

When the Sky Turned Black

Was spring's explosion of tornadoes and escalated death toll linked to climate change, or was it just bad luck?

By Jim McKay | Editor

The statistics from this spring's tornado damage are staggering: 535 deaths — the most since the National Weather Service began compiling official records in 1950 — and 1,588 tornadoes throughout June. This already is well above the previous three-year average of 1,376 and approaches the seasonal record of 1,817 tornadoes set in 2004.

The tornado activity stretched from California to the East Coast, with deadly activity occurring in Alabama, Missouri, Tennessee, North Carolina, Oklahoma, Mississippi, Georgia, Arkansas, Virginia and even Boston.

Both the numbers and the fact that tornadoes touched down in places that rarely see them

raised several questions. Why the increase this year? Is it related to climate change? Is this season an aberration or is it part of something more ominous? Are there lessons to be learned from the high number of casualties?

The answers do not come easy for a variety of reasons.

First of all, National Oceanic and Atmospheric Administration (NOAA) official records only go back to 1950 and since then, the tools for assessing tornado frequency have improved significantly. This relatively short period of time for observing tornadoes has left a steep learning curve for understanding all the variables that constitute a twister.

"We're trying to figure that all out," said Jon Martin, professor and chair of the Department of Atmospheric and Oceanic Sciences at the University of Wisconsin-Madison. "We have a renewed sense of urgency and interest in this question after this horrible spring. Whether this is part of a larger cycle is very hard to discern simply because the record of actually counting these things and having reasonable statistics is not that long."

Martin said experts discount the tornadoes in California and Boston when trying to determine trends because they are aberrations. "But when you consider even the storms that have happened over the Southern states and central plains, places that expect them with greater frequency, that's

where you want to build your case about whether or not the changing global climate may be manifesting itself in some aspect of tornadic activity,” he said.

To build that case, scientists must study all the variables that go into the development of a tornado. Some of those ingredients may be derived from a warming climate and some may not.

The Ingredients

One of the many variables that make up a tornado is precipitation. Precipitation has increased and models project that it will continue increasing, according to Thomas Peterson, chief scientist at the NOAA’s National Climatic Data Center.

Generally for a tornado to form, unusually warm and humid conditions must be present in the lower atmosphere. The wet, warm winds from the Gulf of Mexico move north in spring and summer meeting with colder local winds.

Another variable that must be present is wind shear. The change in wind speed or direction with height is sucked up through a powerful thunderstorm or hurricane and gets spinning quickly. Usually that type of wind shear accompanies a cold front and low-pressure system from the north.

The cold and warm air meet at what’s called the “dry line.” Here the warm air tries to rise but is blocked by the cold air, causing the warm air to rotate. Concurrently the sun heats the Earth, warming more air until eventually the warm air becomes strong enough to break through the cold air, which then sinks, sending the warm air spinning upward.

This scenario for creating a tornado might conflict with the idea that a warming climate will create more tornadoes, according to Harold Brooks, head of the Modeling, Observation and Analysis Team at the NOAA’s National Severe Storms Laboratory in Norman, Okla.

“When you consider physical variables that are important for making tornadoes more likely as the planet warms, we expect one of the significant things, low-level moisture, to increase in frequency and intensity as temperatures warm but wind shear is likely to decrease,” Brooks said. “And the balance between those two as far as tornadoes is really unclear as to which one will win out.”

Tied to La Niña?

Some studies within the last 20 years have suggested a more robust tornado season during a

La Niña event — when the eastern tropical Pacific Ocean is cooler than normal, meaning the western tropical Pacific Ocean would be warmer than normal during the same period.

“That leads to a new idea we’re beginning to explore here at [the University of Wisconsin-Madison] — that the western tropical Pacific Ocean may contribute in significant ways to the production of one of the main ingredients in the tornadic environment,” Martin said. “And that is a very strong jet stream in early spring.”

That may link to what happens when the climate gets warmer in the western tropical Pacific Ocean, he said. “Presumably [the western tropical Pacific Ocean] gets warmer and has a longer season of springtime convective activity in that part of the

globe that then feeds into a longer and perhaps more intense tornadic season for us.”

Though that could be related to a warming climate, looking at just one year’s findings would be shortsighted, and Martin sees no trend in tornado activity through the years. “I’ve never been skeptical that the climate’s changing and that humans have a role in that, but to be able to telescope down to individual events, I’m skeptical about that,” he said. “But there may be a physical link that we can explore.”

Beyond that physical link to a warmer western tropical Pacific Ocean, this year’s numbers might just be the result of very bad luck.

“This is such an unusual set of circumstances,” Martin said. “And I would guess that any year’s

PRACTICE FOR RECOVERY

Don’t wait for a disaster to strike before outlining a recovery plan. Have something on paper outlining the necessary steps to start recovery efforts. This can be as simple as a single page of the necessary services to be provided to get the business operational again. Review this plan with the management team every quarter and make sure it’s foolproof. Determine if there are any functions that can be moved offsite or to other providers. When replacing equipment, keep mobility in mind and work toward the goal of having a 100 percent mobile work force (if that’s possible for your business). Survey the local real estate market once a quarter so available properties are known in the event of fire or flood at your facility. This type of preparation allows a faster and more orderly recovery from any type of disaster. — Andrew Bailey, president, Cabinet NG





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LESSONS LEARNED FROM AN ALABAMA BUSINESS

Alabama was hit exceptionally hard by the tornadoes, and Cabinet NG's office was no exception. Our employees were in a panic. What began as a mild fascination watching storm clouds suddenly jumped to fear and dread. Headquartered in Madison, Ala., we are no stranger to tornado sirens, but we knew this was different.

Although we had many preparations and recovery plans in place, we still didn't account for everything. In case we are ever met with a disaster again in the future, one of the first things we will change is having a company policy that defines a physical rallying point for our employees the day after. It was difficult to contact everyone the next day since the cell network was overloaded. Placing calls and even sending text messages were next to impossible. Another change we're making is to move more of our infrastructure to the cloud or co-location facilities — this would allow us to operate from virtually any location.

KEY LESSONS WE LEARNED:

- **Don't count on cell phones to work.** Cell towers were either overloaded or did not have power. A number of employees could not be reached directly. Have backup methods or even perhaps a physical rallying location.
- **Make sure you have a way to access your main phone number,** especially if you're using an on-premises phone switch. Fortunately we could forward our main line without accessing the physical phone.
- **Don't count on power coming back in one or two days.** It took a full week to get power back at our office building.
- **Have methods for communicating with your customers broadly (e-mail, Facebook, Twitter, etc.)** — our public relations firm kept everyone informed about our status.
- **Move as much as you can to the cloud,** as this lets you work from anywhere.

— Andrew Bailey, president, Cabinet NG

number of deaths that departs from the average is going to have the same story — that one or two storms have hit big cities.”

Indeed the number of deaths and tornadoes correspond to where they actually touch down. “Northeastern Colorado has a lot of tornadoes. They're usually quite small and don't do damage because they're out in the plains where few people live,” Peterson said. “But if you look at where they are reported, you see that there's this line of tornadoes right along the interstate highway up to Nebraska. It isn't that they follow the interstate, it's that that's where the observations of them are.”

A couple of rare monster storms hit metropolitan areas this spring — Tuscaloosa, Ala., and Joplin, Mo. — to account for a large number of deaths. But there are lessons to be learned — and there's even a silver lining, as Martin put it.

Silver Lining

Experts say that modern weather forecasting has gotten very good; that several of these deadly tornadoes were predicted two and three days in

advance and many people may not have heeded warnings until it was too late.

“You have more than 500 deaths, and I'd be willing to say some fraction of them — let's be conservative and say 25 percent — I sure hope that 25 percent of those victims were not people who said, ‘Hey, I've heard these sirens go off before; I'm not paying attention to it,’” Martin said.

On Sunday, May 22, Joplin/Jasper County Emergency Management Director Keith Stammer broke his rule of sounding a storm siren more than once because of the ominous signs of the approaching tornado, according to *The Joplin Globe*. That second siren probably saved lives.

One resident was quoted in *The Joplin Globe* after the storm as saying he ignored the first warning, as did many other residents. The first alarm sounded 30 minutes before the tornado hit. “I had plenty of time,” Jose de Leon told the newspaper. “I didn't take it seriously.”

Even after two sirens, people were caught in places they shouldn't have been, such as big department stores.

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Jon Martin, professor and chair, Department of Atmospheric and Oceanic Sciences, University of Wisconsin-Madison

“They were in places that we know are bad to be in,” Brooks said. “I don’t think we’ll ever get tornado fatalities down to zero, but professionally, it’s very hard for me to accept that 141 fatalities can occur on a day, and that something didn’t go wrong beyond the fact that it was a violent tornado.”

Missouri had just held a statewide tornado drill the previous March.

Brooks said there are a number of questions that must be answered after this spring, including: “Were there messages out there, were they received and were they in the way the public could understand them? There are a lot of things we need to try to figure out in terms of what part of the forecast warning response system didn’t perform the way we would like it to perform.”

Martin said that if he and his colleagues are right — that the tropical Pacific Ocean is playing a role in these storms — then they can perhaps track those ingredients and use the forecast models several days in advance to “begin to maybe enlarge our perspective on just how we’re approaching the forecasting and the alerting of the public to the chance of these storms.”

If scientists can continue to shape their knowledge of the ingredients that make up a tornado and monitor those several days in advance, said Martin, perhaps they can communicate to the public an even more probable level of risk.

“And put people on alert a day or two ahead of time in a more substantial way than they have been willing to accept from us,” Martin said. “We’ve

been doing this for a long time, but I don’t think people have paid attention to the one- and two-day outlook of severe weather forecast. They pay more attention to today, when the sky turns black.”

He said a prepared public that takes advantage of modern weather forecasting can possibly reduce the death toll. “There are going to be improvements in our ability to communicate and the public’s ability to absorb that information in the longer term,” he said. “One to two days ahead of the big event might save lives. That’s where the learning in emergency management is going to be maximized.” +

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