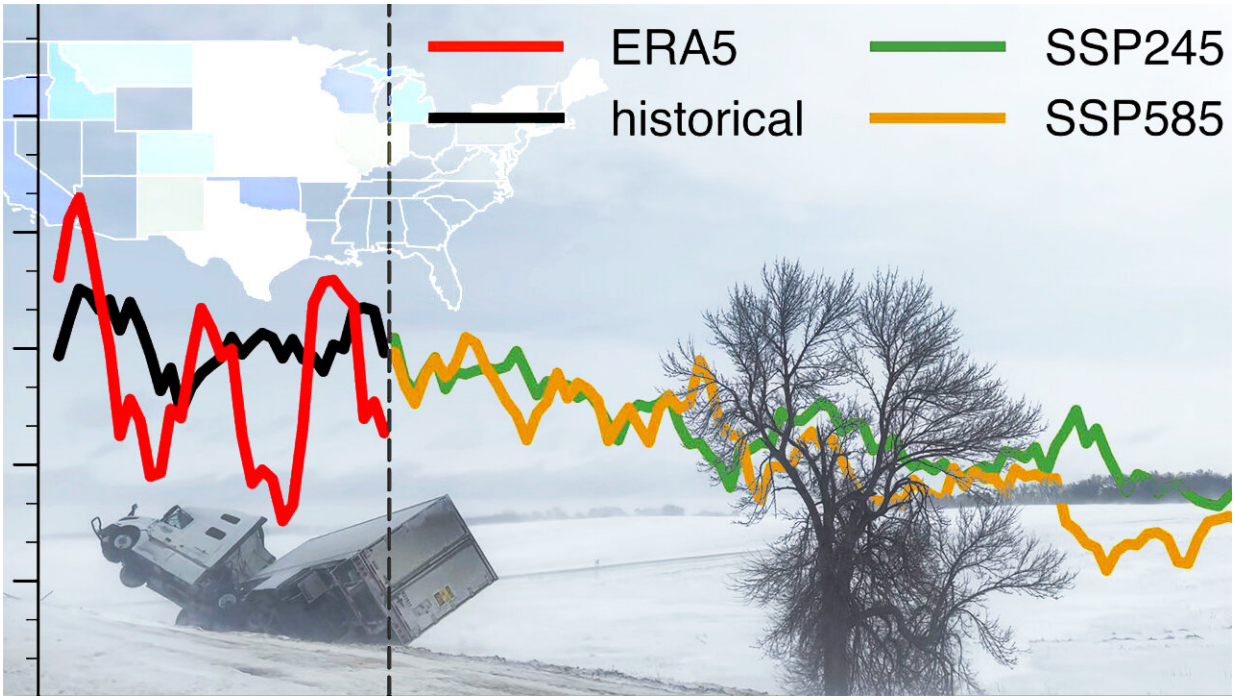
Frequency of US blizzards may decline in coming decades, says study

February 12 2024, by Scott Schrage



Nebraska's Liang Chen took this photo in the aftermath of a blizzard, while riding back from South Dakota to Lincoln in early 2023. The line graph shows the average annual frequency of blizzards in so-called hotspots from 1980 to 2014 (black), compared with two projections: one based on a conservative estimate of future greenhouse emissions (green), the other under a scenario with more extreme emissions (yellow). Credit: Liang Chen / Scott Schrage | University Communication and Marketing

Vehicles in ditches and medians. Nights without power and heat. Injuries suffered. Lives lost. For those in the Midwest, where the frying pan of summer gives way to the snow globe of winter, the scenes of a blizzard are familiar for their frequency. Of the nearly 13,000 U.S. blizzards documented between 1996 and 2020, more than 10,000 struck the northern Plains and Upper Midwest.

But the average number of blizzards could decline amid the lighter snowfalls and milder winds of coming decades, says a first-of-its-kind study from the University of Nebraska–Lincoln published in the journal *Environmental Research Letters*.

With help from the same models used by the Intergovernmental Panel on Climate Change, Nebraska's Liang Chen is predicting a decrease in U.S. blizzards through the end of the 21st century. Chen recently presented the findings at the 104th annual meeting of the American Meteorological Society.

"Blizzards have a huge impact on a lot of our daily life—infrastructure, transportation," said Chen, assistant professor of Earth and atmospheric sciences at Nebraska. "In terms of planning for climate change, people want to know: In the future, how will these blizzards change because of the warming climate?

"But there is no study looking at how they will change in the future, based on climate simulations. The major reason is: It's hard to quantify."

The National Weather Service defines a blizzard as a winter storm featuring sustained winds of 35-plus mph, and snow that limits visibility to less than one-quarter of a mile, for at least three consecutive hours. Due to the difficulty of determining visibility, though, blizzards have proven tricky to capture using climate data alone—which also inhibits the ability to predict them via climate models.

So the National Weather Service has traditionally relied on eyewitness observations to confirm that a blizzard occurred, compiling the date, location, duration and other details of those observed storms in a database.

Until Chen and his then-advisee, Ahmani Browne, had a thought: Maybe the combination of daily snowfall and wind speed data, even sans visibility readings, could quantify a blizzard. When the researchers compared blizzard observations against days boasting both heavy snowfall and sufficiently strong winds, they found substantial agreement between the two—enough to consider the latter a reasonable way of identifying the winter storms. And after plugging their resulting algorithm into IPCC climate models, Chen and Browne found that the models' simulations likewise matched up with historical observations.

Having validated their approach in the past, the duo spun it forward to the short-term and long-term future: 2030–2059 and 2060–2099, respectively. To account for the warming climate, the researchers included two estimates of future greenhouse gas emissions, one generally considered middle-of-the-road and the other more akin to a worst-case scenario.

In both emission scenarios, and across both time frames, the models suggested a gradual decline in the number of blizzards relative to their frequency from 1996 to 2020—not just in the Midwest, but the Northeast, too. If it does come to pass, Chen said, the trend will stem from projected decreases in both the average number of days with extreme wind and days distinguished by extreme snowfall, which would lower the odds of the two elements teaming up to produce a blizzard.

Iowa, for instance, could eventually see 10 fewer days per year of strong winds, while Nebraska, the Dakotas, Kansas, Minnesota and other neighboring states are projected to see drops in windy days, as well. That

could owe partly to the fact that the Arctic is warming faster than the Tropics, smoothing out the so-called temperature gradient that contributes to wind, Chen said.

In a similar vein, global warming will likely smash at least some of the daily temperature windows necessary for snow, even as winter precipitation on the whole is expected to increase in the northern Plains. And given that greater greenhouse emissions generally translate to steeper increases in average temperature, the higher-emission scenario predicts a steeper decline in blizzard frequency from 2060 to 2099.

"Because of higher temperature, precipitation will fall to the ground as rainfall instead of snow," Chen said. "So even though you have an overall increase in precipitation, your snowfall will decrease."

'We never had blizzards'

The researchers emphasized that their study makes no claims about the intensity of future blizzards. Whether the storms might strengthen, weaken or neither is among multiple questions still hanging in the air. Chen himself is planning to investigate why the number of blizzards so often spikes or plummets from decade to decade, both in the past and, if the simulations are on the mark, in the future.

It's not what a younger Chen might have expected to find himself pursuing.

"It's funny, because I was born and raised in central China," he said, "where we never had blizzards."

Which might be why Chen can recall the first he did experience, in the winter of 2015–16, not long after moving from Texas to Washington, D.C. He and his partner, a native of the Lone Star State, were living in a

condo when they learned of an incoming blizzard. Chen's partner suggested buying a shovel.

"I thought, 'Do we really need that?' I was too naïve to get the shovel," he said. "Our cars were stuck in the parking lot for two days, till we finally borrowed a shovel from our neighbors and dug them out."

Now, the one-time novice is also in the early stages of working with the Nebraska Department of Transportation to study exactly how severe winter weather influences road conditions.

"Most of my previous research was about the extreme summer events, like heat waves, drought and heavy precipitation," Chen said. "But severe winter weather is also impactful, especially in Nebraska, and we are interested to see its trajectory in a warming climate.

"I hope our study can provide a good understanding of winter extremes and benefit our local community."

More information: Ahmani Browne et al, Investigating the occurrence of blizzard events over the contiguous United States using observations and climate projections, *Environmental Research Letters* (2023). DOI: 10.1088/1748-9326/ad0449

Provided by University of Nebraska-Lincoln

Citation: Frequency of US blizzards may decline in coming decades, says study (2024, February 12) retrieved 30 April 2024 from https://phys.org/news/2024-02-frequency-blizzards-decline-decades.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private

study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.