

# Researchers develop model to correct tornado records

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(Phys.org) —In the wake of deadly tornadoes in Oklahoma this past spring, Florida State University researchers have developed a new statistical model that will help determine whether the risk of tornadoes is increasing and whether they are getting stronger.

Climatologists have been hampered in determining actual risks by what they call a population bias: That is, the fact that tornadoes have traditionally been underreported in rural areas compared to cities.

Now, FSU geography Professor James B. Elsner and graduate student Laura E. Michaels have outlined a method that takes the population bias into account, as well as what appears to be a recent surge in the number of reported tornadoes, thanks in part to an increasing number of storm chasers and recreational risk-takers roaming Tornado Alley.

Their model is outlined in the article "The Decreasing Population Bias in Tornado Reports across the Central Plains," published in the American Meteorological Society's journal *Weather, Climate, and Society*. The model offers a way to correct the historical data to account for the fact that there were fewer reports in previous decades. In addition to Elsner and Michaels, Kelsey N. Scheitlin, an assistant professor at the University of Tennessee at Knoxville, and Ian J. Elsner, a graduate student at the University of Florida, co-authored the paper.

"Most estimates of tornado risk are probably too low because they are based on the reported number of tornadoes," Elsner said. "Our research

can help better quantify the actual risk of a tornado. This will help with building codes and emergency awareness. With our research, the science of tornadoes can move forward to address questions related to whether cities enhance or inhibit tornadoes."

Although other researchers have proposed methods to address the population bias, all of them assume the bias is constant over time, Elsner said. This model is the first to take into consideration how the population bias has changed over time.

Historically, the number of reported tornadoes across the premiere storm chase region of the central Plains is lowest in rural areas. However, the number of tornado reports in the countryside has increased dramatically since the 1970s and especially since the 1996 release of the disaster movie "Twister." The movie spawned a generation of storm chasers who are partially responsible for more tornado reports, Elsner said.

Interestingly, Elsner's model was developed after he led a team of undergraduate and graduate students on a storm-chasing mission of their own.

"While we were driving around the Great Plains looking for storms, I challenged my students to think about how the historical data could be used to better estimate the risk of getting hit by a tornado," he said. "The observations of other chasers and the geographic spacing of towns led us to our model for correcting the historical record."

In addition to more storm chasers logging tornado sightings, greater public awareness of tornadoes and advances in reporting technology, including mobile Internet and GPS navigating systems, may also have contributed to the increase in reports over the past 15 to 20 years.

The increase in reports has diminished the population bias somewhat,

but it introduced a second problem: There are more reports, but are there also, in fact, more tornadoes? In other words, is the risk actually increasing?

To address these issues, the FSU researchers first made the assumption that the frequency of tornadoes is the same in cities as in rural areas. They also operated on the assumption that the reported number of tornadoes in rural areas is low relative to the actual number of tornadoes.

Their model calls for the reported number in [rural areas](#) to be adjusted upward by a factor that depends on the number of tornadoes in the nearest city and the distance from the nearest city. The model shows that it is likely that tornadoes are not occurring with greater frequency, but there is some evidence to suggest that tornadoes are, in fact, getting stronger.

"The risk of violent tornadoes appears to be increasing," Elsner said. "The tornadoes in Oklahoma City on May 31 and the 2011 tornadoes in Joplin, Mo., and Tuscaloosa, Ala., suggest that tornadoes may be getting stronger."

The Oklahoma City tornado on May 31, 2013, was the largest tornado ever recorded, with a path of destruction measuring 2.6 miles in width. The Tuscaloosa and Joplin [tornadoes](#) are two of the most deadly and expensive natural disasters in recent U.S. history.

**More information:** [journals.ametsoc.org/doi/abs/10.1175/JCLI120011.1](http://journals.ametsoc.org/doi/abs/10.1175/JCLI120011.1) ...  
[0.1?journalCode=wcas](http://journals.ametsoc.org/doi/abs/10.1175/JCLI120011.1)

Provided by Florida State University

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