



Severe Weather



Part 2



Tornado Facts

- Tornadoes can occur almost **anywhere in the world**.
- Most form during the months of **April and May**.
- 99% of all tornadoes in **Northern Hemisphere** rotate **counterclockwise**.
- Duration: **a few minutes**.
- Average diameter 250 feet (80 m), average travel length 4 miles (6 km).
- Funnel can travel with speeds ranging from zero up to ~70 mph, ~30 mph on average.
- Wind speeds within vortex are *usually* less than 110 mph (180 km/h).
- The **most extreme tornadoes**: wind speeds of more than **300 mph (480 km/h)**, stretch more than **2 miles (3 km) across**, and stay on the ground for dozens of miles (more than 100 km).
- Which state has highest frequency of tornadoes?



TEXAS!

Tornado Indicators

- A **greenish colored sky** associated with the thunderstorm (caused possibly by the scattering of light by particles in the sky).
- **Mammatus** clouds.
- A sudden **drop in barometric pressure**.
- **Large hail** of at least 0.75 inch diameter.
- Strong winds > 60 mph.
- Frequent and **intense lightning**.
- A **rotating wall cloud** or a cloud that appears to hang from the sky.
- A **loud rumbling noise** - **seek shelter!**

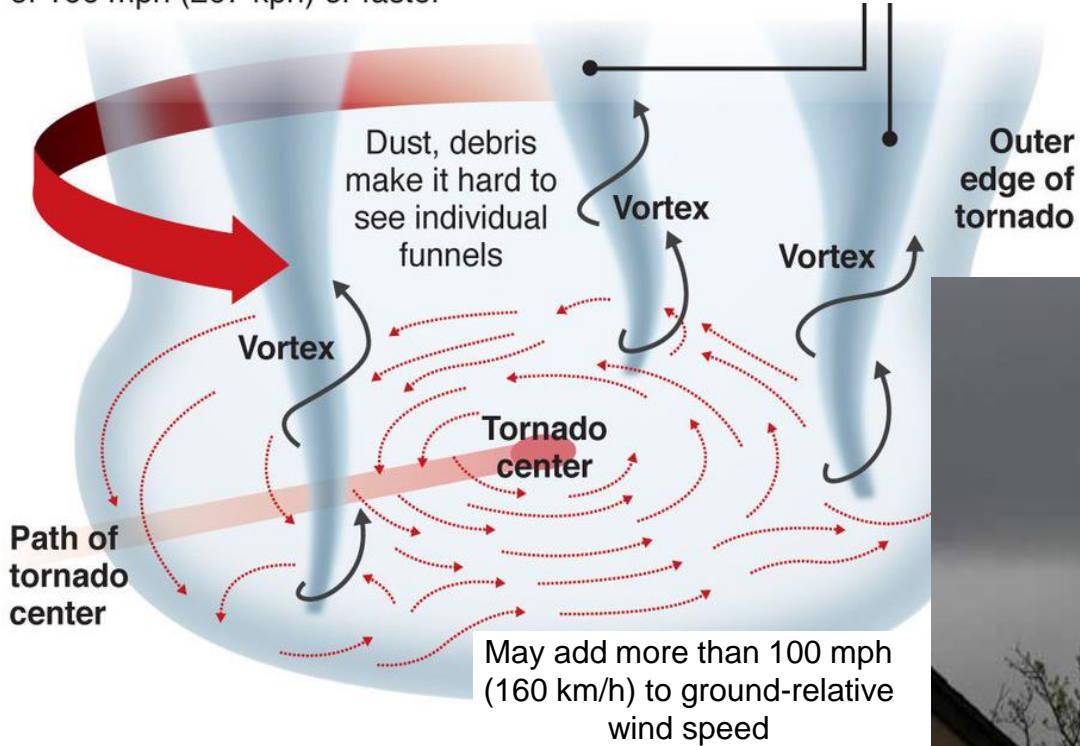


Multiple-Vortex Tornado

A multiple-vortex tornado is a type of tornado in which **two or more columns of spinning air rotate around a common center**.

Most common in tornados with wind speeds of 166 mph (267 kph) or faster

Individual vortices usually last less than one minutes each



A multi-vortex structure can occur in almost any circulation...



...but is very often **observed in intense tornadoes.**

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.

Tornado Forecast

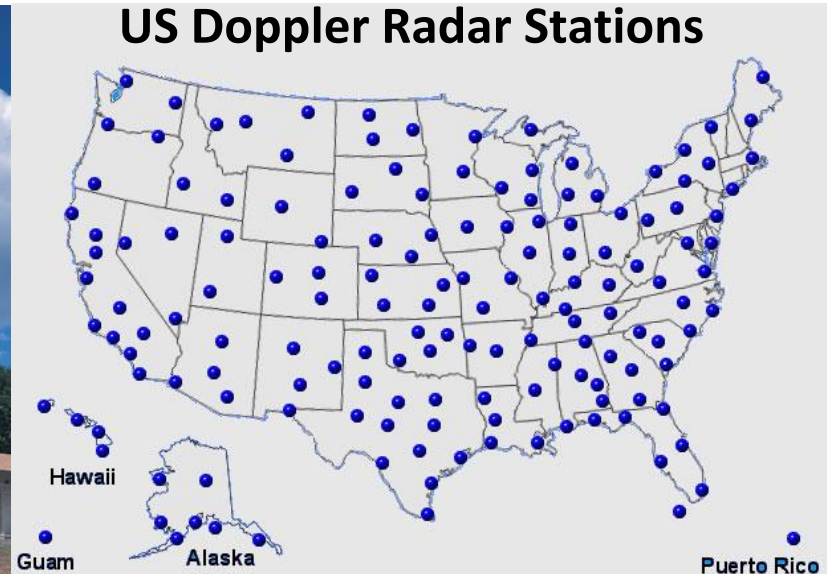
- On **March 25, 1948** Major Fawbush and Captain Miller determined that the conditions of the atmosphere just west of Tinker AFB, OK were suitable for tornado development.
- The **first tornado forecast ever** was issued.
- A few hours later, a tornado arrived causing significant damage to the base.
- However, **no deaths and only a few injuries** occurred.
- Currently, several countries have meteorological agencies which distribute **tornado forecasts, watches** and **warnings**.



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.

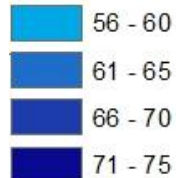
Tri-State Tornado

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 approximately 635 people.
- The funnel was up to 0.75 miles across and traveled as fast as 73 mph (117 km/h).

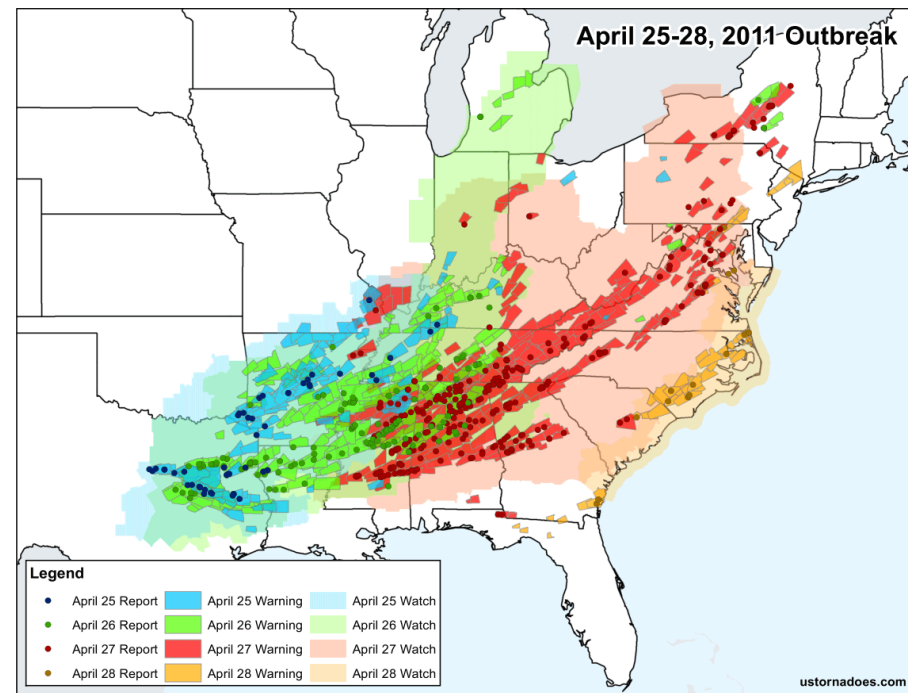


- It was likely an F5, though tornadoes were not ranked on any scale in that era...

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**.



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>