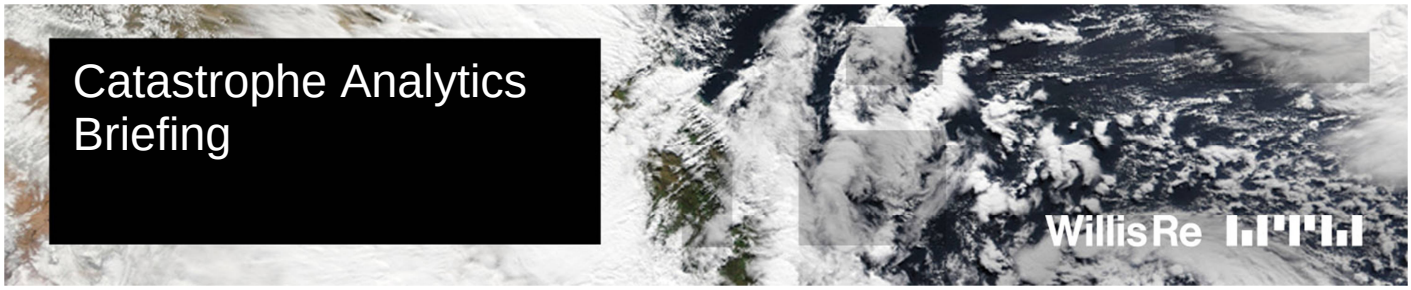

2020 Atlantic Hurricane Season Outlook: June 5, 2020

This seasonal forecast briefing is the first in this season's series to be released as new information becomes available. In this briefing, we provide an initial overview of how the season appears to be shaping up.

Current situation

The atmosphere didn't get the memo that June 1 is the official start of the 2020 North Atlantic hurricane season. The season started in mid-May with Tropical Storm Arthur. Arthur formed to the East of Florida, beat back dry air and brought tropical storm strength winds to the Outer Banks of North Carolina. Tropical Storm Bertha formed in late May, in a somewhat hostile environment, and against expectations. Bertha brought 50mph winds to coastal South Carolina. At the time of writing Tropical Storm Cristobal is gaining strength within a large sprawling mass of disturbed weather known as the Central American Gyre. If it remains intact, Cristobal is forecast to emerge into the Gulf of Mexico with a possible U.S. Gulf Coast landfall late Sunday or Monday, likely at tropical storm strength. This year marks the 6th year in a row with storm activity before June 1. As the Atlantic Ocean follows its annual warming trend into the summer, what levels of hurricane activity can we expect?

Forecasts

Available forecasts from the major forecasting centers are almost unanimous in calling for an active season, with some forecasts pointing towards an extremely active season (**Table 1**). The forecast numbers of named storms across the major forecasting centers fall in range 16 to 20 with an average of 17.8 (compared to an historical average of 12.1). For hurricanes the numbers fall within a range of 7 to 9.5 (compared to an historical average number of 6.4), and for major hurricanes (Saffir-Simpson category 3-5) they range from 3 to 4.5 (compared with an historical average of 2.7).

These forecasts for high activity reflect a confluence of favorable hurricane conditions. The forecast from the National Oceanic and Atmospheric Administration (NOAA) is based on their expectation for a continuation of cool ocean temperatures in the tropical Pacific or the possible emergence of La Niña. Such conditions do not inhibit TC activity. NOAA also expects continued warmer-than-normal North Atlantic Ocean temperatures. The other forecasting centers generally agree on the expectation of these favorable oceanic temperature patterns and atmospheric responses. In their early June forecast Colorado State University (CSU) raised their expectations above their early April forecast. This is based on a warmer than normal North Atlantic Ocean, particularly in the sub-tropical and eastern regions. CSU and Tropical Storm Risk (TSR) also issue guidance on landfall probability. This year, they are both forecasting higher landfall likelihood than normal for the continental U.S.

Atlantic seasonal hurricane forecasts as of June 4, 2020

Table 1. Summary of 2020 Atlantic Seasonal Hurricane Forecasts

Data Source	Date Issued	# Named Storms (% of normal)	# Hurricanes (% of normal)	# Major Hurricanes (% of normal)	ACE[1] (% of normal)
1981-2010 average (Source CSU)		12.1	6.4	2.7	106
Average of 5 analog years (Source CSU)	Jun 4, 2020	16.5 (136%)	7 (109 %)	3.5 (130%)	142 (134%)
Colorado State University[2]	Jun 4, 2020	19 (157%)	9 (141%)	4 (148%)	160 (151%)
NOAA/CPC[3]	May 21, 2020	16 (132%)	8 (125%)	4.5 (166%)	159 (150%)
Tropical Storm Risk	May 28, 2020	17 (140%)	8 (125%)	3 (111%)	135 (127%)
The Weather Company	Apr 16, 2020	18 (149%)	9 (141%)	4 (148%)	n/a
North Carolina State University[3]	Apr 17, 2020	20 (165%)	9.5 (148%)	4 (148%)	n/a
Average of the all of the above		17.8 (147%)	8.4 (131%)	3.8 (141%)	149 (141%)

Analog years

An alternative view to forecast models is provided by hurricane activity in past years that had similar pre-season climate conditions and forecast conditions to this year. CSU uses this approach to qualitatively correct the output from their empirical forecast technique. CSU's selected analog years – 1995, 2003, 2008, 2011, 2013, 2016 – are characterized by cool neutral or weak La Niña conditions and slightly warmer than normal North Atlantic sea surface temperatures for the peak of the hurricane season. The average activity among these 6 analog years is shown in the above table and indicates above normal numbers of named storms, hurricanes and major hurricanes, but slightly lower than their official forecast.

Climate signals: sea surface temperatures

The formation and development of hurricanes is highly dependent on the available energy in the upper layers of the ocean. This is why ocean temperatures are often used as a proxy for available energy as a major factor in determining seasonal activity. This year, waters across almost the entire tropical and sub-tropical North Atlantic are currently warmer than usual (**Figure 1**) by greater than 1°C in places. These departures from normal, should they continue, are more than sufficient to raise hurricane activity.

Warmth in the deep tropics create favorable conditions for storm formations from African Easterly Waves – pulses of energy in the atmosphere that track westward off the coast of Africa. These formations are known to produce almost all our strongest hurricanes. The waters in the Gulf of Mexico are currently much warmer than normal. Should this anomalous warmth persist it would promote the development and maintenance of 'homegrown' hurricanes close to the U.S. coast.

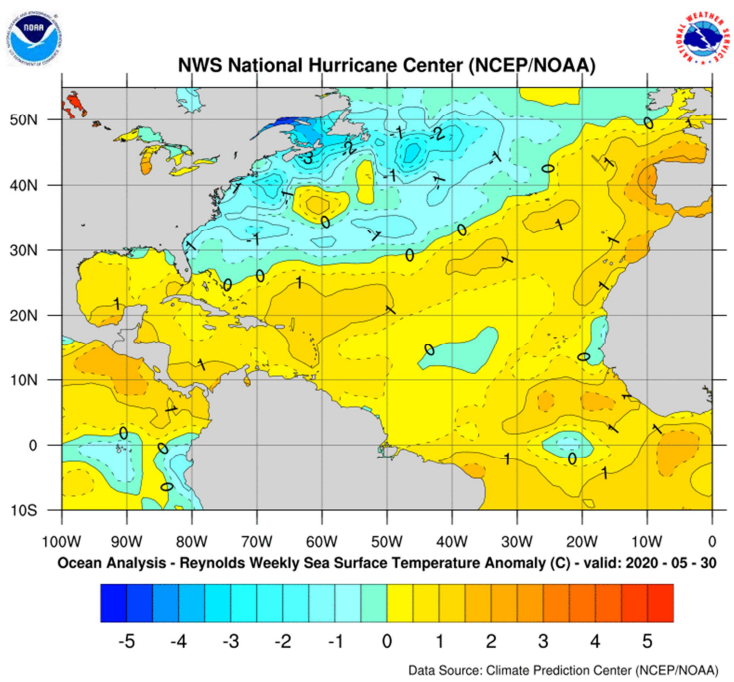

Figure 1. Departure of weekly average sea surface temperature from a long-term average (°C) on May 30 2020.
Source: https://www.nhc.noaa.gov/tafb/atl_anom.gif: NCEP/NOAA

[1] Accumulated Cyclone Energy (ACE) is a combined measure of hurricane intensity, duration and frequency. ACE is calculated as the sum of the square of the maximum wind speed in each 6-hour period during the life of a tropical cyclone from the time it reaches tropical storm strength (wind speeds • 65 kmph (39 mph)) in units of 10^4; ACE = $10^{-4} \cdot v^2$max, where v is measured in knots.

[2] The CSU forecast includes named storms Arthur, Bertha and Cristobal.

[3] NOAA/CPC and NCSU forecast likely ranges rather than single values. The values presented here are the middle of the forecasted ranges.

Climate signals: La Niña?

The sloshing back and forth of warm water across the equatorial Pacific associated with El Niño Southern Oscillation (ENSO) exerts the strongest known control on Atlantic hurricane activity. The atmosphere responds with rising air following the warm water across the Pacific. In turn, this shifts the entire global overturning circulation.

During El Niño, when warm waters slosh over to the central and eastern Pacific, the ascending air drives strong winds aloft over the Western Atlantic. Such strong winds act to rip hurricanes apart. During La Niña, when warm waters slosh over to the Western Pacific, these hostile winds aloft over the Atlantic dissipate, leaving favorable conditions for hurricane activity.

In late 2019 the atmosphere failed to respond to weak El Niño conditions in the ocean, and so an official El Niño was not declared. This warmth in the central and eastern Pacific has begun to dissipate and turned much cooler in recent weeks. This portends the possible emergence of La Niña for the peak of the hurricane season. The latest forecasts call for an 80% likelihood of cool neutral or La Niña conditions (**Figure 2**). Both scenarios are favorable for hurricanes.

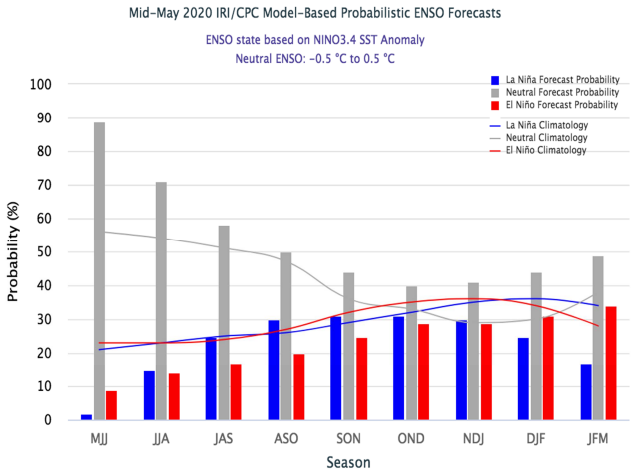

Figure 2. The official CPC/IRI ENSO probability forecast, based on a consensus of forecasters using human judgment and model output.

Experimental Landfall Forecasts for the Gulf of Mexico and Florida

Forecasting U.S. landfall is still an emerging science with much to learn about the drivers of hurricane landfall. The challenge arises from the small number of historical events and the complex and highly sensitive interactions between storm formation, track and coastal orientation that result in landfall.

The Willis Research Network has developed an experimental landfall forecast product. This product is being tested each year to build an understanding of skill, and is offered here to spark discussion and comparison with other forecasts. Our forecast this year points to increased likelihood of above average landfall activity for the Gulf Coast and Florida.

Our approach uses predicted daily weather patterns to infer the anomalous number of tropical cyclones (of at least tropical depression strength) landfalling on the Gulf Coast and Florida. These weather patterns are similar to weather maps seen in weather forecasts. They promote or inhibit landfall through their large-scale wind patterns and also though surface pressure patterns that can sustain or weaken hurricane activity. Throughout the hurricane season we tend to see repeating daily weather patterns. The more a favorable weather pattern repeats, the higher the likelihood of a hurricane landfall.

For the 2020 forecast, daily weather patterns are taken from an ensemble of dynamical model forecasts issued by NOAA. **Figure 3** shows the 2020 forecast distribution of tropical cyclone landfall anomalies compared to the historical distribution. The forecast distribution is shifted to the right of the historical distribution, indicating increased likelihood of above normal Gulf Coast and Florida landfall activity for 2020. Our forecast is consistent with the landfall forecasts issued by CSU and TSR for higher than normal landfall activity.

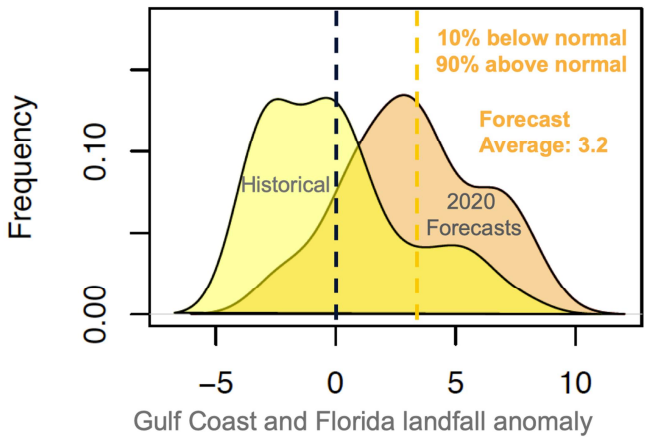

Figure 3. Tropical cyclone landfall anomaly for the Gulf Coast and Florida. The historical distribution is shown in yellow and the forecast distribution for 2020 is shown in orange.

Confidence

Forecasts issued this early in the year tend to have limited skill (all seasonal forecasts should be read with caution), yet they generally outperform the standard benchmark of the so-called "persistence" forecast (a forecast of average activity every year) and therefore provide useful guidance on likely scenarios. The reasons for the general low confidence of actual numbers in these early forecasts are primarily uncertainty in the progression of ENSO, the timing and magnitude of potential intra-seasonal variability, and also the range in the hurricane response to these conditions.

Summary

The latest forecasts for the 2020 hurricane season almost universally point towards an active season. No forecasts call for an inactive season. Things to watch over the next couple of months are the potential emergence of La Niña (favoring an active season) and whether today's warmer-than-normal waters in the Gulf of Mexico and tropical North Atlantic will persist.

Next briefing and additional advice

This briefing will be updated in mid-July to include the latest round of seasonal forecasts. These forecasts are likely to offer increased confidence as the season comes into focus.

The Willis Re Analytics Team will report on all tropical storms and hurricanes in the North Atlantic and the Gulf of Mexico. This includes briefings and updates to our clients during hurricane events. These will contain the latest information from the National Hurricane Center, commentary on likely tracks and intensities and, when available, updates and modeling guidance from the catastrophe modeling companies.

Forecast information sources

Bell, G., and CoAuthors: NOAA 2020 Atlantic Hurricane Season Outlook. Available at https://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.shtml

Klotzbach, P. J., Bell, M. M. and J. Jones: "Extended Range Forecast of Atlantic Seasonal Hurricane Activity and Landfall Strike Probability for 2020", June 4, 2020, Department of Atmospheric Science, Colorado State University, Fort Collins CO, U.S.

Saunders, M. and A. Lea: "Pre-Season Forecast for North Atlantic Hurricane Activity in 2020", May 28, 2020, Department of Space and Climate Physics, University College London, London, U.K.

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