

1. Mark your confusion.
2. Show evidence of a close reading.
3. Write a 1+ page reflection.

Hurricane Ian Is No Anomaly. The Climate Crisis Is Making Storms More Powerful.

Source: Michael E. Mann and Susan Joy Hassol, TheGuardian.com, October 2, 2022

Climate change once seemed a distant threat. No more. We now know its face, and all too well. We see it in every hurricane, torrential rainstorm, flood, heatwave, wildfire and drought. It's even detectable in our daily weather. Climate disruption has changed the background conditions in which all weather occurs: the oceans and air are warmer, there's more water vapor in the atmosphere and sea levels are higher. Hurricane Ian is the latest example.

Ian made landfall as one of the five most powerful hurricanes in recorded history to strike the US, and with its 150 mile per hour winds at landfall, it tied with 2004's Hurricane Charley as the strongest to ever hit the west coast of Florida. In isolation, that might seem like something we could dismiss as an anomaly or fluke. But it's not – it's part of a larger pattern of stronger hurricanes, typhoons and superstorms that have emerged as the oceans continue to set record levels of warmth.

Many of the storms of the past five years – Harvey, Maria, Florence, Michael, Ida and Ian - aren't natural disasters so much as human-made disasters, whose amplified ferocity is fueled by the continued burning of fossil fuels and the increase in heat-trapping carbon pollution, a planet-warming "greenhouse gas."

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This Atlantic hurricane season, although it started out slow, has heated up, thanks to unusually warm ocean waters. Fiona hit Puerto Rico as a category 1 hurricane (subsequently strengthening to a powerful category 4 storm), and hundreds of thousands of people there are still without power. The storm barreled on into the open Atlantic, eventually making landfall in the maritime provinces to become Canada's strongest ever storm. Then came Ian, which feasted on a deep layer of very warm water in the Gulf of Mexico.

Human-caused warming is not just heating the surface of the oceans; the warmth is diffusing down into the depths of the ocean, leading to year after year of record ocean heat content. That means that storms are less likely to churn up colder waters from below, inhibiting one of the natural mechanisms that dampen strengthening. It also leads to the sort of rapid intensification we increasingly see with these storms, where they balloon into major hurricanes in a matter of hours.

Too often we still hear, even from government scientists, the old saw that we cannot link individual hurricanes to climate change. There was a time when climate scientists believed that to be true. But they don't any more. We have developed powerful tools to attribute the degree to which global warming affects extreme events. One study found, for example, that the devastating flooding from Hurricane Florence as it made landfall in North Carolina four years ago was as much as 50% greater and 80km (50 miles) larger due to the warmer ocean.

We can also draw upon basic physics, as we explained in Scientific American in 2017. Warmer oceans mean more fuel to strengthen hurricanes, with an average increase in wind speeds of major hurricanes of about 18mph for each 1C (1.8F) of ocean surface warming, a roughly 13% increase. Since the power of the storm increases roughly the wind speed not only squared but raised to the third power, that amounts to a roughly 44% increase in the destructive potential of these storms.

There is also evidence that human-caused warming is increasing the size of these storms. All else being equal, larger storms pile up greater amounts of water, leading to larger storm surges like the

12 to 18 feet estimated for Ian in some locations. Add sea level rise, and that's the better part of foot of additional coastal flooding baked into every single storm surge. If humanity continues to warm the planet, and destabilize the Greenland and west Antarctic ice sheets, we could see yards, not feet, of eventual sea-level rise. Think of that as a perpetual coastal flooding event.

Then there is the flooding rainfall, like the 20 inches (50cm) of it we're seeing across a large swath of Florida with Ian. Simple physics tells us that the amount of moisture that evaporates off the ocean into the atmosphere increases about 7% for each 1C of ocean surface warming. That means 7% more moisture to turn into flooding rains. But that's not the whole story. Stronger storms can entrain more moisture into them – a double whammy that produced the record flooding we saw in Philadelphia a year ago with Hurricane Ida, and the flooding we saw with Harvey in Texas in 2017 and Florence in the Carolinas in 2018, the two worst flooding events on record in the US.

Tampa's wide shallow coastal shelf, low topography combined with rising sea levels and vulnerable infrastructure make it particularly vulnerable to a landfalling major hurricane. Tampa Bay has dodged multiple bullets in recent years in the form of major hurricanes that ultimately weakened or swerved away from the city. Ian is the latest example, as it passed to the east rather than to the west of Tampa Bay, sparing the sprawling urban population a devastating storm surge that would have flooded the homes of millions.

Unfortunately, Tampa's luck will eventually run out. We must prepare for the inevitable calamity that will occur when the city is at the receiving end of a losing roll of the weather dice.

It is important to take steps to increase resilience and adapt to the changes that are inevitable, taking all of the precautions we can to spare our coasts from the devastating consequences of sea-level rise combined with stronger, more damaging hurricanes. But no amount of adaptation can shield Florida, or anywhere else, from the devastating consequences of the continued warming of our planet.

Only mitigation – the dramatic reduction of heat-trapping pollution – can prevent things from getting worse. We've seen some progress on that front recently, both in the US and globally. The climate provisions of the recently passed Inflation Reduction Act are a great start, but they're not adequate on their own for the US to meet its obligations to cut carbon emissions in half by 2030.

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Possible Response Questions

- What are your thoughts about the climate crisis and its effect on hurricanes? Explain.
- Did something in the article surprise you? Discuss.
- Pick a word/line/passage from the article and respond to it.
- Discuss a "move" made by the writer in this piece that you think is good/interesting. Explain.