Pre-Season Forecast Update for North Atlantic Hurricane Activity in 2025

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TSR raises its forecast and predict North Atlantic hurricane activity in 2025 will see above-average activity.

Summary: The TSR (Tropical Storm Risk) pre-season forecast update for North Atlantic hurricane activity in 2025 anticipates a season with activity around 25% above the 1991-2020 climate norm and close to the recent 10-year 2015-2024 average. Although there remains uncertainty at this lead time, we consider that the more likely scenario is for tropical North Atlantic and Caribbean Sea waters to be above normal by August-September 2025, and for neutral ENSO conditions to be present through summer and autumn 2025. The former factor is expected to have an enhancing influence on the upcoming Atlantic hurricane season whereas the latter factor is expected to have a neutral influence. The forecast has increased since early April due to a warming of tropical Atlantic and Caribbean Sea surface temperature anomalies following a decrease earlier in the year.

1. TSR Pre-Season 2025 North Atlantic Seasonal Hurricane Forecasts

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	146	4	8	16
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	6%	8%	13%	0%

The forecast tercile probabilities (1991-2020 data) for the 2025 North Atlantic hurricane season ACE index are as follows: a 43% probability of being upper tercile (>156)), a 45% likelihood of being middle tercile (75 to 156)) and only a 12% chance of being lower tercile (<75)).

1.2 Forecast US ACE Index and US Landfalling Numbers in 2025:

		U.S. ACE Index	Hurricanes	Tropical Storms
TSR Forecast	2025	3.6	3	5
30-yr Climate Norm	1991-2020	2.7	1.6	3.8
10-yr Climate Norm	2015-2024	3.9	2.5	4.9
Forecast Skill at this Lead	2003-2024	0%	17%	17%

U.S. landfalling intense hurricanes are not forecast since we have no skill at any lead.

The forecast tercile probabilities (1991-2020 data) for the U.S. ACE index in 2025 are as follows: a 57% probability of being upper tercile (>3.19), a 31% likelihood of being middle tercile (1.18 to 3.19) and only a 12% chance of being lower tercile (<1.18).

1.3 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 pre-season 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 2025 and how these chances differ to climatology.

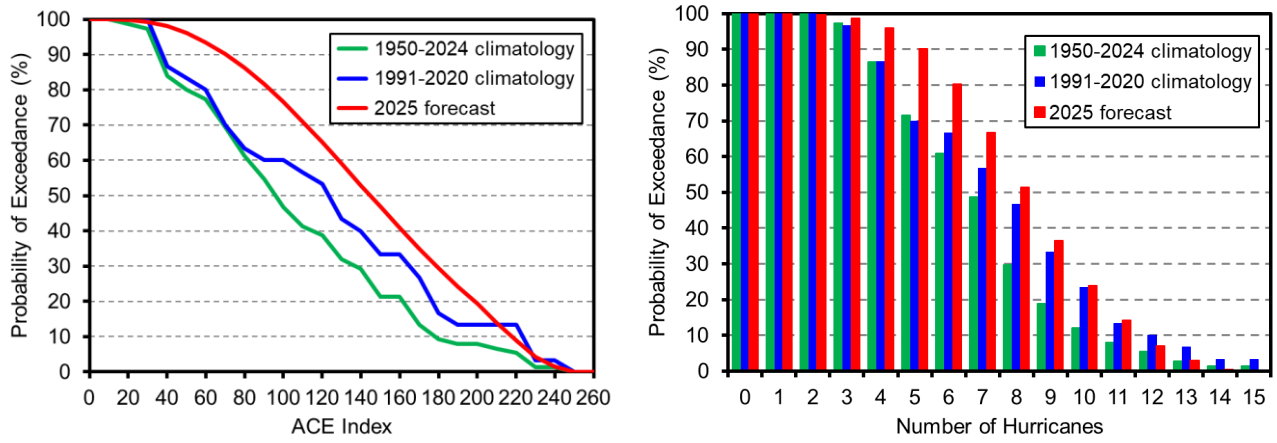

Figure 1. Forecast probability of exceedance (PoE) plots for the North Atlantic ACE index in 2025 (left panel) and for the number of North Atlantic hurricanes in 2025 (right panel). Each plot displays three sets of PoE data comprising the TSR forecast PoE curve issued pre-season and two climatology PoE curves.

2. Factors Influencing the Pre-Season 2025 TSR Forecasts

Atlantic MDR SST: August-September sea surface temperatures in the tropical North Atlantic (region 10°N–20°N, 20°W–60°W) are forecast to be slightly warmer than the 1991-2020 climatology. We anticipate MDR sea surface temperatures to have a small enhancing effect on the 2025 Atlantic hurricane season.

Caribbean Sea SST: August-September sea surface temperatures in the Caribbean Sea are forecast to be warmer than the 1991-2020 climatology. We anticipate Caribbean Sea surface temperatures to have a moderate enhancing effect on the 2025 Atlantic hurricane season.

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 weaker than the 1991-2020 climatology. We anticipate trade wind speed to have a moderate enhancing effect on the 2025 Atlantic hurricane season.

ENSO: Neutral ENSO conditions are currently present and are anticipated to continue through summer and autumn 2025. We do not anticipate ENSO having a significant effect on the 2025 Atlantic

hurricane season; however if cold-neutral conditions are present, this will likely have a small enhancing effect.

Analogue Years:

TSR hindcasts for MDR SST and trade wind anomalies: There are no years where the TSR pre-season hindcasts for MDR ACE and Caribbean/North Atlantic trade wind anomalies match 2025, the closest is 2016 which had an ACE index of 141; however, La Niña conditions developed through summer and autumn which is not expected to happen in 2025. Landfalling activity in 2016 was quite low apart from hurricane Matthew which impacted parts of the Caribbean, the Bahamas and Florida as an intense category 4 hurricane.

3. Confidence and Uncertainties

There is limited confidence that the 2025 Atlantic hurricane activity season will be above-normal based on the 1991-2020 climatology as significant uncertainties remain. Contributions to uncertainty due to other factors are described below:

Atlantic MDR SST: There is limited confidence that sea surface temperatures in the tropical Atlantic will be warmer than the 1991-2020 climatology. Sea surface temperature anomalies in the MDR decreased over the first three months of 2025 due to stronger than normal trade winds and anomalous northerly winds across the eastern tropical Atlantic; however, sea surface temperature anomalies have risen over the last few weeks. At present there are no indications that sea surface temperature anomalies will increase significantly above current levels as there are currently no indications that the trade wind speed will deviate significantly from the 1991-2020 climatology; however, if trade wind speed does become persistently stronger or weaker than normal for an extended period (as happened earlier this year), this will influence tropical Atlantic sea surface temperatures.

Caribbean SST: Sea surface temperatures in the Caribbean Sea are currently warmer than the 1991-2020 climatology and have been warmer than normal for much of this year so far. There are no indications that sea surface temperature anomalies will change significantly over the coming months, therefore we have moderate confidence that warmer than average sea surface temperatures will persist through summer. There is limited confidence as to whether these warm sea surface temperature anomalies will persist through autumn when tropical cyclone genesis in the Caribbean Sea and Gulf of Mexico is more favourable.

ENSO: There is reasonable confidence for neutral ENSO conditions to be in place through summer and autumn implying ENSO is unlikely to be a significant factor in 2025. The IRI suite of models continue to predict a range of conditions from warm-neutral to cold-neutral conditions. Where ENSO conditions fall within this range will likely have some influence on the 2025 Atlantic hurricane season, with cold-neutral conditions leading to slightly more favourable atmospheric conditions for hurricane formation/intensification.

Trade Wind Speed: There is reasonable confidence that the Atlantic and Caribbean Sea trade wind speed will be slightly weaker than the 1991-2020 climatology through the upcoming summer and early autumn. Trade wind speed is influenced by Caribbean Sea surface temperature anomalies and the ENSO state, with the warmer-than-average Caribbean Sea surface temperatures expected to contribute to weaker trade winds.

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. The spring NAO has been near-neutral when averaged over the period 1st April to 20th May; however there have been periods when the NAO has been moderately positive or moderately negative for a week or two at a time. The NAO is currently moderately negative and is forecast to increase to neutral through the rest of May into early June. There is moderate confidence that the spring NAO will not have a significant influence on Atlantic hurricane activity in 2025.

Global Model Monthly Predictions: There is high variance amongst the available forecast models as to how favourable factors such as sea level pressure and moisture are likely to be through the upcoming hurricane season. Overall, the models are suggesting these factors will either be neutral or slightly favourable for hurricane activity averaged over the season; however, occasional periods of high and low hurricane activity cannot be ruled out due to intra-seasonal variability. The available models are consistent in predicting warmer than average sea surface temperatures across the Caribbean Sea and western portion of the tropical Atlantic to high probability which is an enhancing influence on hurricane activity.

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 pre-season forecast for North Atlantic hurricane activity is low to moderate (see section 4a in the Supplementary Information.

Whilst some of the factors analysed are consistent with an upcoming active hurricane season in 2025, overall, the signals are not very strong and there remains significant uncertainty in some of these factors. We anticipate the most likely scenario is that the 2025 North Atlantic will be active but not hyper-active.

4. Forecast Archive and Next Forecast,

The archive of all the TSR publicly released North Atlantic seasonal hurricane forecasts (from 1998 to 2024) may be viewed at *https://www.tropicalstormrisk.com/for_hurr.html*. The next TSR forecast update for the 2025 North Atlantic hurricane season will be issued on the 6th July.

5. List of Predictions Issued for the 2025 North Atlantic Hurricane Season

1. Atlantic ACE Index and System Numbers:

Atlantic ACE Index and System Numbers 2025					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (1991-2020)		122	14.4	7.2	3.2
Average Number (2015-2024)		142	17.9	8.1	3.7
TSR Forecasts	23 May 2025	146	16	8	4
	7 April 2025	120	14	7	3
	10 December 2024	129	15	7	3
CSU Forecast	3 April 2025	155	17	9	4
NOAA Forecast	22 May 2025	-	13-19	6-10	3-5
UK Met Office	21 May 2025	154	16	9	4

2. U.S. ACE Index and US Landfalling Numbers:

US Landfalling Numbers 2025				
		ACE Index	Tropical Storms	Hurricanes
Average Number (1991-2020)		2.7	3.8	1.6
Average Number (2015-2024)		3.9	4.9	2.5
TSR Forecast	23 May 2025	3.6	5	3
	7 April 2025	2.4	4	2