

# The world has never seen a Category 6 hurricane, but the day may be coming

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As a ferocious hurricane bears down on South Florida, water managers desperately lower canals in anticipation of 4 feet of rain.

Everyone east of Dixie Highway is ordered evacuated, for fear of a menacing storm surge. Forecasters debate whether the storm will generate the 200 mph winds to achieve Category 6 status.

That is one scenario for hurricanes in a warmer world, a subject of fiendish complexity and considerable scientific research.

Some changes—such as the slowing of hurricanes' forward motion and the worsening of storm surges from rising sea levels—are happening now. Other effects, such as their increase in strength, may have already begun but are difficult to detect, considering all of the other climate forces at work.

But more certainty has developed over the past few years. Among the conclusions: Hurricanes will be wetter. They are likely to move slower, lingering over whatever area they hit. And although there is debate over whether there will be more or fewer of them, most researchers think hurricanes will be stronger.

"There's almost unanimous agreement that hurricanes will produce more rain in a [warmer climate](#)," said Adam Sobel, professor of applied physics at Columbia University and director of its Initiative on Extreme Weather and Climate. "There's agreement there will be increased coastal flood risk, at a minimum because of sea-level rise. Most people believe that hurricanes will get, on average, stronger. There's more debate about whether we can detect that already."

No one knows how strong they could get, as they're fueled by warmer ocean water. Timothy Hall, senior scientist at the NASA Goddard Institute for Space Studies, said top [wind](#) speeds of up to 230 mph could occur by the end of the century, if current [global warming](#) trends continue. That would be the strength of an F-4 tornado, which can pick up cars and throw them through the air (although tornadoes, because of

their rapid changes of wind direction, are considered more destructive).

Does that mean the current five-category hurricane scale should be expanded to include a Category 6, or even Category 7?

The Saffir-Simpson [hurricane wind scale](#), developed in the early 1970s, ranks hurricanes from Category 1, which means winds of 74-95 mph, to Category 5, which covers winds of 157 mph or more.

Since each category covers a range of wind speeds, it would appear that once wind speed reaches 190 or 200 mph, the pattern may call for another category. Last season saw two Category 5 hurricanes, Irma and Maria, with Irma reaching 180 mph. And in 2015, off Mexico's Pacific coast, Hurricane Patricia achieved a freakish sustained wind speed of 215 mph.

"If we had twice as many Category 5s—at some point, several decades down the line—if that seems to be the new norm, then yes, we'd want to have more partitioning at the upper part of the scale," Hall said. "At that point, a Category 6 would be a reasonable thing to do."

Many scientists and forecasters aren't particularly interested in categories anyway, since they indicate only wind speed, not the other dangers posed by hurricanes.

"We've tried to steer the focus toward the individual hazards, which include storm surge, wind, rainfall, tornadoes and rip currents, instead of the particular category of the storm, which only provides information about the hazard from wind," said Dennis Feltgen, spokesman for the National Hurricane Center. "Category 5 on the Saffir-Simpson scale already captures "catastrophic damage" from wind, so it's not clear that there would be a need for another category even if storms were to get stronger."

Among the most solid predictions is that storms will move more slowly. In fact, that has already happened. A new study in the journal *Nature* found that tropical cyclones have decreased their forward speed by 10 percent since 1949, and many scientists expect the trend to continue.

That doesn't mean a hurricane's winds would slow down. It means the hurricane would be more likely to linger over an area—like last year's Hurricane Harvey. It settled over the Houston area and dropped more than 4 feet of rain on some areas, flooding thousands of houses.

In addition to moving slower, future hurricanes are expected to dump a lot more rain. A study by scientists at the National Center for Atmospheric Research this year looked at how 20 Atlantic hurricanes would change if they took place at the end of the century, under the average projection for global warming. Warm air holds more water than cold air. The study found that hurricanes would generate an average of 24 percent more rain, an increase that guarantees the more storms would produce catastrophic flooding.

The production of horrifying amounts of rain shows another way in which Harvey is a window into the future. One study, which looked at how much rain Harvey would have produced if it had formed in the 1950s, found that global warming had increased its rainfall by up to 38 percent.

Other scientists see Harvey less as a symptom of climate change than an indication of what we can expect in the future.

"Whether we're talking about a change in the number of storms or an increase in the most intense storms, the changes that are likely to come from global warming are not likely to be detectable until 50 years from now," said Brian Soden, professor of atmospheric sciences at the University of Miami's Rosenstiel School of Marine and Atmospheric

Science. "There's so much natural variability in the system, the typical year-to-year variability in hurricane activity, that the signal really doesn't emerge from that background variability until the latter half of this century."

As a hurricane approaches Florida, the question everyone asks is when will it veer north? The answer could determine whether it hits the Keys, slams into Fort Lauderdale or remains harmlessly out in the ocean.

But the familiar upside-down comma shape that characterizes so many hurricane tracks could gradually become a thing of the past, as hurricanes follow paths that are more meandering and less predictable. That's because climate change could alter the jet stream, the high-altitude air current that pushes hurricanes north and east.

"The hurricane track has less guidance steering them, so are more prone to meanders and unusual turns," NASA's Hall said. That could yield weird turns and stalls, such as Harvey's screech to a halt over Texas or Hurricane Sandy's sudden, and catastrophic, lurch toward New Jersey.

"If the jet stream were a lot farther north, then you could imagine a situation where [hurricane](#) tracks could more easily hit the North American continent because they have more ability to continue in the direction of the continent from their tropical formation points," he said.

Warm ocean water provides the fuel for hurricanes, but a hotter world would not necessarily produce more of them. While many scientists for a long time did think an increase in temperatures would produce more storms, they have begun focusing on factors that could suppress the formation of hurricanes.

Many models for future climate show an increase in wind shear, the crisscrossing high-altitude winds that tear up incipient tropical cyclones.

And they show less of the atmospheric instability necessary for the generation of thunderstorms.

But now the thinking is swinging back.

"We used to think 20 years ago that in a warmer climate there would be more hurricanes," Columbia' Sobel said. "Then the computer models got better. Most of those started to show fewer hurricanes, not more. No one knew why. Then some of the models started to show increases with warming. So I think we're back to where we don't know."

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