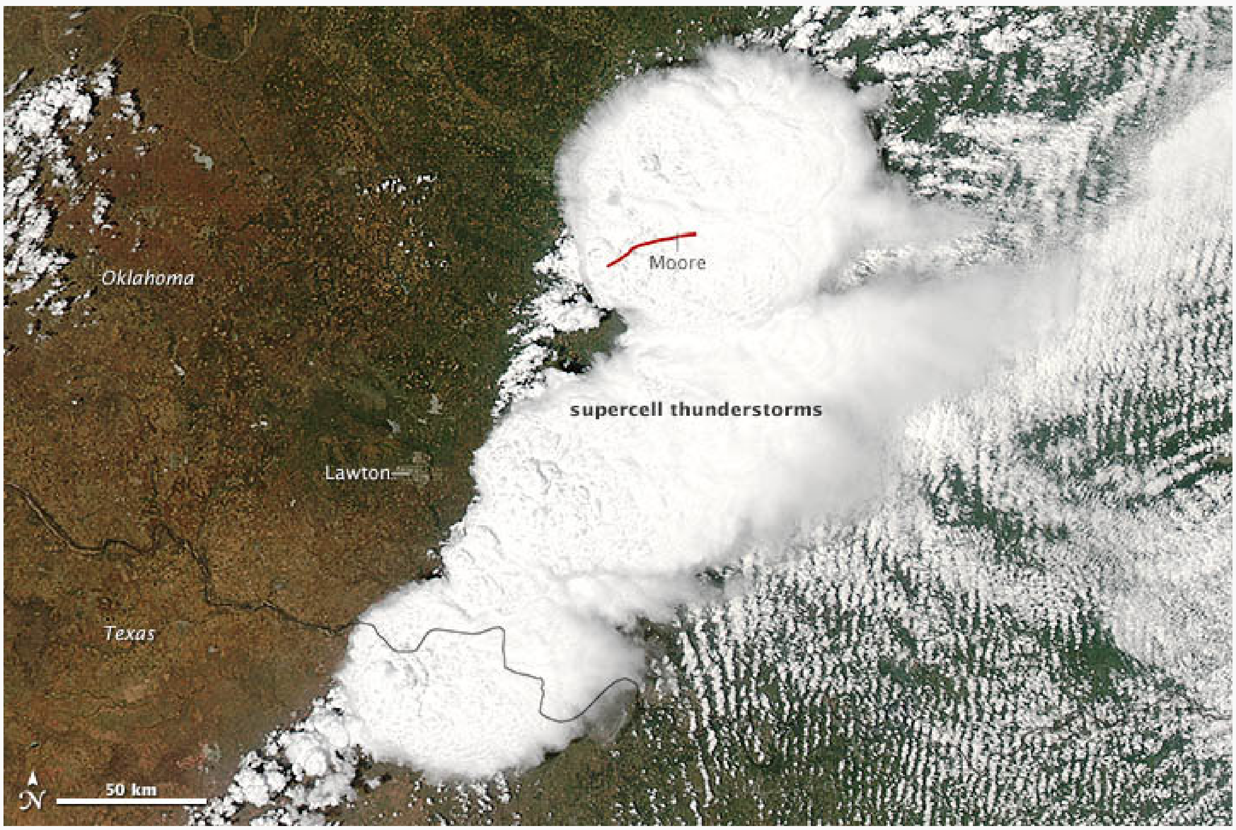
Major twister hits Oklahoma

By Janet Raloff / May 21, 2013

A major tornado touched down around 2:55 p.m. in an Oklahoma City suburb on May 20. At the time, the National Weather Service tweeted: "TORNADO! On the north side of Newcastle moving east." Over the next 40 minutes, this twister cut a devastating path through several communities.

Tornadoes are Mother Nature's most violent storms. Although relatively short-lived, their winds can pack far more power than a hurricane's.



White, ball-shaped cloud structures in this satellite image point to where intense thunderstorms formed on the afternoon of May 20, 2013. The big round ball at top center is where the killer tornado developed. It ravaged Moore, Okla. Caption:
Jeff Schmaltz, LANCE/EOSDIS MODIS Rapid Response Team at NASA GSFC

On May 21, the weather service reported the previous day's tornado had cut a path of destruction 17 miles (27.4 kilometers) long. It began 4.4 miles west of Newcastle, Okla. The tornado continued through the town of Moore and on for another 4.8 miles. Toward the end, this twister had grown to more than a mile wide. Its circulating winds whipped up objects in its path and flung them like missiles. These contributed to the storm's damage.

Explainer

Why a tornado forms

The tornado flattened homes and two schools. It also cut through part of a hospital and many businesses. At least two dozen people died — including 9 children. Roughly 24 hours after the storm struck, the National Weather Service rated the twister a category 5 storm, the most intense possible. Scientists estimated the wind speed at 200 to 210 miles per hour (322 kilometers per hour).

Some news accounts have reported confirmed wind speeds that high. But it's really too early to tell, notes Keli Pirtle. She's a spokesperson for the National Severe Storms Laboratory. The National Oceanic and Atmospheric Administration runs this lab in Norman, Okla. While the twister was immensely big and strong, Pirtle points out that no confirmed measurements of its wind speed yet exist.

To precisely assess the speed of a tornado's rotating winds, a radar must have been operating in just the right place. And it almost never is, observes tornado expert Harold Brooks. He works out of NOAA's Severe Storms Laboratory. In U.S. history, Brooks says, "there may be 10 tornadoes in the [scientific] database that are based on wind speed measurements by radars."

In this case, there was a radar operating nearby, notes Melissa Bird. She's a spokesperson for the National Weather Center in Norman, Okla. Although the radar collected mountains of information during the storm, by May 21 scientists had not yet been able to confirm it's speed. In fact, Bird noted, it's possible the data will never be clear enough to point to an exact speed.

A week before they died, Tim Samaras and Carl Young tracked the birth of a tornado in Kansas. Paul Samaras captured his dad explaining the event on video. The National Geographic Society believes this to be the most "complete" movie of a twister's development. Credit: P. Samaras/ Nat. Geo. Soc.

In the absence of radar data that have precisely clocked a twister, reported tornado speeds can be only educated guesses. Experts make them, Brooks explains, based on the damage they observe firsthand once a storm is over. In the case of the May 20 tornado, those experts had, a day later, tentatively given it a category 5 ranking on the "enhanced Fujita" (or EF) scale.

Structural engineers use science to assess a building's strength. Through detailed calculations, they can determine the minimum wind speeds likely needed to level a building. And it will differ if it's a wooden barn, a brick house or a concrete-and-glass office building reinforced with steel beams. Scientists assign a twister its EF ranking based on the strongest buildings that it damaged.

Think of the three little pigs, Brooks says. Houses made of straw can be blown down easily. But if the pigs in that children's story had lived in a house made of brick, the Big Bad Wolf could huff and puff all he wanted — and still never blow the house down.

If only some of a building's roof shingles, window awnings or gutters blow off, the wind speeds probably have not exceeded 80 miles per hour (128 kilometers/hr). That is at the high end of the EF 0 range. If windows and the glass in doors break, wind speeds might have approached 97 miles per hour, or within the middle of the EF 1 range. It should take speeds of more than 120 miles per hour (at the middle of the EF 2 range) to shift an entire house off of its foundation. At 152 miles per hour, the middle of the EF 3 category, winds might flatten all walls in a building's bottom floor, except its interior walls. But at 200 miles per hour, twisters can destroy even very well constructed brick buildings, sweeping them from their foundations. Winds gusting for 3 seconds or more at 200 miles per hour fall into the top ranking: EF 5.

Caption: NASA, NOAA.

Of course, the critical issue here is how well a building was originally built, Brooks notes. Some buildings are not built correctly. So even if they appear strong, they may not be. In those instances, weaker winds may level them.

There is also the issue of how quickly a tornado travels. For instance, experts initially pegged winds from the major tornado that struck Jarrell, Texas, in 1997 at 250 mph. “It was unquestionably a strong tornado,” he says. “But it was moving very slowly.” So engineers later reviewed the damage it caused. Brooks says that they concluded, “150 mile per hour winds over a period of several minutes could have done this.”

Keep in mind, he warns, that doesn’t mean the winds weren’t higher. After all, if 150 mph winds could have blown a strong building down, so would winds 50 or 100 miles per hour faster. What people need to understand, he says, is that gauging a tornado’s strength is far from an exact science.

So, too, is designing a building to withstand a tornado’s destructive winds. Schools tend to be built tougher than most homes. That is one reason why schools in the storm’s likely path did not release children when sirens warning of a tornado sounded on May 20. Yet the storm still destroyed two of those schools.

NOAA’s Storm Prediction Center in Norman, Okla., has warned that this can occur, even in relatively well-built schools. “Remember,” that center warns, “there is no such thing as guaranteed safety from a tornado. Freak accidents happen; and the most violent tornadoes can level and blow away all but the most intensely fortified structures.”

And that’s why NOAA’s tornado watchers at its Norman lab tweeted shortly after 3 p.m. Monday: “LARGE VIOLENT TORNADO moving toward Moore and SW OKC [meaning Oklahoma City]. Take cover right NOW!!! Do not wait!!” One minute later, they followed up, saying: “This is as serious as it gets for SW OKC and Moore. Please seek shelter now!”

On May 21, President Barack Obama noted that “Our gratitude is with the teachers who gave their all to shield their children; with the neighbors, first responders, and emergency personnel who raced to help as soon as the tornado passed; and with all of those who, as darkness fell, searched for survivors through the night.”

“We don’t yet know the full extent of the damage from this week’s storm. We don’t know both the human and economic losses that may have occurred,” the president said. But he pledged that federal money and workers will help to find what is lost and repair what is broken.

Meanwhile, Obama noted, the “severe rumbling of weather — bad weather — through much of the country still continues.”

Power Words

tornado A violently rotating column of air extending from the ground to a thunderstorm above.

tweet Message consisting of 140 or fewer characters that is available to people with an online Twitter account.

radar A system for calculating the position, distance or other important characteristic of a distant object by sending out periodic radio waves that bounce off of the object and then measuring how long it takes that bounced signal to return.

structural engineer An individual who uses science to determine the strength or vulnerabilities of a building, bridge or other structure.