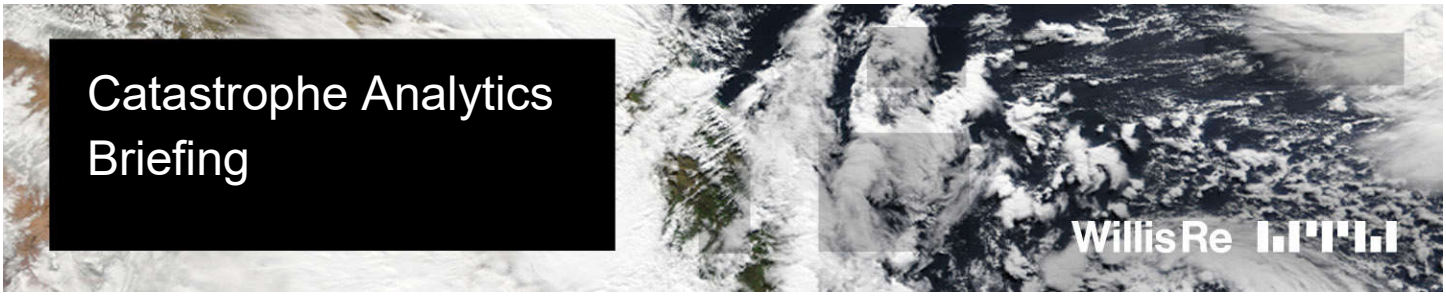

2020 Atlantic Hurricane Season Outlook: July 16, 2020

As the hurricane season enters the months of peak activity, this briefing provides an update on how the season appears to be shaping up.

Current situation

Early activity at the start of the season has continued over the past month. With 6 named storms (Arthur, Bertha, Cristobal, Dolly, Edouard and Fay) the season is progressing at record pace. Tropical storm Fay was the earliest 6th named storm on record by 12 days, and 56 days ahead of the typical date of the 6th named storm. The pace of this season is even beating the highly active year of 2005. Conditions are clearly favorable for storm activity. However, not one of these 6 named storms strengthened enough to become a hurricane. In fact, measuring the season by Accumulated Cyclone Energy (a cumulative measure of the overall intensity and duration of all storms) this season is pretty average so far. None of our 6 named storms to date formed in the deep tropical North Atlantic. This region was closed off to hurricanes by the record-breaking African dust event that tracked all the way to the U.S. Now the dust has cleared, what levels of hurricane activity can we expect?

Forecasts

Available forecasts from the major forecasting centers remain almost unanimous in calling for an active season, with some forecasts pointing towards an extremely active season. Some forecasts have even nudged slightly higher than their pre-season forecasts. An updated forecast summary from some of the major forecasting centers is presented in (**Table 1**). We also highlight here a forecast issued by the University of Colorado Boulder based on a relatively new forecasting technique that uses the relationship between the spatial distribution of thunderstorm activity over the African continent and seasonal hurricane activity. Their forecast issued on June 2nd is consistent with other forecasts in calling for above-average numbers of tropical storms with a range of 14 to 20.

The forecast numbers of named storms across the major forecasting centers fall within a range of 16 to 20 (compared to an historical average of 12.1). For hurricanes the numbers fall within a range of 7.8 to 9.5 (compared to an historical average number of 6.4), and for major hurricanes (Saffir-Simpson category 3-5) they range from 4 to 4.5 (compared with an historical average of 2.7). In summary, forecasts are generally calling for activity levels at around 150% of the long-term average across a number of hurricane metrics. Colorado State University (CSU) and Tropical Storm Risk also issue guidance on landfall probability. Their latest forecasts again call for higher than normal landfall activity for the continental U.S.

The forecast for favorable hurricane environments has not changed much from the early-season outlooks. However, we now have greater confidence than we had at the beginning of the season. The major drivers of this season's high activity are i) expectation of continued cool conditions over the equatorial Pacific or possible emergence of a weak La Niña, and ii) warmer than normal tropical North Atlantic Ocean temperatures.

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*)	Jul 7, 2020	16 (132%)	7.8 (122%)	4 (148%)	160 (151%)
Colorado State University[2]	Jul 7, 2020	20 (165%)	9 (141%)	4 (148%)	160 (151%)
NOAA/CPC[3]	May 21, 2020	16 (132%)	8 (125%)	4.5 (167%)	159 (150%)
Tropical Storm Risk	Jul 7, 2020	18 (149%)	8 (125%)	4 (148%)	137 (129%)
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		18 (149%)	8.6 (134%)	4.1 (152%)	154 (145%)

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 – 1966, 1995, 2003, 2008, 2011, 2016 – are characterized by cool neutral or weak La Niña conditions and slightly warmer than normal tropical North Atlantic sea surface temperatures for the peak of the hurricane season. The average activity among these 6 analog years is shown in **Table 1** and indicates above normal numbers of named storms, hurricanes and major hurricanes, but slightly lower than their official forecast.

[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 = $10^{-4}\sum v^2max$, where v is measured in knots.

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

[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: Ocean heat content and ocean surface temperatures

Ocean temperatures are used as a major factor in determining seasonal activity. This year, waters across almost the entire tropical North Atlantic are currently warmer than usual (**Figure 1, top panel**). Warmth in the deep tropics creates 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.

However, to sustain a strong hurricane the ocean heat must extend down through the top few hundred meters of the ocean. A summary measure of this heat is known as the Ocean Heat Content (OHC). **Figure 1, bottom panel** shows that high OHC extends across the main hurricane breeding grounds.

The highest abnormal warmth extends across parts of the Caribbean and into the Gulf of Mexico. These departures from normal, should they continue as expected, are more than sufficient to raise hurricane activity and promote 'homegrown' hurricanes close to the U.S. coast. Jeff Masters' Eye on the Storm blog post from July 6, 2020 notes that the OHC in these regions reached record levels during July this year. He also noted that OHC this year is very similar to the formidable 2005 season.

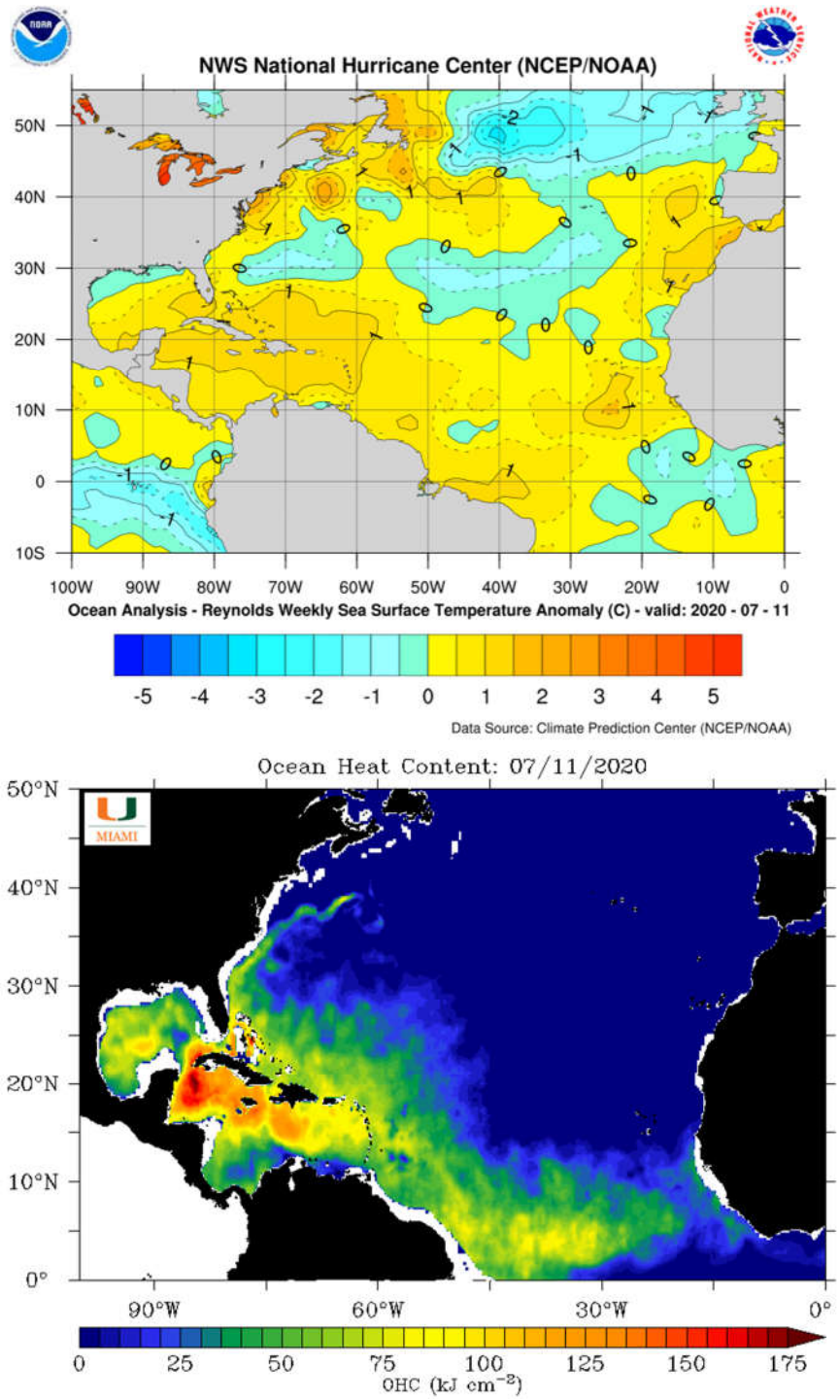

Figure 1. (top panel) Departure of weekly average sea surface temperature from a long-term average (°C). (bottom panel) Ocean Heat Content (KJcm-2). Both images are on Jul 11 2020. Sources: https://www.nhc.noaa.gov/tafb/atl_anom.gif: NCEP/NOAA, and http://isotherm.rsmas.miami.edu/heat/weba/atlantic.php: University of Miami Rosenstiel School.

Climate signals: La Niña?

Our early-season outlook called for an 80% likelihood of cool neutral conditions or La Niña phase of the El Niño Southern Oscillation (ENSO, see below for an ENSO explainer). During June, the central and eastern equatorial Pacific continued to cool. In response, the atmosphere is also looking rather La Niña-like. The latest round of predictions is consistent with earlier predictions: Roughly half of the dynamical models predict weak La Niña conditions for the summer with most others predicting neutral conditions (**Figure 2**). The reluctance of the models to come into agreement for La Niña is due, in part, to the lack of a deep reservoir of cold sub-surface water across the Pacific. There is a stronger suggestion of a slide to La Niña conditions as we enter the Autumn and Winter. In response, NOAA recently issued a La Niña Watch, which means that forecasts favor the development of La Niña within the next 6 months.

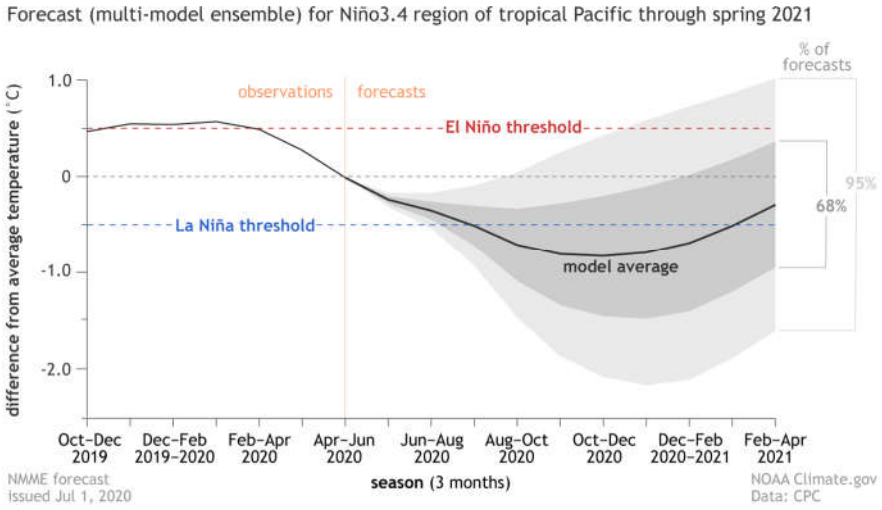

Figure 2. Recently observed and forecasted ENSO conditions, based on output from a collection of dynamical models. *Source: Emily Becker (NOAA/CPC)*

Explainer: El Niño Southern Oscillation (ENSO)

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.

Confidence

Forecasts issued in early to mid-July start to bring useful skill (all seasonal forecasts should be read with caution), and therefore provide useful guidance on likely scenarios. The sources of enhanced skill arise from persistence of temperature anomalies in the oceans and the fact we are past the April/May predictability barrier for ENSO.

Summary

The latest round of forecasts for the 2020 hurricane season indicates an active season. No forecasts call for an inactive season. Things to watch as we enter the peak hurricane months of August and September are the potential emergence of La Niña (strengthening the case for an active season), and the amount of Ocean Heat Content across the tropical North Atlantic, Caribbean and Gulf of Mexico. The immediate next couple of weeks look to remain quiet across the North Atlantic as we watch for the potential of a Madden Julian Oscillation event (a mode of sub-seasonal variability) to open a window of more favorable atmospheric conditions.

Additional advice

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.

Information sources

Sam Lillo, @splillo, Phil Klotzbach, @philklotzbach

Becker, E. July 2020 ENSO update: La Niña Watch! Published July 9, 2020. Available at https://www.climate.gov/news-features/blogs/enso/july-2020-enso-update-la-niña-watch

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Masters, J. Eye on the Storm blog, Yale Climate Connections. July 6, 2020. Available at: https://www.yaleclimateconnections.org/2020/07/tropical-storm-edouard-is-fifth-named-storm-of-2020/

Saunders, M. and A. Lea: "July Forecast for North Atlantic Hurricane Activity in 2020", Jul 7, 2020, Department of Space and Climate Physics, University College London, London, U.K.

University of Colorado Boulder, Oceans and Climate Lab. 2020 Predictions. Available at: https://www.colorado.edu/oclab/projects/atlantic-seasonal-hurricane-prediction/2020-predictions

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