CSU researchers increase forecast, now predict near-average 2023 Atlantic hurricane season

Note to reporters: The full report is available at tropical.colostate.edu.

Colorado State University hurricane researchers have increased their forecast slightly and are now predicting a near-average Atlantic hurricane season in 2023. El Niño development appears imminent, as water temperatures across the eastern and central tropical Pacific have anomalously warmed over the past couple of months. Tropical and subtropical Atlantic sea surface temperatures are now much warmer than normal.

The tropical Pacific currently has warm neutral ENSO conditions, that is, water temperatures are slightly above-normal across the eastern and central tropical Pacific. Current large-scale conditions and forecasts indicate that a transition to El Niño is virtually assured in the next couple of months. However, there remains uncertainty as to how strong El Niño will be. El Niño tends to increase upper-level westerly winds across the Caribbean into the tropical Atlantic. The increased upper-level winds result in increased vertical wind shear, which is a difference in direction and strength of winds from the lower to the upper levels of the atmosphere. Vertical wind shear can tear apart hurricanes as they try to form.

Waters across the tropical and subtropical Atlantic have anomalously warmed over the past couple of months and are near or at record levels in the eastern part of the basin. Warmer-than-normal waters in the eastern and central tropical Atlantic tend to force a weaker subtropical high that leads to weaker winds blowing across the tropical Atlantic. These weaker winds favor additional anomalous warming of the tropical Atlantic for the peak of the Atlantic hurricane season. The warmer-than-normal tropical Atlantic may counteract some of the increase in vertical wind shear typically associated with El Niño. The increase in sea surface temperature anomalies in the Atlantic are the primary reason for the increase in forecasted hurricane activity.

Given the conflicting signals between a potentially robust El Niño and a much warmer-than-normal tropical and subtropical Atlantic, the team stresses that there is more uncertainty than normal with this outlook.

15 named storms

The CSU Tropical Meteorology Project team is predicting 14 additional named storms during the Atlantic hurricane season, which runs from June 1 to November 30. Of those, researchers expect seven to become hurricanes and three to reach major hurricane strength (Saffir/Simpson category 3-4-5) with sustained winds of 111 miles per hour or greater. The National Hurricane Center has recently identified that a subtropical storm formed in January, so this storm has been added to the total for the 2023 season.

The team bases its forecasts on a statistical model, as well as four models that use a combination of statistical information and climate model output from the European Centre for

Medium-Range Weather Forecasts, the UK Met Office, the Japan Meteorological Agency, and the Centro Euro-Mediterraneo sui Cambiamenti Climatici. These models use 25–40 years of historical hurricane seasons and evaluate conditions including: Atlantic sea surface temperatures, sea level pressures, vertical wind shear levels (the change in wind direction and speed with height in the atmosphere), El Niño (warming of waters in the central and eastern tropical Pacific), and other factors.

So far, the 2023 hurricane season is exhibiting characteristics similar to 1951, 1957, 1969, 2004, and 2006. “Our analog seasons exhibited a wide range of outcomes, from below-normal seasons to hyperactive seasons,” said Phil Klotzbach, research scientist in the Department of Atmospheric Science and lead author of the report. “This highlights the large uncertainty that exists with this outlook.” Forecasters also note that there are not many good analogs for this season, where a moderate/strong El Niño and a much warmer-than-normal Atlantic are likely to co-exist.

The team predicts that 2023 hurricane activity will be about 100 percent of the average season from 1991–2020. By comparison, 2022’s hurricane activity was about 75 percent of the average season. The 2022 hurricane season will be most remembered for its two major hurricanes: Fiona and Ian. Fiona brought devastating flooding to Puerto Rico before causing significant surge, wind and rain impacts in the Atlantic Provinces of Canada as a post-tropical cyclone. Ian made landfall as a Category 4 hurricane in southwest Florida, causing over 150 fatalities and $113 billion dollars in damage.

In addition to the various hurricane metrics that CSU has forecast for many years, the forecast team is introducing a new metric this year. This metric is Accumulated Cyclone Energy (ACE) occurring west of 60°W. ACE is an integrated metric accounting for storm frequency, intensity and duration. ACE generated west of 60°W correlates better with landfalling storms in the Atlantic basin than basinwide ACE. Generally, a slightly lower percentage of basinwide ACE occurs west of 60°W in El Niño years, and since the team favors El Niño in 2023, the percentage of basinwide ACE occurring west of 60°W is slightly lower this year.

The CSU team will issue forecast updates on July 6 and August 3.

This is the 40th year that the CSU hurricane research team has issued an Atlantic basin seasonal hurricane forecast. The Tropical Meteorology Project team also includes Michael Bell, professor in the CSU Department of Atmospheric Science and Alex DesRosiers, a PhD candidate in the same department. Bill Gray, who originated the seasonal forecasts, launched the report in 1984 and continued to author them until his death in 2016.

The CSU forecast is intended to provide a best estimate of activity in the Atlantic during the upcoming season – not an exact measure.

As always, the researchers caution coastal residents to take proper precautions.

“It takes only one storm near you to make this an active season for you,” Bell said.

Landfalling probability included in report

The report also includes the probability of major hurricanes making landfall:

- 43 percent for the entire U.S. coastline (average from 1880-2020 is 43 percent)
- 21 percent for the U.S. East Coast including the Florida peninsula (average from 1880-2020 is 21 percent)
- 27 percent for the Gulf Coast from the Florida panhandle westward to Brownsville (average from 1880-2020 is 27 percent)
- 47 percent for tracking through the Caribbean (average from 1880-2020 is 47 percent)

The forecast team also provides probabilities of named storms, hurricanes and major hurricanes tracking within 50 miles of each county or parish along the Gulf and US East Coast, as well as hurricane-prone coastal states, Mexican states, Canadian provinces and countries in Central America and the Caribbean. These probabilities for regions and countries are adjusted based on the current seasonal forecast.

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Extended range Atlantic Basin hurricane forecast for 2023

Released June 1, 2023
Tropical Cyclone Parameters Extended Range
(1991–2020 Climatological Average Forecast for 2023
in parentheses)
Named Storms (14.4)* 15**
Named Storm Days (69.4) 60
Hurricanes (7.2) 7
Hurricane Days (27.0) 30
Major Hurricanes (3.2) 3
Major Hurricane Days (7.4) 7
Accumulated Cyclone Energy (123) 125
Accumulated Cyclone Energy West of 60°W (73) 70
Net Tropical Cyclone Activity (135%) 135
* Numbers in ( ) represent averages based on 1991–2020 data.
** Forecast numbers include the unnamed subtropical storm that formed in January.