



# the weekly anthropocene



dispatches from the wild, weird world of humanity and its biosphere

By Sam Matey

**USA: Hurricane Florence.** The Carolinas have been ravaged by Hurricane (now Tropical Depression) Florence. As of September 15<sup>th</sup>, over 20,000 people have been displaced and over 800,000 were without power. (Pictured: Robert Simmons Jr. and his kitten Survivor, just after being rescued from floodwaters in New Bern, North Carolina). As of September 17<sup>th</sup>, at least 18 people had been killed by the storm.

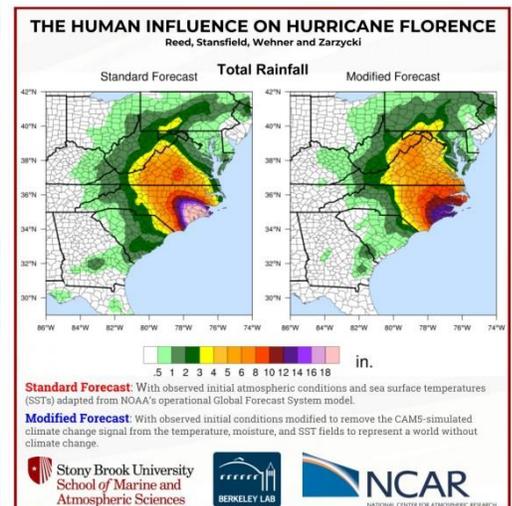


This can be directly attributed to climate change. Just before Florence hit, a team of scientists from three major atmospheric research institutions (Lawrence Berkeley National Laboratory, Stony Brook University, and the National Center for Atmospheric Research) issued a report on their research into how climate change affected the hurricane's forecast. (Due to time constraints, this research has not yet been published or peer-reviewed). They compared the real-world forecast for Florence with an atmospheric model that removed the effects of climate change from the situation-essentially a simulation of what Florence would have been like in a "normal" climate (pictured). The researchers found that Hurricane Florence was about 80 kilometers wider and dropped over 50% more rain due to climate change. "There is a very clear message here. Dangerous climate change is here and now. It is not something in the future," said Dr. Michael Wehner, coauthor of the new research. "If this storm had happened in a world where humans had not interfered in the climate system, there wouldn't be as much rain. By a large amount." In a case of tragic irony, the North Carolina

government has made this situation considerably worse. A law enacted by the state's Republican-controlled legislature in 2012 essentially banned the use of sea-level rise projections that factor in climate change, a craven cop-out to those who feared that warnings that North Carolina's coast was in grave risk of flooding would hinder development. It is unclear how much new development in at-risk areas took place due to this action, but it's likely a non-zero amount.

In sum, Hurricane Florence is both a human tragedy and a reminder that know-nothingism and obfuscation are not viable responses when faced with a planet-wide crisis. Storms like this are the new normal. Our response is up to us.

Thanks to CNN for the picture. For more, see [goo.gl/6py7Jh](http://goo.gl/6py7Jh). For an in-depth look at the study analyzing climate change's impact on Florence, see [goo.gl/R89TXw](http://goo.gl/R89TXw).



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**USA: New York.** As the Trump Administration seeks to roll back clean car standards and prop up the lumbering monster of the coal industry, states are taking the lead in action on climate change. Governor Andrew Cuomo of New York has just ordered new regulations to phase out the use of HFCs in the state of New York. HFCs, or hydrofluorocarbons, are one of a class of compounds informally known as “super greenhouse gases.” Along with a few other exotic chemicals (like nitrous oxide, sulfur hexafluoride and CFCs), HFC molecules have a much greater warming potential (per molecule) than carbon dioxide, with each molecule “trapping” much more heat. The only reason they’re not a tremendous problem is that they’re fairly rare: HFCs are generally used as a refrigerant in air conditioners and refrigerators. (Since HFCs are extra-harmful but quite rare, they should be an easy target in the fight against climate change. In fact, President Obama approved a 2016 international agreement (the Kigali Amendment) meant to institute a worldwide phase-out of HFCs, but Trump’s EPA let the issue slide). Now, New York’s crackdown on HFCs (joining a similar action by California earlier this year) might encourage more states to do the same. In Cuomo’s new initiative, HFCs will be phased out between 2020 and 2024, with state funding available to help municipalities switch to alternative refrigerants. This is some rare good news for legal action on climate change in the US. For more, see [goo.gl/MA9z2V](https://goo.gl/MA9z2V).

**USA: San Francisco.** From September 12<sup>th</sup> to 14<sup>th</sup>, the Golden Gate City hosted the Global Climate Action Summit. Unlike the annual, multinational UN-led climate summits, the Action Summit was attended by an array of national, subnational, and corporate leaders who were already committed to addressing the threat of climate change. The summit was led by Jerry Brown, the governor of California, who kicked off proceedings a few days early by signing SB 100, the awesome bill that requires California to generate 100% of its electricity from zero-carbon sources by 2045. He also added, on his own initiative, an executive order committing the state to economy-wide carbon neutrality by 2045 and net negative greenhouse gas emissions thereafter. Over the next few days, the summit saw (among much more) the launch of the Global Green Bond Partnership, a pledge by 29 major donors to invest \$4 billion over the next 5 years in fighting climate change, and an announcement of a new analysis that found that 27 major world cities have not only passed their peak greenhouse gas emissions but have decreased their emissions further by at least 2% every year since their peak, while their economies and population continued growing. The scrappy and proactive nature of the summit was perhaps best exemplified by Mia Mottley, the prime minister of Barbados (which has set a goal of a fossil fuel-free economy by 2030). She said “Climate knows no boundaries and respects no classes. But it will respect people acting in numbers. The time for talk has past. This is truly a time to act.” Let us hope that this inspiring summit will push more national governments to follow her advice. For more, check out [www.globalclimateactionsummit.org/](http://www.globalclimateactionsummit.org/). Great news!



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**Science Spotlight: Feedbacks.** One of the most important concepts in climate science is the notion of *feedbacks*: the results of a system “going back” and changing that system. Feedbacks come in two types. With *stabilizing feedbacks*, outputs from the system help keep the system stable. *Amplifying feedbacks* amplify changes to the system, moving the



system further and further in a new direction. Here, we’re examining two feedbacks of vital import to Earth’s climate.

First, and most famously, there’s the Arctic albedo feedback. *Albedo* is the proportion of light (or other electromagnetic radiation) that a surface reflects. Bright substances like ice, snow, and white T-shirts have high albedos, and reflect more light, while dark substances absorb more light. Climate change is causing the Arctic to move from being primarily made up of high albedo substances (ice and snow) to being a patchwork of high and low albedo substances, as darker-colored oceans and pine forests occupy more land. This means that the Arctic region as a whole is absorbing more energy, which is making it even warmer (part of the reason why the Arctic is warming even faster than the rest of the world), which changes the region’s overall albedo still further...And so on. That’s an amplifying feedback, further altering the system.

Secondly, there’s the Amazon transpiration feedback. *Transpiration* is the process where plants exude water through stomata in their leaves, which then evaporates into the air. Recently, it was discovered that in the Amazon rainforest, this process is creating a stabilizing feedback. There are so many trees in the Amazon that a huge amount of water is moving up through them from the ground into the atmosphere. This creates a wetter



local climate, which means more rainfall, which makes the region more hospitable for rainforest tree species. In short, the Amazon rainforest, when not disturbed, keeps itself going by creating its own personal climate! On that awesome thought, this Science Spotlight ends.

Thanks to NASA for the awesome images. For all your climate science needs, always go first to [climate.nasa.gov](https://climate.nasa.gov)!