



Extended Range Forecast for North Atlantic Hurricane Activity in 2025

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Forecast Summary

TSR predicts that North Atlantic hurricane activity in 2025 will be close to the 1991-2020 30-year norm. This outlook has large uncertainties.

The TSR (Tropical Storm Risk) extended range forecast for North Atlantic hurricane activity in 2025 anticipates a season with activity close to the 1991-2020 climatology. The forecast spans the period from 1st June to 30th November 2025 and employs data through to the end of November 2024. TSR uses the forecast August-September sea surface temperatures in the Atlantic Main Development Region (10°-20°N, 60°-20°W) and the forecast July-September Caribbean trade wind anomaly over the region 7.5°-17.5°N, 100°-30°W as predictors. The former is forecast to be warmer than average leading to an enhancement of Atlantic hurricane activity, and the latter is predicted to be slightly weaker than normal due to predicted near neutral ENSO conditions and above average sea surface temperatures in the Caribbean Sea. This forecast has high uncertainty due to the current very warm sea surface temperature anomalies across much of the Atlantic Ocean and whether these warm anomalies will persist through spring and summer 2024. We express the forecast uncertainty in terms of probability of exceedance for Accumulated Cyclone Energy (ACE) and for hurricane numbers.

1. TSR Extended Range North Atlantic Seasonal Hurricane Forecast

Further information on the TSR statistical prediction models and adjustments that are used to generate the forecasts below can be found in [Section 2](#) of Supplementary Information.

1.1 Forecast North Atlantic ACE Index and System Numbers in 2025:

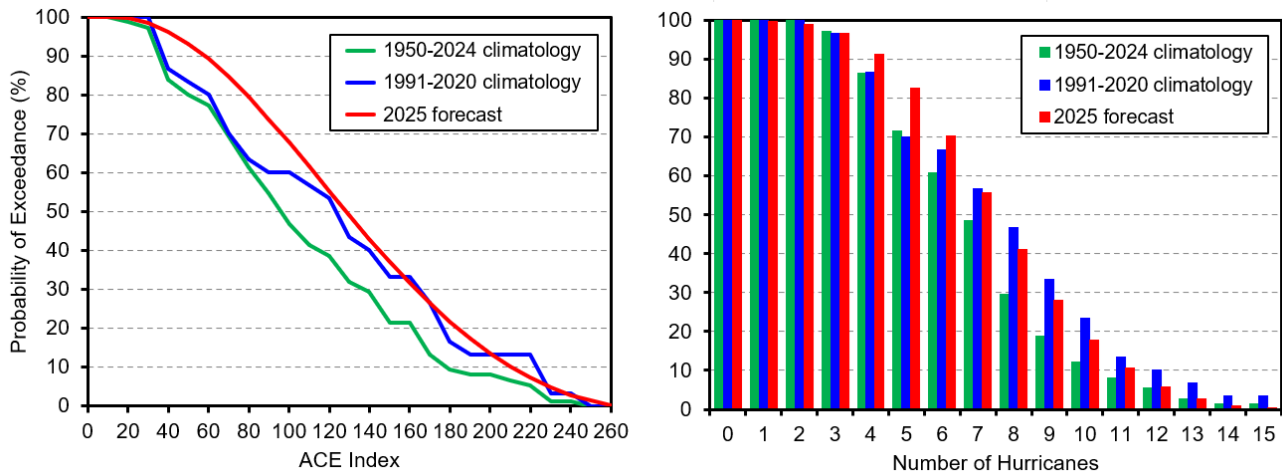
		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast	2025	129	3	7	15
74-yr Climate Norm	1950-2024	107	2.7	6.5	12.4
30-yr Climate Norm	1991-2020	122	3.2	7.2	14.4
10-yr Climate Norm	2015-2024	142	3.7	8.1	17.9
Forecast Skill at this Lead	2003-2024	4%	3%	0%	0%

The forecast tercile probabilities (1991-2020 data) for the 2025 North Atlantic hurricane season ACE index are as follows: a 34% probability of being upper tercile (>156), a 48% likelihood of being middle tercile (75 to 156) and an 18% chance of being lower tercile (<75).

1.2 Forecast Probability of Exceedance Plots for the North Atlantic Hurricane Season in 2025:

See [Section 3](#) in the Supplementary Information for motivation behind probability of exceedance charts. Figure 1 displays our April forecast PoE plots for the 2025 North Atlantic hurricane season. The forecast PoE curves are computed using the method described in section 3 of Saunders et al. (2020) while the climatology PoE curves are computed directly from observations. The two forecast PoE plots specify

the current chance that a given ACE index and/or hurricane total will be reached in 2024 and how these chances differ to climatology.



Reference: Saunders, M. A., Klotzbach, P. J., Lea, A. S. R., Schreck, C. J., & Bell, M. M. (2020). Quantifying the probability and causes of the surprisingly active 2018 North Atlantic hurricane season. *Earth and Space Science*, 7, e2019EA000852. <https://doi.org/10.1029/2019EA000852>

2. Factors Influencing the Extended Range TSR Forecasts

Atlantic MDR and Caribbean Sea SST: August-September sea surface temperatures in the tropical North Atlantic (region 10°N–20°N, 20°W–60°W) and the Caribbean Sea are forecast to be warmer than normal. The current forecast is for $0.3\pm 0.35^{\circ}\text{C}$ warmer than normal (1991-2020 climatology) for both regions. Warmer than normal waters provide additional heat and moisture to help power the development of more storms within the hurricane main development region.

Trade Wind Speed: The July-September forecast trade wind at 925mb height over the Caribbean Sea and tropical North Atlantic (region 7.5°N–17.5°N, 30°W–100°W) is forecast to be slightly weaker than normal. Trade wind speed is weaker than normal when La Niña conditions are in place or Caribbean sea surface temperatures are warmer than normal. The current forecast for the July-September trade wind is for $0.15\pm 0.79\text{ ms}^{-1}$ weaker than normal (1991-2020 climatology). Weaker than normal trade winds during July-September in the tropical north Atlantic are associated with higher cyclonic vorticity and decreased vertical wind shear over the hurricane main development region. This in turn increases hurricane frequency and intensity.

ENSO: Based on the International Research Institute for Climate and Society (IRI) model projections, cold-neutral or weak La Niña conditions are likely through winter 2024/25 and are most likely to trend towards neutral ENSO conditions by summer 2025. Neutral ENSO conditions may have a small enhancing or suppressing effect on hurricane activity if they are warm-neutral (suppressing) or cold-neutral (enhancing); however, it is currently most likely that factors other than ENSO will be more influential.

Analogue Years: The November 2024 sea surface temperature pattern globally is most comparable to November 1999, 2007, 2010, 2011 and 2017. The following hurricane seasons during these years were close to the 1991-2020 climate norm, with the ACE index ranging from 119 to 146 and an average ACE index across these years of 131. Given the current cold-neutral ENSO state, the closest analogue years are 2011 and 2017 when weak La Niña conditions were in place through winter which transitioned into neutral conditions by the following summer. The ACE indices from these two years was 133 and 129 which is comparable with the TSR extended range forecast ACE index of 129.

3. Confidence and Uncertainties

Forecast skill at this lead time is historically low and there are large uncertainties in the extended range forecast for North Atlantic hurricane activity in 2025. These uncertainties are described below:

Atlantic MDR and Caribbean Sea SST: There is reasonable confidence that sea surface temperatures in the tropical Atlantic and Caribbean Sea will be warmer than average which is an enhancing effect for hurricane activity. Sea surface temperatures across much of the Atlantic Ocean are currently well above average and we expect some persistence of these warm anomalies through 2025. In addition, two available climate models (accessed via Tropical Tidbits¹) are predicting warmer than average sea surface temperatures across much of the tropical Atlantic Ocean and Caribbean Sea through August-September 2025.

ENSO: There is limited confidence for near-neutral ENSO conditions to be in place through summer and autumn due to the historically low skill in predicting the summer ENSO state prior to mid-Spring.

Trade Wind Speed: There is limited confidence that Atlantic and Caribbean Sea trade wind speed will be weaker than normal through the upcoming summer as historically there is high uncertainty in predicting July-September trade wind speed at this lead time.

Spring NAO: The sign of the April to June NAO has an inverse correlation with upcoming Atlantic hurricane activity i.e. a positive spring NAO tends to be followed by a less active Atlantic hurricane season through enhancement of trade wind speed leading to cooling of tropical Atlantic SSTs. It is not possible to predict the April-June NAO at this lead time with any confidence; therefore, this factor has not been included in our extended range forecast.

Intra-seasonal factors: Other factors which are impossible to predict such as the strength and frequency of Saharan air outbreaks, and the frequency of tropical upper tropospheric troughs (TUTT) across the tropical Atlantic (both of which inhibit hurricane activity) are not accounted for. In addition, for a given set of climate factors, a spread in hurricane activity levels can still ensue.

Skill: Historically the skill of the early December extended range forecast for North Atlantic hurricane activity is low (see [section 4a](#) in the Supplementary Information).

Further Information and Next Forecast

Further information about the TSR forecasts and their verifications may be obtained from the TSR web site <https://www.tropicalstormrisk.com>. We anticipate that the first TSR forecast update for the 2025 North Atlantic hurricane season will be issued on Monday 7th April 2025.

1 <https://www.tropicaltidbits.com/analysis/models/>