

Expert: Climate Change Means Stronger Storms, More Hurricanes

by **Liz Donnan Kintz**

CHATHAM – The contours of Cape Cod’s iconic coastline tell a story of a landscape dramatically and dynamically defined by Atlantic storms. At the heart of the peninsula’s narrative are the nor’easters and hurricanes that shape and reshape the Cape’s shorelines each year. This summer, the 2020 Atlantic hurricane season is setting records. As of early this week, the Atlantic had experienced 11 named storms, nine of which formed since the season’s official start on June 1. Historically, an average of only two named storms have formed by early August, with a ninth named storm typically forming in early October. In its Aug. 6 hurricane outlook update, the National Oceanic and Atmospheric Administration released one of the most active seasonal forecasts that it has generated in its 22-year history of hurricane outlooks -with a forecast of 19 to 25 named storms, seven to 11 hurricanes, and three to six major hurricanes. Friends of Chatham Waterways (FCW) President Jeff Mason notes that with 66 miles of shoreline, Chatham is especially vulnerable to storm surges, flooding, and erosion accelerated by more frequent and intense storm systems. "The variability and magnitude of weather events in Chatham is increasing, and because of our location, the effects of extreme weather events are especially pronounced," said Mason, who has observed a measurable change in tidal range at his Oyster River home. Mason notes that flooding and rising sea levels not only significantly impact tidal ecosystems and coastal habitats, but also

Senior Scientist Dr. Jennifer Francis, address the question, "How Does the Arctic Meltdown Affect Tropical Storms?" Francis' research focuses on understanding the links between these two seemingly disparate happenings: the melting ice of the Arctic and the rise of unruly tropical storms.

Francis said that the Arctic is melting at an alarming rate. In only the past 40 years, half of the Arctic's sea ice cover has melted - with ice volume in the Arctic declining by 75 percent. "The Arctic's meltdown is amplifying the effects of global warming by as much as 25 to 40 percent," said Francis, who explained that the loss of ice in the Arctic accelerates ocean warming, fuels storms, and increases sea level rise.

A disappearing Arctic means a warmer climate system. Francis explained that without the Arctic's bright ice cover reflecting the sunlight away from Earth, the exposed ocean absorbs a greater fraction of the sun's energy and heat. The added heat in the water and air leads to more evaporation. This extra water vapor, in turn, fuels storms as it condenses into clouds and releases energy to the air. "More heat in the atmosphere, more heat in the oceans, and more moisture in the atmosphere equals more fuel for storms," she said.

Warmer oceans also give rise to elevated sea levels. As oceans warm, they expand. This phenomenon, known as thermal expansion, contributes to 38 percent of sea level rise, Francis said. Another 45 percent of sea level rise is attributed to the melting of glaciers, 13 percent to Antarctica

it obliterated communities.

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Reverend William C. Coleman was recently presented with Friends of Chatham Waterways Captain’s Award. Pictured left to right are FCW Vice President Frank Messina, Coleman, and FCW Vice President Tom King. Messina and King presented Reverend Coleman with the Captain’s Award on Aug. 14 at his home in Chatham. The Captain’s Award honors an individual who has contributed outstanding accomplishments to protect and preserve Chatham’s vital environmental resources. The Captain’s Award plaque is engraved with the names of recipients and hangs in the Chatham Town Hall on Main Street. ROZ COLEMAN PHOTO



compromise personal property, critical town infrastructure, and public access points to local waterways. Understanding and communicating the science behind extreme weather patterns, he said, is an essential piece of ensuring a community's preparedness and resiliency. The science driving the escalation in storm systems headlined FCW's annual meeting, which was held virtually on Aug. 20. Founded in 1983, FCW is a non-profit organization that provides informational resources on the condition, development, preservation, and enhancement of Chatham waterways and adjoining lands, and takes action on those issues. Last Thursday's FCW annual meeting was open to both FCW membership and the general public. Approximately 40 attendees tuned in to hear FCW's keynote speaker, Woodwell Climate Research Center (previously known as the Woods Hole Research Center)

Ice Sheet melting, and 4 percent to ice loss from Greenland. Francis noted that, contrary to popular belief, sea levels do not uniformly rise. Some regions, such as North America's East Coast, are experiencing a more rapid rise than most other regions worldwide. Rising seas increase a storm's capacity for destruction; when a hurricane's storm surge and damaging waves ride on an increasingly higher sea, they are capable of devastating infrastructure farther inland.

A study of recent unruly storms reveals a pattern of strong systems stalling over regions where they caused catastrophic damage, Francis said. In 2017, Hurricane Harvey stalled over Houston, where it dumped more than 40 inches of rain in areas. Similarly, in 2018, Hurricane Florence stalled over the Carolinas and unleashed nearly 20 inches of rain in that area. In 2019, Hurricane Dorian stalled over the northern Bahamas, where

At the Aug. 20 Friends of Chatham Waterways annual meeting, Woodwell Climate Research Center (previously known as the Woods Hole Research Center) Senior Scientist Dr. Jennifer Francis presented her research on the question "How Does the Arctic Meltdown Affect Tropical Storms?"
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This trend in slow-moving storm systems, she said, can be attributed in part to the Arctic melt and its disruption of steering winds. As their name suggests, steering winds are the winds that steer storm systems. They derive their force from the temperature difference between the Arctic and regions to its south. As the Arctic warms and this temperature difference diminishes, the steering winds lose their force and become weaker. Similarly, the jet stream gains its force from the temperature difference between the Arctic and the equator. An increased gradient in temperature produces faster winds

assimilating all of that data; how do we take the information that satellites are giving us and assimilate that data into forecasts in a valuable way."

Francis noted that the field currently lacks the ability to forecast a hurricane's intensity since technology capable of routinely measuring the ocean's energy does not yet exist.

The unprecedented hurricane season forecasted is indicative of a world deep in global warming, she said. "While we cannot turn global warming around, we can definitely take actions to slow it down. And we must. This is the planet we're leaving our children and our children's children."

Additionally, each year FCW allocates \$ 4,000 in education grants for Monomoy Regional School District teachers to use for Chatham waterways projects. Mason noted that, even in the midst of the COVID-19 pandemic, FCW members worked to ensure a strong scholarship and grant season.

"This year, we were all thrown a wildcard," said Mason. "And, what amazed me was the unwavering level of commitment, dedication, and energy I saw across the organization — from the board of directors to our volunteers out in the field - as everyone pivoted and adapted to a new way of conducting our work. That's really the hallmark of this organization."

within the jet stream. Francis explained that as temperatures in the Arctic rise, this temperature gradient decreases, and the jet stream weakens, creating a waviness within the jet stream. Amplified waves within the jet stream move more slowly, which means that the weather patterns that those large jet stream waves are generating and steering also move over regions more slowly. As recent headlines evidence, slowmoving storm systems can be especially devastating.

With this hurricane season promising to be an extremely active one, Francis spoke to current forecasting models and technology. “We have this incredible amount of information coming in from satellites, and they help us tremendously in filling those big gaps over the ocean where we can’t post a scientist to measure data,” she said. “The challenge is

With Cape Cod at the epicenter of climate change, Mason said that partnering with local organizations to mitigate the local impacts of global warming will be an important component of FCW, which is in the midst of a strategic planning initiative. In charting a course for the year ahead, he said that FCW’s wheelhouse water quality monitoring initiatives and coastswep beach cleanup will continue to be mainstays of the organization’s work, along with FCW’s environmental education grant program and environmental studies scholarships.

“Now, more than ever, it’s important to train the next generation of local environmental stewards and resource managers,” said Mason. Since 2007, FCW has awarded \$88,000 in local scholarships to graduate and undergraduate students pursuing careers in the environmental sciences.

For more information about the Friends of Chatham Waterways, including its initiatives, events, grants, scholarships, and volunteer opportunities, and to view the annual meeting materials including Dr. Jennifer Francis’ presentation, visit FCW’s newly-designed website www.chathamwaterways.org.

[chathamwaterways.org](http://www.chathamwaterways.org). Additional information about Francis’ work can be found at Woodwell Climate Research Center <https://www.woodwellclimate.org/staff/jennifer-francis/>.