually seen in the wintertime and indicate fair, cold weather.



A plane just flew by and made this contrail.




This contrail is a few minutes older. It is spreading out!




This contrail is the oldest of the three. It is becoming a cirrus cloud!

This is a good example of a *persistent spreading* contrail!



Contrails that stay in the sky a long time are called *persistent*.



Some contrails don't stay in the sky very long. They are called *short-lived*.

Do you know that when airplanes fly they often leave behind a trail of moisture? This is called a **contrail**. Some contrails stay in the sky for a long time after the airplane is gone. These contrails can become human-made cirrus clouds.

(Remember cirrus clouds?
Here's a hint: They are
high in the sky and
look like wispy
horse tails.)

**Teachers:**

The word “contrail” comes from the phrase “condensation trail.” **Contrails** are clouds formed when water vapor condenses and freezes around small particles (aerosols) that exist in aircraft exhaust. The water vapor comes from the air around the plane and the exhaust of the aircraft. The study of contrails addresses important scientific questions, as they are clouds whose formation is a direct result of human activities. A change in the amount of high-level cloudiness resulting from contrails may impact our climate.



But wait a minute, we are not done yet! We have gone over the names of clouds, from low to high. What are we missing?

Here's a hint: Do you know that some clouds make different types of precipitation like rain and snow?

One of these types of clouds is called **nimbostratus**. This cloud is like a big blanket that covers the sky and has steady rain falling from it for a long time. When rain falls from a nimbostratus cloud, it goes on and on and you'll need your raincoat if you go outside!

Sometimes the cloud covers the whole sky, and you can't see any edges. Sometimes you can't even see the cloud because it is raining or snowing really hard.

Teachers:

Nimbostratus clouds form a dark gray, "wet" looking cloudy layer associated with continuously falling rain or snow. They produce precipitation that is light to moderate. Nimbostratus clouds are low to middle clouds, forming below 2000 m in the sky.



Do you know that the other type of rain cloud can be very noisy?

Cumulonimbus clouds are big, billowing clouds that can be darker at the bottom and white and puffy at the top. Sometimes they produce thunder and lightning and are called thunderheads. These clouds can also produce tornadoes and hail.

**Teachers:**

Cumulonimbus clouds are thunderstorm clouds that form if cumulus clouds continue to grow vertically. Their bases may be no more than 1,000 m above Earth's surface. Their tops may extend upward to over 18,000 m. At the top of cumulonimbus clouds, the cloud spreads out, forming an anvil shape. Rain, snow, hail, lightning, thunder, and even violent tornadoes are associated with cumulonimbus clouds.



The next time you go outside, take a look at the sky. Do you see clouds? What types of clouds do you see?

Now you know that those clouds have names!



Teacher's Notes

Tips for Determining Cloud Size, Height and Cloud Type

The cloud heights provided in the text and the definitions below are accurate for middle latitudes. For height ranges at other latitudes, see the diagram at the bottom of the page.

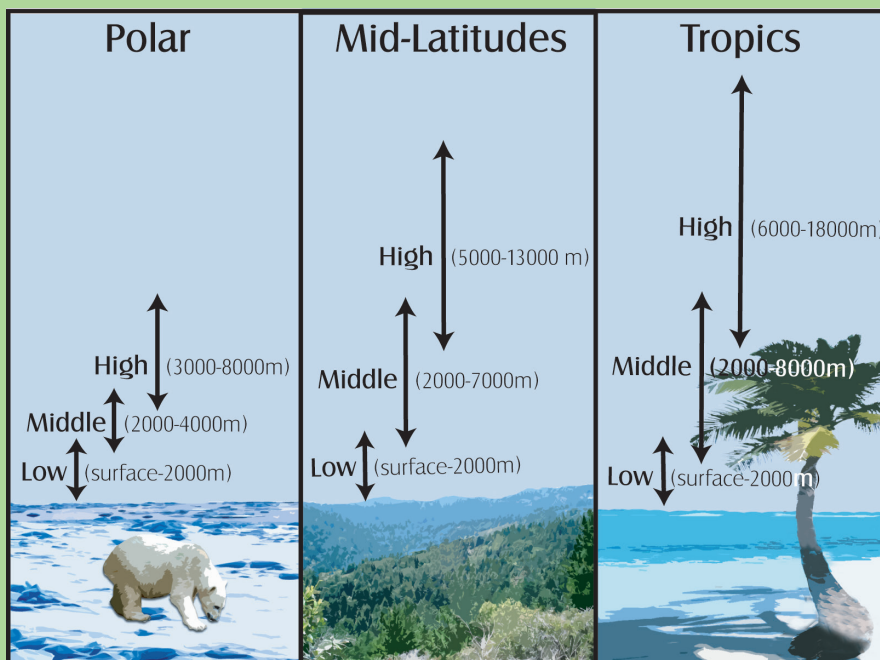
Note about safety: Remind students not to look directly at the Sun when observing clouds!

Low Clouds: These are generally clouds made of water droplets whose base is below 2,000 m altitude. Low cloud types include stratocumulus, cumulus, stratus, cumulonimbus, and nimbostratus. Fog can also be put in this class because it is a ground-level stratus cloud. The tops of cumulonimbus clouds can be high enough to form ice crystals. Note: depending on how dry the air is, the cloud base may be higher than the level listed here.

Mid-level Clouds: These are generally clouds whose base is between 2,000 and 7,000m altitude. Altostratus or altocumulus clouds are mid-level clouds. These clouds are generally made of water, depending on the atmosphere's temperature and other conditions at the cloud altitude.

High Clouds: High clouds are those whose base is 5,000m to 13,000m. This includes cirrus, cirrocumulus, and cirrostratus. These clouds can be made of either ice or water droplets, but are more often made of ice crystals. Water clouds tend to have definite edges, while ice clouds are more wispy. Persistent contrails (airplane trails of moisture that don't just disappear as the airplane passes) are high clouds as well.

Multiple Cloud Layers: Often there is more than one cloud layer present in the sky. If the lower layer is broken, then you will be able to see different clouds above it. When a solid cloud layer is present, any clouds in the layers above it will not be observable from the ground.



Cloud Height	Cloud Type
High	Cirrus Cirrostratus Cirrocumulus
Medium	Altostratus Altostratus
Low	Cumulus Stratus Stratocumulus Cumulonimbus Nimbostratus

Note: *The International Cloud Atlas* uses the cloud heights listed above. *The GLOBE Teacher's Guide* lists slightly different heights in an effort to average out cloud heights in different latitudes.

Relative Sizes of Clouds

To give your students practice with measuring relative size of clouds, take your students outside or into a hallway and have one student stand at a certain distance away from your group (approximately 3 meters away) and another student stand at a farther distance (approximately 10 meters away). Have the rest of the group look at each student and “measure” their height with their hands/fingers. They will see that the student who is farther away “measures” smaller. This activity can also be done on a stairway or a hill. Students will use this information when determining the level of cumulus and stratus clouds (see hints below).

Unless you live next to a tall skyscraper or a mountain, or you are in an airplane, it isn’t possible to figure out the height of a cloud just by looking. This is because there aren’t any points of reference in the sky. That’s why our determination of height relies on identifying the cloud type.

Hints about Perspective/Relative Sizes:

- It is more difficult to estimate the height of a distant tree than one you can stand by. The farther away an object is, the smaller it looks.
- When we know the actual height of something in the distance, the size it appears to be helps us to estimate how far away it is.
- Estimating both the distance and the height of an unfamiliar object is very difficult unless you can also see the height and distance of something you already know.

Hints for Cumulus-Type Clouds:

- Low cumulus cloud cells (the individual puffs of stratocumulus or cumulus clouds) are about the size of your fist or larger when you hold up your hand at arm’s length.
- Mid-level cumulus cloud cells (altocumulus) are about as wide as your thumb when you hold your hand at arm’s length.
- High-level cumulus cloud cells (cirrocumulus) are the same size or smaller than the width of your littlest finger when you hold your hand at arm’s length.

Hints for Stratus-Type Clouds:

- Without the size clues provided by individual cumulus clouds, determining the height of stratus-type clouds can be a challenge.
- If it rained recently or the cloud layer is very thick and you can’t see the Sun, it is most likely a low-level stratus cloud.
- If it’s raining during your observation, it is a nimbostratus cloud (or cumulonimbus – but the difference should be obvious if there is thunder and lightning!).
- If a stratus cloud is so thick you can’t tell where the Sun is, it is most likely a low-level stratus cloud.
- If you can see the Sun but it looks diffused (like looking through ground glass), it is most likely an altostratus cloud.
- If there is a halo around the Sun whose edge is the width of your hand at arm’s length from the Sun itself, then it is a cirrostratus cloud.
- Cirrostratus clouds will generally be thin enough that the Sun is still quite distinct. If the cirrostratus cloud isn’t located between you and the Sun, you may be able to distinguish cirrostratus clouds as being so thin that parts of the cloud appear bluish (that is, you are seeing through to blue sky).
- If the cloud does not produce a halo, it can still be a cirrostratus cloud.

For information about clouds, see the Atmosphere section of the GLOBE Teachers Guide (www.globe.gov).



The GLOBE Program is a hands-on international education and science program that joins students, educators, and scientists from around the world in studying Earth system science (ESS). The core objectives of GLOBE are to improve science education, enhance environmental awareness, and increase understanding of Earth as a system. For more information, please visit www.globe.gov.

Elementary GLOBE is designed to introduce K-4 students to the study of Earth system science (ESS). Elementary GLOBE forms an instructional unit that comprises multiple modules that address ESS and interrelated subjects including aerosols, seasons, soils, water, weather, and climate.

Each Elementary GLOBE module contains a science-based storybook, classroom learning activities that complement the science content covered in each book, and teacher's notes. The storybooks explore a component of the Earth system and the associated classroom learning activities provide students with a meaningful introduction to technology, a basic understanding of the methods of inquiry, and connections to mathematics and literacy skills. For more information, please visit www.globe.gov/elementaryglobe

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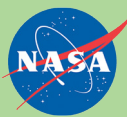
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Meet the Clouds!

What do these clouds look like? Simon, Anita, and Dennis learn that clouds can look like horse tails, cauliflower, water ripples, sheep, and other things while they learn the names of different types of clouds.



This storybook is one of several books in the Elementary GLOBE unit. Elementary GLOBE is designed to introduce K-4 students to the study of Earth system science (ESS). The books form an instructional unit that addresses ESS and related subjects including aerosols, weather, water, seasons, soils, and climate. The science content provided in the books serves as a springboard to GLOBE's scientific protocols, and also provides students with a meaningful introduction to technology, a basic understanding of the methods of inquiry, and connections to mathematics and literacy skills. Each book has associated hands-on Learning Activities to support learning exploration. For more information, please visit www.globe.gov/elementaryglobe.



Simon



Anita



Dennis