

## Global warming 'hiatus' never happened, US government scientists say

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June 5, 2015

Was it all really just an illusion?

Ever since the Intergovernmental Panel on Climate Change acknowledged that the ominous rise in Earth's mean surface temperature had begun to slow in 1998, scientists have struggled to explain this puzzling "pause" or "hiatus" in warming.

Some have argued that dust and ash blasted into the sky by Mount Pinatubo and other volcanoes had reflected the sun's heat back into space before it could be trapped by greenhouse gases. Others hypothesised that the sun had entered a rare period of calm, temporarily interrupting its habit of explosive tantrums.

Still more insisted this "missing" heat was absorbed by the Pacific Ocean, and other waters, and still lurks deep below the waves awaiting a stormy return to the surface.

On Thursday, however, researchers at the National Oceanographic and Atmospheric Administration published yet another explanation in the prestigious journal *Science*.

Their assessment: The hiatus never happened.

In an argument that drew criticism from both sides of the rancorous debate over man-made climate change, NOAA researchers wrote that long-existing instrument biases have masked rising sea surface temperatures.

Once those biases are accounted for, "this hiatus or slowdown simply vanishes," said lead study author Thomas Karl, director of NOAA's Climatic Data Center.

Karl and his colleagues insist that global average surface temperature has climbed 0.2 degrees Fahrenheit each decade since 1950, without interruption, due to the heat-trapping effects of man-made greenhouse gases.

In contrast, the IPCC had determined that from 1998 to 2012, the warming trend was just one-third to one-half what it had been from 1951 to 2012.

"The IPCC's statement of two years ago - that the global surface temperature 'has shown a much smaller increasing linear trend over the past 15 years than over the past 30 to 60 years' - is no longer valid," Karl and his team concluded.

Not surprisingly, this conclusion was quickly dismissed by so-called climate change sceptics - those scientists and policy groups who say the hiatus proves climatologists have greatly miscalculated the warming effects of fossil fuel emissions.

"The main claim, that it uncovers a significant recent warming trend, is certainly dubious," wrote a panel of climatologists at the libertarian Cato Institute.

"I don't find this analysis at all convincing," wrote Judith Curry, a climate scientist at Georgia Tech. "While I'm sure this latest analysis from NOAA will be regarded as politically useful for the Obama administration, I don't regard it as a particularly useful contribution to our scientific understanding of what is going on."

More surprising, however, was the fact that researchers on the opposite side of the debate also rejected the idea of a vanishing slowdown.

"It is a bit misleading to say there is no hiatus," said climate scientist Kevin Trenberth of the National Center for Atmospheric Research.

"I would argue the study is misleading on the implications of its results," said Piers Forster, an atmospheric physicist at the University of Leeds, in England. "This study has not 'magiced' the hiatus away or somehow corrected the IPCC."

The data that Karl and his colleagues based their conclusion on are contained in the new Extended Reconstructed Sea Surface Temperature dataset version 4 - one of a number of complex computer programs that seek to monitor and describe the effects of climate change.

Karl said the new data set was the result of some recent revelations on the part of climatologists.

Although researchers have long known that sea surface temperatures measured by autonomous buoys run cooler than temperatures measured by ships, Karl and his co-authors argued that they have failed to properly account for the expanded use of buoy readings over the last two decades.

This, combined with the fact that ships have come to sample a smaller area of the world's oceans overall, have skewed data toward cooler temperatures, they insist.

Also, while it had long been assumed that ships measured seawater temperature via engine intake thermometers - an innovation that began after World War II - Karl said it was only recently that researchers realized this wasn't the case. Some ships still employ canvas or metal buckets to scoop up seawater.

"The buckets, when you pull them up, tend to evaporate their water, and if they're canvas there's even more evaporation," Karl said. "By the time people stick a thermistor in the bucket to measure temperature, it's already slightly cool."

To correct for this discrepancy between bucket and engine measurements, Karl and his colleagues used nighttime air temperature readings taken from the deck of the ship to serve as a baseline.

The researchers also argued that the IPCC's decision to use 1998 as a start of the hiatus was statistically flawed. That year marked an extreme El Nino, a period of unusually warm sea surface temperatures.

"If you start a short time series on an anomalous value, you tend to get an anomalous trend," Karl said.

Since the IPCC acknowledged a warming slowdown in 2013, global average temperatures have begun edging upward once again. Researchers say 2014 was among the warmest years on record and 2015 may be even hotter.

Karl's team and other researchers have noted that a large swath of the industrialised world has enjoyed a period of land surface cooling during the first 15 years of the 21st century. This cooling has occurred in the mid latitudes of the Northern Hemisphere.

An increasing number of climate scientists have argued that this cooling, as well as other hiatus effects, are evidence of a poorly understood pattern of wind, ocean current and temperature variations that exert far-reaching effects on climate.

Although the rise of average global surface temperatures slowed for a period, these researchers say the oceans still absorbed heat energy from the sun, which was manifested in melting Arctic ice and sea level rise.

"One way to think about it is that global warming continued, but the oceans just juggled a bit of heat around and made the surface seem cooler for a while," said Joshua Willis, a climate scientist at NASA's Jet Propulsion Laboratory in La Canada Flintridge.

One of these patterns, called the Pacific Decadal Oscillation, or PDO, has a warm and a cool phase that, as the name implies, can last many years.

**Los Angeles Times**