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Climate warms the Earth, not chance

August 14, 2017, by Tim Radford



Greenhouse in the snow, Iceland: Climate change extremes have most impact.
Image: Axel Kristinsson via Wikimedia Commons



Recent record year temperatures show how climate warms the Earth. Without global warming, such a sequence would have been highly improbable.

LONDON, 14 August, 2017 – Each of the last three years has seen record temperatures worldwide, further evidence that climate warms the Earth, not mere chance. Each has been named the warmest year since records began.

The chance of this being pure co-incidence is little more than one in a thousand, unless human-induced or anthropogenic climate change is factored in. The chance of 2016 reaching the temperature it did, when it did, would have been [one in a million](#) , unless climate change was counted as a contributor.

And if anthropogenic global warming, driven by the profligate combustion of fossil fuels over the last two centuries, is fed into the calculations, then the probability becomes quite high: in fact there would be a 50% chance of three consecutive record-breaking years at any time since the beginning of the century, according to a new study in [the journal Geophysical Research Letters](#) .

Calculating the odds

[Michael Mann](#) , the distinguished climate scientist at Pennsylvania State University, is at it again. He and colleagues have been calculating the odds on the recent run of high temperatures to see if they can be explained by any factors other than climate change.

He has done this before: at the beginning of the year [he calculated the chance that 13 of the warmest 15 years ever had all occurred in the first 15 years of this century](#) . The probabilities at their highest worked out at one chance in 5,000, unless climate change was taken into account. At their lowest, the probability was one in 170,000.

Professor Mann, who first drew [the “hockey stick” graph](#) that shows a steep rise in global temperatures with ever greater levels of carbon dioxide in the atmosphere, also attracts considerable abuse from [those who claim that climate change is not happening](#) .

Relying on statistics

But he prefers to counter denial with simple statistics. The run of record breaking temperatures from 2014 to 2016 would have a chance of no more than 0.03% without anthropogenic influence: that is, without all that extra greenhouse gas from fossil fuels.

“With climate change, this is the kind of thing we would expect to see. And without climate change, we really would not expect to see it,” he said.

Since the late 19th century, the average surface temperature of the planet has risen by about 1.1°C. Most of this warming has been in the past 35 years. According to the US space agency Nasa, 16 of the 17 warmest years have all happened since 2001.

If natural and human events – these include cyclic natural weather phenomena such as El Niño and volcanic eruptions and of course the increasing emissions of carbon dioxide, methane and nitrous oxide in the atmosphere – are taken into account, and understood to overlap the three years in question, then the chance of 2014 to 2016 becoming the hottest consecutive years on record since 1880 rises to up to 3%.

“*When it comes to climate change impacts ... a lot of the most impactful climate related events are extreme events. The events are being made more frequent and more extreme by human-caused climate change*”

This kind of statistical calculation delivers odds that professional gamblers, merchant bankers, stockbrokers and hedge fund managers would take seriously. The challenge is now to get the rest of the human race to take the hazards seriously.

The odds are shortening on increasingly destructive consequences. Even a modest further rise in temperatures will be accompanied by a series of [dangerous extremes of rainfall](#) and [potentially lethal heat](#) .

“The things that are likely to impact us most about climate change aren’t the averages, they’re the extremes,” said Professor Mann. “Whether it’s extreme droughts, or extreme floods, or extreme heat waves, when it comes to climate change impacts ... a lot of the most impactful climate related events are extreme events. The events are being made more frequent and more extreme by human-caused climate change.” – *Climate News Network*



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