

Tornadoes



Essential Standard 2.5

Understand the structure of and processes within our atmosphere.

Learning Objective 2.5.3

Explain how cyclonic storms form based on the interaction of air masses.

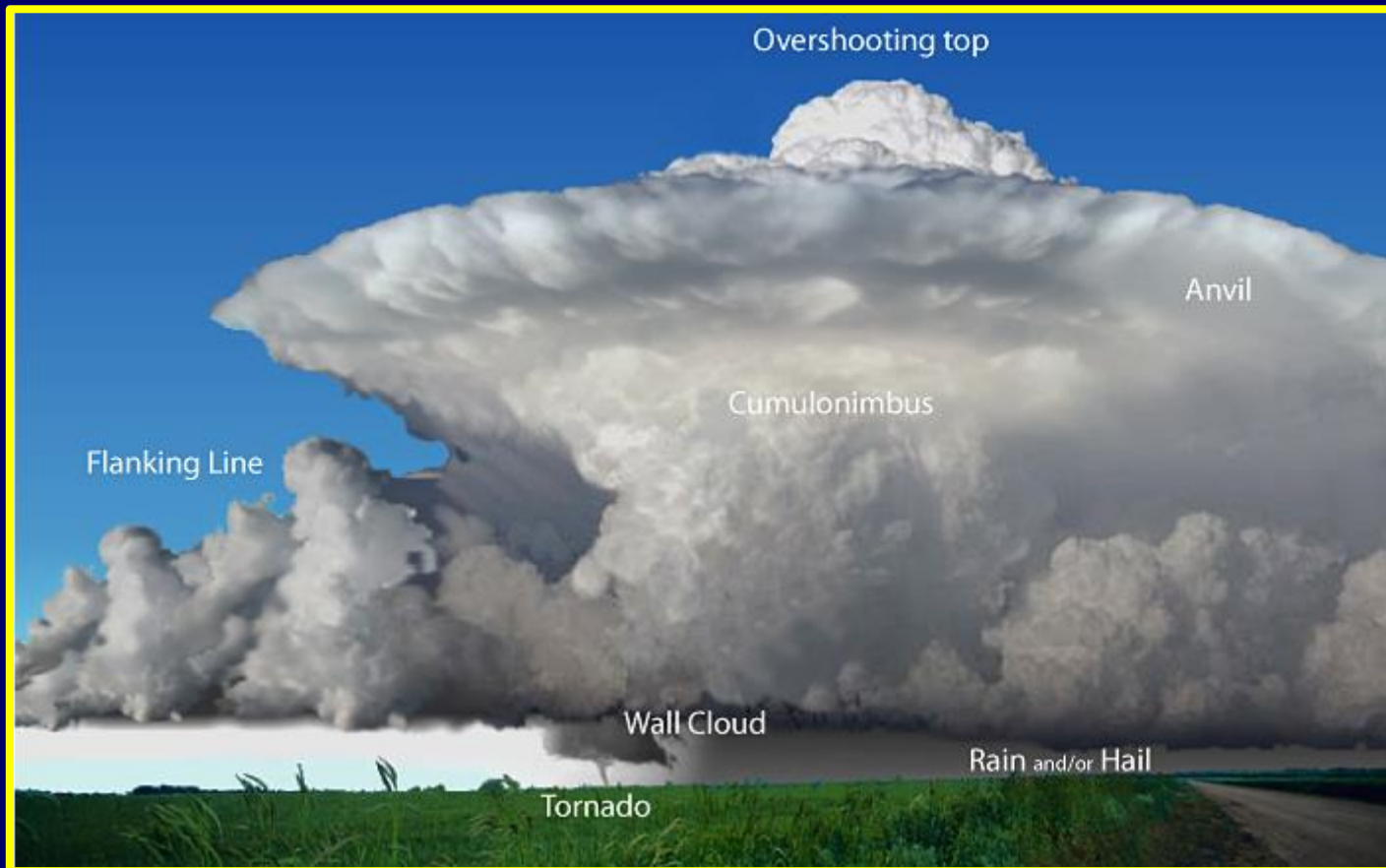
I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can explain how supercell thunderstorms are formed.
- I can explain how tornadoes are formed and describe favorable conditions for tornado formation.
- I can describe what to do during tornado warnings.

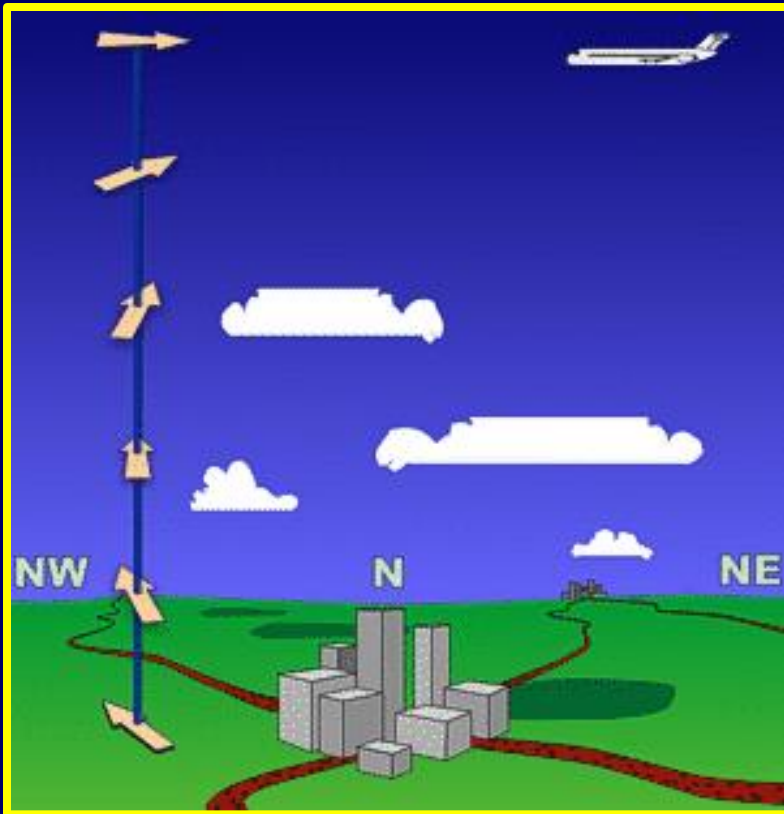
Supercell Thunderstorms

Supercell thunderstorms are extremely large thunderstorms capable of producing hail, wind gusts greater than 58 mph, flash flooding, and tornadoes.



Directional Shear

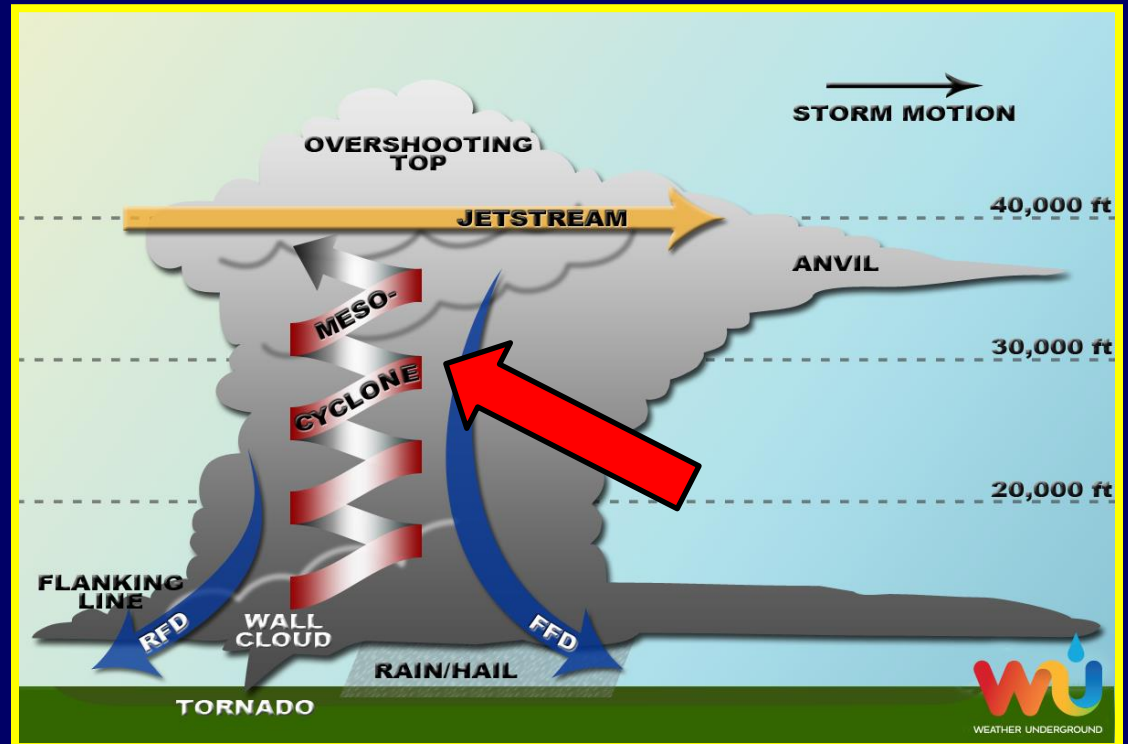
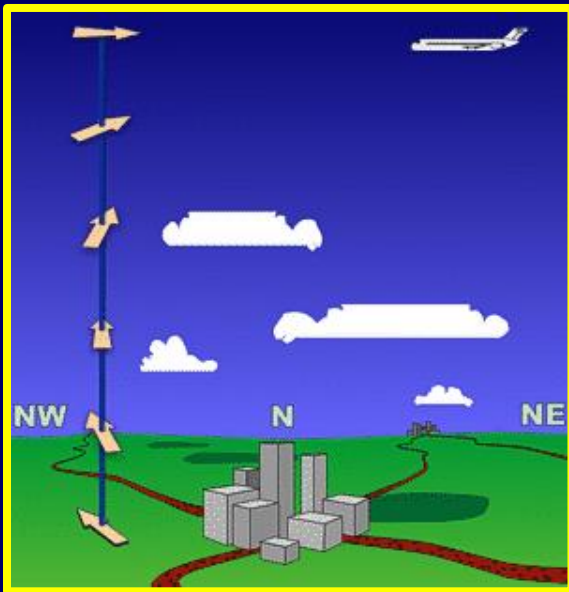
Supercell thunderstorms form when directional wind shear is present.



Direction wind shear occurs when the wind changes direction with height or altitude.

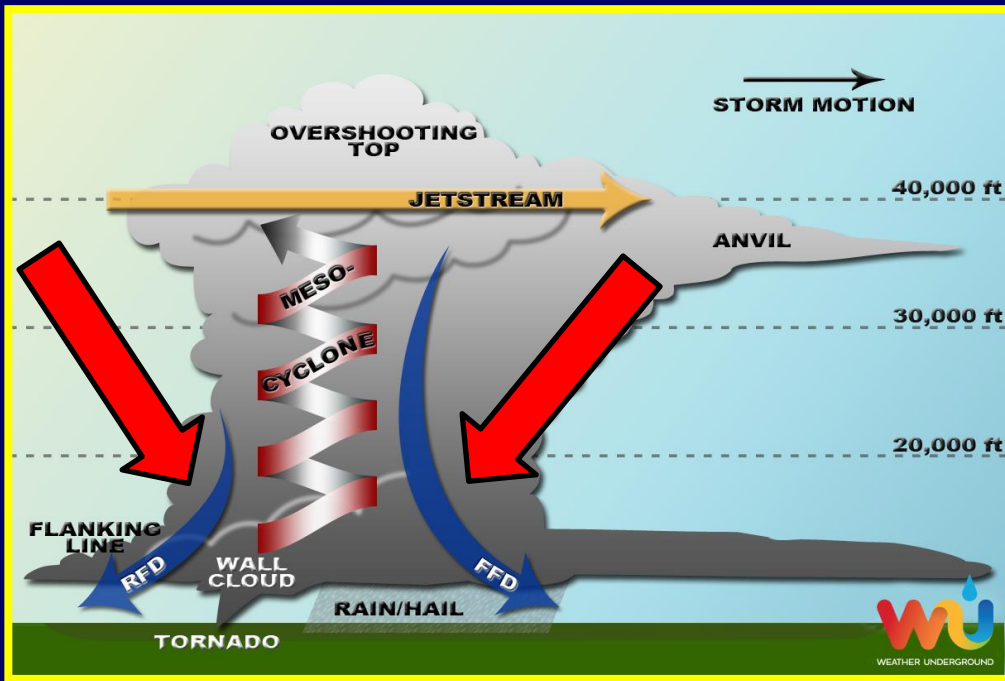
Mesocyclone

When directional wind shear is present, the updraft, inside a thunderstorm, begins rotating in a vertical column called a mesocyclone.



Flanking Downdrafts

Downdrafts of cold, dense air occur at both the front and at the rear of the storm.

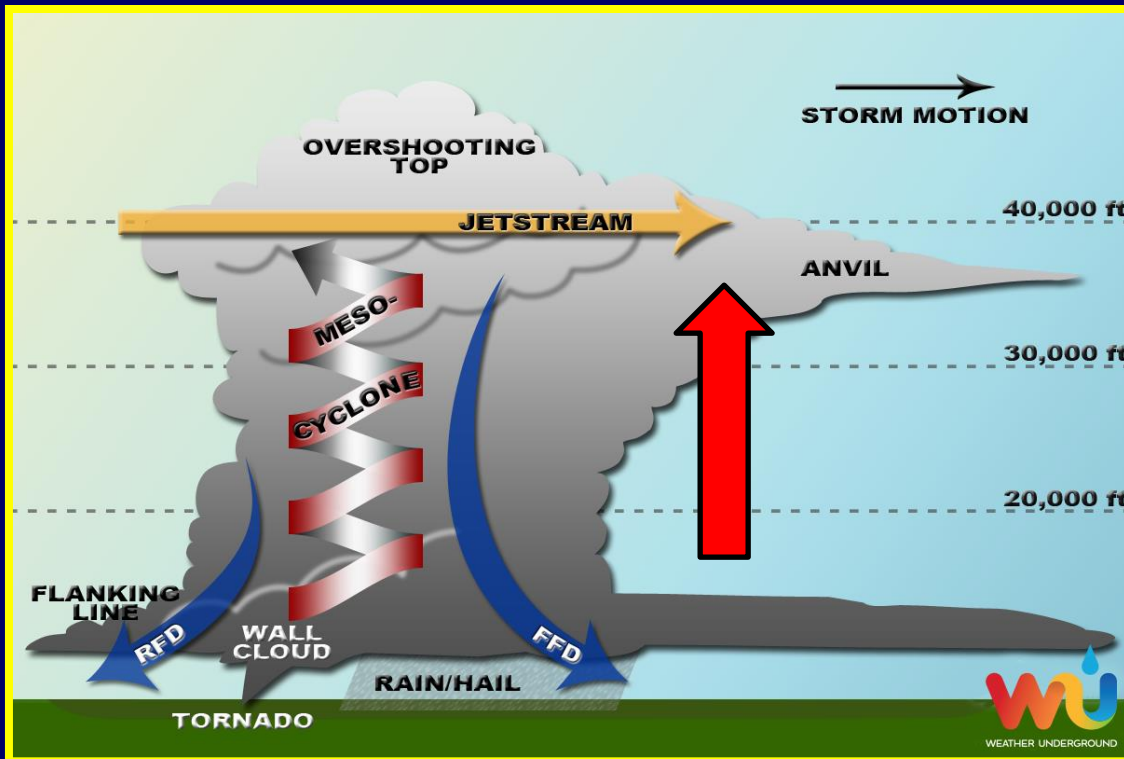


The downdraft in the front of the storm is called the forward flanking downdraft or FFD.

The downdraft in the back of the storm is called the rear flanking downdraft or RFD.

Anvil

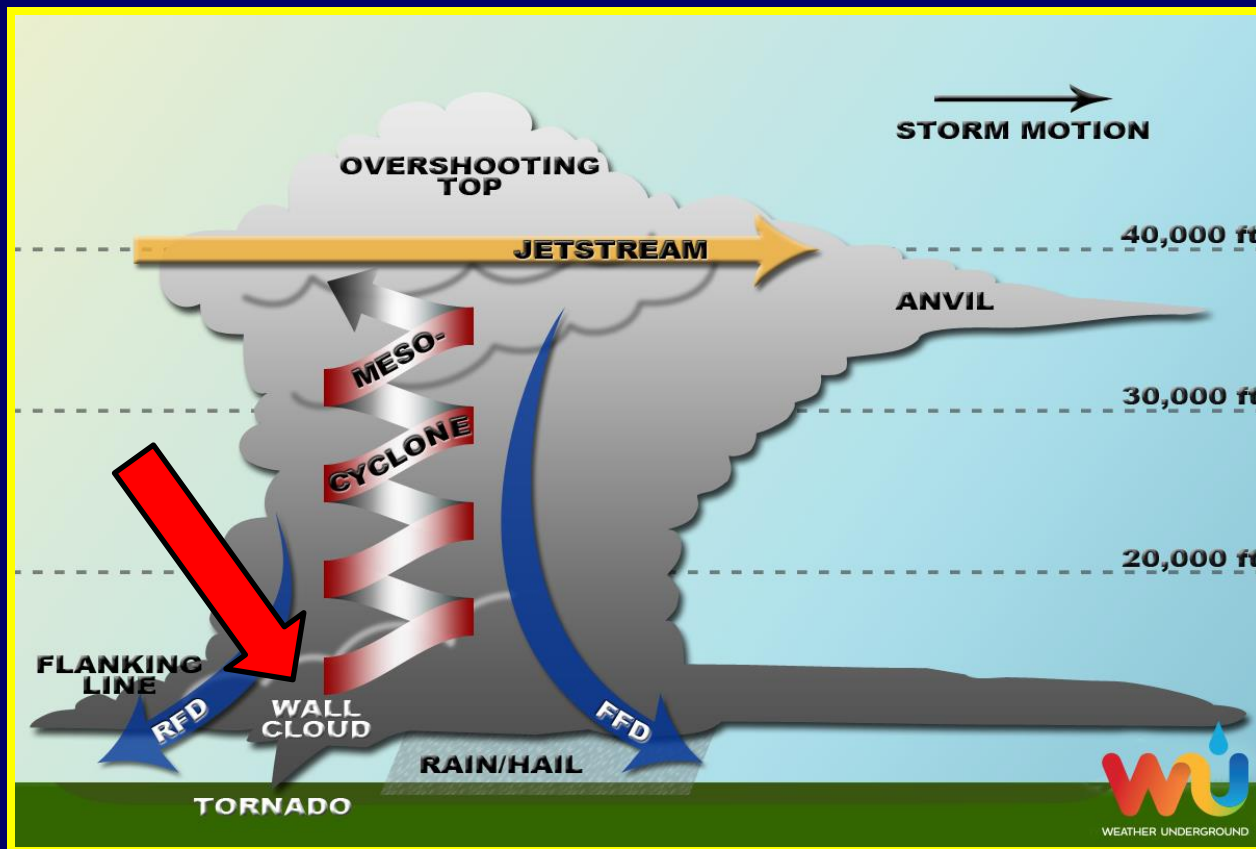
If the cloud grows tall enough to encounter the jet stream, the top of cloud will begin to move faster than the rest of the cloud, giving the cloud the appearance of an anvil.



Anvil

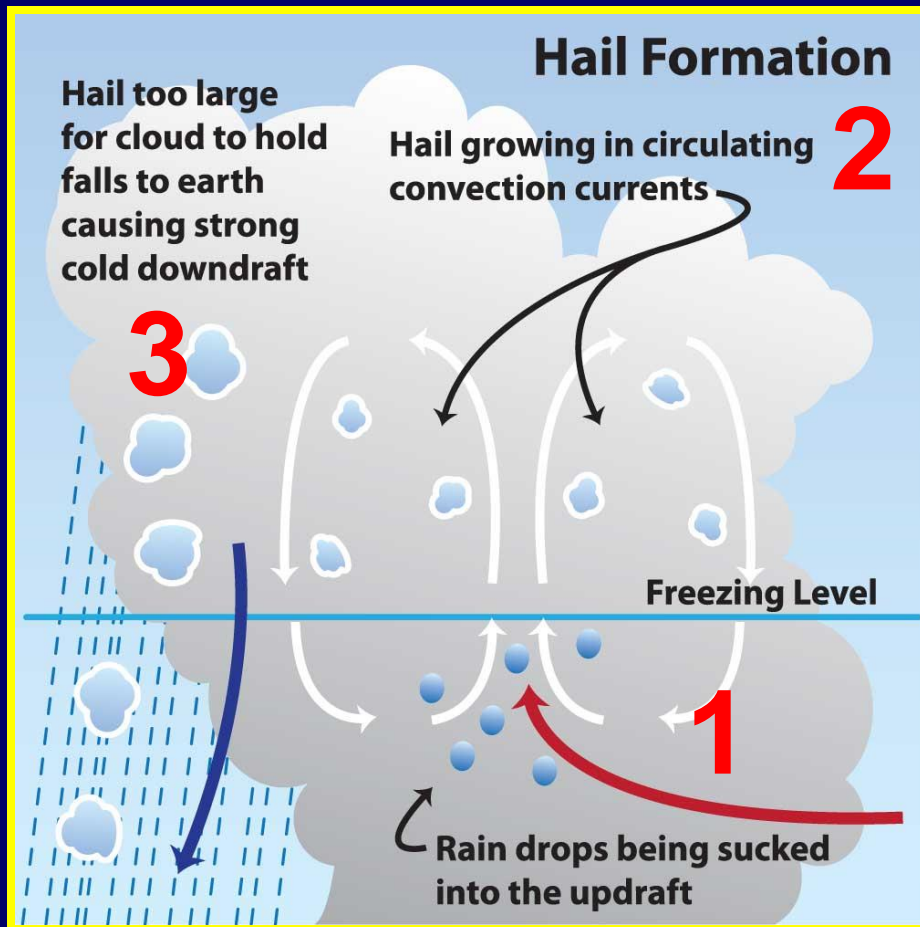
Wall Cloud

As very humid air is pulled into the updraft, a very thick, dark, low lying cloud, called a wall cloud, forms at the bottom of the supercell.



Hail Formation

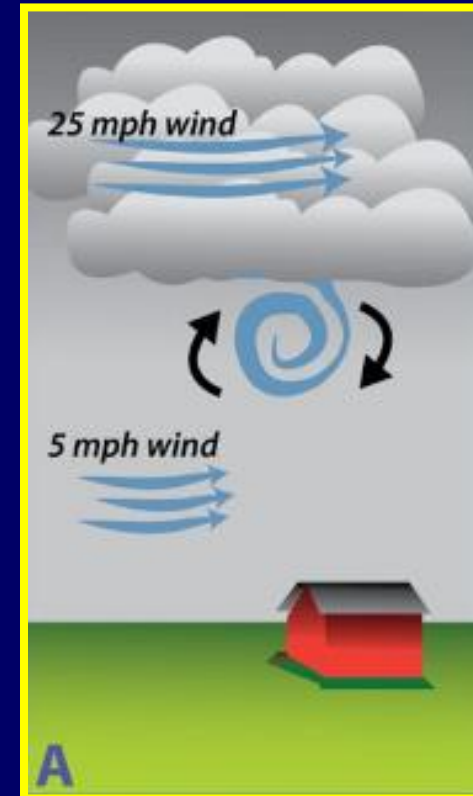
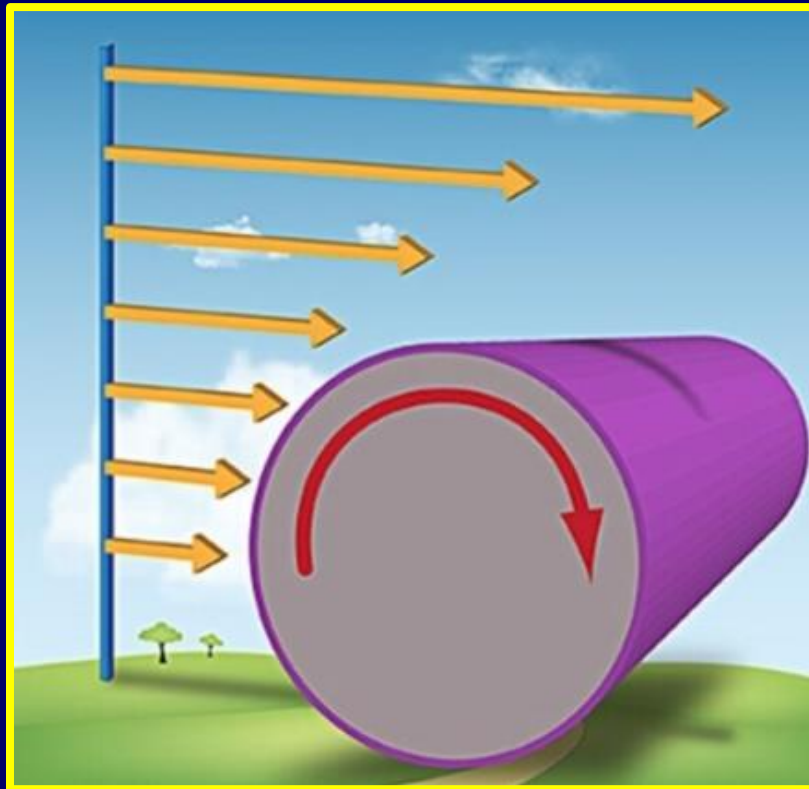
Hail is formed when raindrops are sucked into the updraft and freeze as they move upward.



Individual hail pieces tend to grow larger as they are circulated in convection currents until they finally become heavy enough to fall to the ground.

Speed Shear

When the wind is moving at different speeds with height or altitude, it creates speed shear, which results in rotating columns of air.



Funnel Clouds

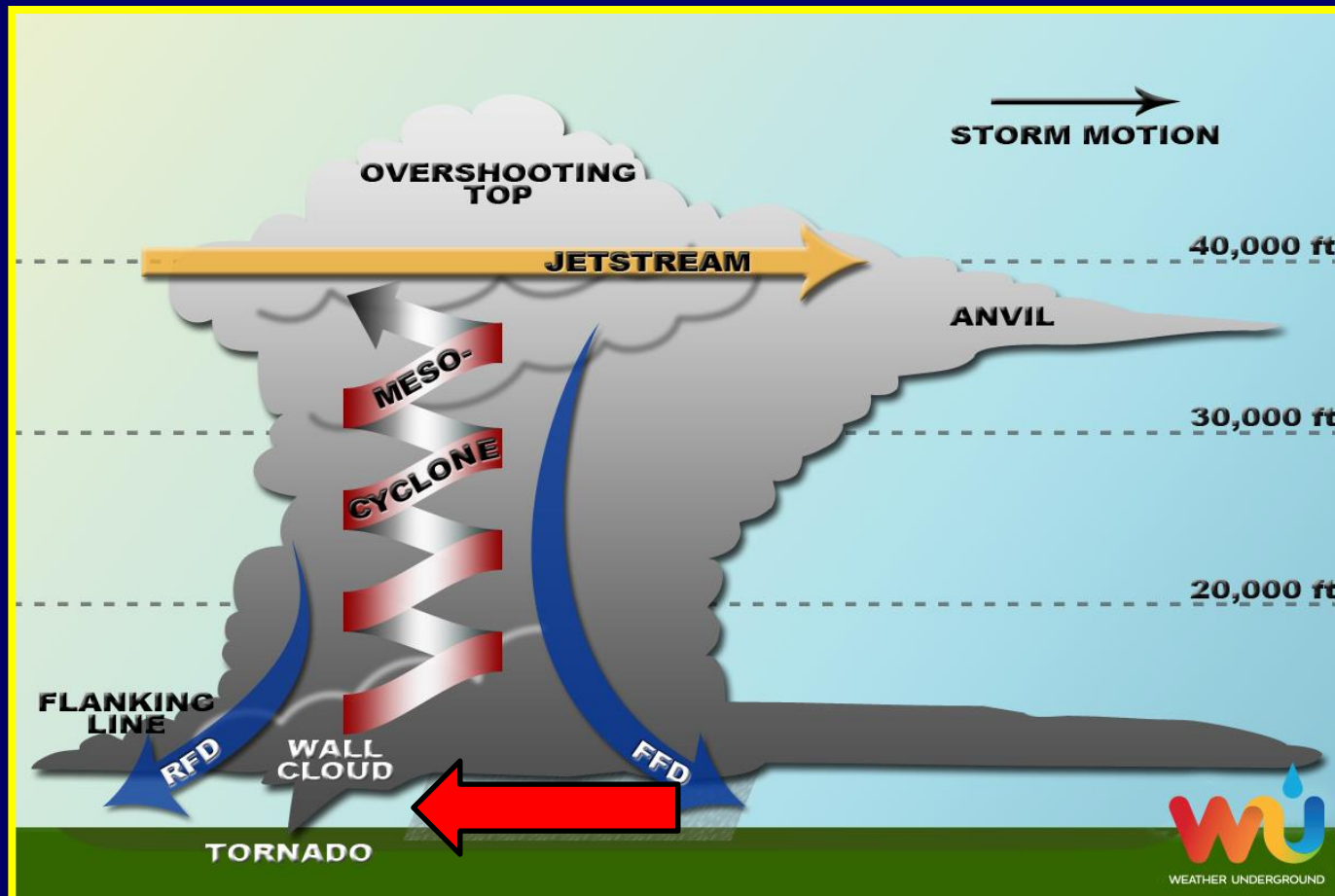
If a rotating column of air gets caught in an updraft, it will increase in speed and tighten into a horizontal funnel cloud within the supercell.



If rain and hail get caught up into the funnel cloud, their weight will cause the funnel cloud to become vertical and head towards the ground.

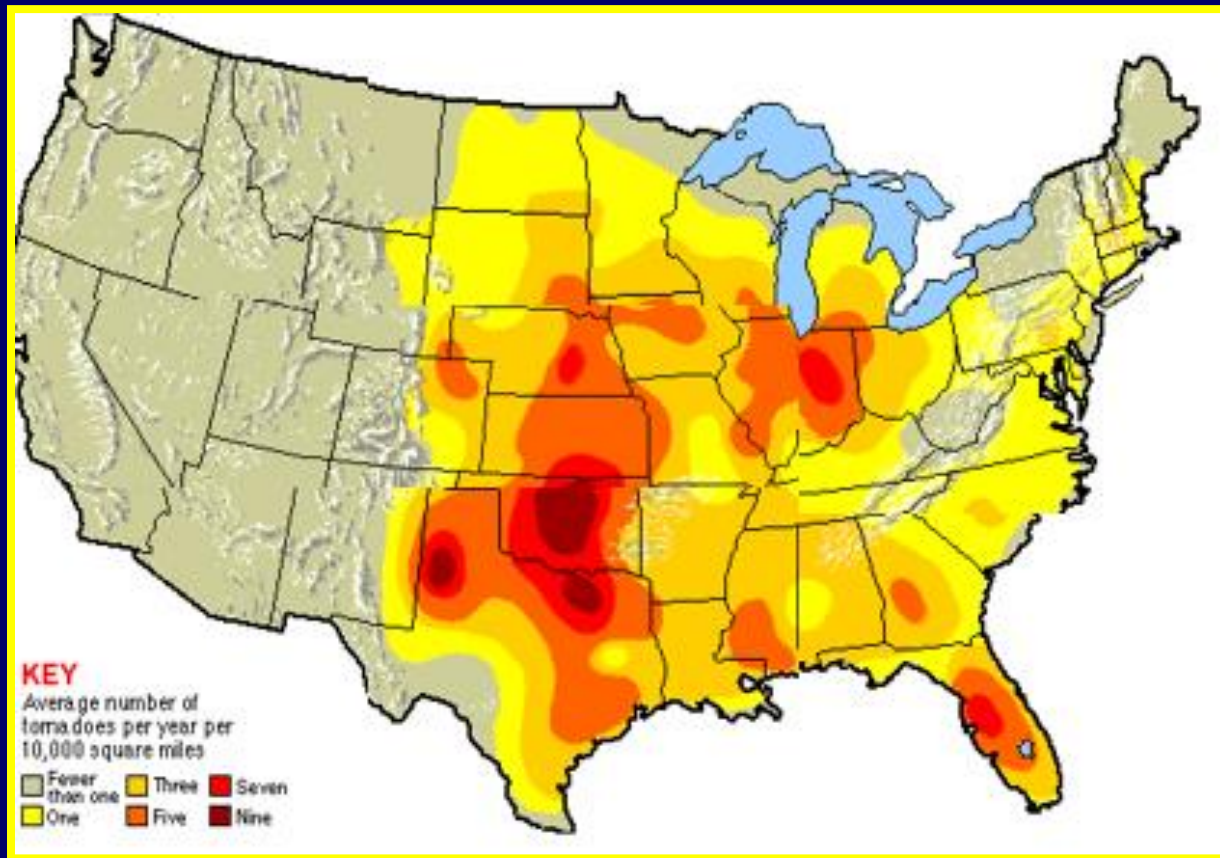
Tornado Formation

If the funnel cloud touches the ground, it will become a tornado.



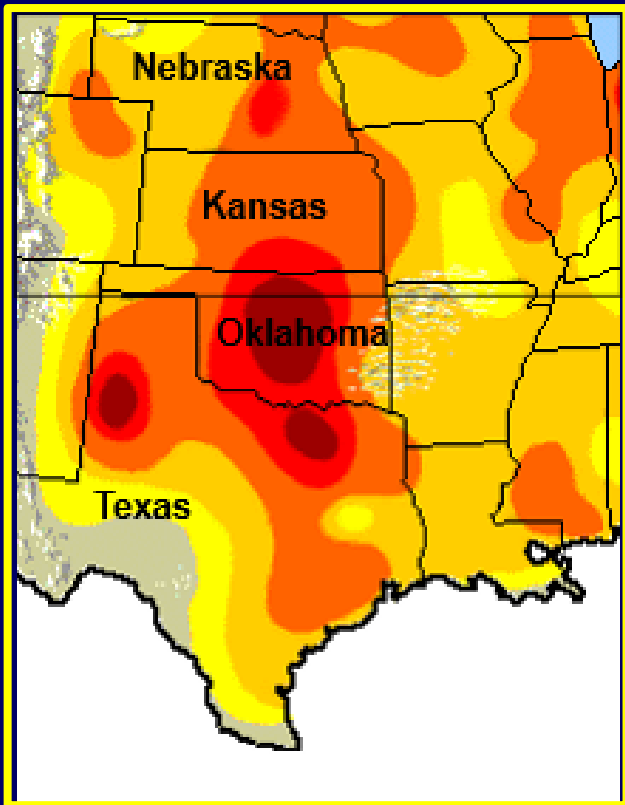
Tornadoes

Tornadoes occur east of the Rockies in the United States and are sometimes called twisters or cyclones.



Tornado Alley

Tornadoes are most common in the Central Plains region of the United States where cool, dry air in the upper levels of the atmosphere caps warm, humid surface air.



This along with long spans of flat land which allows wind to build and strengthen, leads to a very unstable atmosphere and the development of severe thunderstorms.

Tornado Ratings

Because it is so hard to measure wind speeds in a tornado, they are compared based on the damage they cause and from that, wind speed is estimated.

ENHANCED FUJITA SCALE	
EF No.	3-Second Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

The movie Twister was about trying to measure wind speed within a tornado.

Tornado Ratings

65 – 85 mph winds

86 – 110 mph winds

111 - 135 mph winds



136 - 165 mph winds

166 – 200 mph winds

Over 200 mph winds

Tornado Related Hazards



High Speed Winds

Wind speed in tornadoes have reached as high as 300 mph.



Winds at this speed can cause automobiles to become airborne and tear buildings to shreds.

People and animals can also be picked up and thrown around by these winds.

Flying Debris

The largest threat to humans is from flying debris.



It is highly recommended that you stay away from windows and move to a windowless interior room during a tornado.

Wind Driven Hail

Wind-driven hail can tear up siding on houses, break windows and blow into houses, break side windows on cars, and cause severe injury and/or death to people and animals



Tornado Watch or Warning

TORNADO TERMINOLOGY



Tornado Watch

Weather conditions could lead to the formation of severe storms and tornadoes. **BE PREPARED:** Know your safe location. Be ready to act quickly if a Warning is issued or you suspect a tornado is approaching.

Tornado Warning

A tornado has been spotted or indicated by weather radar, meaning a tornado is occurring or expected soon. **TAKE ACTION:** There is imminent danger to life and property. Immediately seek refuge in the safest location possible.

Tornado Emergency

An exceedingly rare situation with a severe threat to human life and catastrophic damage due to a confirmed violent tornado. **TAKE ACTION:** There is imminent danger to life and property. Immediately seek refuge in the safest location possible.



What to Do



Tornado Safety



During a Tornado

- Go to a safe location away from windows on the lowest level of a sturdy building
- If you are caught outside, get in a car, buckle up, and try to drive to the closest sturdy shelter. **NEVER** seek shelter under a bridge, and only lie flat in a ditch as a last resort.
- Go to a secure storm shelter if you are in a mobile home



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NWS Lincoln, IL
www.weather.gov/Lincoln

What Not to Do

As wind is squeezed into a smaller space, it increases in speed, creating a “wind tunnel effect”.



Under an overpass is one of the most dangerous places to be during a tornado due to higher speed winds and flying debris.

After a Tornado



Tornado Safety



After a Tornado

- Beware of downed power lines, broken gas lines, and sharp/dangerous debris
- **Avoid damaged areas**
- Stay off the roads to allow rescue workers clear passage
- **Follow instructions from local officials**



The End

