Summary of 2025 North Atlantic Hurricane Season and Verifiation of Seasonal Forecasts

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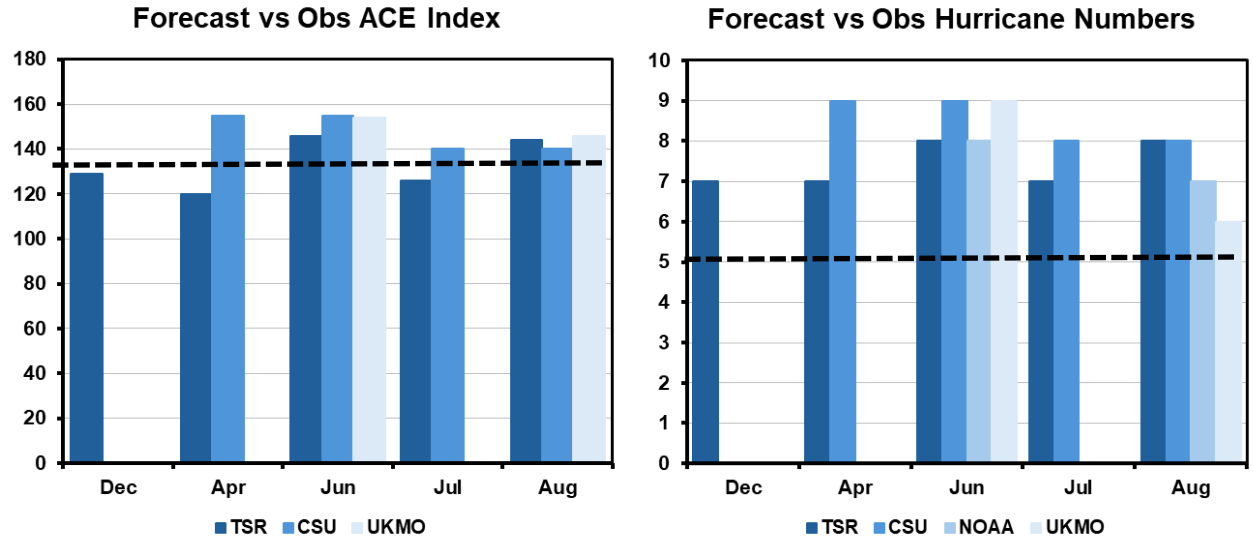
Summary

The 2025 North Atlantic hurricane season *was* unusual as it had a low overall number of hurricanes but a high number of which were intense hurricanes, including three category 5 storms. As a result, the 2025 North Atlantic hurricane season saw activity close to the 1991-2020 climate norm in terms of ACE index despite below-average hurricane numbers. ACE index was generally predicted to within 10% of observed, but hurricane numbers were over-forecast by all agencies.

Features of the 2025 Atlantic Hurricane Season

- 13 names storms, 5 hurricanes, 4 intense hurricanes and an ACE index of 133. Only 1894 saw as few as five hurricanes of which four were intense hurricanes, although it is possible storms may have been missed during the 19th century due to a far less dense observational network than in recent decades.
- Hurricane Melissa was an extremely intense category 5 hurricane which made landfall in Jamaica with 1-minute sustained winds of 160 kts (185 mph), causing catastrophic damage. Melissa later struck Cuba as a category 3 hurricane and crossed the Bahamas as a category 1 hurricane before becoming extra-tropical near Bermuda. Some records related to Melissa are as follows:
    - The strongest tropical cyclone in 2025 globally to date.
    - A gust of 252 mph at an altitude of 200 m is the highest ever recorded by dropsonde. The previous record was 248 mph in typhoon Megi (2010).
    - The joint second strongest Atlantic hurricane on record in terms of maximum sustained wind, along with the 1935 Labor Day hurricane, hurricane's Wilma (2005), Gilbert (1988) and Dorian (2019).
    - The joint strongest landfalling hurricane on record along with the 1935 Labor Day hurricane (Florida) and hurricane Dorian (Bahamas).
- The U.S. mainland was spared any significant tropical cyclone landfalls in 2025. No hurricanes and only one tropical storm (Chantal) made landfall in North Carolina. The last season to have only one tropical storm make landfall in the U.S. was 2013, which was a much quieter season overall (ACE index of 36).
- Three category five hurricanes formed in 2025. Only 2005 has seen more than two category five hurricanes in a single season, and unlike this year, 2005 was very active throughout the season with nearly double the ACE index of 2025.

Verification of Seasonal Forecasts



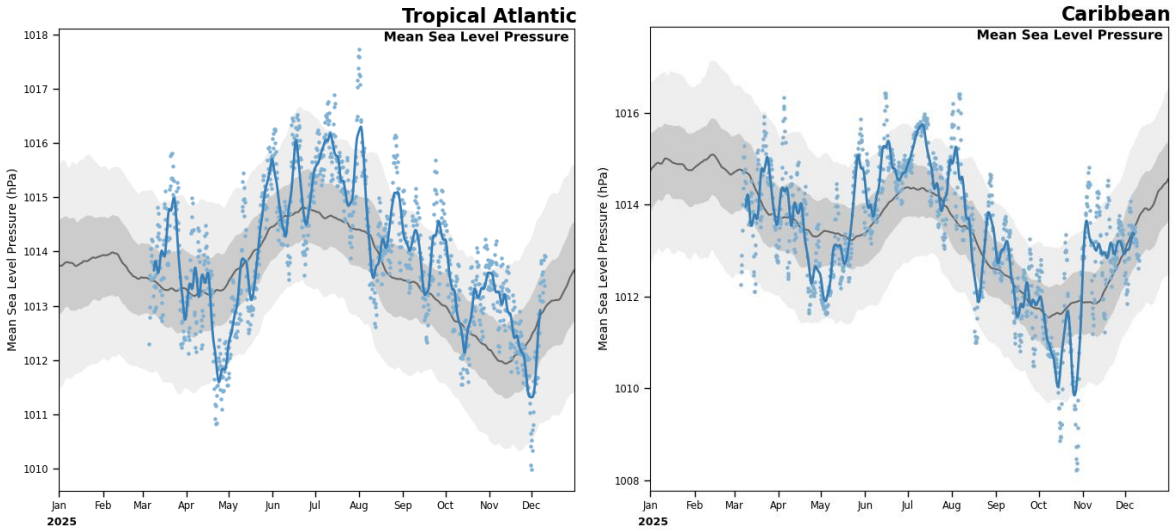
Comparison of forecast ACE index (left) and hurricane numbers (right) issued by different agencies compared to observed (black dashed line).

All forecasts for ACE index were correct to within 10% apart from the April and June CSU forecasts which were too high. Hurricane numbers were over-forecast by all agencies and at all lead times. North Atlantic tropical cyclone activity in 2025 was very atypical in terms of the ratios of named storm, hurricane and intense hurricane numbers. The season was characterised by periods where tropical cyclone activity was suppressed, interspersed by periods when conditions locally were so favourable that disturbances could develop into very intense hurricanes. It is exceptional for a season to have four major hurricanes and only five hurricanes in total, and has only happened once in the historical records in the 19th century. Discussion on likely causes of the anomalous features of the 2025 North Atlantic hurricane season can be found below.

Further Discussion of Anomalous Features of the 2025 Hurricane Season

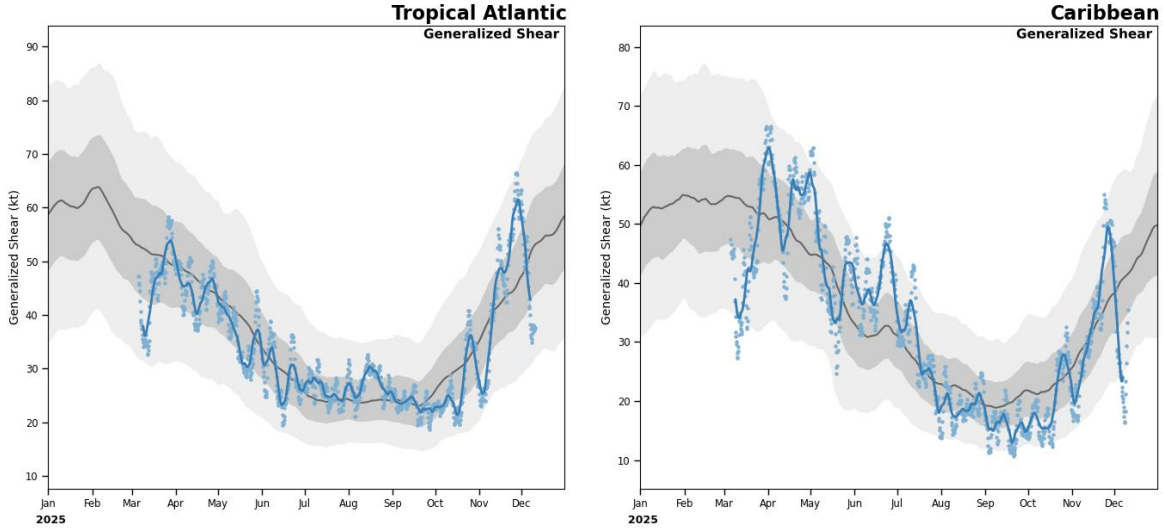
Apart from category 5 hurricane Erin which formed during the middle of August, there was little activity from the 1st August through to the 15th September, which consists of much of the peak hurricane season. This is similar to what happened during the 2024 hurricane season. The only other activity during this period was two short lived tropical storms (Dexter and Fernand). This was not anticipated and can be attributed to unusually high influence from intra-seasonal factors which dominated over the large-scale favourable conditions, which would normally be present when the tropical Atlantic sea surface temperatures are warm and ENSO is cold-neutral.

a) Sea Level Pressure Anomalies



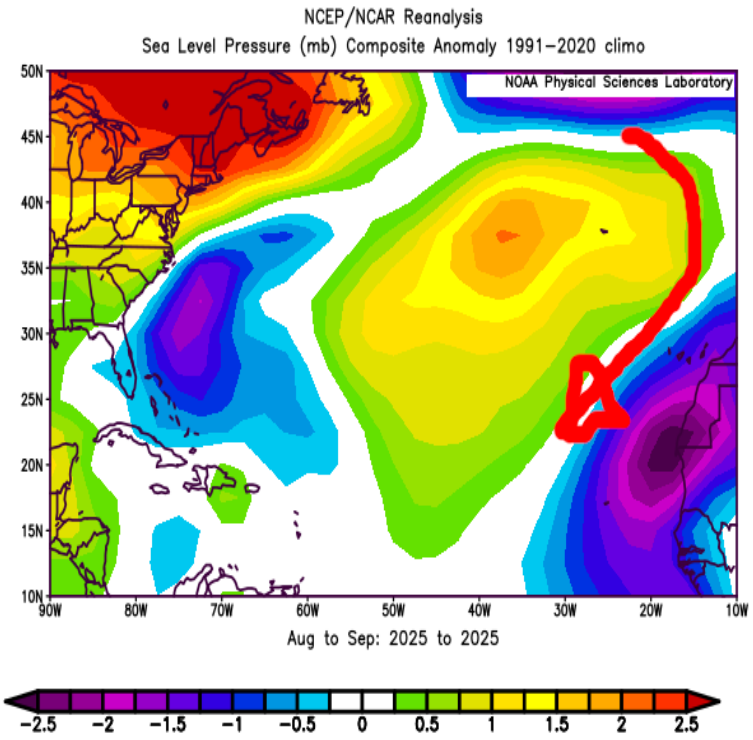
Mean sea level pressure across the tropical Atlantic and the Caribbean Sea has been mostly higher than normal. Higher than normal sea level pressure is indicative of a more stable atmosphere detrimental to deep convection and tropical cyclone genesis. The Caribbean Sea saw minimal tropical cyclone activity prior to hurricane Melissa, and all storms that tracked across the tropical Atlantic were weak and didn't develop into hurricanes until they moved into the sub-tropics (apart from hurricane Melissa).

b) Vertical Wind Shear



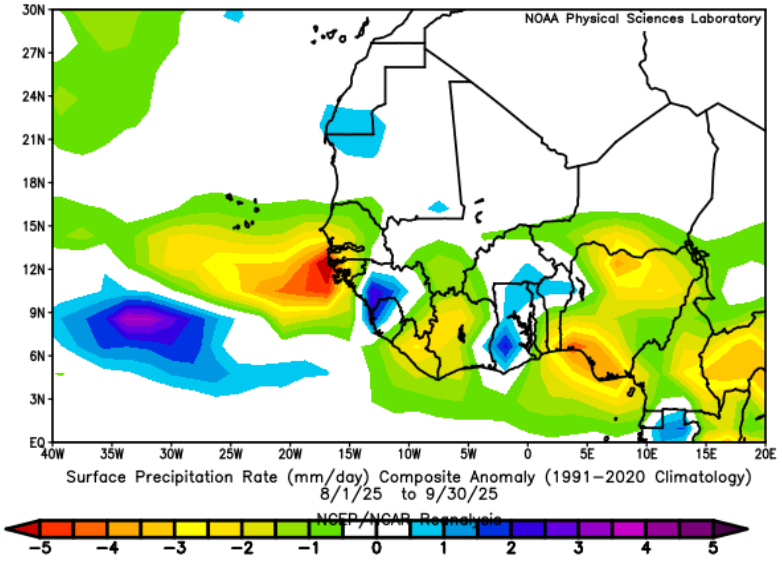
During August, much of the month saw above-average wind shear across the tropical Atlantic, which is inhibitive to tropical cyclone genesis and strengthening. This is likely one reason why storms developing and tracking across the tropical Atlantic struggled to intensify. The Caribbean had below-average wind shear through August-September, meaning wind shear is unlikely to be a reason for the largely very low levels of tropical cyclone activity across the peak season in this region.

c) Advection of stable air from the mid-latitudes



August-September sea level pressure across the central Atlantic was higher than normal, indicative of a stronger than normal Azores high pressure system. Anomalous north/north-east winds over the eastern Atlantic advected cooler, drier mid-latitude air into the tropical Atlantic. This drier air contributed to suppressing the development of easterly waves into tropical cyclones by inhibiting deep convection.

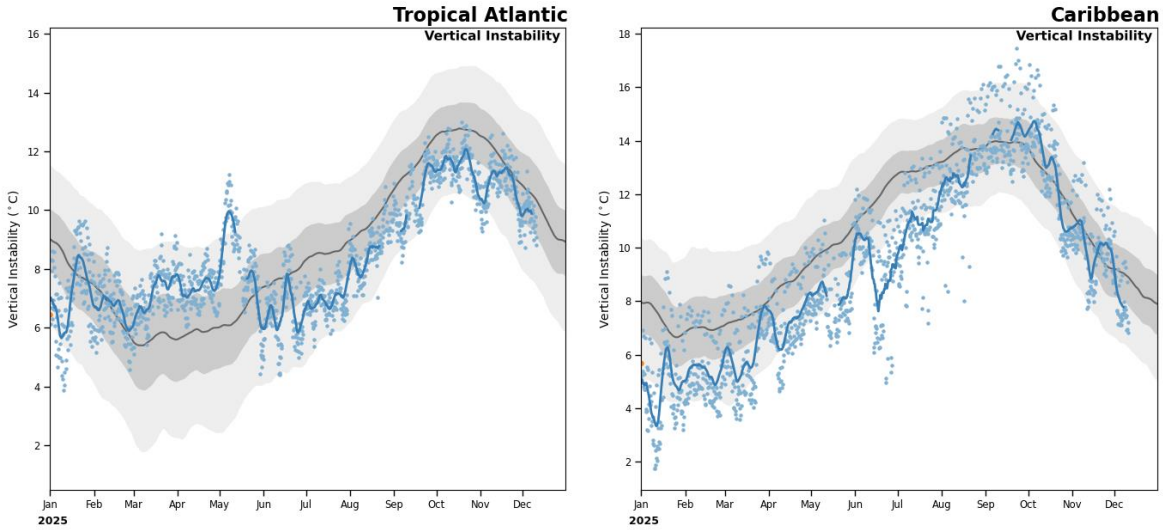
d) Below-average rainfall across eastern tropical Atlantic



Parts of the West African and eastern Atlantic tropical regions saw below-average rainfall through much of August and September. Below-normal rainfall in this region is indicative of reduced deep convection and weaker easterly waves propagating

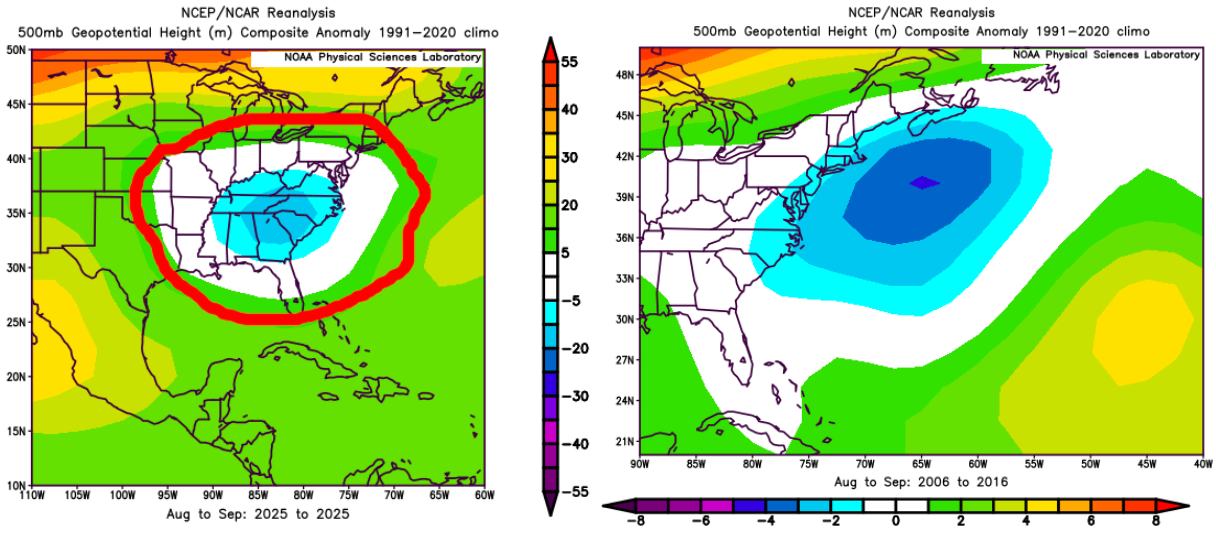
into the Atlantic. Weaker easterly waves are more likely to dissipate due to dry air or vertical wind shear before they can move into more favourable conditions and develop into tropical cyclones.

e) Low Vertical Instability



Vertical instability across the tropical Atlantic and Caribbean has been below normal through much of the hurricane season. Below-normal vertical instability is detrimental to deep convection and the development of disturbances into tropical cyclones.

f) Very low U.S. Landfalling Activity



August-September 500mb geopotential height anomaly in 2025 (left) and from August-September 2006-2016 (right) a period when no category 3 or higher hurricanes made landfall in the U.S.

The 2025 North Atlantic hurricane season consisted almost entirely of storms that formed in the tropical or sub-tropical Atlantic Ocean and recurved out to sea. Only hurricane Melissa managed to form in the Caribbean Sea and unfortunately

recurved in the direction of Jamaica whilst it was undergoing rapid intensification. There was anomalous troughing at mid and upper levels over the U.S. eastern seaboard, which has been a feature of active hurricane seasons in the past that have featured below-normal hurricane landfalls on the U.S. mainland. This troughing results in atmospheric steering winds deflecting storms away from the U.S. coastline, back out to sea.

Forecasts for 2026

The TSR extended range forecast for the 2026 North Atlantic hurricane season can be found here. Updated TSR outlooks will be issued on the 7th April, 29th May, 6th July and the 5th August.