Climate change and hurricanes: do we need a smoking gun?

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Cubans recover their belongings after the passage of Hurricane Irma

Many climate scientists are convinced that mega-storms Harvey and Irma—which left scores dead and caused massive economic losses—were boosted by global warming, but hesitate to say so in as many words.

Call it the hurricane paradox.

On the one hand, top experts point to the laws of physics, computer modelling, and measurable increases in sea levels and the temperatures of both ocean water and the atmosphere—all pointing to destructive tropical cyclones.

Taken together, they are like the overwhelming body of circumstantial evidence a prosecutor might lay out in a murder trial.

On the other hand, there is something crucial missing: the fingerprints on the weapon, the smoking-gun proof that would convince a jury to lock up the culprit and throw away the key.

In climate science, that gold-standard evidence comes from observation over a long period of time.

"It is incredibly frustrating," said Dann Mitchell, an expert on atmospheric circulation at the University of Bristol in England. "We still can't say with 100 percent certainty that Hurricane Irma was enhanced by climate change, while with other extreme events—such as heat waves—we can."

A lot of scientists, however, think the case is already solid enough to nail down a conviction.

"The physics are very clear: hurricanes get their destructive energy from ocean heat," said Anders Levermann, a professor at the University of Potsdam in Germany.

"Greenhouse gas emissions from burning coal, oil and gas raise our planet's temperatures and provide the energy for ever stronger tropical storms."

And then there is the global ocean watermark, which has gone up 20

centimetres (eight inches) on average since the 1880s, and is set to rise far more by century's end.

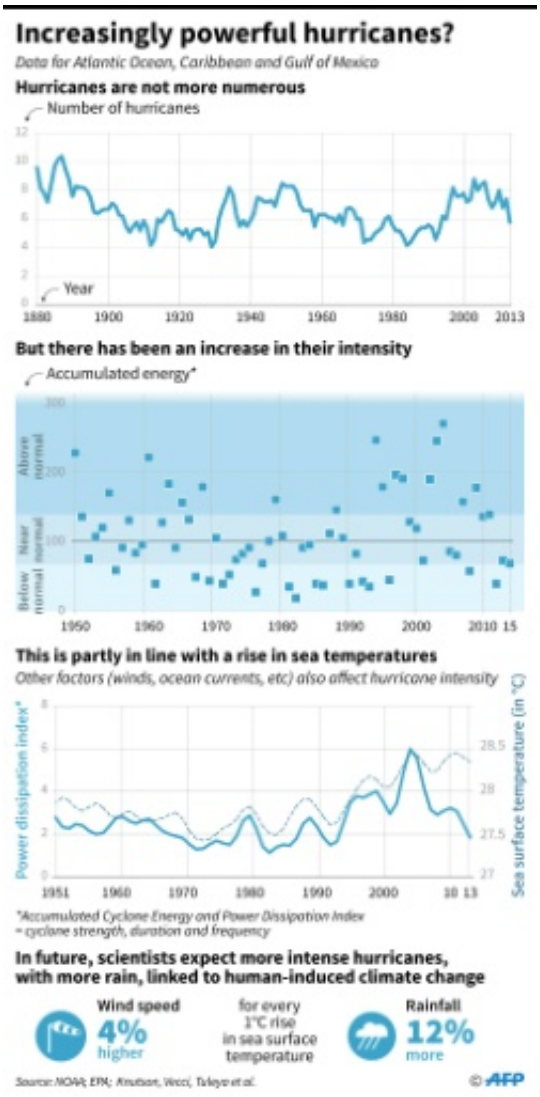
'Noisy' phenomena

"We are extremely confident that sea level rise is happening and will continue to happen as the climate warms," said Chris Holloway, a hurricane expert at the University of Reading. "This adds to the risk of storm surge flooding from any event," he told AFP.

But—convincing as they may be—these remain "it stands to reason" arguments, not direct measurements of the major tropical storms known variously around the world as hurricanes, cyclones and typhoons.

And that's where things get a little dicey, and scientific opinion divides.

"Increased intensity of storms is an expected climate change signature, but it is too early to tell if this particular storm was enhanced in this way," Mitchell said of Irma.



Charts showing how hurricanes appear to be increasing in intensity

The problem, he and other scientists caution, is several-fold.

To begin with, major tropical storms—category 4 or 5 on the Saffir-Simpson scale, keyed to wind speed—are very rare compared to heat waves, drought or intense bouts of rainfall.

In science, a small sample size makes it hard to pick out patterns, a

problem exacerbated in this case by poor quality data only reaching back a few decades.

When it hit Texas in late August, Harvey rapidly jumped to a category 4 storm packing sustained winds of 209 to 251 km/h (130 to 156 mph), while category 5 Irma rampaged across the Caribbean blowing at nearly 300 km/h before losing steam as it moved over Florida.

Hurricanes are also "particularly 'noisy' phenomena," said Mitchell.

Translation: Whether it's heat waves or cyclones, discerning the fingerprint of human influence depends on being able to distinguish between the "noise" of natural fluctuations in weather and the patterns caused by manmade global warming.

Drifting poleward

"It's a little like listening to someone next to you speak with some very loud music in the background," said Sally Brown, a reasearch fellow at the University of Southampton.

"You have to ask the person to repeat themselves several times to be sure you understand."

Some scientists say that clear trend lines have emerged despite these limitations.

"Globally we have observed over the past 30 years that the strongest storms are getting stronger due to warming oceans," James Elsner, a professor of atmospheric science at Florida State University, told AFP.

"The evidence is already solid."

Perhaps the strongest case that global warming has already exerted an influence on super-storms comes from Jim Kossin, a scientist at the US National Oceanic and Atmospheric Administration's National Centers for Environmental Research.

In a 2014 study that went largely unnoticed in the media but sent shockwaves among his fellow hurricane experts, Kossin presented iron-clad evidence that all tropical cyclones around the world have been steadily drifting poleward for at least 30 years, at the rate of 50 to 60 kilometres (30 to 35 miles) per decade.

This, he showed, could only be caused by global warming.

"The historical data is sparse, mostly confined to the Atlantic, and not very good," said hurricane guru Kerry Emanuel, co-director of the Lorenz Center at MIT in Boston.

"Kossin's genius was to recognise that the latitude at which storms reach their peak could be identified easily even if the wind speed measurements for that storm were completely different than another storm."

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