Florida faces hectic hurricane season: Can science say who will get hit in coming months?

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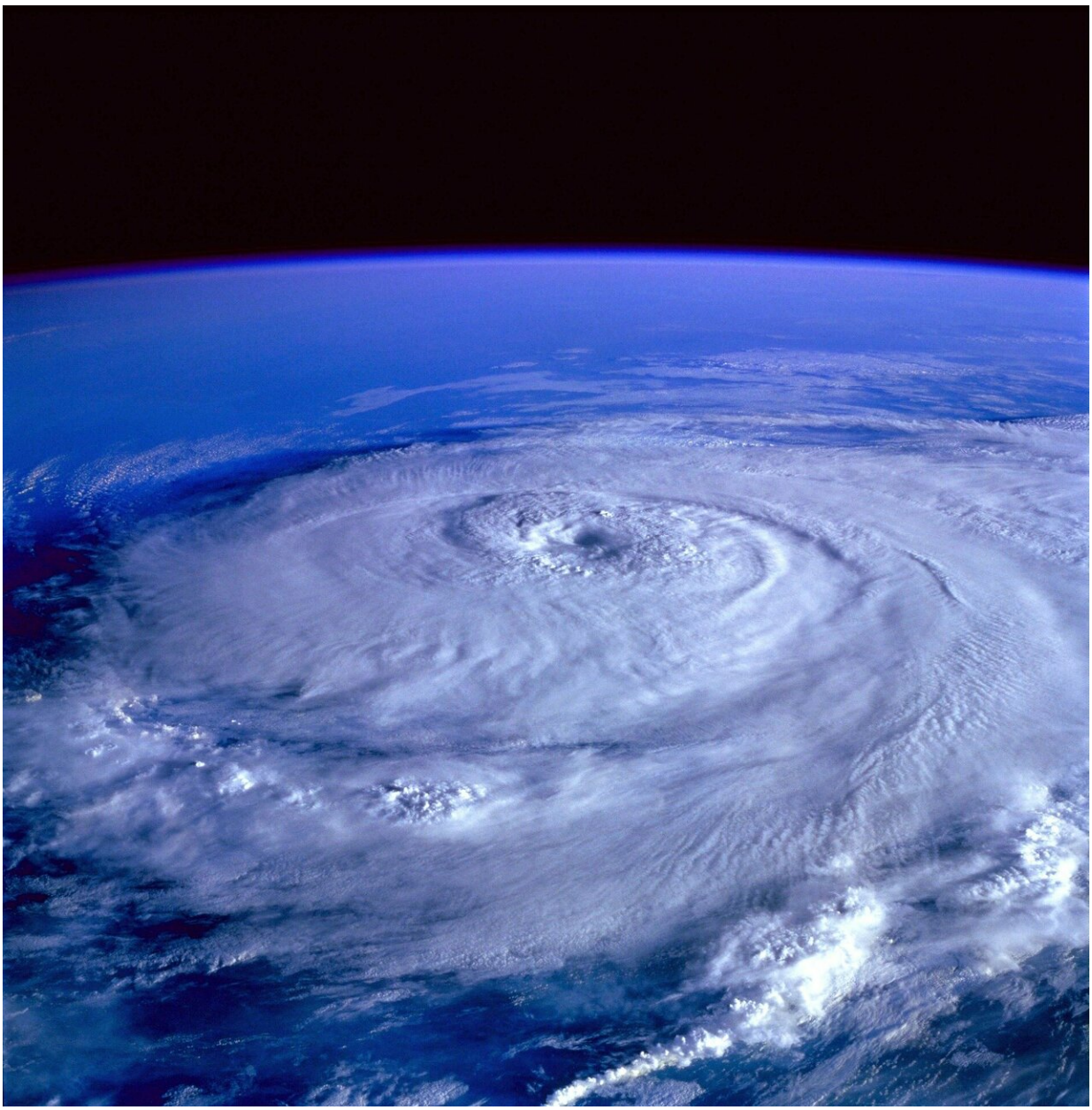

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The bottom line of every preseason hurricane forecast this spring has been sobering, even a little scary. Meteorologists and their computer models all agree that it's going to be a super busy and perhaps record-breaking season—and that with so many expected storms, it's very likely that somebody, somewhere is going to get smacked this year.

But exactly who and where?

That's been a question many scientists have long considered impossible to answer months ahead of any storm forming.

But an increasing number of experts are starting to take a crack at it. This year, for instance, both AccuWeather and Colorado State University included landfall chances in their advance forecasts for hurricane season 2024, which officially starts on Monday and runs through November.

Their odds will only add to Florida's seasonal hurricane anxiety: CSU, for instance, predicts a near-lock that the state will be impacted somewhere by a tropical system and a roughly one-in-three chance that South Florida will see a hurricane. Accuweather predicts four to six direct hits somewhere along the United States coastline this season.

Meteorologists stress considerable uncertainty remains in such long-range forecasts but that they also reflect a sign of evolving science and constantly improving understanding of tropical weather systems.

"No matter how bananas the hurricane season, the odds of any one spot getting hit are low," said Philip Klotzbach, a meteorologist and researcher who oversees the closely watched Colorado State University forecasts. "But when you have an environment as amped up as it is in 2024, the odds of it being a quiet season for everybody are extremely low."

Looking to the past to predict the future

There are lots of reasons why forecasting landfalls is much more daunting than seasonal numbers. The global forces that brew up storms, such as hot Atlantic Ocean and Gulf of Mexico temperatures, can be measured and tend to change slowly. But many of the forces that steer them can be regional and mercurial, such as weather fronts sweeping across the Southeast United States that can push storms back out to sea.

That's why the National Hurricane Center predicts storm tracks out only five days—and even those increasingly accurate plots can shift in the last days or hours before landfall. There are plenty of recent examples.

Two years ago, Hurricane Ian's eye shifted about 80 miles south in the last day, barreling into Fort Myers Beach and becoming one of the deadliest storms in Florida history, killing 149 people. Two decades ago in 2004, Hurricane Charley had been forecast to swamp downtown Tampa but also jogged east on the last day, slamming into Port Charlotte some 100 miles south.

But much of the science around predicting landfalls a long way off isn't about looking into the future but studying the past. It's based in large part on something obvious to anyone who's lived in South Florida awhile: this place has a history of hurricane hits.

Forecasters call it a "return interval" or "return period." At its most

simple, it's a statistical average of how often hurricanes have hit any one place over the last 100-plus years or records. By the National Hurricane Center's calculations, for example, South Florida has a return period, or a hurricane landfall, every six to seven years.

But forecasters also are building on to that basic data. AccuWeather, for instance, also compares the upcoming season to other meteorologically similar seasons to analyze which spots got hit more often. They also factor in the warmer sea surface temperatures we've seen in recent years, thanks to human-caused global warming, which are linked with more storm formations.

"We plotted storm landfalls of those years and we highlighted areas there's clustering as areas that are most vulnerable," said Alex DaSilva, lead hurricane forecaster for AccuWeather. "It's not perfect, of course, but it does give you a good gauge."

CSU's forecast for this year gives Miami-Dade a 36% shot at seeing impacts from a hurricane, which is higher than the average 23% chance of impacts from a hurricane from 1880–2020. For all of Florida, CSU gives the state a 96% chance of seeing fallout from some type of storm this season.

But, like with the stock market, past performance is no guarantee of future results. And the landfall forecasts are pretty broad. Predicting a tropical system might impact Florida during any season is a pretty good bet. No forecaster can say exactly where or when storms will land in what promised to be the busy months ahead.

Longshot predictions

The quest for better forecasts isn't new. For as long as science has sought to de-mystify the comings and goings of hurricanes, there's always been

a push to know sooner, sooner, sooner. Even a few days of advance warning buys time to put up shutters, evacuate people or position aid resources close by.

Knowing when and where a hurricane could strike weeks or months in advance could save lives and billions of dollars. And it goes beyond public safety—insurers, investors, industries and multiple interests all want to know when and where storms may strike.

But historically every step forward in hurricane forecasting is a cautious one. Get it wrong, and there's a chance people won't listen to the next warning. And while short-term forecasting has gotten drastically better in the last 50 years, the further out the forecast, the less confident scientists are.

And despite the slow and careful creep of measured warnings and watches from official sources, plenty of people can still fall for disinformation or pranks from less official realms like social media.

Last summer, a viral TikTok posted in August convinced at least some people on the internet that "September 6 of this year, Florida and the Carolinas will be hit with a Category 6 hurricane." Despite the fact that there's no such thing as a Category 6 (the scale stops at five), and putting aside the original source for the claim was a joke account pretending to be a time traveler, the false information traveled far and wide.

Though more outlets are including landfall odds in preseason forecasts, many experts say not only is it impossible to accurately predict place and power in advance right now, it may never be possible.

"In terms of being able to say there's going to be a storm Sept 1 impacting Florida, I don't know if we'll ever get there in our lifetime," DaSilva said.

Moving the goalpost

Still, it doesn't stop many people from asking, why not?

Mike Ventrice, senior quantitative meteorologist for DRW Holdings, a Chicago-based investment firm, said traders at his firm often ask him what's stopping forecasters from being able to predict storms months in advance.

The answer, he said, is part technological limitations, part knowledge gap and part atmospheric chaos.

Despite all the advancement in science, some aspects of the weather remain unpredictable— particularly far out. The National Hurricane Center recently extended its long-view tropical outlook from five days to seven, a cautious step in the direction of more long-shot predictions. But that week-out picture is mostly used to identify when and where storms are likely to form.

Where they are likely to go—that closely watcjed cone of uncertainty—only goes five days out and has lots of wiggle room. Even at three days, the NHC forecast for landfall still has an error margin of just over 100 miles.

AccuWeather, a private company that produces similar weather forecasts, uses a seven-day cone. DaSilva said that one day, he could imagine the company expanding that to eight or nine days, although there are no plans for that yet,

"Once you get past 10 days, if you're going that far out you're basically pinpointing landfall," he said.

Moving that goal post out even more, Ventrice said, would require a

deeper understanding of what makes a hurricane tick. Computer models used to predict global weather patterns would also have to churn out their predictions faster. As it stands, it can take days, if not weeks, for the supercomputers to spit out data suggesting what the near-term future of the atmosphere might hold.

"Trying to model that out further is going to require high-resolution models we don't have the computing power for today," he said. "You don't want to wait a month to get a forecast out three weeks down the road."

The first step in getting to a point where meteorologists can confidently forecast in advance where and when a hurricane will strike is figuring out what kind of conditions the would-be storm will encounter close to shore. And that, he said, is still an open question that far out.

"As everyone knows here, we can't tell if it's going to be wet or dry in your area in 25 days," Ventrice said.

Improving science, skills

And yet, there are encouraging signs that the science of far-out forecasts is improving.

The National Weather Service has a tool designed to pinpoint regions where a storm might form in two to three weeks, technology Klotzbach says has "not a lot of skill, but still cool." And the hurricane center's error rate for forecasting storm path and intensity has dropped precipitously in recent decades.

WeatherTiger, a Tallahassee-based weather analytics firm, even recently started offering landfall odds for Florida, updated daily, to paid subscribers.

"It's challenging, but the amount we're forecasting out is growing because we have better skill," Klotzbach said. "Will there be progress? Sure."

However, he said, there is likely a ceiling on how good forecasting can get. And that's due to the chaos in the atmosphere. The Atlantic Ocean, in particular, is like a super highway of overlapping jet streams and weather patterns that interact in ways science is still trying to understand.

"There's an inherent noise in the system," Klotzbach said. "A wobble can make a difference between a $100 billion hurricane and a $10 billion hurricane."