Did global warming 'supercharge' Hurricane Michael?

Doyle Rice Updated 12:27 a.m. ET Oct. 13, 2018

Governor Rick Scott called Florida "a very resilient state" following his tour of the destruction caused by Hurricane Michael. USA TODAY

Hurricane Michael exploded in intensity this week, from a rather nondescript tropical depression Sunday with winds of 35 mph to a Category 4 monster Wednesday with 155 winds.

When it hit land, it became the most powerful hurricane on record to slam Florida's Panhandle and the third-strongest U.S. landfall of all time.

Along with other weather factors, Michael's rapid intensification was fueled in part by unusually warm sea water in the Gulf of Mexico. Warm water of at least 80 degrees fuels hurricanes, and the water in the eastern Gulf this week was as much as 4 to 5 degrees warmer than normal.

Although random weather patterns certainly played a role, the warm waters in the Gulf have a “human fingerprint” of climate change, according to National Oceanic and Atmospheric Administration climate and hurricane expert Jim Kossin.

Penn State University climatologist Michael Mann told ThinkProgress that "once again we see a storm undergoing extreme rapid intensification over unusually warm ocean waters. We saw this pattern last year with Harvey and earlier this year with Florence and now, with my namesake, Michael.”

Weather.us meteorologist Ryan Maue said "there's no doubt the ocean water encountered by Michael was quite warm compared to the last three decades,

especially near the coast."

Maue analyzed early October water temperatures in the eastern Gulf and found that when comparing data from 1985-2005 to data from 2006-2018, the average temperature rose nearly 1 degree.

More: 'It looks like a bomb went off': Tropical Storm Michael menaces Southeast; 2 dead

Also: Michael officially stronger than Katrina at landfall

Related: Hurricane Michael: What you need to know in graphics

He said the cause of the rise is still a research puzzle and that "more detailed climate analysis is needed to better understand what has happened over the past 12 years across the Gulf of Mexico."

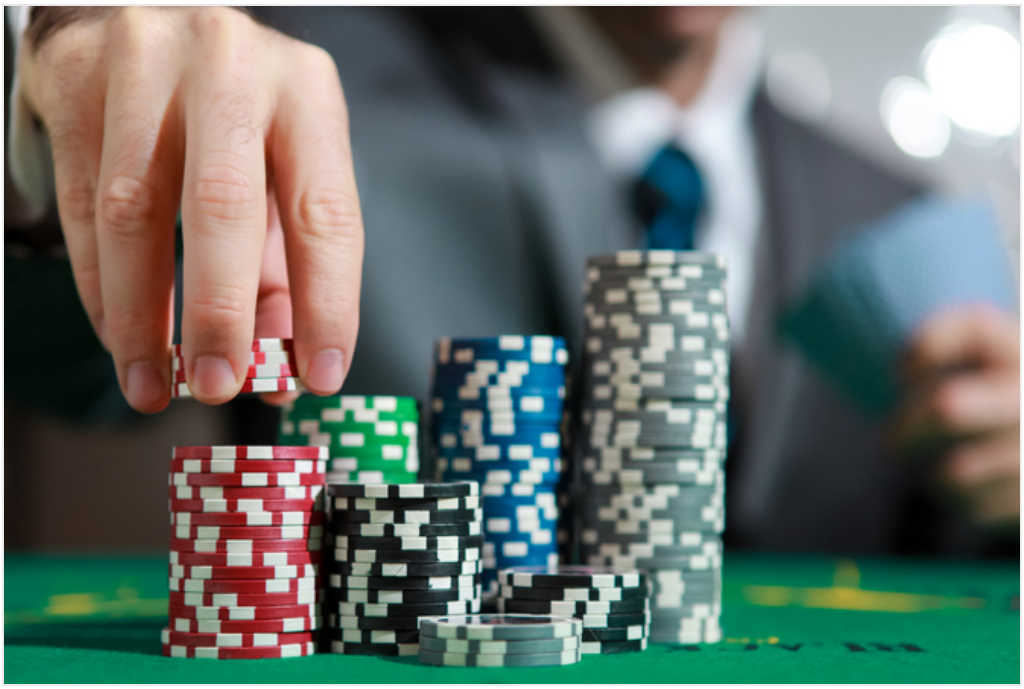
Several recent scientific studies say that hurricanes are intensifying more rapidly than they used to. One study this year in Geophysical Research Letters said that since 1986, the rate of intensification of storms like Michael has increased by about 13 mph.

A 2015 study on how ocean temperatures affect hurricane intensity in the North Atlantic found intensification increases by 16 percent for every 1.8 degree increase in average sea-surface temperatures, ThinkProgress reported.

Regardless of the cause, “Michael saw our worst fears realized, of rapid intensification just before landfall on a part of a coastline that has never experienced a Category 4 hurricane,” University of Miami hurricane researcher Brian McNoldy said.

Contributing: The Associated Press

99.999% certainty humans are driving global warming: new study



A new study finds overwhelming odds that humans have contributed to higher global temperatures – so how much are we willing to gamble that it's wrong? Kraevski Vitaly/Shutterstock

There is less than 1 chance in 100,000 that global average temperature over the past 60 years would have been as high without human-caused greenhouse gas emissions, our new research shows.

Published in the journal **Climate Risk Management** today, our research is the first to quantify the probability of historical changes in global temperatures and examines the links to greenhouse gas emissions using rigorous statistical techniques.

Our new CSIRO work provides an objective assessment linking global temperature increases to human activity, which points to a close to certain probability exceeding 99.999%.

Our work extends existing approaches undertaken internationally to detect climate change and attribute it to human or natural causes. The 2013 **Intergovernmental Panel on Climate Change Fifth Assessment Report** provided **an expert consensus that**:

> *It is extremely likely [defined as 95-100% certainty] that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic [human-caused] increase in greenhouse gas concentrations and other anthropogenic forcings together.*

Decades of extraordinary temperatures

July 2014 was the 353rd consecutive month in which global land and ocean average surface temperature exceeded the 20th-century monthly average. The last time the global average surface temperature fell below that 20th-century monthly average was in February 1985, as reported by the **US-based National Climate Data Center**.

This means that anyone born after February 1985 has not lived a single month where the global temperature was below the long-term average for that month.

We developed a statistical model that related global temperature to various well-known drivers of temperature variation, including **El Niño**, **solar radiation**, **volcanic aerosols** and **greenhouse gas concentrations**. We tested it to make sure it worked on the historical record and then re-ran

it with and without the human influence of greenhouse gas emissions.

Our analysis showed that the probability of getting the same run of warmer-than-average months without the human influence was less than 1 chance in 100,000.

We do not use physical models of Earth's climate, but observational data and rigorous statistical analysis, which has the advantage that it provides independent validation of the results.

Detecting and measuring human influence

Our research team also explored the chance of relatively short periods of declining global temperature. We found that rather than being an indicator that global warming is not occurring, the observed number of cooling periods in the past 60 years strongly reinforces the case for human influence.

We identified periods of declining temperature by using a moving 10-year window (1950 to 1959, 1951 to 1960, 1952 to 1961, etc.) through the entire 60-year record. We identified 11 such short time periods where global temperatures declined.

Our analysis showed that in the absence of human-caused greenhouse gas emissions, there would have been more than twice as many periods of short-term cooling than are found in the observed data.

There was less than 1 chance in 100,000 of observing 11 or fewer such events without the effects of human greenhouse gas emissions.

CSIRO scientists Dr Steve Rintoul, Dr John Church and Dr Pep Canadell explain how and why the Earth's climate is warming.

The problem and the solution

Why is this research important? For a start, it might help put to rest some common misunderstandings about there being no link between human activity and the observed, long-term trend of increasing global temperatures.

Our analysis – as well as **the work of many others** – shows beyond reasonable doubt that humans are contributing to significant changes in our climate.

Good risk management is all about identifying the most likely causes of a problem, and then acting to reduce those risks. Some of the projected impacts of climate change can be avoided, reduced or delayed by effective reduction in global net greenhouse gas emissions and by effective adaptation to the changing climate.

Ignoring the problem is no longer an option. If we are thinking about action to respond to climate change or doing nothing, with a probability exceeding 99.999% that the warming we are seeing *is* human-induced, we certainly shouldn't be taking the chance of doing nothing.

Swinging CO2 Levels Show The Earth Is 'Breathing' More Deeply

Plants accumulate carbon in the spring and summer, and they release it back into the atmosphere in the fall in winter. And a change in the landscape of the Arctic tundra, seen here, means that shrubs hold onto snow better, which keeps the organic-rich soils warmer and more likely to release carbon dioxide that's stored there.

Jean-Erick Pasquier/Gamma-Rapho via Getty Images

Plant life on our planet soaks up a fair amount of the carbon dioxide that pours out of our tailpipes and smokestacks. Plants take it up during the summer and return some of it to the air in the winter. And a new study shows that those "breaths" have gotten deeper over the past 50 years.

This isn't just a curiosity. Plant life is helping to reduce the speed at which carbon dioxide is building up in our atmosphere. That's slowing the global warming, at least marginally, so scientists are eager to understand how this process works. The new study

provides some clues.

If you look at the graph of carbon dioxide concentrations in the atmosphere, you'll notice that it has climbed sharply over the past five decades, from about 315 parts per million to 400 parts per million. But that's not the whole story.

"In addition to this steady increase caused by fossil fuel combustion and other human activities, there's a regular seasonal cycle of CO_2 concentration," says Heather Graven, a postdoctoral researcher at the Scripps Institution of Oceanography.

The graph actually looks like the edge of a saw. The annual zigzag follows the seasons. There's more carbon dioxide in the winter and a bit less in the summer. That's the collective breathing of all the plants in the Northern Hemisphere.

"Plants are accumulating carbon in the spring and summer when they're active, and they're releasing carbon back to the air in the fall and winter," Graven explains.

And that up-and-down pattern contains important clues about the plants that grab that carbon dioxide and use it to grow.

Scientists at Scripps and elsewhere are publishing a new study that looks at that global breathing pattern in detail. The new data include air samples taken from an airplane that flew repeatedly over the Pacific Ocean, from one pole to the other, to look for small differences in carbon dioxide.

The group reports in *Science* magazine that the teeth in that saw-tooth pattern have grown bigger over the past 50 years.

"The vegetation is taking deeper breaths, if you will," Graven says.

In particular, that is happening in the far northern parts of the planet, mostly the boreal forest and the Arctic tundra. And Graven says you can actually see changes in the vegetation from space and in aerial photographs.

"The area covered by forest in these northern latitudes has grown over the past few decades, so there's more forests," she says. "We've also seen that some species and

ecosystems have been migrating pole-ward," she says.

Some of the biggest changes are in the open fields of the Arctic, the tundra.

"The really big visual difference is the amount of shrubs, which is increasing greatly," says Steven Oberbauer, a plant physiologist at Florida International University. He has witnessed these big changes firsthand at his research sites in northern Alaska. But Oberbauer says the story isn't quite so simple.

True, plants are taking up carbon dioxide. But this plant growth is also changing the ecosystems. For example, Arctic shrubs hold onto snow that would otherwise blow away, "and that snow makes an insulation blanket, basically, over the soil, which allows the soil to be warmer in the winter."

Warmer soil is likely to release carbon dioxide that's stored there, and that could be very worrisome.

"The kicker for the Arctic is there's a huge amount of carbon stored in the peat there, in the organic soils, and if that were to be released into the atmosphere, it would increase the atmospheric CO_2 concentrations enormously," Oberbauer says. And this would have repercussions far beyond the Arctic. Climate change means more sea-level rise back at Oberbauer's home in Florida.

Oberbauer was not involved in the study that's being published in *Science*, but he says it should help the many scientists who have been trying to figure out the fate of all that carbon dioxide. There are other lines of evidence that suggest what's happening in the Arctic is not the whole story.