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2022 Hurricane Season Outlook

HALLIWELL
Engineering Associates

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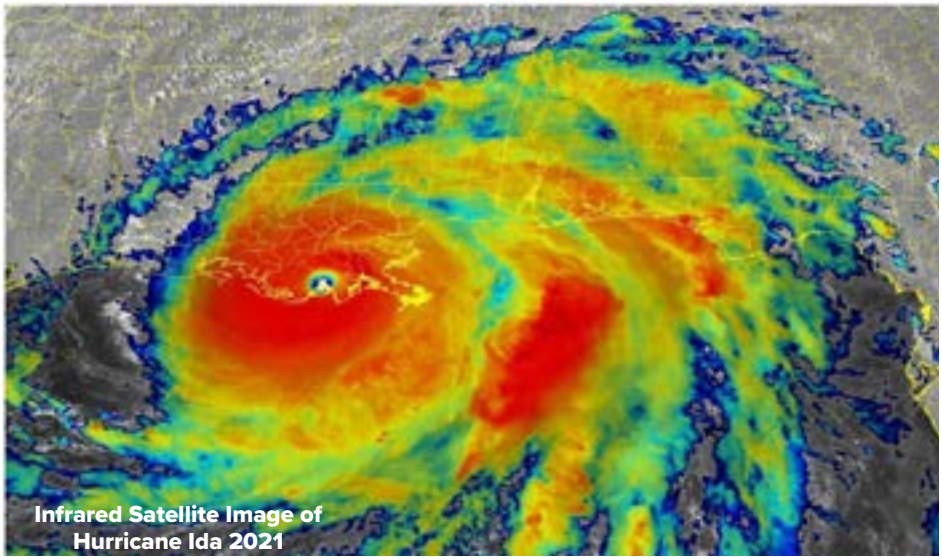
The 2022 Atlantic Basin Hurricane Season Outlook

It only takes one hurricane to strike your area of interest to make the season "active" for your organization. In 1992 there were only six named tropical storms and one unnamed subtropical storm. Yet, the 1992 hurricane season produced devastating Hurricane Andrew. Andrew caused nearly $26 billion in damage. This made Andrew, at the time, the costliest hurricane in the history of the United States.

However, in general it is statistically more likely to have a hurricane strike when the total number of hurricanes is higher than normal. Meteorologists usually issue local weather forecasts for periods of three to 10 days. The Atlantic basin hurricane season lasts six months. Outlooks, as opposed to daily forecasts, predict patterns months in advance and take specific training to produce. Today, there are three primary agencies that produce seasonal hurricane forecasts: The National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center, a division of the National Weather Service, the private company AccuWeather and the Colorado State University (CSU) Tropical Weather & Climate Research department.

All three forecast centers are predicting an above normal 2022 hurricane season. The Atlantic basin entered a more active period beginning in 1995. The average number of tropical cyclones has increased over the last 25 years compared to the 25-year period prior.



Infrared Satellite Image of Hurricane Ida 2021

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Table 1
CSU Forecast for 2022 Hurricane Activity

Forecast Parameters	*CSU Forecast for 2022*	*Average for 1991-2020*
Named Storms	19	14.4
Named Storm Days	90	69.4
Hurricanes	9	7.2
Hurricane Days	35	27.0
Major Hurricanes	4	3.2
Major Hurricane Days	9	7.4
Accumulated Cyclone Energy+	160	123

+A measure of a named storm's potential for wind and storm surge destruction defined as the sum of the square of a named storm's maximum wind speed (in 104 knots2) for each 6-hour period of its existence.

Starting in 1984, Dr. William Gray of Colorado State University documented that there were large-scale factors that influenced the total number of hurricanes and tropical storms in the Atlantic hurricane basin. He continued to refine those forecasting features over the years and many of the same features are incorporated into the NOAA seasonal hurricane forecast.

There are three large scale factors that make the atmosphere more conducive for hurricane development. Wind shear, which is the change in wind direction and speed with height, prevents hurricanes from concentrating their heat energy near the core. So, if wind shear is expected to be high, there will likely be fewer hurricanes. If wind shear is expected to be low, there will likely be more hurricanes than normal. High surface water temperatures are conducive to hurricane development since the source of energy for hurricanes is warm surface water. Mid-level moisture is also an important factor in hurricane development. If the air is dry in the mid-levels, the atmosphere prevents hurricanes from converting warm water at the surface into energy above the surface.

Figure 1 Official NOAA 2022 Atlantic Hurricane Season Outlook

The last ten years have seen great improvement in the verification of hurricane outlooks made in the spring. NOAA's spring 2022 prediction is:

- 14 to 21 named storms, compared with an annual average of 14.4.
- Six to 10 hurricanes, compared with an annual average of 7.2.
- Three to six major hurricanes, compared with an annual average of 3.2.

Furthermore, NOAA stated that there is a 65 percent chance of an above-normal season, a 25 percent chance of a near-normal season and a 10 percent chance that it will be below normal.

NOAA's outlook is similar to other research institutions and private companies. Colorado State University, for example, is predicting 19 named storms, with a 71 percent chance that the United States will be hit by a major hurricane. Similarly, AccuWeather, the private forecast company based in State College, Pa., is expecting 16 to 20 named storms.

Factors Indicating an Active 2022 Season

1. Sea surface temperatures and deep reservoirs of ocean water.
   - Water temperatures in the Gulf of Mexico and western Atlantic are running 1 to 3 degrees above average.

2. The loop current.
   - The Loop Current is an area of warm water that travels up from the Caribbean, past the Yucatan Peninsula, and into the Gulf of Mexico. The current is also known as the Florida current as it flows through the Florida Strait, into the Gulf Stream, and heads north up the eastern coast of the United States.
   - When a tropical cyclone moves over the Loop Current the storm can increase rapidly in strength as it draws energy from the warm water.
   - This year, the Loop Current looks remarkably similar to the way it did in 2005, the year Hurricane Katrina crossed the Loop Current before devastating New Orleans. (See Figure 2 and 3)

3. La Niña.
   - The El Niño/La Niña Southern Oscillation (ENSO) is a cyclical warming and cooling of the equatorial Pacific Ocean.
   - Usually, the pendulum swings between warm Pacific Ocean conditions (El Niño) and cold Pacific Ocean conditions (La Niña).
   - El Niño occurs on average every two to seven years, and episodes typically last nine to 12 months.
   - The average length of time for a La Niña event is 5 months to a year and a half.
   - This year, La Niña is entering a rare third straight year. A La Niña sets up a chain reaction that reduces hurricanes in the Eastern North Pacific (off the coast of west Mexico) and favors increased Atlantic hurricane activity.

4. Wind Shear.
   - Wind shear is a change of wind speed or direction with height. Too much shear can disrupt the storm's circulation and concentration of energy near the center.
   El Niño occurs on average every two to seven years, and episodes typically last nine to 12 months.
   - During La Niña summers, usually wind shear is reduced over the tropical Atlantic. The lack of significant shear will make it easier for hurricanes to form and remain stronger for longer.

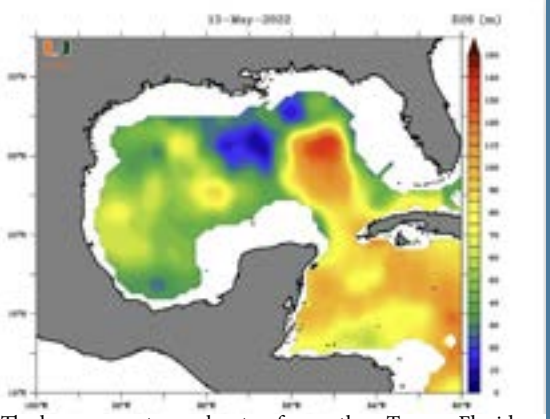

Figure 2 Loop current s of May 13, 2022

The loop current was about as far north as Tampa, Florida in mid-May 2022. The scale, in meters, shows the maximum depth at which temperatures were 78 F (26C) or greater.
Nick Shay/University of Miami, CC BY-ND

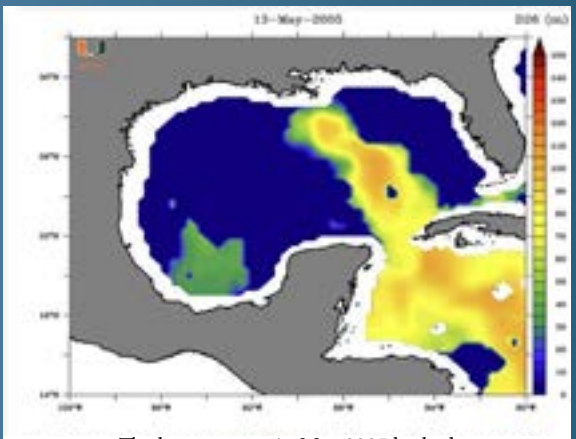

Figure 3 Loop current in May 2005

The loop current in May 2005 looked strikingly similar to May 2002.
Nick Shay/University of Miami, CC BY-ND

New Forecasting Tools for the 2022 Hurricane Season

Weather forecasting is constantly advancing. According to Rick Spinrad, NOAA's administrator, "NOAA will triple operational supercomputing capacity this summer (2022). This upgrade will allow for higher-resolution earth models that can handle larger ensembles of models with more numerous calculations, more advanced physical considerations and more advanced ability to assimilate the data collected out in the storm."

In addition to long range seasonal outlooks, the day-to-day hurricane forecasting is improving also. NOAA will deploy five Saildrones, which are uncrewed vehicles on the ocean's surface, to measure conditions near the ocean surface. Ships generally avoid going right into the center of a hurricane. So, these unmanned vehicles will collect data where there has been a paucity of data in the past. This new data could extend forecasts for extreme rainfall potential three to five days into the future. Also, a new forecasting product will be issued in 2022 that will pinpoint where the peak surge will occur when a storm is approaching the coast.

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