



Extended Range Forecast for Atlantic Hurricane Activity in 2020

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Forecast Summary

TSR predicts North Atlantic hurricane activity in 2020 will be close to average. This is due to the current projected absence of sizeable climate forcings during August-September 2020. The uncertainties associated with this outlook are large and forecast skill at this extended range is historically low.

The TSR (Tropical Storm Risk) extended range forecast for North Atlantic hurricane activity in 2020 anticipates a season with activity close to the long-term norm. The forecast spans the period from 1st June to 30th November 2020 and employs data through to the end of November 2019. Current and projected climate signals show an absence, at present, of any climate forcing that will notably influence North Atlantic basin tropical cyclone activity in August-September 2020. TSR’s main predictor at this extended lead (6 months before the 2020 hurricane season starts) is the forecast July-September trade wind speed over the Caribbean Sea and tropical North Atlantic. This parameter influences cyclonic vorticity (the spinning up of storms) and vertical wind shear in the main hurricane track region. At present TSR anticipates that the July-September 2020 trade wind speed will be near to average – due in part to ENSO (El Niño Southern Oscillation) also expected to be near to average. The precision of TSR’s December outlooks for upcoming North Atlantic hurricane activity between 1980 and 2019 is low.

North Atlantic ACE Index and System Numbers in 2020

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2020	105 (\pm 58)	4 (\pm 3)	7 (\pm 3)	15 (\pm 4)
70yr Climate Norm (\pm SD)	1950-2019	104	3	6	11
10yr Climate Norm	2010-2019	121	4	8	15
Forecast Skill at this Lead	1980-2019	13%	0%	2%	2%
Forecast Skill at this Lead	2010-2019	20%	0%	1%	4%

- Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the Squares of 6-hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength. ACE Unit = $\times 10^4$ knots².
- Intense Hurricane = 1 Minute Sustained Wind > 95Kts = Hurricane Category 3 to 5.
Hurricane = 1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5.
Tropical Storm = 1 Minute Sustained Winds > 33Kts.
SD = Standard Deviation.
FE (Forecast Error) = Standard Deviation of Errors in Replicated Real Time Forecasts 1980-2019.
Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts for 1980-2019 and 2010-2019.

There is a 35% probability that the 2020 North Atlantic hurricane season ACE index will be above-average (defined as an ACE index value in the upper tercile historically (>127)), a 37% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (71 to 127)) and a 28% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<71)). The 70-year period 1950-2019 is used for climatology.

Key: Terciles	= Data groupings of equal (33.3%) probability corresponding to the upper, middle and lower one-third of values historically (1950-2019).
Upper Tercile	= ACE index value greater than 127.
Middle Tercile	= ACE index value between 71 and 127.
Lower Tercile	= ACE index value less than 71.

Methodology and Key Predictor(s) for 2020

The TSR statistical seasonal hurricane forecast model divides the North Atlantic into three regions and employs separate forecast models for each region before summing the regional hurricane forecasts to obtain an overall forecast. For two of these three regions (tropical North Atlantic, and the Caribbean Sea and Gulf of Mexico) the forecast model pools different environmental fields involving August-September sea surface temperatures (SSTs) and July-September trade wind speed to select the environmental field or combination of fields which gives the highest replicated real-time skill for hurricane activity over the prior 10-year period. The nature of this process means that the details of the seasonal forecast model can vary subtly from year-to-year and also with lead time within the same year. Separate forecast models are employed to predict the July-September trade wind speed and to predict the August-September SSTs. Finally bias corrections are employed for each predictand based on the forecast model performance for that predictand over the prior 10 years.

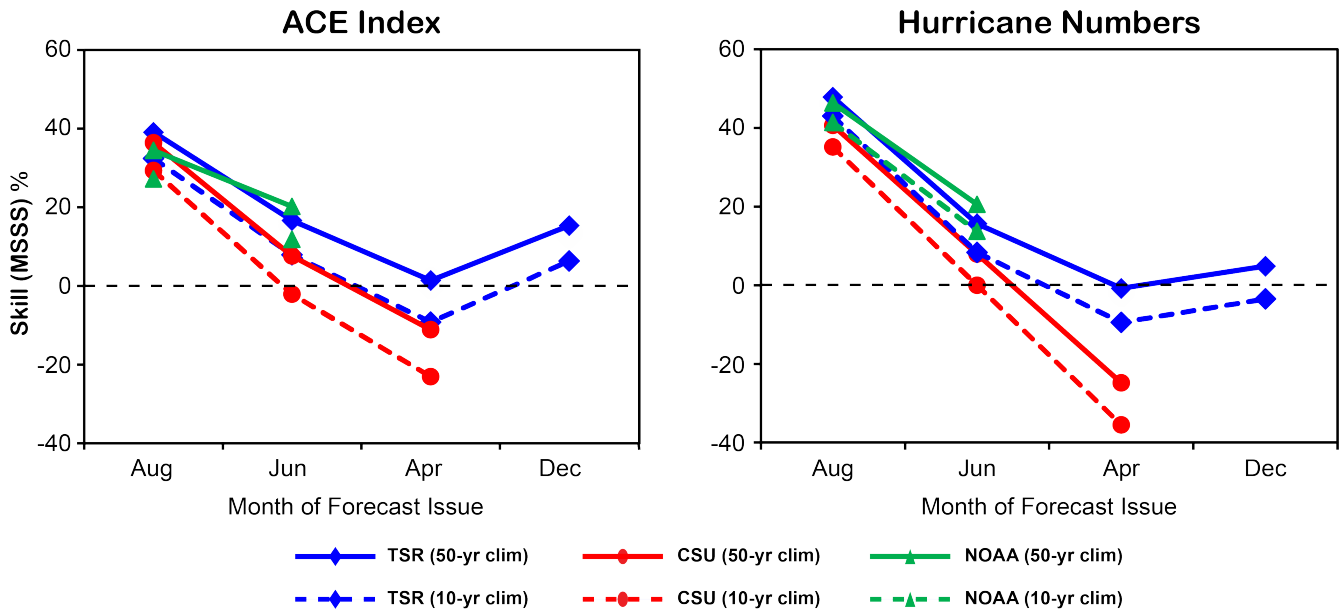
The reason why the TSR extended forecast for 2020 Atlantic hurricane activity calls for near-average activity is the current projected absence of any climate forcing factor. The July-September 2020 forecast trade wind speed at 925mb height over the Caribbean Sea and tropical North Atlantic region (7.5°N – 17.5°N, 100°W – 30°W) is forecast to be $0.07 \pm 0.88 \text{ ms}^{-1}$ weaker than normal (1980-2019 climatology). The July-September 2020 trade wind prediction incorporates the current expectations for neutral ENSO conditions during July-September 2020 and for slightly warmer than normal tropical North Atlantic SSTs during July-September 2020. The current consensus of dynamical and statistical model ENSO outlooks (https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso-sst_table) published by the International Research Institute for Climate and Society on the 19th December 2019 is used for the ENSO outlook. However, it should be stressed that uncertainties in the forecast July-September 2020 trade wind speed are large due to the large uncertainties in forecast ENSO and in the forecast North Atlantic and Caribbean Sea SSTs at this extended 6-month range.

Precision of Seasonal Hurricane Forecasts 2003-2019

The figure on the next page displays the seasonal forecast skill for North Atlantic hurricane activity for the 17-year period between 2003 and 2019. The assessment uses the seasonal forecast values issued publicly in real-time by the three forecast centres TSR, NOAA (National Oceanic and Atmospheric Administration) and CSU (Colorado State University). Skill is assessed as a function of lead time for two measures of seasonal hurricane activity: ACE and basin hurricane numbers.

Forecast precision is provided using the Mean Square Skill Score (MSSS) which is the percentage improvement in mean square error over a climatology forecast. Positive skill indicates that the model performs better than climatology, while a negative skill indicates that it performs worse than climatology. Two different climatologies are used: a fixed 50-year (1951-2000) climatology and a running prior 10-year climate norm.

It should be noted that NOAA does not issue seasonal hurricane outlooks before late May and that CSU stopped providing quantitative extended-range hurricane outlooks from the prior December after 2011. It is clear there is little skill in forecasting the upcoming ACE and numbers of hurricanes from the previous December for the period 2003-2019. Skill starts to climb after April as the hurricane season approaches with moderate-to-good skill levels being achieved, on average, by early August.



Although there are mostly only small differences in skill between the three forecast centres, the TSR model has been either the near-equal best or the best performing statistical seasonal forecast model at all lead times for the period 2003-2019.

Further Information and Next Forecast

Further information about TSR forecasts and verifications may be obtained from the TSR web site <http://www.tropicalstormrisk.com>. The first TSR forecast update for the 2020 North Atlantic hurricane season will be issued on Tuesday 7th April 2020.