Why Beryl is an early sign of a particularly dangerous hurricane season

Not all storms will become behemoths like Beryl. But the hurricane has underscored the ways the stage is set for other storms to undergo similarly explosive development

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When Hurricane Beryl strengthened into the Atlantic Ocean's earliest Category 5 storm on record, it did so some two months ahead of the heart of hurricane season.
More storms typically form and intensify by August and September because that's when Atlantic waters are warmest, loaded with storm-fueling energy from a summer of sunshine. But Beryl strengthened in Caribbean waters that were as hot as they normally are in mid-September, just as the calendar turned to July.

Its record-shattering intensification, occurring earlier in the year than any storm before it, is an early sign of the historically stormy year scientists have been warning about. Off-the-charts warmth that has dominated Atlantic waters for more than a year was a key factor in early seasonal forecasts — and was integral to Beryl's extraordinary development.

In the United States, officials closely watching the forecast said the storm stirred a sense of urgency. And in the Caribbean, the storm prompted immediate calls for action on climate change. Human burning of fossil fuels has warmed the planet about 1.2 degrees Celsius (2.2 degrees Fahrenheit) over the past 150 years, and along with a recent episode of the planet-warming El Niño climate pattern, has pushed the world's oceans to dramatic and sustained warmth since early 2023.

Beryl is "clear and overwhelming evidence of the fact that we are constantly facing an existential threat to our way of life," said Dickon Mitchell, the prime minister of Grenada. He called on other nations to "move past the talking" and help island dwellers weather the "ever-present threat that they have created."

Not all storms will become behemoths like Beryl over the next few months, meteorologists said, stressing that short-lived meteorological conditions can dampen storm activity, or instigate it. But the hurricane has underscored the ways the stage is set for other storms to undergo similarly explosive development.

Another warning of what may come: Many of the records Beryl is breaking were set in 2005, a year of unprecedented hurricane frequency and of devastating storms such as Hurricane Katrina.

“All signs are hinting that this season is going to rival 2005,” said Ben Kirtman, director of the Cooperative Institute for Marine and Atmospheric Studies at the University of Miami.

Conditions are ‘far more conducive than normal’ for hurricanes

Beryl is an extraordinary storm for not only how early it intensified, but also where. In previous years, early storm activity in the area where this one developed has been a reliable indicator of a busy hurricane season, said Philip Klotzbach, who studies hurricanes at Colorado State University.

When it strengthened into a Category 4 storm, Beryl was in the middle of the tropical Atlantic. At this time of year in that part of the ocean — an area at the center of what is known as the main development region for hurricanes — cyclones rarely organize or strengthen much until they move farther west or north. That’s because relatively cool waters, an abundance of Saharan dust or dry air all tend to limit early-season storm activity anywhere east of the longitude of places such as the Bahamas, Cuba and Jamaica, Klotzbach said.

But none of those factors stopped Beryl. It shows that “environmental conditions are far more conducive than normal” for hurricanes, Klotzbach said.

Beryl strengthened into Category 4 a week earlier than any storm of that strength ever observed, breaking a record set by Hurricane Dennis in the hyperactive 2005 storm season. It also became the fastest-strengthening storm on record before the month of September.

This kind of early-season activity in the area is a strong predictor of a large tally of tropical storms by late fall, he said.

The National Oceanic and Atmospheric Administration in May predicted 17 to 25 tropical storms would form in the Atlantic basin this year — approaching the record 27 named storms that developed in 2005.

Beryl continues churning through the Caribbean Sea, and its long-term track is uncertain. Still, the hurricane prompted coastal U.S. residents to prepare.

In Texas, Galveston County officials urged residents to stay alert: “Although there is uncertainty in the Beryl’s path when it reaches the Gulf, this is certainly the season to stay vigilant and prepared,” they wrote on X, formerly known as Twitter.

And authorities farther from the storm's path nonetheless used Beryl as an opportunity to stress caution. In Pinellas County, Fla., Emergency Management Director Cathie Perkins said dire hurricane season forecasts have prompted hundreds of people to attend community expos on hurricane risks in recent weeks. Now, Beryl is a reminder of how quickly a storm can intensify from a tropical storm to a major hurricane, and of how important it is to prepare, she said.

"With these rapid intensification storms, it cuts your time frame down," Perkins said. "Knowing that the waters were warm this year already, these are the things that we worry about."

Why more storms could be intense and damaging

How many of those storms dramatically intensify will depend on conditions that naturally vary, including ocean temperatures and wind shear, or differences in wind speed and direction at varying heights. But a baseline of unusual warmth will only encourage stronger storms, scientists said.

NOAA predicted eight to 13 storms likely to become hurricanes, including four to seven "major" hurricanes of at least Category 3, with maximum sustained winds of between 111 to 129 mph.

"Will all the storms be intense? Possibly not," said Marjahn Finlayson, a climate scientist from the Bahamas. "But will we see more major hurricanes this year compared to other years? That is very likely."

For example, meteorologists are watching another tropical system in the central Atlantic that could follow a similar path as Beryl. But after Beryl churned through that part of the tropics, much of the energy that allowed it to strengthen has since dissipated, Kirtman said.

It's too early to say if perhaps some short-lived conditions contributed to Beryl's intensity that may be less present with other storms, he added. But the larger picture in the tropics remains conducive to cyclone formation, and it will probably become more so, he said.

Along with normal summer warming, a La Niña climate pattern is likely to develop by late summer or early fall. La Niña is known for encouraging Atlantic hurricanes because it tends to reduce wind shear.

"My sense is that we're going to see more stronger storms this year," Kirtman said. "This is just the beginning."

On top of that, those storms could also wreak more damage than normal as a consequence of another disaster linked to global warming: coral death. As temperatures surged higher than ever observed last summer, corals across the world's third-largest reef in Florida struggled to survive a heat wave so intense, scientists had to expand their scale for coral bleaching.

Coral reefs act as barriers for storm surge, providing protection on land from a windblown rise in water levels. If large swaths of reefs are now dead, that barrier may be weakened, Finlayson said.

Amanda Coletta and Matthew Cappucci contributed to this report.