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Hurricane Florence Is Going to Slow Down. That's Not Good.



By Kendra Pierre-Louis

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With wind speeds that have approached 140 miles per hour, Hurricane Florence isn't exactly slow. But forecasters don't expect the storm to blow through quickly once it reaches land.

Instead, they think it will stall, much as Hurricane Harvey did over Houston last year, besieging the area for days with wind and rain. That is part of the reason Florence is expected to be so dangerous.

Unfortunately, Florence and Harvey are not alone. Tropical cyclones, which include hurricanes, have grown more sluggish since the mid-20th century, researchers say.

A study published this summer in the journal *Nature* focused on what is known as translation speed, which measures how quickly a storm is moving over an area, say, from Miami to the Florida Panhandle. Between 1949 and 2016, tropical cyclone translation speeds declined 10 percent worldwide, the study says. The storms, in effect, are sticking around places for a longer period of time.

Lingering hurricanes can be a problem, as Texans learned when Harvey caused devastating flooding and billions of dollars of damage. The storm dropped more than 30 inches of rain in two days and nearly 50 inches over four days in some places. A report

issued in June by Harris County, which includes Houston, found that Harvey's rainfall exceeded every known flooding event in American history since 1899.

"The really, really high rainfall totals were because the storm moved so slowly," said Deanna Hence, a professor of atmospheric sciences at the University of Illinois at Urbana-Champaign, who was not involved in the research. "The large amount of rain that is going to come out of a tropical storm or hurricane anyway fell in the same place over a long period of time."

[We're answering readers' questions about hurricane forecasting and climate change.]

To analyze the changes in translation speeds, James Kossin, a climate scientist with the National Centers for Environmental Information at the National Oceanic and Atmospheric Administration, tapped into a global data set on past tropical storms. The data included estimates of the latitude and longitude of each named storm's center at six-hour intervals.

By comparing a given storm's positions over time, Dr. Kossin was able to measure how quickly it had moved across the landscape. He then calculated the average speeds of the storms from year to year, and found that tropical cyclones had been slowing over time.

There were limitations to the analysis, Dr. Hence said. The study did not say how much of the extra rainfall produced by a storm like Harvey was caused by the storm staying in one place, as compared to other contributing factors, like the unusually warm ocean waters that fueled that hurricane.

There is also the question of what is causing the slowdown, which the study did not answer directly. But broader evidence suggests that climate change is playing a role.

Belts of wind known as steering winds are responsible for moving hurricanes along their paths. "Hurricanes are carried passively by the winds that they're sitting in," Dr. Kossin said. "It's not quite like a cork in a stream, but not too different, either."

The steering winds draw power from the temperature differences between the tropics and the poles. But because of climate change, that temperature difference is declining, weakening the winds. The slower steering winds move hurricanes more slowly.

That is what is expected to happen with Florence, said Jeff Masters, director of meteorology at the forecasting service Weather Underground. “It’s going to come roaring into the coast Thursday night or Friday morning, penetrate inland maybe only a few tens of miles, and then meander for several days erratically because the steering currents are going to collapse,” he said.

“A good part of its circulation will be over water, which means it’s going to continue sucking up a lot of moisture from the ocean and dumping it as heavy rain inland,” Dr. Masters said.

[Scientists want to clear up these misconceptions about hurricanes.]

Adding to the evidence of slowing cyclones, researchers at the National Center for Atmospheric Research compared computer simulations of 22 past storms with simulations of those same storms based on future climate conditions. They found that average hurricane translation speeds slowed in the future simulations. The Journal of Climate published their conclusions this year.

A growing body of research is showing that hurricanes are becoming more dangerous. A recent analysis by climate scientists, though not a peer-reviewed study, suggested that even as the winds that move hurricanes are getting weaker, the winds inside hurricanes are getting stronger.

The threats aren’t limited to those who live along coastlines. “Freshwater flooding is particularly dangerous because that happens inland and people don’t typically evacuate,” Dr. Kossin said. “If you live in a place with any sort of mountainous area — or any

topography at all, really — then you have that compound danger of mudslides. As it's turning out, it's the freshwater flooding that poses the highest mortality risk nowadays in certain regions.”

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