Tornadoes occurring earlier in 'Tornado Alley'

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A supercell storm, known to produce violent tornadoes, forms in Courtney, Oklahoma in April 2014. A new study shows that peak tornado activity is occurring nearly two weeks earlier in Oklahoma, Kansas, and northern Texas, according to a new study published in *Geophysical Research Letters*. Credit: Kelly DeLay/Flickr

Peak tornado activity in the central and southern Great Plains of the United States is occurring up to two weeks earlier than it did half a century ago, according to a new study whose findings could help states in "Tornado Alley" better prepare for these violent storms.

Tornado records from Nebraska, Kansas, Oklahoma, and northern Texas – an area of high tornado activity dubbed "Tornado Alley"—show that peak tornado activity is starting and ending earlier than it did 60 years ago.

Peak tornado activity, which occurs in the region from early May to early July, has moved an average of seven days earlier in the year over the past six decades. The study's authors observed the shift in tornado activity for all categories of tornadoes that occurred in the region from 1954 to 2009.

The research team published its findings last week in *Geophysical Research Letters*, a journal of the American Geophysical Union.

Additional, more-selective analyses by the authors show that for some states in the region and for stronger tornadoes the season advances an average of 14 days compared to 1954.

"If we take Nebraska out [of the data], it is nearly a two-week shift earlier," noted John Long, a research scientist in the Department of Land Resources and Environmental Sciences at Montana State University in Bozeman, Montana, and lead author of the new paper. For tornadoes rated above F0, the lowest rung on the original Fujita scale of tornado strength, the shift is also close to 14 days, according to a preliminary analysis by Long and his colleagues that's not included in the new paper.

A home destroyed by a tornado that struck Quapaw, Oklahoma on April 27, 2014. New research showing that peak tornado activity in the central and southern Great Plains is occurring earlier could help residents in the region be better prepared for severe weather. Credit: National Weather Service in Tulsa, Oklahoma

F1 tornadoes have winds between 117 and 180 kilometers per hour (73 and 112 miles per hour), while the strongest tornadoes, F5, have winds between 420 and 511 kilometers per hour (261 and 318 miles per hour), according to the original Fujita scale. Although the Fujita scale was updated in 2007, Long and his colleagues stayed with the original Fujita scale because most data in this new study originates from prior years.

The new research does not attribute the shift in tornado activity in the region to any single cause. However, the earlier tornado activity seen in

the study is in-line with what could be expected in a warmer climate, the study's authors said.

The new research could help residents in the region be better prepared for severe weather, said Long. About 1,300 tornadoes hit the U.S. every year, killing an average of 60 people, according to the National Weather Service's Storm Prediction Center. This year, the majority of the 309 tornadoes that have hit the U.S. occurred in May and the deadliest storms were in April, according to the Storm Prediction Center.

"From a public safety perspective, if this trend (of an earlier tornado season) is indeed occurring, then people need to begin preparing for severe weather earlier in the year," said Greg Carbin, the warning coordination meteorologist at the Storm Prediction Center in Norman, Oklahoma, who was not involved in the new study.

The new research analyzed National Weather Service tornado data for Tornado Alley from 1954 to 2009. The authors broke the data into ten-year time frames and analyzed how the dates of peak tornado activity changed over time.

The analysis showed the date of peak tornado activity in the region moved earlier at a rate of 1.55 days per decade over the time period studied. In the heart of Tornado Alley, an area with the highest density of tornadoes, peak activity shifted by seven days: from May 26 in the 1950s to May 19 in the early 2000s.

Although there is a consistent movement in the region toward earlier tornado activity, it is difficult to pinpoint a cause, said Paul Stoy, assistant professor in the Department of Land Resources and Environmental Sciences at MSU and co-author of the new study. Records of tornado activity in the U.S. only date back to the 1950s, making it difficult to study changing trends in tornado activity.

Furthermore, tornadoes can be influenced by many regional factors, including topography of the land and areas where cooler air meets warm, subtropical air, making it difficult to attribute the shift in the tornado season to any one factor, he said.

Carbin, of the Storm Prediction Center, said a warmer climate might play a role. "If winters are not as cold, or if spring times are warmer, the location of the jet stream is most likely displaced north of where it has been in the past," he said. This would cause tornado activity to shift earlier in the year, like what is seen in the new study, Carbin said.

The study has revealed a connection between one global climate pattern and tornado activity, specifically in the state of Oklahoma. When El Niño conditions occur between January and April, peak tornado activity in Oklahoma occurs earlier in the spring, the researchers report. El Niño, an oscillation of the ocean-atmosphere system that is associated with warm ocean waters in the Pacific Ocean, changes the air surface pressure and atmospheric circulation.

"The relationship we do see in Oklahoma is a light but significant connection to El Niño," Stoy said. "This makes one suspect that if global climate change is changing these larger circulations, then there is a connection between a global [variability] and tornado activity."

More information: *Geophysical Research Letters*, onlinelibrary.wiley.com/doi/10 … 014GL061385/abstract

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