Climate 'Normals' Are Anything But Normal In Weather Forecasting

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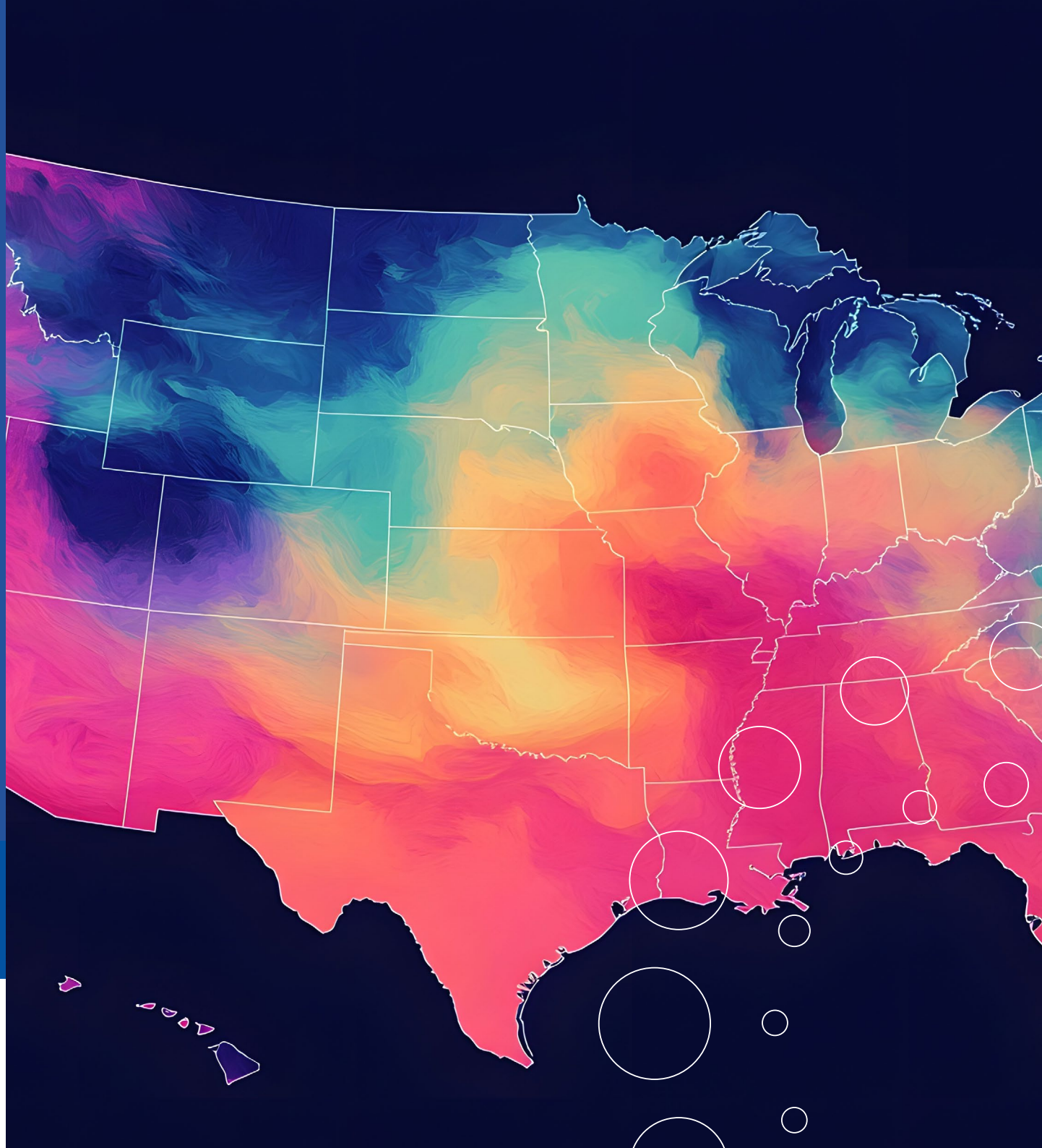
JANUARY 2025

doi.org/10.33548/SCIENTIA1224



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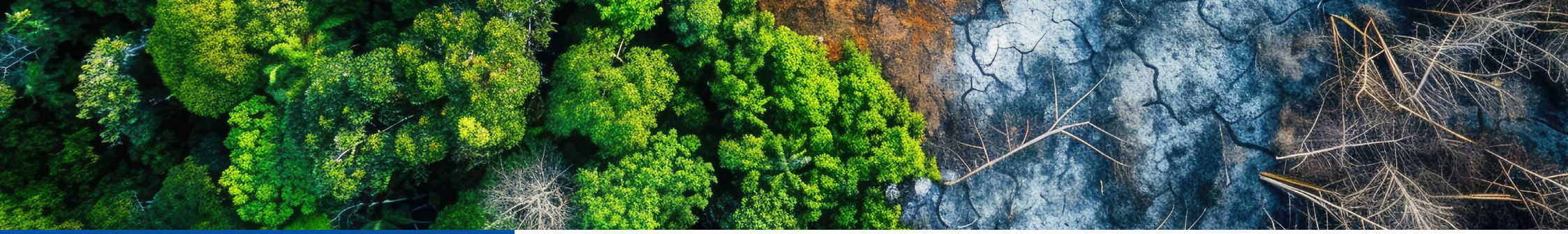


Climate 'Normals' Are Anything But Normal In Weather Forecasting

Weather forecasters and meteorologists have long used the term 'climate normal' to describe average temperatures, but this seemingly innocuous phrase might be causing widespread public misunderstanding. New research suggests that describing temperature data as 'normal' leads many people to incorrectly assume these values represent the most common or expected temperatures when, in reality, actual temperatures regularly deviate significantly from these averages.

Challenging Long-Standing Weather Communication Practices

Dr Peter Gent from the National Center for Atmospheric Research in Boulder, Colorado, has identified a concerning trend in how weather forecasts communicate temperature data to the public. His research reveals that the use of terms like 'normal' and the phrase 'where we should be' in weather forecasts can create misconceptions about what temperatures to expect on any given day.

The problem stems from the technical definition of 'climate normals' – a term that has been used since the nineteenth century and was formally adopted by the World Meteorological Organization in 1950. These 'normals' are calculated as 30-year averages and are updated every decade, with the most recent values covering the period from 1991 to 2020. While meteorologists understand these 'normals' represent long-term averages rather than typical daily temperatures, Dr Gent argues that the general public often interprets 'normal' to mean 'usual' or 'expected'.

Surprising Findings Show How Rare 'Normal' Actually Is

Dr Gent conducted a detailed analysis of temperature data from Denver, Colorado, to demonstrate how misleading the term 'normal' can be. His findings paint a striking picture of just how unusual it is for temperatures to match their supposed 'normals'.

During a four-month study period from September to December 2021, Denver's high temperature fell within 2 degrees Fahrenheit of the 'normal' high on only 18 out of 122 days – just 15% of the time. Even when expanding the range to within 3 degrees of the 'normal', temperatures only fell within this broader range 20% of the time.

To ensure these findings weren't just a quirk of that particular time period, Dr Gent examined temperature data for specific dates across the entire 30-year period used to calculate the current normals. The results were even more dramatic. Looking at four specific dates (November 23, November 30, December 25, and January 1), temperatures only fell within 2 degrees of the 'normal' value 11% of the time, and within 3 degrees just 17% of the time.

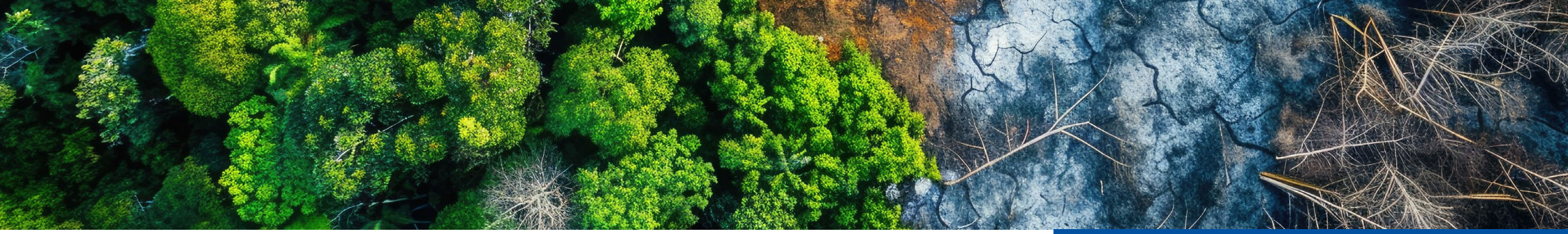
How Television Weather Reports May Mislead Viewers

The research highlights how television weather forecasts may contribute to public misunderstanding. While some Denver TV channels, such as Channels 7 and 9, use the more accurate term 'average', others continue to use 'normal'. Perhaps more problematically, forecasters frequently use the phrase 'where we should be' when comparing actual temperatures to the long-term averages.

Dr Gent argues that this language implies temperatures ought to closely match these average values every day, which misrepresents how atmospheric temperatures actually behave. This is particularly evident in Denver, where record highs and lows can differ from the average by more than 30 degrees Fahrenheit, especially during winter months. If the Denver high temperatures were always close to their average values, then forecasts could be made weeks, months or even years ahead!!

The Science Behind Why 'Normal' Temperatures Are Rare

Understanding why actual temperatures rarely match their historical averages requires a basic grasp of atmospheric science. The atmosphere is what scientists call a 'chaotic fluid', meaning its behaviour is inherently unpredictable beyond a certain time frame. This is why accurate weather forecasts become increasingly difficult to make beyond about two weeks.



The chaotic nature of atmospheric systems means that while we can calculate long-term averages, these figures do not represent what we should typically expect to see on any given day. This is similar to how the average family size might be 2.3 children – a mathematically accurate figure that doesn't represent what we'd consider a 'normal' family size in reality.

Proposed Solutions for Better Public Communication

Dr Gent and other researchers have proposed several solutions to improve how weather information is communicated to the public. First and foremost, they suggest replacing the term 'normal' with 'average' in all weather communications, as the general public has a better understanding of what an average represents.

Additionally, researchers suggest that weather forecasts could include information about temperature variability. This might involve showing the standard deviation of temperatures over the 30-year period, helping viewers understand whether current temperatures are truly unusual or within expected variations.

This approach could be extended beyond just temperature readings to other weather measurements, such as monthly precipitation, snowfall, or annual averages like the Colorado snowpack. By providing this context, viewers would better understand how current conditions compare to historical patterns.

The Challenge of Changing Established Practices

Despite the clear benefits of more accurate terminology, changing established practices presents significant challenges. As one Denver Channel 4 meteorologist noted in correspondence with Dr Gent, many stations are waiting for the National Weather Service to take the lead in changing terminology before adjusting their own practices.

This highlights the institutional inertia that often slows changes in scientific communication. However, Dr Gent sees an opportunity for improvement through the American Meteorological Society (AMS), which provides certification for many television meteorologists. By addressing this issue in AMS materials and courses, the organisation could help drive a shift toward more accurate and helpful weather communications.

Future Implications for Weather Communication

Looking ahead, the implications of this research extend beyond just terminology. As climate change continues to affect weather patterns, accurate communication of weather data becomes increasingly important. Understanding that significant temperature variations are to be expected rather than unusual could help the public better comprehend both weather and climate change.

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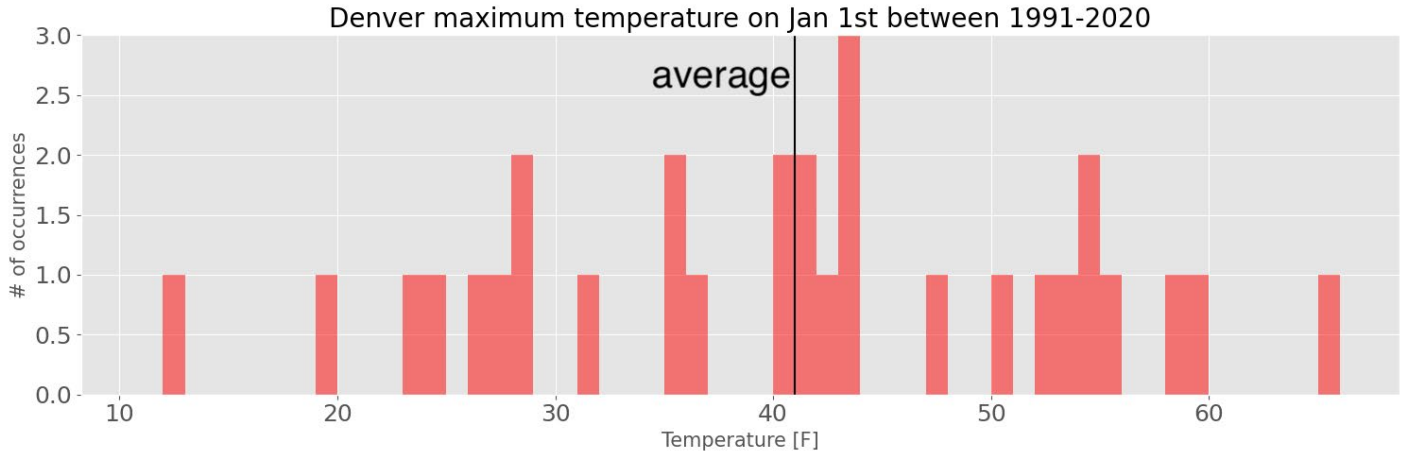
Credit: Peter Gent



Dr Gent's work also raises broader questions about how scientific information is communicated to the public. The challenge of balancing technical accuracy with public understanding is not unique to meteorology, and the solutions proposed here could inform how other complex scientific concepts are explained to general audiences.

Continuing the Push for Clearer Weather Communication

Dr Gent continues to advocate for changes in how weather information is presented to the public. His work builds on previous research by other scientists who have identified similar issues in weather communication across different regions of the United States.

He hopes that highlighting these communication challenges and proposing practical solutions can help create a more informed public that better understands both daily weather variations and longer-term climate patterns. This improved understanding could lead to better decision-making at both individual and community levels when it comes to weather-related planning and preparation.

As our reliance on accurate weather information continues to grow, the importance of clear, precise communication becomes increasingly critical. Dr Gent's research not only identifies current problems but also points the way toward solutions that could benefit both meteorologists and the public they serve.

MEET THE RESEARCHER

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Dr Peter Gent is a Senior Research Associate with the Oceanography Section at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. He obtained his PhD in Fluid Dynamics from the University of Bristol in 1973. Dr Gent has been at NCAR since 1976, serving in various roles, including Deputy Head and Head of the Oceanography Section. His research focuses on ocean modelling, air-sea interaction, equatorial ocean dynamics, and parameterising eddies in ocean circulation models. He was one of the lead developers of the NCAR Community Climate System Model. Dr Gent is a Fellow of the American Meteorological Society and American Geophysical Union. In 2020, he was awarded the prestigious Sverdrup Gold Medal from the American Meteorological Society.

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FUNDING

NCAR is funded by the National Science Foundation.

FURTHER READING

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