

Precipitation

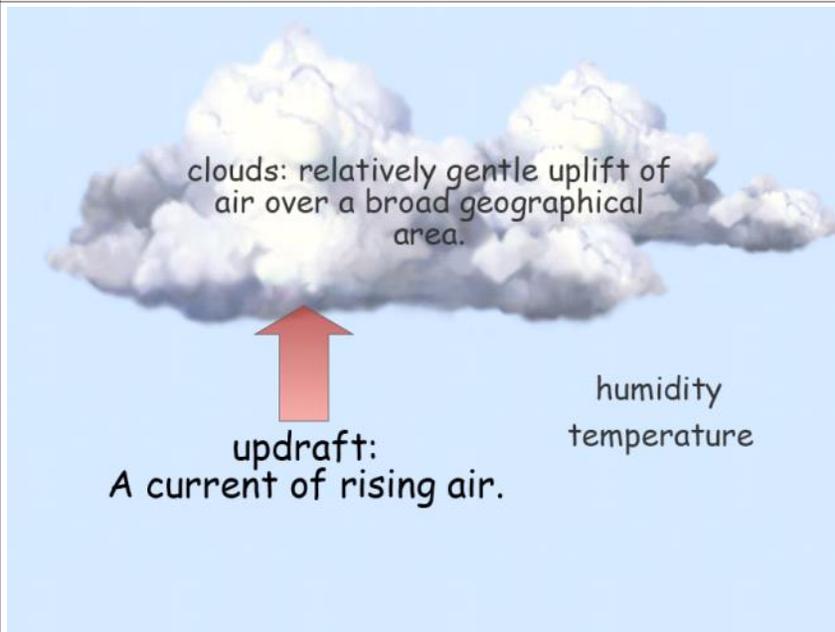
Thursday, January 31, 2013
8:06 AM

Slides



Notes

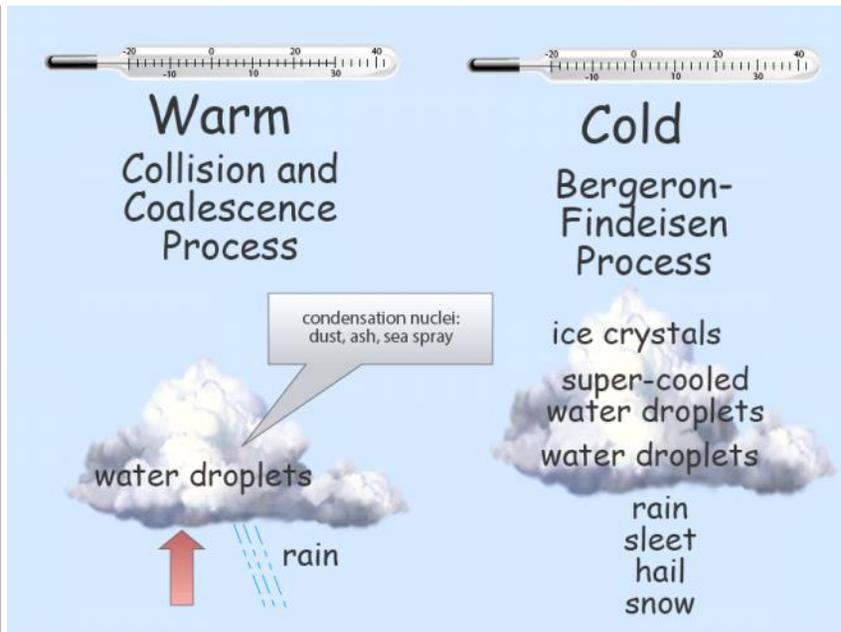
Precipitation



Since so much of weather has to do with clouds, we better know what the definition of a cloud is. It is the relatively gentle uplift of air over a broad geographical area.

That uplift of air is called an updraft which is a current of rising air.

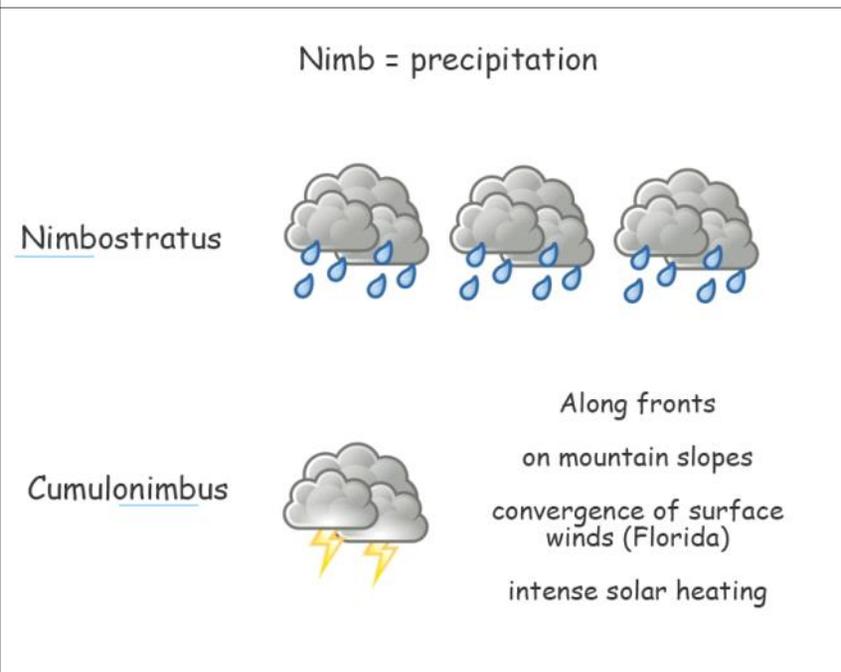
In addition to that upward movement of air, temperature and humidity plays a part as well because it has to be cool enough to make the humidity in the air form visible droplets.



Condensation nuclei give the water a place to grab onto to make the droplets. The nuclei could be dust, ash, even sea spray.

There are warm and cold air processes. The Collision and Coalescence Process happens in warm conditions. The result can be rain.

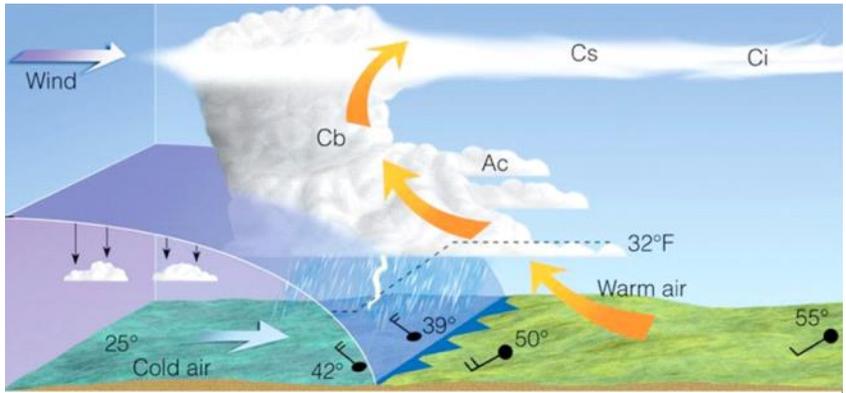
When the conditions are cold, you have the Bergeron-Findeisen Process. This can result in rain as well, but also cold types of precipitation such as sleet, hail, and snow or some mixture of any of these.



The root 'nimb' mean precipitation, so the nimbostratus and the cumulonimbus both are cloud types associated with precipitation.

The Nimbostratus is the type that may give you days and days of rain without the threat of thunderstorms.

The cumulonimbus types of clouds are more often associated with thunderstorms and will come and go relatively rapidly. These form up along fronts, mountain slopes, where convergences of surface winds occur such as in Florida, and when there is intense solar heating.



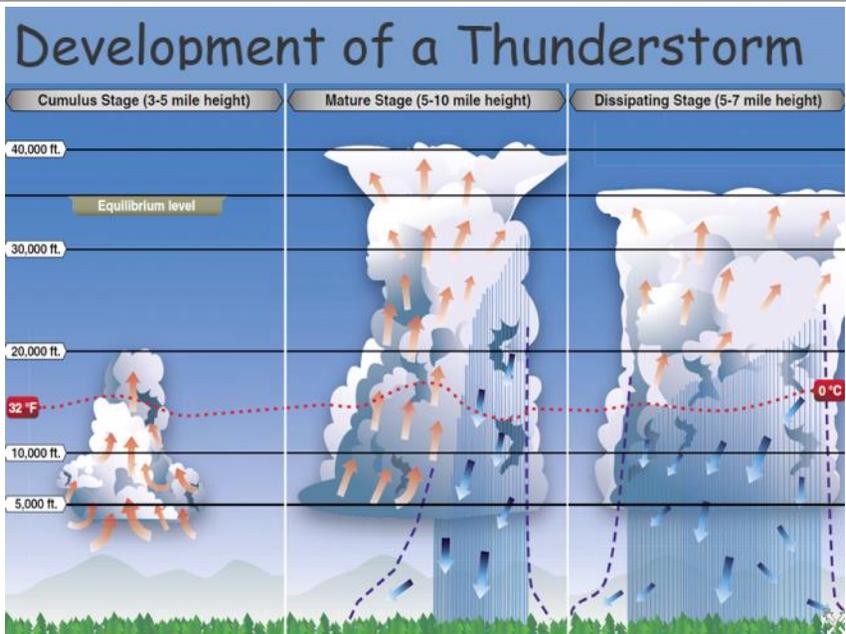
Cold Front

Warm Front

Severe thunderstorms cells typically form ahead of a fast-moving, well-defined cold front hitting a warm front.

Severe thunderstorm cells typically form ahead of fast-moving, well-defined cold fronts as they collide with warm fronts.

Take a few moments to examine the graphic to note how the warm air typically flows up and over the leading edge of the cold front. The warm air typically carries with it a lot of humid air that will turn into large, menacing clouds. Upper level winds will give the storm clouds there famous anvil shape as it pushes the top portion forward..



Thunderstorms develop in three stages.

The Cumulous Stage is when the cloud begins to form and grow taller and taller. Warm air uplifts until it is above the temperature where water begins to freeze.

In the mature stage, you begin to get rain coming down on one side and plenty of warm, humid air still feeding it on another edge.

In the dissipating stage, the rain is predominant and the feeding updraft is all but gone away. Without the feeding of new moisture, the storm cloud begins to shrink.



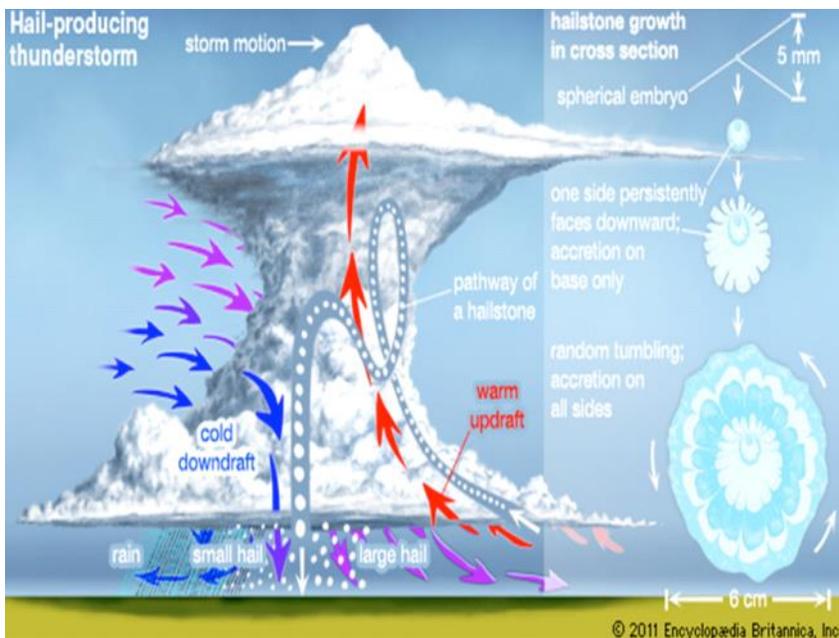
Now, let's take a look at lightning.

Lightning can occur when the clouds get tall enough to build negative charges. The ground will have the opposite charge. The two opposite charges become strongly attracted to each other. Lightning is the movement of the charges from one to the other. Sometimes even within the clouds you can get an imbalance of charges and get a cloud to cloud lightning strike.

Lightning begins as a stepped leader which begins to form the path. Next comes the return stroke and dart leaders.

Thunder is what you hear after the lightning is seen. Sound moves slower than light, so you can actually tell if the storm is coming closer or going away by counting from the time you see the lightning until the time you hear the thunder. If you find the count getting smaller, the storm is coming closer.

The sound of thunder is caused by the intense, rapid heat that lightning produces. It causes the molecules in the air to speed up suddenly and that creates a wave of air that moves outward from the source of the heat. Your ears pick up on the vibration as the wave passes your body.

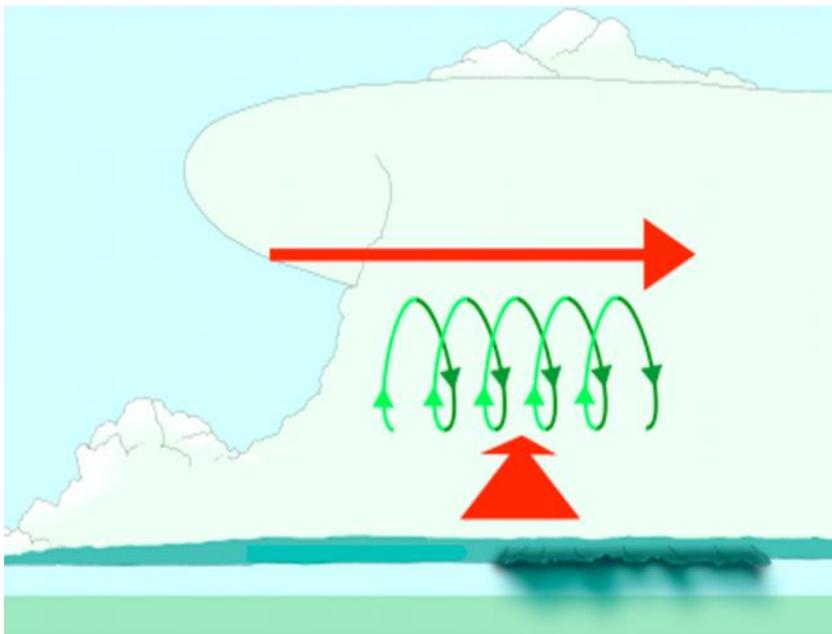


Hail is our next topic and it is often associated with storms.

Hail formed by water freezing and the frozen core getting pushed up and aloft so that the layers begin to build. The faster the updraft of air the longer it can stay aloft and grow. Eventually, it becomes heavier than the updraft can keep aloft and it falls to the ground.

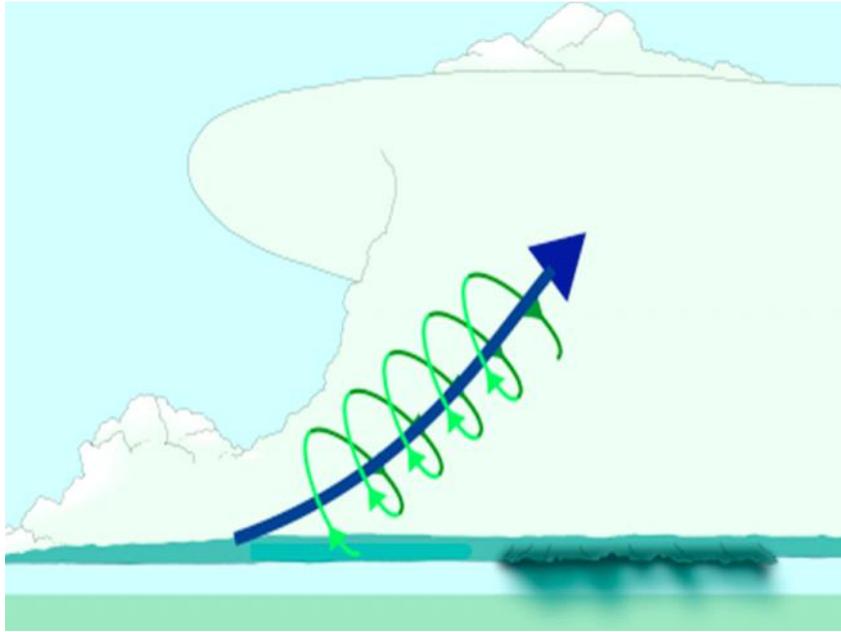


Hailstones can get very large indeed and even be spikey in shape.

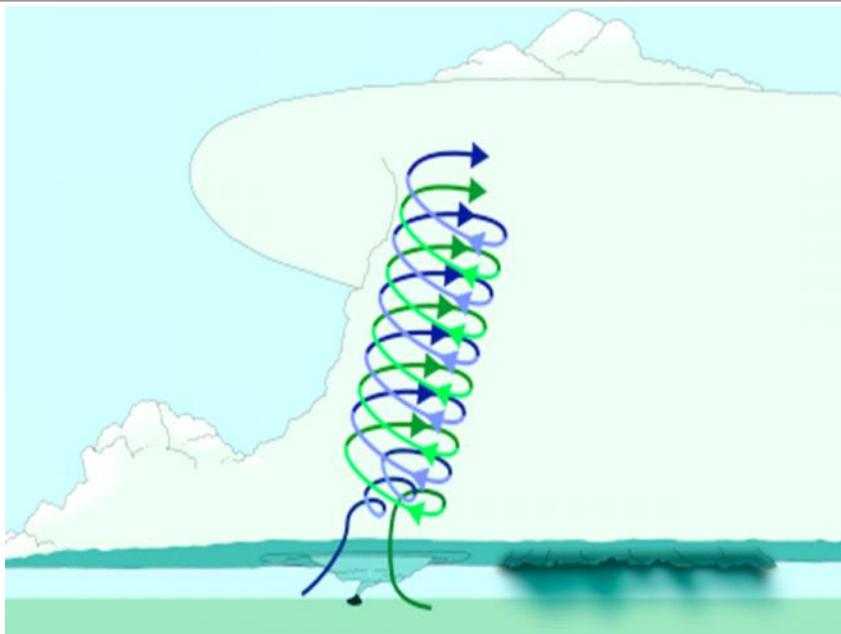


Tornados are one of the most destructive elements of a thunderstorm.

They actually begin as a spinning current of air that runs parallel to the ground.

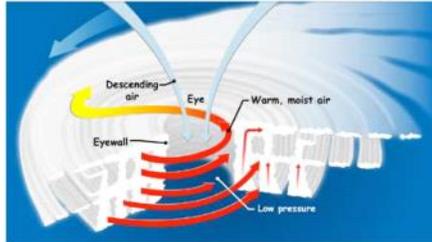


The updraft of air then tips the spinning current upright.



Once it is upright the destructive force of the wind speed causes damage especially if the lower tip touches the ground.

The phase where the tornado touches the ground is called the organization stage.



Category	Wind Speed (mph)	Damage at Landfall	Storm Surge (feet)
1	74-95	Minimal	4-5
2	96-110	Moderate	6-8
3	111-130	Extensive	9-12
4	131-155	Extreme	13-18
5	Over 155	Catastrophic	19+

Hurricanes are massive storm systems that form over warm ocean water. The storm forms a characteristic swirl pattern when it is at a high enough strength. Before that it is called a tropical storm system.

The center of the storm is called the eye. It is a few miles across and it is perfectly calm. It is the safest place within the hurricane to be, but it doesn't last very long in any one location because the hurricane moves.

Just beyond the eye, or center of the storm, you have the wall. It has very fast moving winds. Beyond that are leader bands that look something like strings of clouds being spun out of the storm. In the Western Hemisphere above the equator, the storms in the leader bands to the right of the eye are often stronger than the storms to the left leader bands. This is because the leader bands to the left are interacting with colder, drier air which diminish the strength of the storms compared to all the moist warm air on the right side being fed by air coming in from above ocean water.

In the chart, you can see that meteorologists have devised a category system to describe the strength of a hurricane. The bigger the number, the greater the damage it can cause.



After all the talk of storms, let's leave you with something gentle and wondrous, dew.

When the temperature drops enough, the water in the air will condense onto ground level surfaces. This temperature is called dew point. It isn't just one temperature though. The level of humidity in the air influences what temperature it has to be before dew will form.

Try it section begins here

wind

Place the labels in the correct order

cumulus stage dissipating stage mature stage

Submit Undo Reset

Collision and Coalescence Process

Bergeron-Findeisen Process

Remove the items that do not belong to the process and place them here in the center

snow

rain

sleet

hail

snow

rain

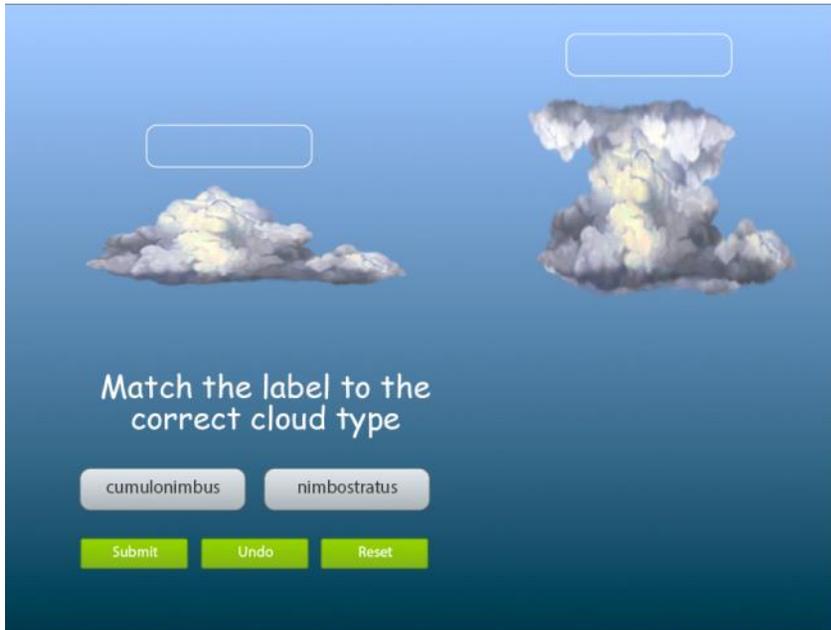
sleet

hail

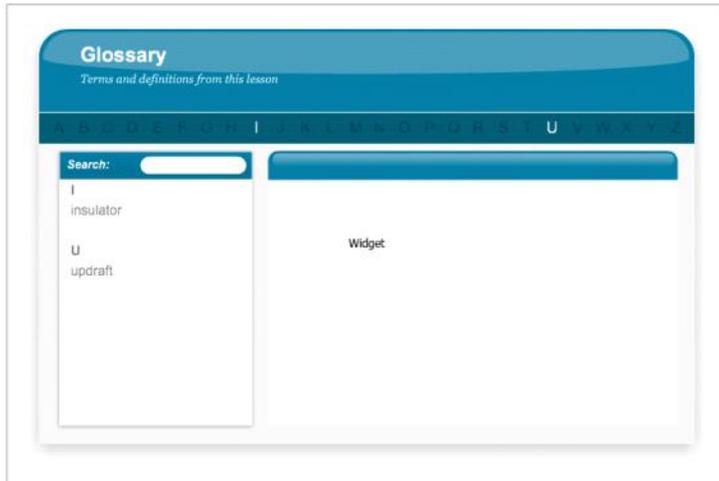
Submit

Undo

Reset



A matching game interface with a blue gradient background. At the top, there are two empty rounded rectangular boxes. Below them are two clouds: a smaller, lower cloud on the left and a larger, taller cloud on the right. The text "Match the label to the correct cloud type" is centered. Below the text are two buttons: "cumulonimbus" and "nimbostratus". At the bottom are three buttons: "Submit", "Undo", and "Reset".



A glossary search interface with a blue header. The header contains the word "Glossary" and the subtitle "Terms and definitions from this lesson". Below the header is a horizontal bar with letters A through Z. A search box is on the left, and a list of terms is on the right. The search box contains the letter "U". The list shows "insulator" under "I" and "updraft" under "U". The search results area is empty.

Next

Credits

[softball-sized hail](#)

[NASA images](#)

[Meso-1.svg by Vanessa Ezekowitz](#)

[Meso-2.svg](#)

[Meso-3](#)