

Hurricanes and typhoons are taking their cues from a changing global climate

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Image 1. Flooding submerged a road after Hurricane Harvey hit Conroe, Texas, on August 28, 2017. Photo from Tharindu Nallaperuma/Anadolu Agency/Getty Images

Around the world, tropical cyclones have slowed near coastlines over the past seven decades. The information comes from a new study by a scientist with the National Oceanic and Atmospheric Administration, or NOAA.

The findings published in the journal *Nature* describe a clear link between global warming and the behavior of these severe storms. The consequences are potentially devastating for the people who live near them.

Scientists overwhelmingly agree that the climbing average global temperature over the past century has been fueled largely by human behavior. Human activities have released heat-trapping greenhouse gases such as carbon dioxide into the atmosphere.

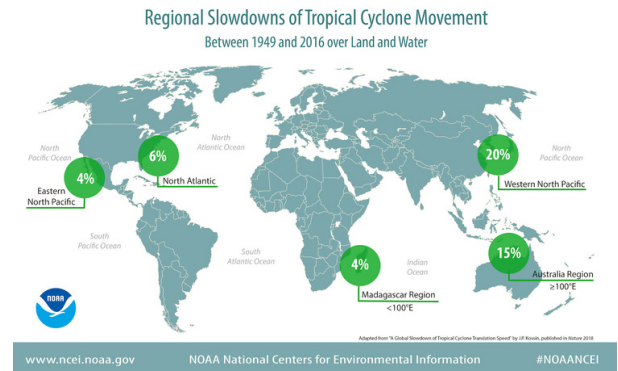
Among its negative effects, the rising heat has been linked to the melting of glaciers and the rise of oceans. It also has been tied to the spread of diseases and the worsening of drought.

Lingering Storms Can Cause More Problems

Study author James Kossin is a climate scientist with NOAA in Madison, Wisconsin. He said a storm that lingers longer over inhabited coastlines is a more dangerous storm. That is because it allows more rain to fall in a local area, raising the risk of flooding and storm surge. It might even increase the damage from hurricane winds, simply by battering the same buildings over a longer period.

"These tropical cyclones arrive carrying many, many hazards with them — none of them good — and the longer it's in your area, the worse it's going to be," Kossin said. "You don't want them to move slowly."

Scientists have been trying to understand the link between global warming and the behavior of extreme weather events. Those include the hurricanes that pound Atlantic Ocean coastlines in the summer and fall.



There is one clear physical link, said Christina Patricola, an atmospheric scientist at Lawrence Berkeley National Laboratory. For every 1 degree Celsius (33.8 degrees Fahrenheit) rise in temperature, the atmosphere is able to hold 7 percent more moisture. In other words, when it does rain, there is much more water coming down. This could raise the risk of flooding. Patricola was not involved in the study.

Storms Can No Longer Hide

The relationship of global warming to other aspects of storms has been tougher to check, Kossin said. It is hard to compare frequency and intensity of storms. That is because of problems in comparing older data to the information that's been gathered in recent years with better instruments.

Of course, before weather satellites began to be used in the 1960s, some storms would have gone unnoticed. Many lived and died over the open ocean. That could make them seem less frequent in the past than they really were.

However, one of the hallmarks of Hurricane Harvey was how slowly it moved across the Houston region. It damaged the Texas coastline in 2017. The storm dumped about 50 inches of rain in some areas.

"Research has been focused largely on numbers of tropical cyclones and then of course on intensity," Patricola said. Events like Hurricane Harvey are "a reminder that we need to consider the other characteristics of tropical cyclones," she said.

North And South Poles Are Warming

Kossin wanted to see if the traveling speed of such tropical cyclones was slowing down. To find out, he used data from the U.S. National Hurricane Center and the Joint Typhoon Warning Center to study the position of such storms' centers every six hours. From those, he was able to calculate the moving speed of these coastal storms between 1949 and 2016.

His study found that, on average globally, the speed at which these tropical cyclones moved had fallen about 10 percent. It came with just 0.5 degree Celsius (32.9 degrees Fahrenheit) of warming. In some places, that slowdown was more extreme. It was about 30 percent over land affected by tropical cyclones from the western North Pacific and 20 percent over land affected by tropical cyclones from the North Atlantic.

Kossin said he was surprised "at how strong a signal it was and how large a signal it was. Ten percent over 70 years is really quite a lot."

Still, the finding fits with what is known about global warming and the atmosphere, he said. Tropical cyclones are largely carried along by atmospheric circulation — and that has been slowing down. It has slowed as the temperature difference between the North Pole and South Pole and the tropics begin to shrink. The poles are warming faster than the tropics are.

Kossin pointed out that his results show only what had happened over the 68-year period. They do not show what might happen in the future.

Rainfall Amounts Are Changing

Patricola, who called the findings "quite convincing," said the study opened new questions that need to be answered. For example, how has tropical cyclone rainfall changed in recent records? How did the moving speed of these storms affect regional rainfall totals?

Scientists will also need to look more closely at the moving speeds of stalled tropical cyclones, she said. Those are moving extremely slowly and are much rarer, she said.

"It's a little bit harder to understand how they're changing because we've observed fewer of them," she said. "But the good news is that we can tackle that question with a combination of observations and climate models to try to get that kind of understanding."