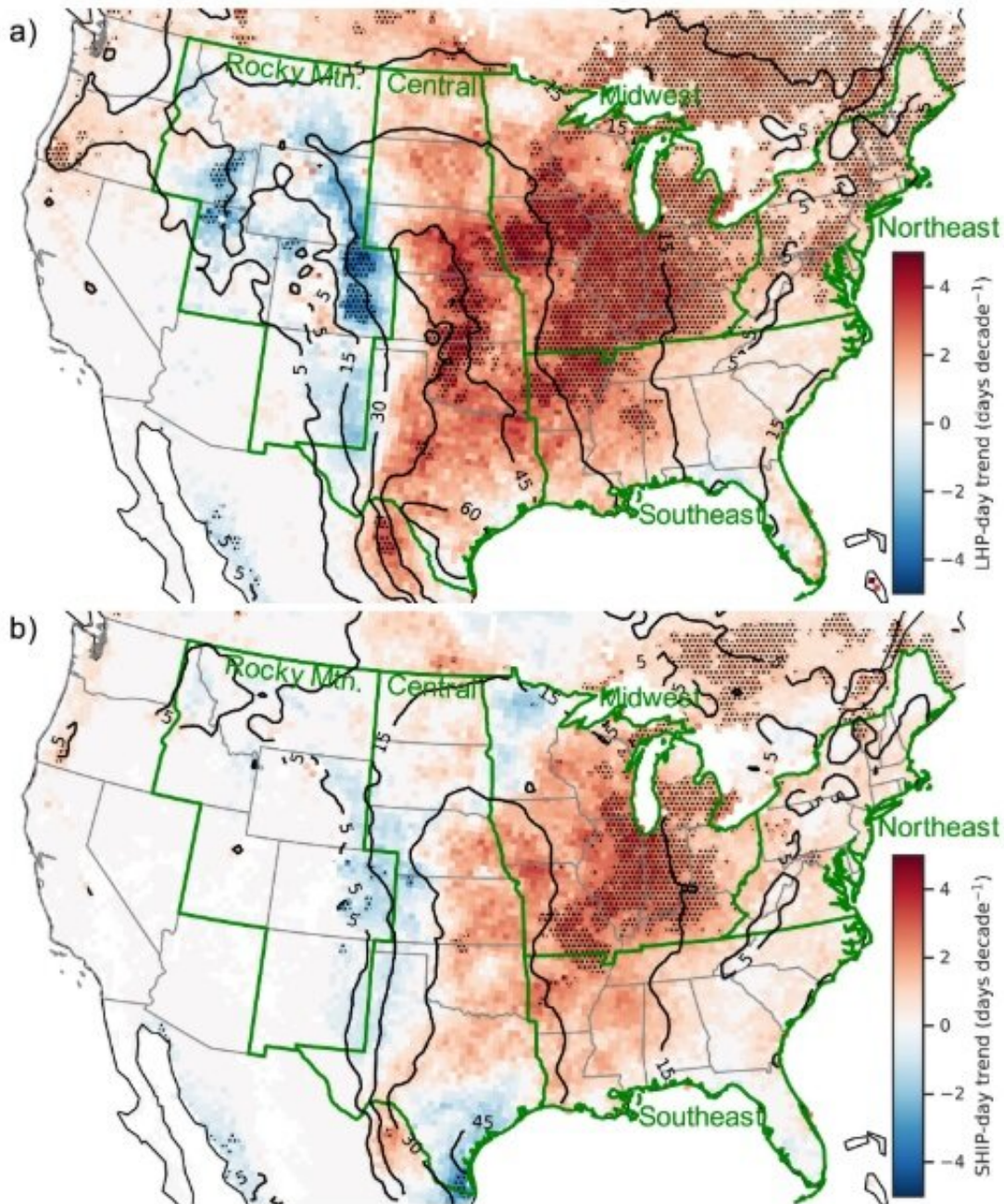


# Study: Favorable environments for large hail increasing across U.S.

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Trends in annual large hail environment days. Credit: Brian Tang

A group of atmospheric scientists have uncovered an environmental footprint that could help explain why the cost of hailstorm damage is rapidly increasing in the United States.

The scientists, led by Brian Tang at the University at Albany, combined 38 years of weather data—from 1979 to 2017—to determine how many days per year had favorable conditions for large hail, greater than the size of a golf ball, across the U.S.

Consistent increases over the 38-year period were observed east of the Rocky Mountains, including a 10 to 15-day uptick in parts of the Central Plains and Midwest. Most of the Northeast also experienced an increase of about three to eight days. The findings were consistent with increases in reported large hailstones in these regions.

Using a combination of publicly-available 3-D atmospheric data, NOAA hail reports and NEXRAD radar data, the scientists focused on a number of different moisture, temperature and wind variables that are relevant to the production of large hail in severe thunderstorms.

Study results were published on Friday in *Nature's Climate and Atmospheric Science*.

"Insurers are continuing to see big increases in hail-related claims across the country," said Tang, who is an associate professor in UAlbany's Department of Atmospheric and Environmental Sciences. "We wanted to see how environmental conditions that are conducive for large hail

might be influencing this trend."

"You only need one large hail event over a large metropolitan area to cause significant damage," he added.

A [report in 2018](#) found that each year since 2008 has produced well over \$10 billion in U.S. insured losses from severe thunderstorms. That's more than twice the inflation-adjusted damage rate that was typical in the early 2000s and more than four times the rate seen in the 1980s. Hail makes up the majority of these losses, typically between 50 percent and 80 percent. Total damages from hail, including uninsured losses, most likely are varying between \$12 and \$20 billion per year.

Experts have pointed to the growth in the number of U.S. households in hail-vulnerable areas as a primary factor. However, the increasing threat of large hail caused by a changing environment also needs to be considered, according to Tang.

He notes two important observations: an increase in the number of days that have large lapse rates (a decreasing temperature when moving upward through the atmosphere two to three miles above the ground) and an increase in the number of days with high amounts of instability (heat and humidity) and vertical wind shear (winds changing direction and speed with altitude). Both variables are critical in the development of severe thunderstorms with large hail.

"We cannot discount the possibility that our observations are part of natural variability, and 38 years of data are not enough to capture this possible variability," Tang said. "However, we also have scientific reason to believe that there might be a connection with anthropogenic climate change. More research is needed to better determine the causes of these large hail trends."

Researchers collaborating with Tang included Vittorio (Victor) Gensini at Northern Illinois University and Cameron Homeyer at the University of Oklahoma. Tang was supported by the Risk Prediction Initiative of the Bermuda Institute of Ocean Sciences.

**More information:** Brian H. Tang et al. Trends in United States large hail environments and observations, *npj Climate and Atmospheric Science* (2019). [DOI: 10.1038/s41612-019-0103-7](https://doi.org/10.1038/s41612-019-0103-7)

Provided by University at Albany

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