

# Are hurricanes getting stronger – and is the climate crisis to blame?

As the Atlantic season nears, we look at whether destructive weather events are getting worse – and how they get their names by *Oliver Milman*

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Debris covers parts of a highway as Hurricane Irma lands in Delray Beach, Florida, in 2017. Photograph: UPI / Barcroft Images/UPI Barcroft Images

## What is a hurricane, exactly?

A hurricane is a large rotating storm that forms over tropical or subtropical waters in the Atlantic. These low pressure weather systems draw upon warm water and atmospheric moisture to fuel their strength and will gather pace if not slowed by patches of dry air, crosswinds or landfall.

“They are very tall towers of winds that move at the same speed, sometimes 60,000ft tall,” says Jim Kossin, a scientist at the US National Oceanic and Atmospheric Administration. “If they are unmolested by wind shear or run over land they will continue on their merry way.”

Storms are given names once they have sustained winds of more than 39mph. Hurricanes are gauged by something called the Saffir-Simpson hurricane wind scale, which runs from one to five and measures speed.

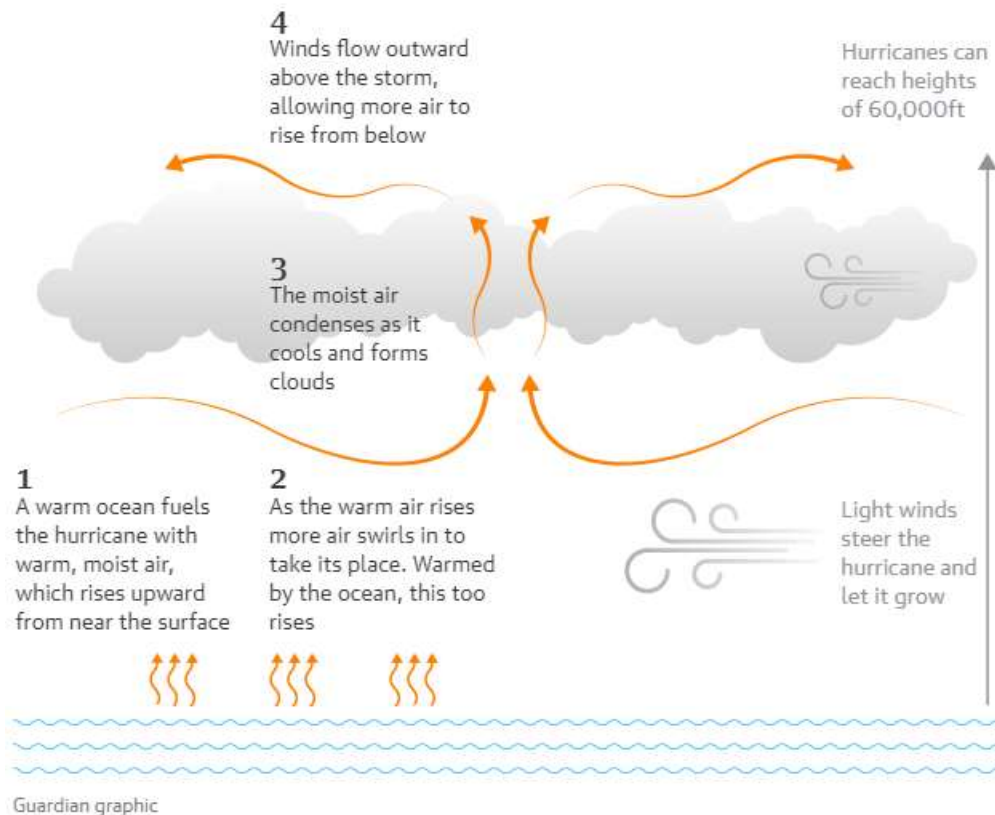
Once a storm gets to category three it is classed as a major hurricane, with winds of at least 111mph and enough force to damage homes and snap trees. Category five storms, of at least 157mph, can raze dwellings, cause widespread power outages and result in scores of deaths.

This strongest class of hurricanes includes Hurricane Katrina, which caused the inundation of New Orleans in 2005, and Hurricane Maria, which flattened much of Puerto Rico in 2017.

## How do they differ from typhoons and cyclones?

Both hurricanes and typhoons are tropical cyclones – the only difference is the location where they occur. In the Atlantic, the term “hurricane” is used, while “typhoon” is used in the Pacific. In the South Pacific and Indian Ocean, the term “tropical cyclone” is often deployed.

## How hurricanes form



## Why is there a hurricane season?

Almost all hurricanes develop once the northern hemisphere approaches summer, with the hurricane season running from 1 June to 30 November. The season peaks between August and October.

This is because wind shear, which can disrupt hurricanes, dies down during summer, while the temperature of the oceans rise and the amount of moisture in the atmosphere increases. These conditions are ideal for spawning hurricanes.

The season isn't strictly defined, however. "It can start earlier," says Jennifer Collins, a hurricane expert at the University of South Florida. "Recall 2016, when Hurricane Alex (a storm that rattled Bermuda) formed in January."

### **Why do we name hurricanes, anyway?**

In short, to avoid confusion when there are two or more active hurricanes. In the past, storms were named after saints, with hurricanes only named from 1950 onwards, using the phonetic alphabet.

The names used have diversified since then, with a list drawn up ahead of each hurricane season and ticked off as each named storm develops. Particularly devastating hurricanes cause names to be retired, which is why we won't see a Hurricane Katrina, for example, again.

From 1953, female names were used for hurricanes, prompting an outcry. "You can imagine that women did not want something as destructive as a hurricane to be associated with their sex alone, so with the feminist movement pushing the issue, in 1979 males and female names alternated," Collins explained.

This does appear to make a difference, at least in psychological terms. In 2014, US researchers found that Americans are less afraid of hurricanes with female names. "People imagining a 'female' hurricane were not as willing to seek shelter," said study co-author Sharon Shavitt.

### **What has happened with hurricanes in recent years?**

It's been a punishing past few years for people living in the path of hurricanes in the US and Caribbean. Last year there were an above-average 15 named storms, including Hurricane Florence, which brewed off the west African coast before barreling into North Carolina, plunging much of the state into darkness and dumping up to 76cm (30 inches) of rain in places, resulting in flooding that killed dozens of people.

This was followed by Hurricane Michael, the first storm to make landfall in the US as a category five event since 1992. The 160mph storm obliterated the town of Mexico Beach in Florida, caused more than 70 deaths and racked up an estimated \$25bn (£19bn) in damage.

These disasters came in the wake of the 2017 hurricane season, which caused a record \$282bn in damage. Hurricane Harvey unloaded 33tn gallons of water on Texas, the astonishingly strong Hurricane Irma, which reached a top speed of 177mph, ravaged Florida and several thousand people died in Puerto Rico after Hurricane Maria, another category five storm, tore across the island.

The misery in Puerto Rico, in particular, is ongoing, with the US government strongly criticised by local elected officials for a sluggish and insufficient response to the catastrophe.



Shredded trees, derailed train cars and a sunken trailer in Panama City, Florida, in the wake of Hurricane Michael in 2018. Photograph: Gerald Herbert/AP

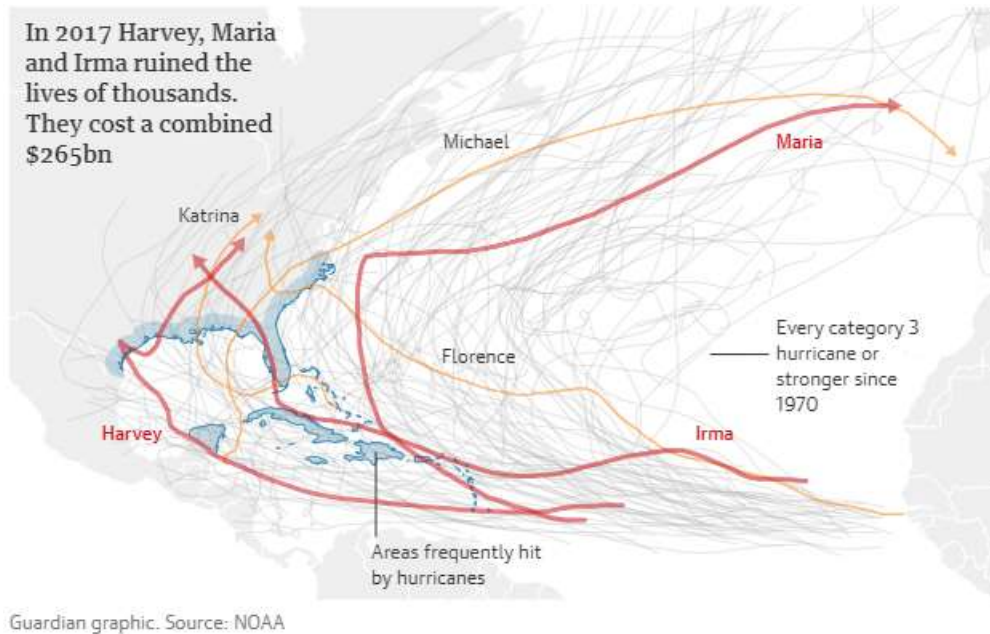
## **Does this mean that hurricanes are getting stronger and more damaging?**

While the overall number of hurricanes has remained roughly the same in recent decades, there is evidence they are intensifying more quickly, resulting in a greater number of the most severe category four and five storms.

The proportion of tropical storms that rapidly strengthen into powerful hurricanes has tripled over the past 30 years, according to recent research. A swift increase in pace over a 24-hour period makes hurricanes less predictable, despite improving hurricane forecasting systems, and more likely to cause widespread damage.

The devastation unleashed by recent hurricanes has led to warnings that premiums may rise as insurers face ballooning claims. A record \$135bn was paid out by insurers in North America in 2017, mostly as a result of hurricane damages. “We have a new normal,” says Ernst Rauch, a senior executive at insurance company Munich Re. “We must have on our radar the trend of new magnitudes.”

**Since 1970, there has been an average of six Atlantic hurricanes per year**



## Is the climate emergency to blame?

A range of factors influence the number of hurricanes smashing into land, from localised weather to periodic climatic events such as El Niño. Prior to 2017, the US had experienced a hurricane “drought” that had stretched back to Hurricane Wilma in 2005.

But there is a growing evidence that the warming of the atmosphere and upper ocean, due to human activity such as burning fossil fuels, is making conditions ripe for fiercer, more destructive hurricanes.

“The past few years have been highly unusual, such as Irma staying strong for so long, or the hurricane in Mozambique that dumped so much rain,” says Kossin. “All of these things are linked to a warming atmosphere. If you warm things up, over time you will get stronger storms.”

The climate emergency is tinkering with hurricanes in a variety of ways. More moisture in the air means more rain, while storms are intensifying more quickly but often stalling once they hit land, resulting in torrential downpours that cause horrendous flooding.



Damage in the Rockaway neighbourhood of Queens, New York, where the boardwalk was washed away during Hurricane Sandy in 2012. Photograph: Spencer Platt/Getty Images

Rising sea levels are aiding storm surge whipped up by hurricanes – one study found that Hurricane Sandy in 2012 probably wouldn't have inundated lower Manhattan if it occurred a century previously because the sea was a foot lower then. According to the UN's Intergovernmental Panel on Climate Change, the maximum intensity of hurricanes will increase by about 5% this century.

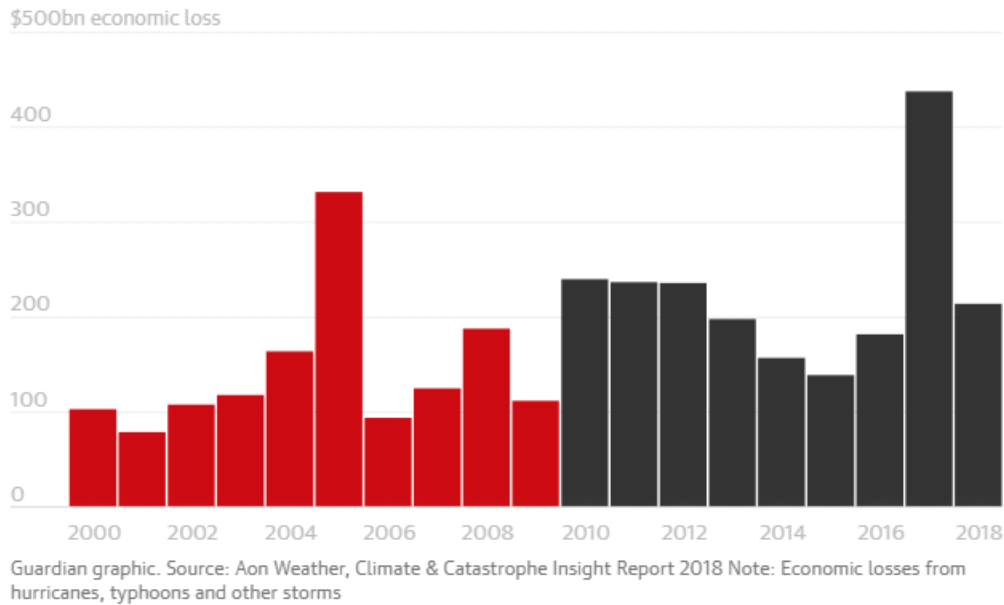
The expanding band of warmth around the planet's tropical midriff also means a larger area for hurricanes to develop, resulting in fierce storms further north than before, such as Florence. In the Pacific, this change means typhoons' focal point is switching from the Philippines towards Japan.

Researchers are currently attempting to ascertain if climatic changes will help bend the path of hurricanes enough that more will charge in the direction of the UK in the future.

“This has implications for places that have historically been unaffected by tropical cyclones,” says Collins, who added these newly-hit areas are likely to suffer a significantly higher risk of structural damage than traditional hurricane zones.

“We are already seeing effects of climate change,” says Collins. “While there is not consensus on the frequency of hurricanes in a warmer world, there is a consensus that the hurricanes are becoming more intense, and hence their impact will be worse.”

## The cost of major weather events globally has surged over the past decade



### Are people adapting to these changes?

The forecasting of hurricanes has become a fine art, with scientists able to predict with sharp accuracy the anticipated path and ferocity of hurricanes. In the US, affected states have refined systems for warnings and evacuations and have a hefty federal agency, Fema, to plough billions of dollars into patching up shattered towns and lives.

But planning is often haphazard, with flooded houses repeatedly rebuilt in the same locations despite the morphing risks posed by the climate crisis. The concreting of Houston's green spaces removed key sponges for Harvey's water, which sloshed into people's homes. Meanwhile, natural buffers to hurricanes, such as mangroves and coral reefs, are being stripped away around the world as a result of coastal development, pollution and warming waters.

There are more people in harm's way, too – in the south-eastern US, for example, coastal populations grew by more than 50% from 1980 to 2003. Climate change adaptation rules have been scrapped by Donald Trump's administration, making it easier to build critical infrastructure in risky coastal areas.

“Coastal towns and cities are not currently prepared for the changes already occurring and will continue to occur,” says Collins. “We know that there are areas

that are prone to flooding. We need to not rebuild on these areas, and build on higher ground.



Damage to homes in the town of Jeremie, Haiti, after the arrival of Hurricane Matthew in 2016. Photograph: Logan Abassi/AFP/Getty Images

“Those who deny scientific findings in favour of magical thinking and other such fallacies will only leave the world a more unstable and dangerous place for future generations to come.”

The situation is even starker for poorer Caribbean nations that will increasingly rely upon international help to deal with stronger hurricanes and rising sea levels.

Hurricane Maria devastated the island of Dominica, leaving just 5% of the country’s buildings intact. Its prime minister, Roosevelt Skerrit, who lost his own roof in the storm, subsequently told the UN that he had come “straight from the front line of the war on climate change”.

“We as a country and as a region did not start this war against nature,” a visibly shaken Skerrit says. “We did not provoke it. The war has come to us.”

### **What next?**

Researchers have been poring over ocean temperatures and other data to ascertain what’s in store for the 2019 hurricane season, which starts on 1 June. US officials will unveil their best guess on Thursday in Washington.



Meteorologists at Colorado State University have predicted there will be a slightly below-average Atlantic season of 13 named storms, five of which will become hurricanes. This prediction rests on the presence of a mild El Nino – a natural climatic event that periodically warms the Pacific Ocean, a process that tends to suppress the development of Atlantic hurricanes.

There is still plenty of uncertainty in these early predictions. “Early forecasts can be a bit sketchy,” says Kossin. “In general, it looks like it will be around average. But we will have to see.”