DOI:10.1063/PT.6.1.20171226a

26 Dec 2017 in Research & Technology

Extreme weather events tied conclusively to humans

A heat wave in Asia, warm Arctic seas, and record warmth globally in 2016 were caused by human activity, scientists say.

David Kramer

Arctic sea ice reached its minimum extent for the year on 13 September. It was the eighth lowest minimum on record. The yellow line shows the 30-year average minimum sea-ice extent. Credit: NASA's Scientific Visualization Studio

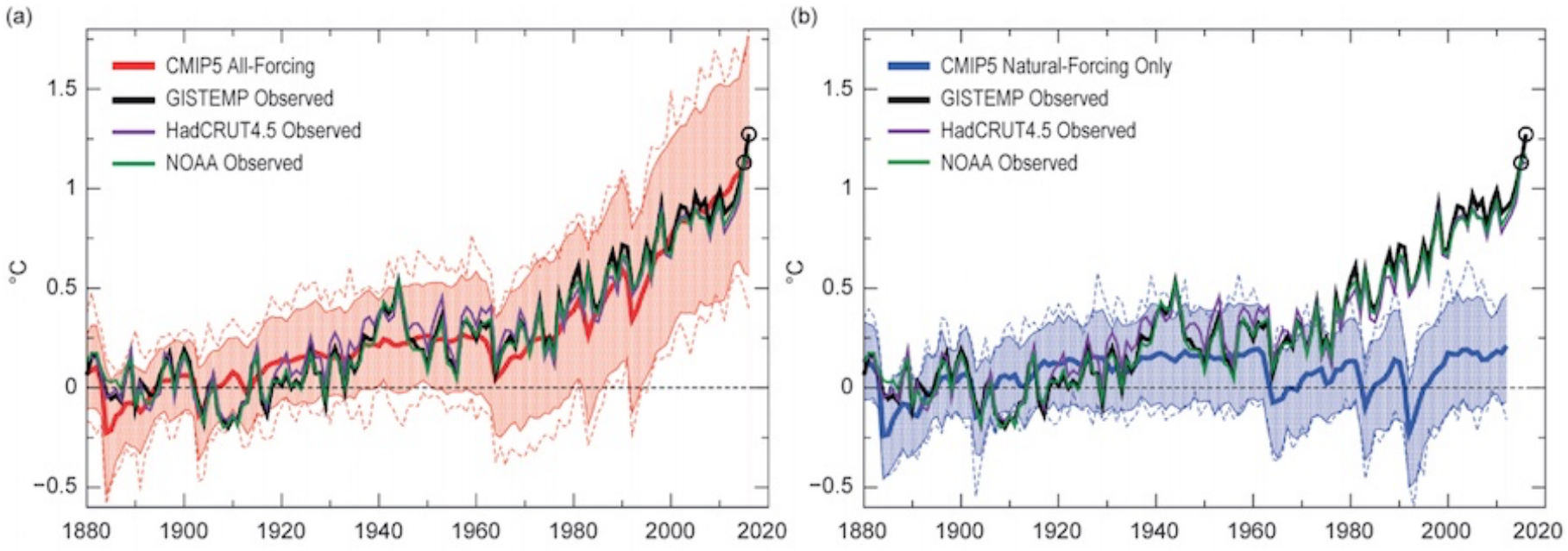
In a rare and likely unprecedented step, a peer-reviewed scientific study has definitively concluded that certain extreme weather events could not have occurred without human-caused climate change. The record-high global average temperatures recorded in 2016 couldn't be attributed to natural variability alone, say the authors of a 13 December report by the American Meteorological Society (AMS).

Meanwhile, NOAA reported that land surface temperatures in the Arctic this year are the second-highest, behind 2016, since records began in 1900, and the maximum extent of sea ice is the smallest ever. Both announcements were made during the fall meeting of the American Geophysical Union (AGU) in New Orleans.

Stephanie Herring was lead editor of the sixth annual AMS report that examines

the impact of climate on extreme weather events of the previous year. She said the record-setting global heat in 2016—the warmest since modern record keeping began and nearly 1 °C above the mid-20th-century average—could not have occurred without a century of human-caused climate change. Climate was also a necessary contributor to the record heat wave that occurred over much of Asia that year and to the anomalously warm surface temperatures of the Bering Sea, part of a larger area of warm water in the eastern Pacific Ocean known as "the blob."

"From a technical perspective, we have evidence now that climate change is pushing events beyond the threshold that could be achieved with natural variability alone," Herring, a climate scientist at NOAA's National Centers for Environmental Information, told reporters at the AGU meeting.



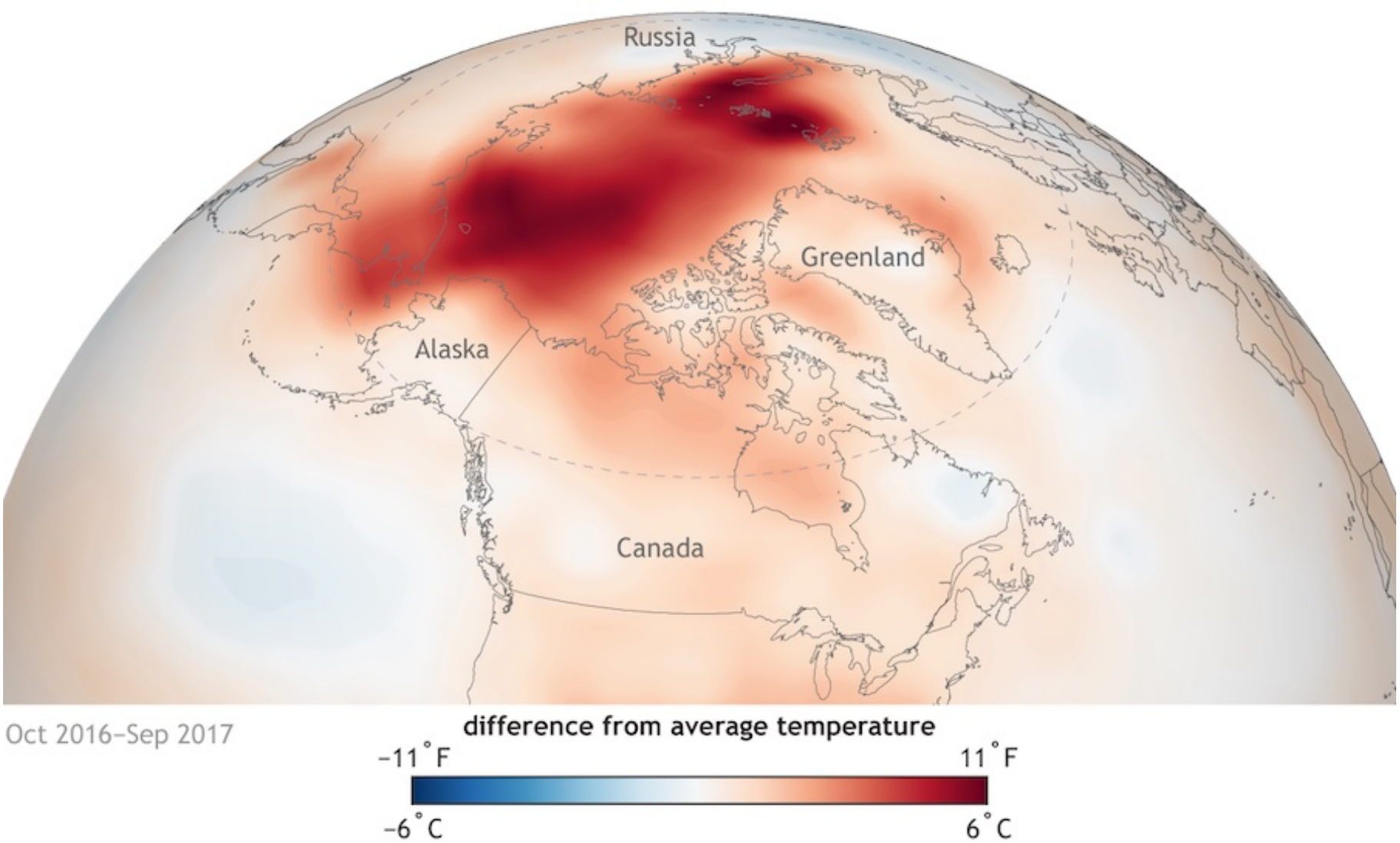
The shaded regions in the graphs denote the temperature anomalies predicted by climate models that include (a) and don't include (b) the impact of human emissions. Observed temperature anomalies are shown in black, purple, and green. Credit: T. R. Knutson et al., AMS report, chap. 3

Scientists have been reluctant to attribute any single extreme weather event to climate change alone, preferring to maintain that human activity increases the frequency of such events, including the most intense ones. Over the six years of

reports, the AMS team has determined that climate change had at least a partial role in 89 of 131 extreme weather events, including 21 of 27 in 2016.

Jeremy Mathis, director of NOAA's Arctic Research Program, told reporters at the meeting that agency scientists are "fairly confident" of a connection between the warming Arctic and some extreme weather events at lower latitudes, including cold snaps, droughts, and hurricanes. But he cautioned that no single event can be conclusively tied to the Arctic changes. Improved observations in the polar region are needed to validate the association that models have drawn, he said.

The Arctic is warming at twice the global average rate, and the impacts of that warming are being felt throughout the Northern Hemisphere. The higher temperatures have created imbalances in the jet stream that allow polar air to migrate into lower latitudes. "The door to the refrigerator has been left open and the cold is spilling out," Mathis said.



The Arctic experienced its second warmest year on record, NOAA reported in its annual Arctic Report Card. Credit: NOAA Climate.gov based on data from ARC 2017

Although the growth of atmospheric greenhouse gases has been a contributor to the Arctic warming, Mathis said the primary cause has been Arctic amplification. Rising temperatures have created a positive feedback loop, as the loss of reflective sea ice and snow cover leaves darker open water and landmasses that absorb more sunlight, accelerating the warming and melting.

At +1.6 °C, the mean annual air surface temperature anomaly measured on land north of 60° N latitude during the year ending on 30 September was the second-highest value since records began in 1900. Cooler summer temperatures slowed the rate of summer sea-ice loss, yet at 4.6 million km^2, the minimum was still 25% smaller than its 1981–2010 average. Each of the 10 lowest minimum sea-ice extents has occurred during the past 11 years.

The unusually cool summer of 2017 slowed the rate of loss of the Greenland ice sheet to below that of the 1981–2010 average. But the net loss of the ice sheet, a major contributor to sea-level rise, continued.

SHARE

Physics Today Comment Policy

Comments are held for moderation by Physics Today staff. Off-topic statements and personal attacks will not be approved.

Please read our Comment Policy before commenting.

The only significant cause I see for Arctic warming is the recent volcanic activity with the Gakkel Ridge. In fact, it would not surprise me if this is the only reason...

3 ^ v • Reply • Share ›

Merlin Khan • 2 years ago

A heat wave is a weather event, not a climate event.

2 ^ v • Reply • Share ›

nor ne' Erg ➚ Merlin Khan • 2 years ago

well, why was the so-called California heat-wave a " example of a prediction by climate-change modeling", and now you say it is 'weather" "

^ v • Reply • Share ›

vidyaguy • 2 years ago

What this research shows is that current predictive models with programmed anthropogenic drivers "turned on" fits historical data better than current predictive models with anthropogenic drivers "turned off." The problem with this "proof" is that it assumes that current predictive models without anthropogenetic drivers replicate reality to begin with. Many of the parameters fitting current models are themselves a posteriori, derived from historical data that has been "corrected." Further, the modeling of anthropogenic drivers has been long known to be inaccurate. As a result, adding or subtracting one source of erroneous modeling to/from another source of erroneous modeling can, with sufficient ad hoc parameter adjustment, "prove" just about any conclusion you may wish to entertain; except, perhaps, the existence of Audhumla.

5 ^ v • Reply • Share ›

StronzoBestiale • 2 years ago

"With four parameters I can fit an elephant, and with five I can make him wiggle his trunk."

~ John von Neumann

5 ^ v • Reply • Share ›

Roman Maciejko ➚ StronzoBestiale • 2 years ago

Agreed. So much bad physics caused by curve fitting! «Climate» equations (v.g. Lorenz Model) are notoriously non-linear and therefore predictions are beyond reach. Statistics must be used with extreme caution and depend strongly on hypotheses. In my view, a «conclusive» proof still needs to be given. For the record (?), I am a retired professor of physics.

^ v • Reply • Share ›

nor ne' Erg ➚ Roman Maciejko • 2 years ago

I like as the best proof of the value of correlations, is the one in which there is

a 92% agreement between the " number of ex-nuptial births" v " number of passengers on the municipal tramway system", and this, like the case for "climate change" - proves that all bus drivers are molesters.

MOST READ

Tracking the journey of a uranium cube

Getting rid of the Swedish bomb

The stormy fluid dynamics of the living cell

Environmental sustainability goals drive changes in conference practices

When dense crowds act like soft solids

Physics Today is a publication of the American Institute of Physics.
Learn more about *Physics Today* or contact us.

Resources

AUTHOR

LIBRARIAN

ADVERTISER

General Information

ABOUT

CONTACT

HELP

PRIVACY POLICY