



Severe Weather



Part 2



Tornado Videos

Tornado Signs and Birth Moment:

<https://www.youtube.com/watch?v=xo4lkic3kfs>

Violent Tornadoes:

https://www.youtube.com/watch?v=eeyou7BL_0g

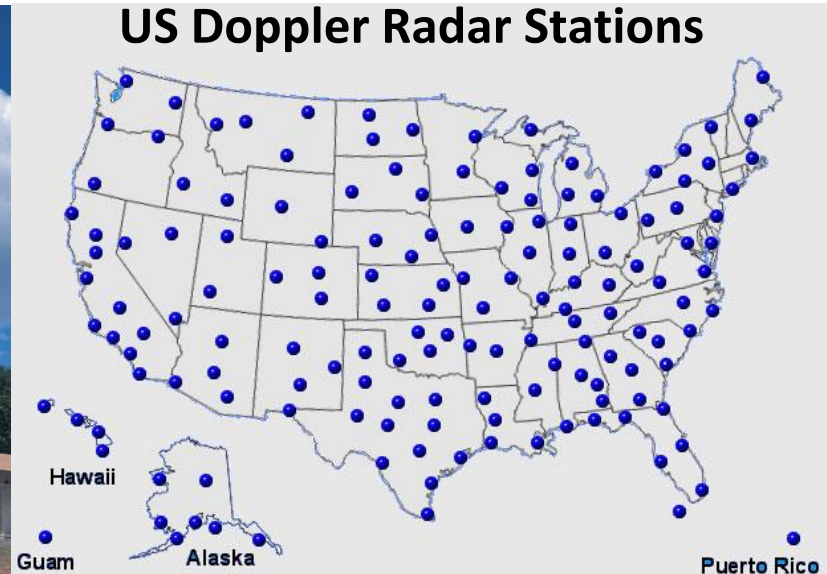
Tornado Destructive Power:

<https://www.youtube.com/watch?v=ZLN0c-CWN-0>

Measuring Tornado Wind Speed

Direct measurement of the most violent tornado wind speeds is **nearly impossible**: conventional **anemometers** **would be destroyed** by the intense winds and flying debris.

- Most developed countries have a **network of weather radars**: these devices can spot evidence of rotation in storms from more than a hundred miles (160 km) away.



- The **highest wind speed ever measured in a tornado**, which is also the highest wind speed ever recorded on the planet, is **301 ± 20 mph** (484 ± 32 km/h) in the infamous 1999 Bridge Creek-Moore, Oklahoma twister which killed 36 people.

Waterspout

A waterspout is an intense vortex, usually appearing as a funnel-shaped cloud, that **occurs over a body of water**.



Frequently seen in tropical and sub-tropical climates, they occur most commonly in the Florida Keys (up to 400 per year!) and in the northern Adriatic Sea.

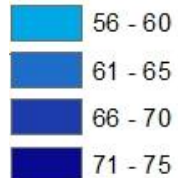
Tri-State Tornado

March 18, 1925

- The **most violent** tornado on record.
- Formed in **Missouri** and traveled **219 miles (352 km)** across **Illinois** into **Indiana**.



Speed of Tornado



Tri-State Tornado

- It lasted ~3.5 hours and killed 695 people.
- The funnel was up to 0.75 miles across and traveled as fast as 73 mph (117 km/h).

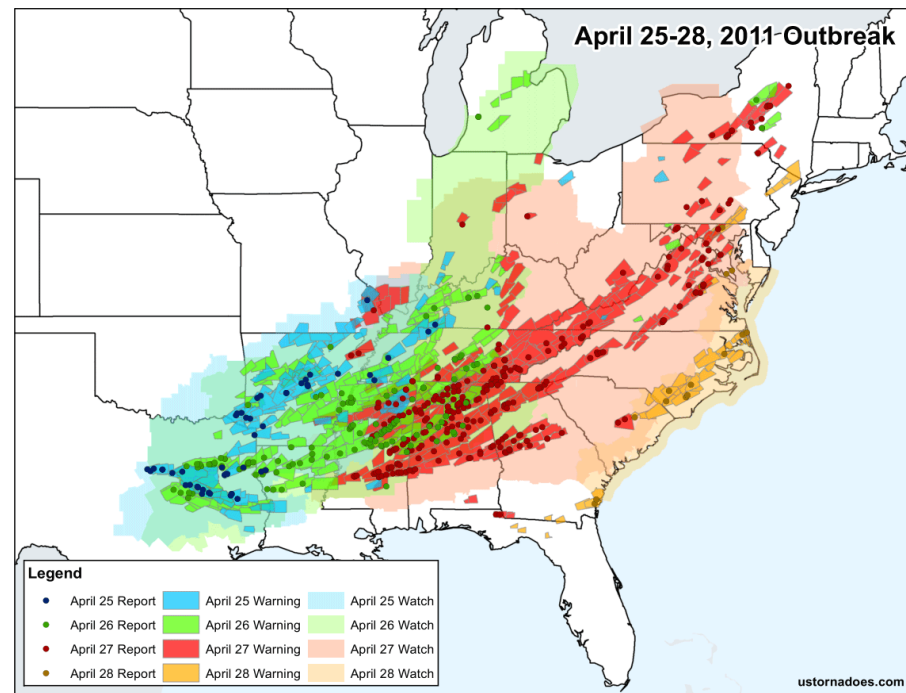


- It was likely an F5, though tornadoes were not ranked on any scale in that era...

2011 Tornado Outbreak

The **largest, costliest** and **one of the deadliest** tornado outbreaks ever recorded occurred between **April 25–28, 2011** affecting the Southern, Midwestern, and Northeastern United States and even southern Canada.

- Originating from a huge frontal storm system, roughly **90% of the supercell thunderstorms that day produced tornadoes** (“normal” rate is about 25%).
- **355 tornadoes** were confirmed (**37** of them **rated EF3 or higher**).
- April 27, the most active day: record of **211 tornadoes** (four rated EF5).
- **324 deaths** across six states.
- One of the costliest natural disasters in United States history, with total damages of approximately **\$11 billion**.



Tropical Cyclone

A tropical cyclone is a **rapidly rotating storm system** characterized by a **low-pressure center**, **strong winds**, and a spiral arrangement of thunderstorms that produce **heavy rain**.

- Formed from *organized groups of thunderstorms*.
- Classified depending on its location and strength:
 - Cyclonic storm (general term)
 - Tropical Depression
 - Tropical Storm
 - Tropical cyclone (Southern Hemisphere and Indian Ocean)
 - Typhoon (Northwestern Pacific)
 - Hurricane (Northeast Pacific or North Atlantic)

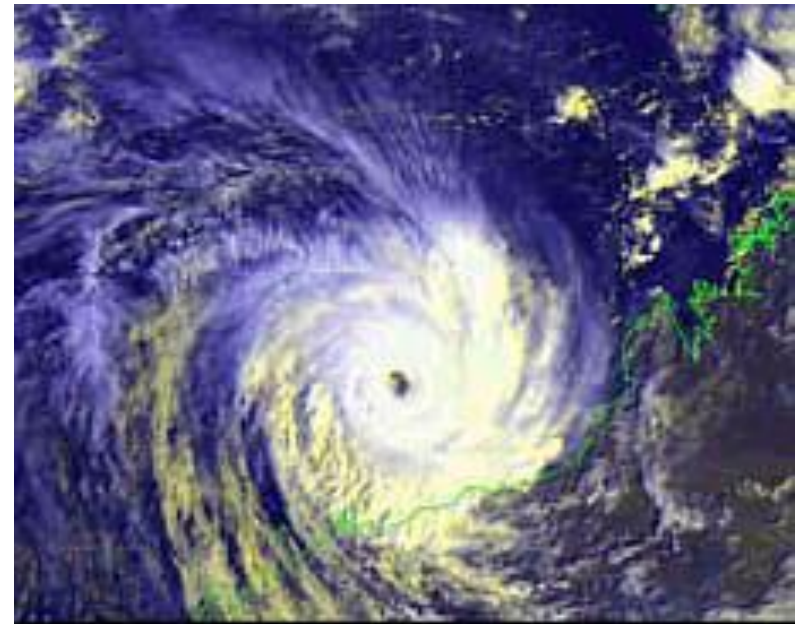


Winds, Pressure, Rotation

- “Hurricane strength” wind speeds **> 74 mph**.
- Barometric pressure inside a cyclonic storm is **LOW**.
- In which direction does a cyclonic storm rotate?

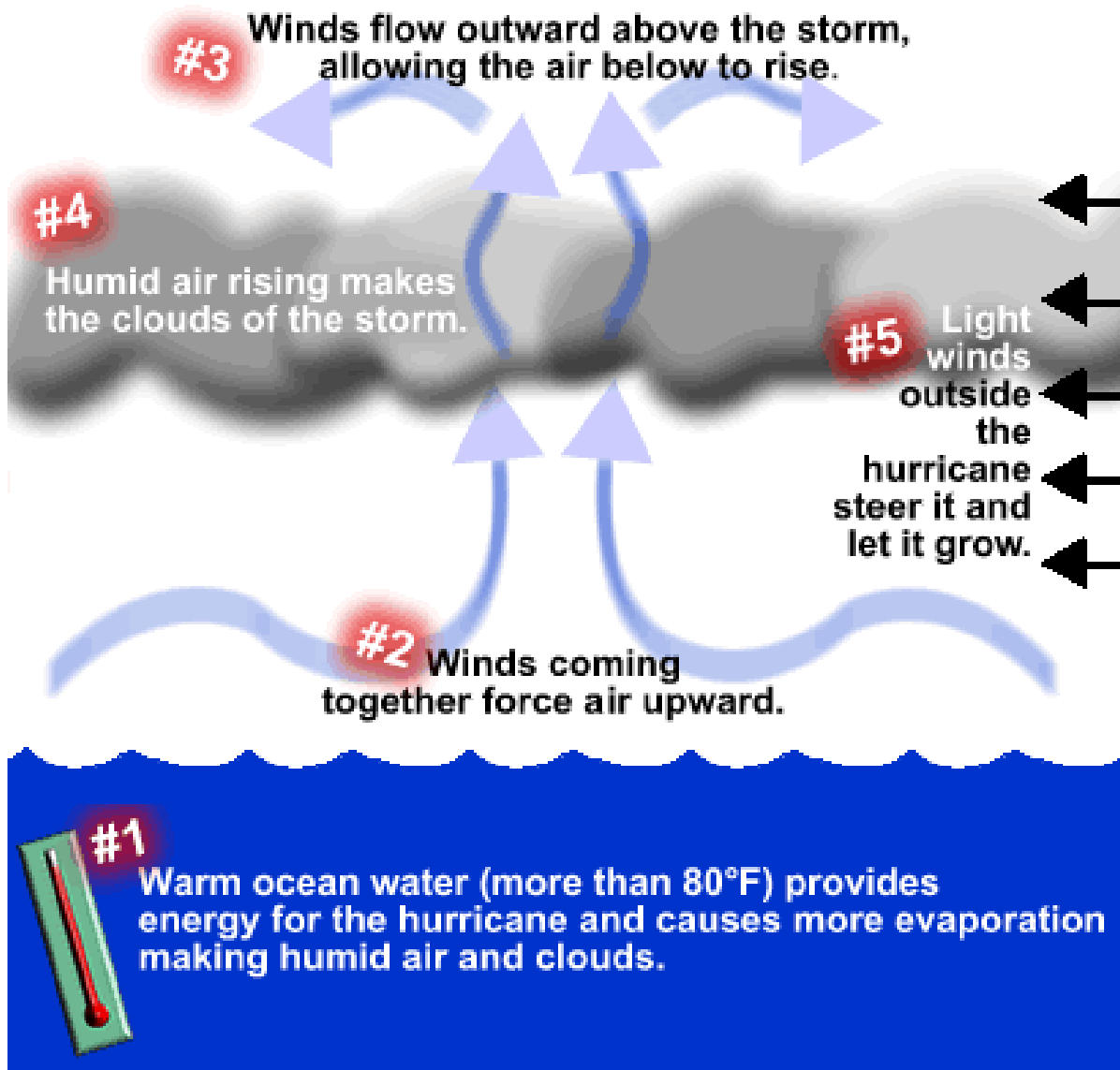


COUNTERCLOCKWISE
in **Northern** Hemisphere



CLOCKWISE
in **Southern** Hemisphere

Ingredients of a Cyclonic Storm



- **Warm water**
(at least 26.5°C/
79.7°F are needed
down to a depth of
at least 50 m/ 160 ft)
- **Time to grow**
- **Conditions
to develop
circulation**
(location off equator)
- **Light upper
level winds**
(wind shear destroys
thunderstorm
organization)

Where are Hurricanes Forming?

InterTropical Convergence Zone (ITCZ)



Area of low pressure near the Equator, a worldwide band of thunderstorm activity.

