# Extended Range Forecast for Atlantic Hurricane Activity in 2018

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## Forecast Summary

**TSR predicts Atlantic hurricane activity in 2018 will be slightly above the long-term norm and close to the last 10-year norm. However, the uncertainties associated with this outlook are large and the forecast skill at this extended range is historically low.**

The TSR (Tropical Storm Risk) extended range forecast for Atlantic hurricane activity in 2018 anticipates a season with slightly above-norm activity. Based on current and projected climate signals, Atlantic basin tropical cyclone activity is forecast to be close to the 2008-2017 10-year norm and slightly above the 1950-2017 long-term norm. The forecast spans the period from 1st June to 30th November 2018 and employs data through to the end of November 2017. TSR's main predictor at this extended lead (6 months before the 2018 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 July-September trade wind speed will be slightly weaker than normal and thus have an enhancing effect on Atlantic hurricane activity in 2018. The precision of TSR's December outlooks for upcoming Atlantic hurricane activity between 1980 and 2017 is low.

### Atlantic ACE Index and System Numbers in 2018

| | | ACE Index | Intense Hurricanes | Hurricanes | Tropical Storms |
|---|---|---|---|---|---|
| TSR Forecast (±FE) | 2018 | 117 (±60) | 3 (±2) | 7 (±3) | 15 (±4) |
| 68yr Climate Norm (±SD) | 1950-2017 | 103 | 3 | 6 | 11 |
| 10yr Climate Norm | 2008-2017 | 115 | 3 | 7 | 15 |
| Forecast Skill at this Lead | 1980-2017 | 14% | 10% | 4% | 3% |
| Forecast Skill at this Lead | 2008-2017 | 17% | 19% | 9% | 7% |

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 = $x10^4$ $knots^2$.
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 1980-2017.
Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts for 1980-2017 and 2008-2017.

There is a 47% probability that the 2018 Atlantic hurricane season ACE index will be above-average (defined as an ACE index value in the upper tercile historically (>121)), a 32% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (69 to 121)) and a 21% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<69)). The 68-year period 1950-2017 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 (1950-2017).
Upper Tercile = ACE index value greater than 121.
Middle Tercile = ACE index value between 69 and 121.
Lower Tercile = ACE index value less than 69.

## Methodology and Key Predictor(s) for 2018

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.

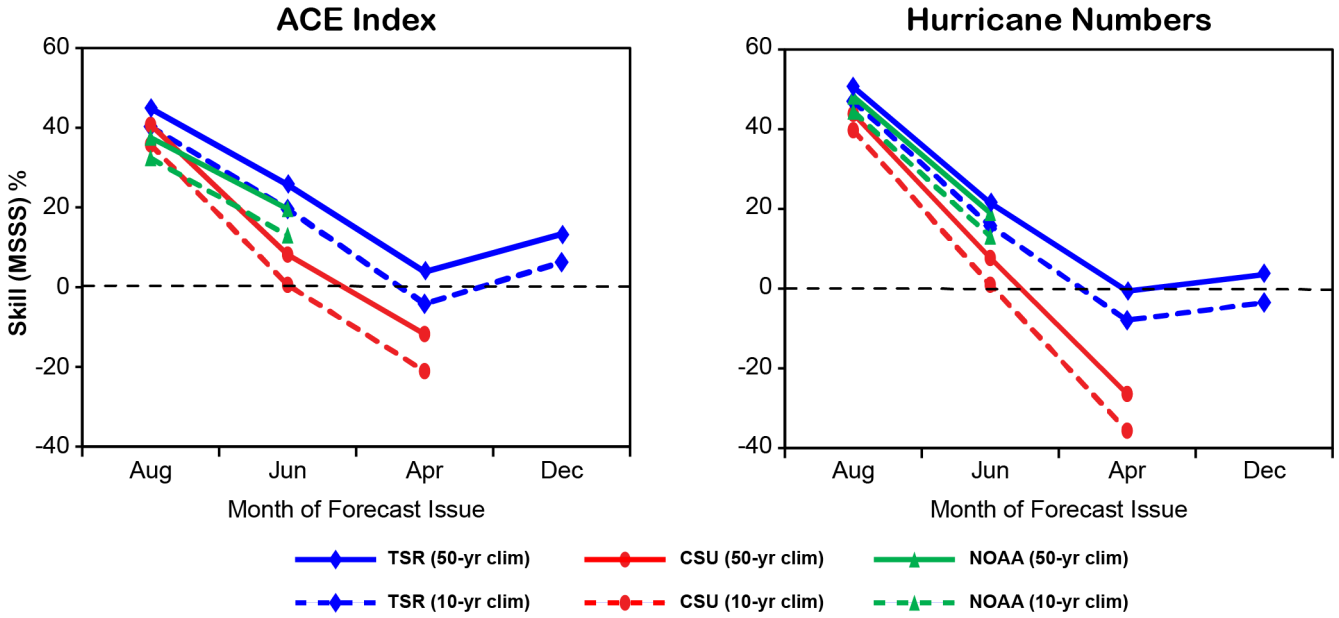
The main factor underpinning the TSR forecast for 2018 hurricane activity being above the long term norm is the anticipated small enhancing effect of the July-September 2018 forecast trade wind speed at 925mb height over the Caribbean Sea and tropical North Atlantic region (7.5$^{o}$N – 17.5$^{o}$N, 100$^{o}$W – 30$^{o}$W). The current forecast for this predictor is 0.37±0.87 ms$^{-1}$ weaker than normal (1980-2017 climatology). The July-September 2018 trade wind prediction incorporates the current expectations for slightly warmer than normal tropical North Atlantic SSTs in July-September 2018 and slightly warm ENSO conditions in July-September 2018. 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 20$^{th}$ November 2017 is used for the latter. However, it should be stressed that uncertainties in the forecast July-September 2018 trade wind speed are large due to the large uncertainties in ENSO and in North Atlantic and Caribbean Sea SSTs at this extended 6-month range.

## Precision of Seasonal Hurricane Forecasts 2003-2017

The figure on the next page displays the seasonal forecast skill for North Atlantic hurricane activity for the 15-year period between 2003 and 2017. This 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 2003-2017. Skill climbs from April as the hurricane season approaches with moderate-to-good skill levels being achieved by early August.




TSR was the best performing statistical seasonal forecast model at all lead times for the period 2003-2017.

## 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 2018 Atlantic hurricane season will be issued on Thursday 5th April 2018.