**FORECAST OF ATLANTIC SEASONAL HURRICANE ACTIVITY AND LANDFALL STRIKE PROBABILITY FOR 2015**

We continue to foresee a well below-average 2015 Atlantic hurricane season. A strong El Niño event is already underway. Conditions in the tropical Atlantic remain unfavorable for hurricane formation. We continue to call for a below-average probability of United States and Caribbean major hurricane landfall.

(as of 4 August 2015)

By Philip J. Klotzbach[1] and William M. Gray[2]

This forecast as well as past forecasts and verifications are available online at http://hurricane.atmos.colostate.edu/Forecasts

Kate Jeracki, Colorado State University Media Representative, (970-491-2658) is available to answer various questions about this verification.

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ATLANTIC BASIN SEASONAL HURRICANE FORECAST FOR 2015

| Forecast Parameter and 1981-2010 Median (in parentheses) | Issue Date 9 April 2015 | Issue Date 1 June 2015 | Issue Date 1 July 2015 | Observed Activity Through July 2015 | Forecast Activity After 31 July | **Total Seasonal Forecast** |
|---|---|---|---|---|---|---|
| Named Storms (NS) (12.0) | 7 | 8 | 8 | 3 | 5 | **8** |
| Named Storm Days (NSD) (60.1) | 30 | 30 | 30 | 5.50 | 19.50 | **25** |
| Hurricanes (H) (6.5) | 3 | 3 | 3 | 0 | 2 | **2** |
| Hurricane Days (HD) (21.3) | 10 | 10 | 10 | 0 | 8 | **8** |
| Major Hurricanes (MH) (2.0) | 1 | 1 | 1 | 0 | 1 | **1** |
| Major Hurricane Days (MHD) (3.9) | 0.5 | 0.5 | 0.5 | 0 | 0.5 | **0.5** |
| Accumulated Cyclone Energy (ACE) (92) | 40 | 40 | 40 | 4 | 31 | **35** |
| Net Tropical Cyclone Activity (NTC) (103%) | 45 | 45 | 45 | 5 | 35 | **40** |

POST-31 JULY PROBABILITIES FOR AT LEAST ONE MAJOR (CATEGORY 3-4-5) HURRICANE LANDFALL ON EACH OF THE FOLLOWING UNITED STATES COASTAL AREAS:

1) Entire U.S. coastline - 23% (full-season average for last century is 52%)

2) U.S. East Coast Including Peninsula Florida - 12% (full-season average for last century is 31%)

3) Gulf Coast from the Florida Panhandle westward to Brownsville - 12% (full-season average for last century is 30%)

POST-31 JULY PROBABILITIES FOR AT LEAST ONE MAJOR (CATEGORY 3-4-5) HURRICANE TRACKING INTO THE CARIBBEAN (10-20°N, 60-88°W)

1) 17% (full-season average for last century is 42%)

POST-31 JULY HURRICANE IMPACT PROBABILITIES FOR 2015 (NUMBERS IN PARENTHESES ARE LONG-PERIOD FULL SEASON AVERAGES)

| State | Hurricane | Major Hurricane |
|---|---|---|
| **Texas** | 13% (33%) | 4% (12%) |
| **Louisiana** | 12% (30%) | 4% (12%) |
| **Mississippi** | 4% (11%) | 2% (4%) |
| **Alabama** | 6% (16%) | 1% (3%) |
| **Florida** | 22% (51%) | 8% (21%) |
| **Georgia** | 4% (11%) | <1% (1%) |
| **South Carolina** | 6% (17%) | 1% (4%) |
| **North Carolina** | 11% (28%) | 3% (8%) |
| **Virginia** | 2% (6%) | <1% (1%) |
| **Maryland** | <1% (1%) | <1% (<1%) |
| **Delaware** | <1% (1%) | <1% (<1%) |
| **New Jersey** | <1% (1%) | <1% (<1%) |
| **New York** | 3% (8%) | 1% (3%) |
| **Connecticut** | 2% (7%) | 1% (2%) |
| **Rhode Island** | 2% (6%) | 1% (3%) |
| **Massachusetts** | 2% (7%) | 1% (2%) |
| **New Hampshire** | <1% (1%) | <1% (<1%) |
| **Maine** | 1% (4%) | <1% (<1%) |

POST-31 JULY PROBABILITIES OF HURRICANES AND MAJOR HURRICANES TRACKING WITHIN 100 MILES OF EACH ISLAND OR LANDMASS FOR 2015 (NUMBERS IN PARENTHESES ARE LONG-PERIOD FULL SEASON AVERAGES)

| Island/Landmass | Hurricane within 100 Miles | Major Hurricane within 100 Miles |
|---|---|---|
| **The Bahamas** | 22% (51%) | 12% (30%) |
| **Cuba** | 23% (52%) | 11% (28%) |
| **Haiti** | 10% (27%) | 5% (13%) |
| **Jamaica** | 10% (25%) | 4% (11%) |
| **Mexico (East Coast)** | 26% (57%) | 9% (23%) |
| **Puerto Rico** | 11% (29%) | 5% (13%) |
| **Turks and Caicos** | 9% (24%) | 3% (9%) |
| **US Virgin Islands** | 12% (30%) | 4% (12%) |

**Please also visit the Landfalling Probability Webpage at http://www.e-transit.org/hurricane for landfall probabilities for 11 U.S. coastal regions and 205 coastal and near-coastal counties from Brownsville, Texas to Eastport, Maine as well as probabilities for every island in the Caribbean. We suggest that all coastal residents visit the Landfall Probability Webpage for their individual location probabilities.**

# ABSTRACT

Information obtained through July 2015 indicates that the remainder of the 2015 Atlantic hurricane season will be much less active than the average 1981-2010 season. We estimate that the remainder of 2015 will have about 2 hurricanes (average is 5.5), 5 named storms (average is 10.5), 19.5 named storm days (average is 58), 8 hurricane days (average is 21.3), 1 major (Category 3-4-5) hurricane (average is 2.0) and 0.5 major hurricane days (average is 3.9). The probability of U.S. major hurricane landfall and Caribbean major hurricane activity for the remainder of the 2015 season is estimated to be well below its long-period average. We expect the remainder of the Atlantic basin hurricane season to accrue Net Tropical Cyclone (NTC) activity approximately 35 percent of the seasonal average. We have maintained our below-average seasonal forecast, primarily due to a strong El Niño that is now firmly entrenched in the tropical Pacific. In addition, vertical wind shear during July was at record high levels in the Caribbean.

This forecast is based on a newly-developed extended-range early August statistical prediction scheme developed over the previous 33 years. Analog predictors were also considered.

Starting today and issued every two weeks following (e.g., August 4, August 18, September 1, etc.), we will issue two-week forecasts for Atlantic TC activity during the peak of the Atlantic hurricane season from August-October. A late-season forecast for the Caribbean basin will be issued on Thursday, October 1.

# Special Note from Bill Gray

I began making seasonal Atlantic hurricane forecasts from Colorado State University (CSU) in 1984 and have been involved with all of the seasonal forecasts over the past 31 years. Phil Klotzbach joined my research project as a graduate student in 2000. He had an outstanding academic undergraduate record and a great desire to study hurricanes. He was a talented graduate student. He received both his M.S. (2002) and Ph. D. (2007) degrees on climate-hurricane related topics.

Phil has shown outstanding growth in his knowledge and prowess as a hurricane researcher and forecaster over the last 15 years. He continues to work full-time at improving our understanding of the global climate-hurricane relationship and in the development of new and more skillful forecast products.

Klotzbach became lead author on the CSU forecasts in 2006 and in recent years has expended most of his efforts in researching and writing up these forecasts and their post-season evaluation. We still talk nearly every day on climate-hurricane matters, and no forecast has been released without my detailed comments. Phil has been making all the final forecast decisions in recent years. He has, nevertheless, appointed me to serve in the important role of taking the blame for any and all forecast busts with all credit for successful forecasts going to him. I have fully embraced this special arrangement!

Although I still come to my office every working day and remain quite active, I am now devoting more of my research efforts to the climate change and global warming issue. For this reason I will be discontinuing my formal association with these seasonal hurricane forecasts at the end of this year. But I will remain as a special personal advisor to Phil in all of his future CSU hurricane forecasts as long as I am able.

I am happy at the progress in climate-hurricane relationship studies that have been made by my research project (including former graduate students Chris Landsea, John Knaff, Eric Blake and Todd Kimberlain) and by other non-CSU groups since I began issuing these forecasts in 1984. At that time we had no objective way of determining how active the upcoming hurricane season was likely to be. But we do now!

Age, technology change, and my growing new interests in the climate change debate dictate that I discontinue my formal involvement with these Atlantic basin seasonal hurricane forecasts after this year (my 32$^{nd}$). I expect and hope that Phil Klotzbach will carry these CSU seasonal hurricane forecasts forward for many years into the future with his ever improving hurricane-climate understanding and continuous forecast skill improvement. There is no one (in my view) better able to do this than Phil. I will assist him in the coming years as much as I can.

## Why issue forecasts for seasonal hurricane activity?

We are frequently asked this question. Our answer is that it is possible to say something about the probability of the coming year's hurricane activity which is superior to climatology. The Atlantic basin has the largest year-to-year variability of any of the global tropical cyclone basins. People are curious to know how active the upcoming season is likely to be, particularly if you can show hindcast skill improvement over climatology for many past years.

Everyone should realize that it is impossible to precisely predict this season's hurricane activity in early August. There is, however, much curiosity as to how global ocean and atmosphere features are presently arranged as regards to the probability of an active or inactive hurricane season for the coming year. Our new early August statistical forecast methodology shows strong evidence over 33 past years that improvement over climatology can be attained. We utilize this newly-developed model when issuing this year's forecast. **We would never issue a seasonal hurricane forecast unless we had a statistical model constructed over a long hindcast period which showed significant skill over climatology.**

We issue these forecasts to satisfy the curiosity of the general public and to bring attention to the hurricane problem. There is a general interest in knowing what the odds are for an active or inactive season. One must remember that our forecasts are based on the premise that those global oceanic and atmospheric conditions which preceded comparatively active or inactive hurricane seasons in the past provide meaningful information about similar trends in future seasons. This is not always true for individual seasons. It is also important that the reader appreciate that these seasonal forecasts are based on statistical schemes which, owing to their intrinsically probabilistic nature, will fail in some years. Moreover, these forecasts do not specifically predict where within the Atlantic basin these storms will strike. The probability of landfall for any one location along the coast is very low and reflects the fact that, in any one season, most U.S. coastal areas will not feel the effects of a hurricane no matter how active the individual season is.

Acknowledgment

We are grateful for support from Interstate Restoration, Ironshore Insurance and Macquarie Group that partially support the release of these predictions. We acknowledge a grant from the G. Unger Vetlesen Foundation for additional financial support. We thank the GeoGraphics Laboratory at Bridgewater State University (MA) for their assistance in developing the United States Landfalling Hurricane Probability Webpage (available online at http://www.e-transit.org/hurricane).

The second author gratefully acknowledges the valuable input to his CSU seasonal forecast research project over many years by former graduate students and now colleagues Chris Landsea, John Knaff and Eric Blake. We also thank Professors Paul Mielke and Ken Berry of Colorado State University for statistical analysis and guidance over many years. We thank Bill Thorson for technical advice and assistance.

## DEFINITIONS AND ACRONYMS

Accumulated Cyclone Energy (ACE) - A measure of a named storm's potential for wind and storm surge destruction defined as the sum of the square of a named storm's maximum wind speed (in $10^4$ $knots^2$) for each 6-hour period of its existence. The 1950-2000 average value of this parameter is 96 for the Atlantic basin.

Atlantic Multi-Decadal Oscillation (AMO) – A mode of natural variability that occurs in the North Atlantic Ocean and evidencing itself in fluctuations in sea surface temperature and sea level pressure fields. The AMO is likely related to fluctuations in the strength of the oceanic thermohaline circulation. Although several definitions of the AMO are currently used in the literature, we define the AMO based on North Atlantic sea surface temperatures from 50-60°N, 10-50°W.

Atlantic Basin – The area including the entire North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico.

El Niño – A 12-18 month period during which anomalously warm sea surface temperatures occur in the eastern half of the equatorial Pacific. Moderate or strong El Niño events occur irregularly, about once every 3-7 years on average.

Hurricane (H) - A tropical cyclone with sustained low-level winds of 74 miles per hour (33 $ms^{-1}$ or 64 knots) or greater.

Hurricane Day (HD) - A measure of hurricane activity, one unit of which occurs as four 6-hour periods during which a tropical cyclone is observed or is estimated to have hurricane-force winds.

Madden Julian Oscillation (MJO) – A globally propagating mode of tropical atmospheric intra-seasonal variability. The wave tends to propagate eastward at approximately 5 $ms^{-1}$, circling the globe in roughly 40-50 days.

Main Development Region (MDR) – An area in the tropical Atlantic where a majority of tropical cyclones that become major hurricanes form, which we define as 10-20°N, 20-60°W.

Major Hurricane (MH) - A hurricane which reaches a sustained low-level wind of at least 111 mph (96 knots or 50 $ms^{-1}$) at some point in its lifetime. This constitutes a category 3 or higher on the Saffir/Simpson scale.

Major Hurricane Day (MHD) - Four 6-hour periods during which a hurricane has an intensity of Saffir/Simpson category 3 or higher.

Multivariate ENSO Index (MEI) – An index defining ENSO that takes into account tropical Pacific sea surface temperatures, sea level pressures, zonal and meridional winds and cloudiness.

Named Storm (NS) - A hurricane, a tropical storm or a sub-tropical storm.

Named Storm Day (NSD) - As in HD but for four 6-hour periods during which a tropical or sub-tropical cyclone is observed (or is estimated) to have attained tropical storm-force winds.

Net Tropical Cyclone (NTC) Activity –Average seasonal percentage mean of NS, NSD, H, HD, MH, MHD. Gives overall indication of Atlantic basin seasonal hurricane activity. The 1950-2000 average value of this parameter is 100.

Saffir/Simpson Hurricane Wind Scale – A measurement scale ranging from 1 to 5 of hurricane wind intensity. One is a weak hurricane; whereas, five is the most intense hurricane.

Southern Oscillation Index (SOI) – A normalized measure of the surface pressure difference between Tahiti and Darwin. Low values typically indicate El Niño conditions.

Sea Surface Temperature – SST

Sea Surface Temperature Anomaly – SSTA

Thermohaline Circulation (THC) – A large-scale circulation in the Atlantic Ocean that is driven by fluctuations in salinity and temperature. When the THC is stronger than normal, the AMO tends to be in its warm (or positive) phase, and more Atlantic hurricanes typically form.

Tropical Cyclone (TC) - A large-scale circular flow occurring within the tropics and subtropics which has its strongest winds at low levels; including hurricanes, tropical storms and other weaker rotating vortices.

Tropical North Atlantic (TNA) index – A measure of sea surface temperatures in the area from 5.5-23.5°N, 15-57.5°W.

Tropical Storm (TS) - A tropical cyclone with maximum sustained winds between 39 mph (18 $ms^{-1}$ or 34 knots) and 73 mph (32 $ms^{-1}$ or 63 knots).

Vertical Wind Shear – The difference in horizontal wind between 200 mb (approximately 40000 feet or 12 km) and 850 mb (approximately 5000 feet or 1.6 km).

1 knot = 1.15 miles per hour = 0.515 meters per second

# 1 Introduction

This is the 32nd year in which the CSU Tropical Meteorology Project has made forecasts of the upcoming season's Atlantic basin hurricane activity. Our research team has shown that a sizable portion of the year-to-year variability of Atlantic tropical cyclone (TC) activity can be hindcast with skill exceeding climatology. This year's August forecast is based on a statistical methodology derived from 32 years of past data. Qualitative adjustments are added to accommodate additional processes which may not be explicitly represented by our statistical analyses. These evolving forecast techniques are based on a variety of climate-related global and regional predictors previously shown to be related to the forthcoming seasonal Atlantic basin TC activity and landfall probability. We believe that seasonal forecasts must be based on methods that show significant hindcast skill in application to long periods of prior data. It is only through hindcast skill that one can demonstrate that seasonal forecast skill is possible. This is a valid methodology provided that the atmosphere continues to behave in the future as it has in the past.

The best predictors do not necessarily have the best individual correlations with hurricane activity. The best forecast parameters are those that explain the portion of the variance of seasonal hurricane activity that is not associated with the other forecast variables. It is possible for an important hurricane forecast parameter to show little direct relationship to a predictand by itself but to have an important influence when included with a set of 2-3 other predictors.

A direct correlation of a forecast parameter may not be the best measure of the importance of this predictor to the skill of a 3-4 parameter forecast model. This is the nature of the seasonal or climate forecast problem where one is dealing with a very complicated atmospheric-oceanic system that is highly non-linear. There is a maze of changing physical linkages between the many variables. These linkages can undergo unknown changes from weekly to decadal time scales. It is impossible to understand how all these processes interact with each other. No one can completely understand the full complexity of the atmosphere-ocean system. But, it is still possible to develop a reliable statistical forecast scheme which incorporates a number of the climate system's non-linear interactions. Any seasonal or climate forecast scheme should show significant hindcast skill before it is used in real-time forecasts.

## 1.1 2015 Atlantic Basin Activity through July

The 2015 Atlantic basin hurricane season has had approximately average TC activity, based on the ACE index, during June and July.

<u>Ana</u> formed on May 8 as a subtropical cyclone from a surface trough off of the South Carolina coast. It drifted slowly northwestward under weak steering currents and

made landfall near Myrtle Beach, SC on May 10. It dissipated over land shortly thereafter. Minimal damage and no direct fatalities were reported from Ana.

Bill developed on June 16 from an upper-level trough and moved slowly northwestward towards the Texas coast. It strengthened to its maximum intensity of 50 knots just before making landfall near Port O'Connor Texas. It then weakened to a tropical depression on June 17. It brought considerable rainfall to Texas and Oklahoma, and its associated flooding drowned two individuals in Oklahoma.

Claudette was a short-lived tropical cyclone that formed from a non-tropical area of low pressure northeast of North Carolina on July 13. It accelerated towards the northeast and became extratropcial on July 15.

Table 1 records observed Atlantic basin TC activity through 31 July, while tracks through 31 July are displayed in Figure 1. All TC activity calculations are based upon data available in the National Hurricane Center's b-decks.

Table 1: Observed 2015 Atlantic basin tropical cyclone activity through July 31. Dates listed are those where TCs had maximum sustained winds of at least 35 knots and are given in UTC time.

| Highest Category | Name | Dates | Peak Sustained Winds (kts)/lowest SLP (mb) | NSD | HD | MHD | ACE | NTC |
|---|---|---|---|---|---|---|---|---|
| TS | Ana | May 8 – 10 | 50 kt/998 mb | 2.75 | | | 2.1 | 2.7 |
| TS | Bill | June 16 – 17 | 50 kt/997 mb | 1.25 | | | 1.0 | 2.2 |
| TS | Claudette | July 13 – 15 | 45 kt/1004 mb | 1.50 | | | 1.1 | 2.2 |
| | | | | | | | | |
| Totals | 3 | | | 5.50 | | | 4.3 | 7.1 |

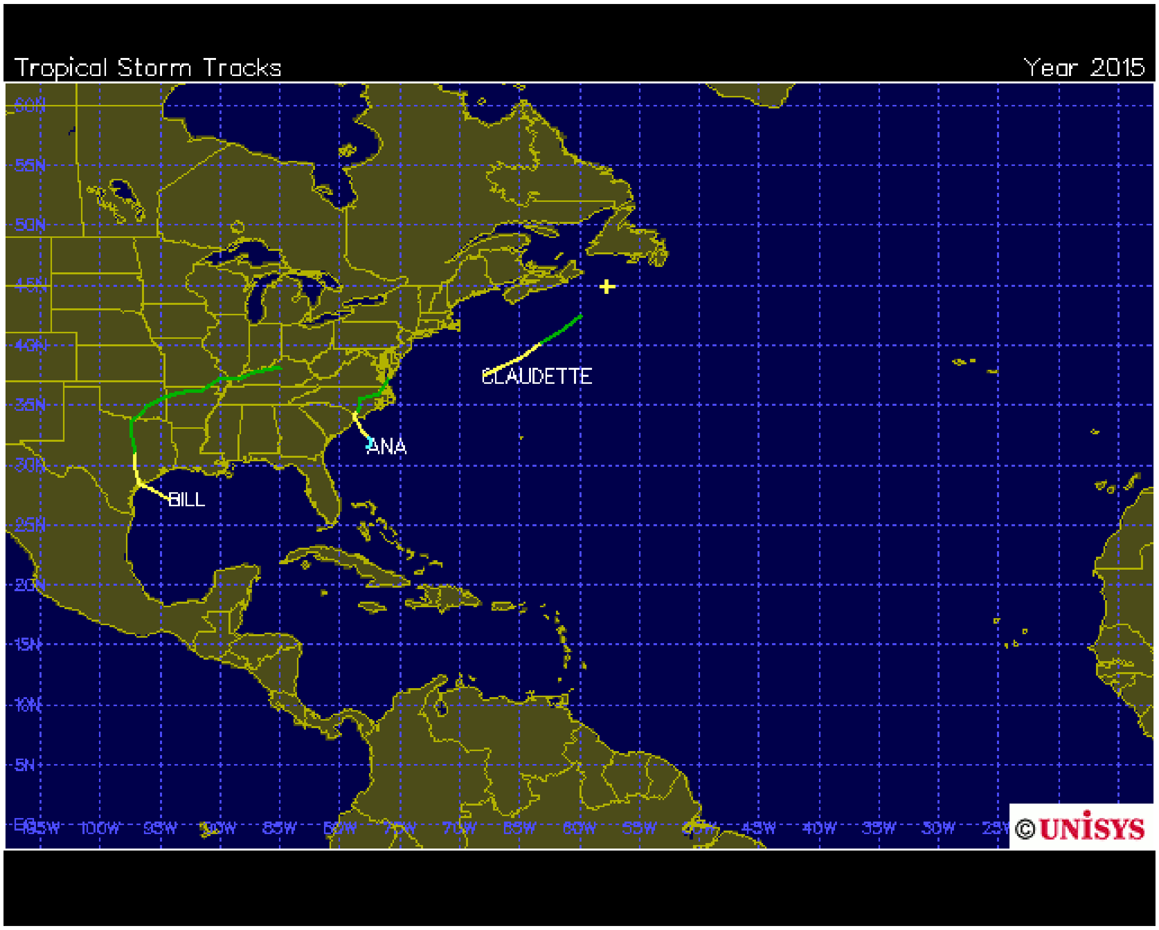


Figure 1: 2015 Atlantic basin hurricane tracks through July. Figure courtesy of Unisys weather (http://weather.unisys.com). A yellow lines indicate a TC at tropical storm strength, a cyan line indicates a TC at subtropical storm strength, while a green line indicates a TC at tropical depression storm strength.

## 2 Newly-Developed 1 August Forecast Scheme

We developed a new 1 August statistical seasonal forecast scheme for the prediction of Net Tropical Cyclone (NTC) activity three years ago. This model uses a total of three predictors, all of which are selected from the ERA-Interim Reanalysis dataset, which is available from 1979-present. Real-time predictor estimates are done from the Climate Forecast System version 2 products, as ERA-Interim Reanalysis products are not available in real time. The major components of the forecast scheme are discussed in the next few paragraphs.

The pool of three predictors for this new early August statistical forecast scheme is given and defined in Table 2. The location of each of these predictors is shown in Figure 2. Skillful forecasts can be issued for post-31 July NTC based upon hindcast results over the period from 1979-2011 as well as real-time forecasts in 2012 and 2014.

Like all of our forecasts, the model did not anticipate the below-average 2013 Atlantic hurricane season. When these three predictors are combined, they correlate at 0.88 with observed NTC using a drop-one cross validation approach over the period from 1979-2014 (Figure 3).

Table 2: Listing of 1 August 2015 predictors for this year's hurricane activity using the new statistical model. A plus (+) means that positive deviations of the parameter indicate increased hurricane activity this year, and a minus (-) means that positive deviations of the parameter indicate decreased hurricane activity this year. Two of the three predictors are calling for a below-average season this year.

| Predictor | Values for 2015 Forecast | Effect on 2015 Hurricane Season |
|---|---|---|
| 1) July Surface U (10-17.5°N, 60-85°W) (+) | -1.1 SD | Suppress |
| 2) July Surface Temperature (20-40°N, 15-35°W) (+) | +1.2 SD | Enhance |
| 3) July 200 mb U (5-15°N, 0-40°E) (-) | +3.4 SD | Strongly Suppress |

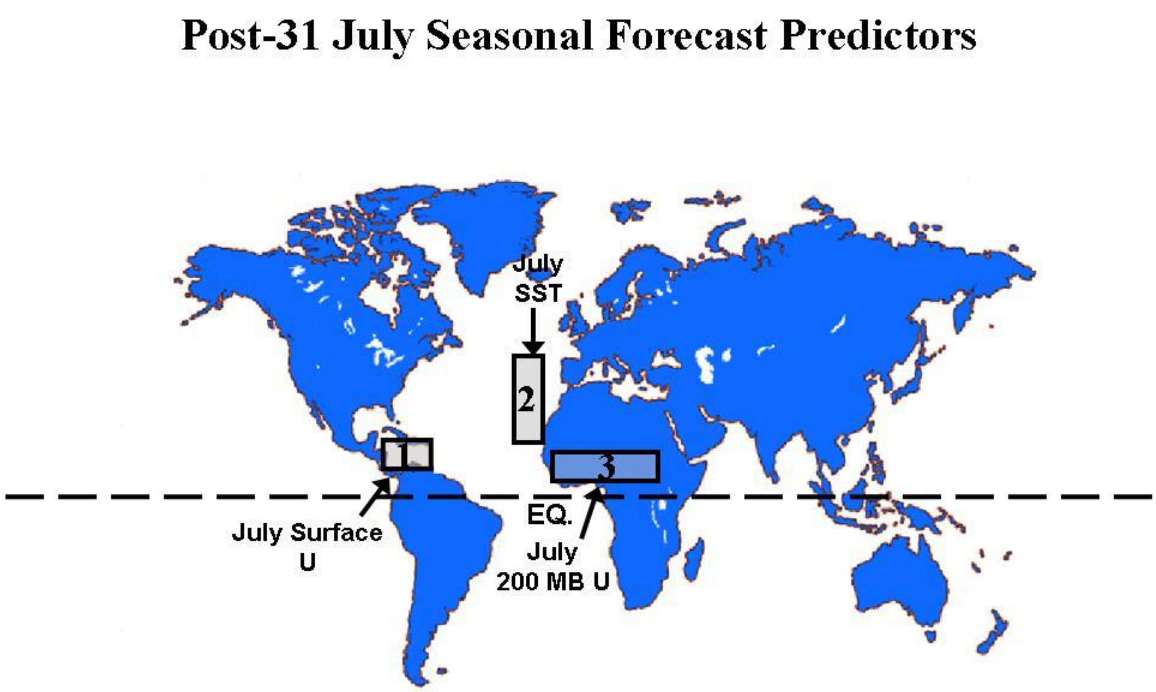


Figure 2: Location of predictors for the post-31 July forecast for the 2015 hurricane season from the new statistical model.

Post-31 July NTC (Observed vs. Cross-Validated Hindcast)

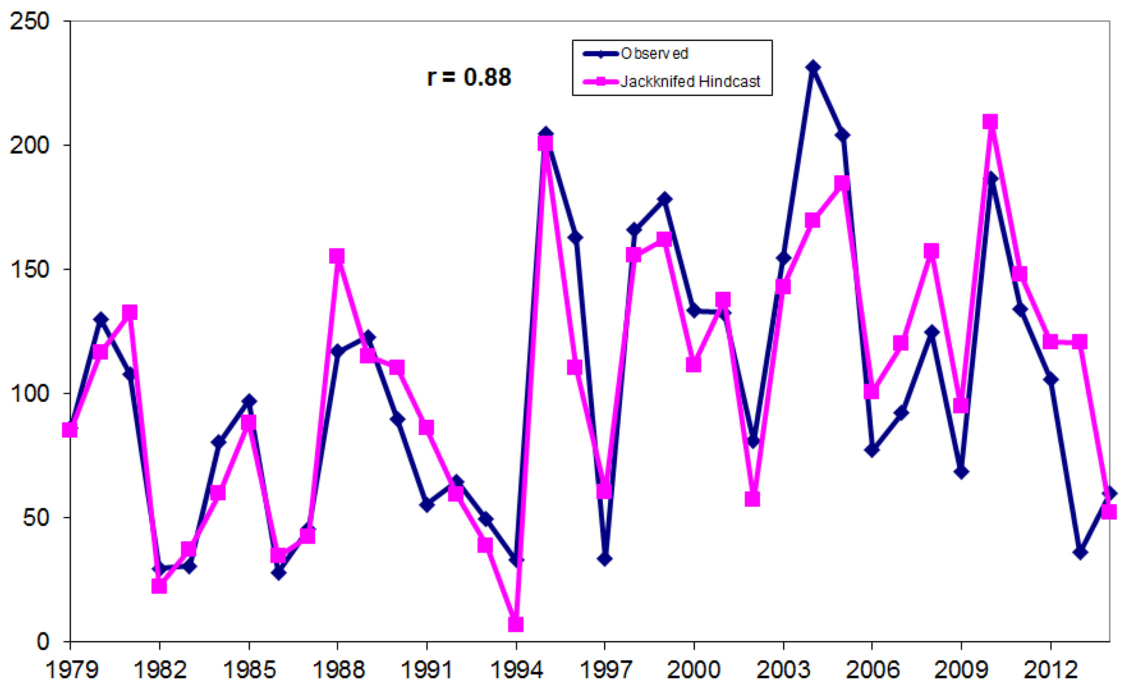


Figure 3: Observed versus hindcast values of post-31 July NTC for 1979-2014 using the new statistical scheme.

Table 3 shows our statistical forecast for the 2015 hurricane season from the new statistical model and the comparison of this forecast with the 1981-2010 median. Our statistical forecast is calling for a very quiet remainder of the hurricane season.

Table 3: Post-31 July statistical forecast for 2015 from the new statistical model.

| Predictands and Climatology (1981-2010 Post-31 July Median) | Statistical Forecast |
|---|---|
| Named Storms (NS) – 10.5 | 6.9 |
| Named Storm Days (NSD) – 58.0 | 24.5 |
| Hurricanes (H) – 5.5 | 3.2 |
| Hurricane Days (HD) – 21.3 | 6.9 |
| Major Hurricanes (MH) – 2.0 | 0.4 |
| Major Hurricane Days (MHD) – 3.8 | 0.0 |
| Accumulated Cyclone Energy Index (ACE) – 86 | 28 |
| Net Tropical Cyclone Activity (NTC) – 95 | 35 |

Table 4 displays our early August cross-validated hindcasts for 1979-2011 along with the real-time forecasts in 2012-2014 using the new statistical scheme. Our early August model has correctly predicted above- or below-average post-31 July NTC in 31 out of 36 years (86%). These hindcasts have had a smaller error than climatology in 25 out of 36 years (69%). Our average hindcast errors have been 21 NTC units, compared with 46 NTC units had we used only climatology.

Table 4: Observed versus hindcast post-31 July NTC for 1979-2014 using the new statistical scheme. Average errors for hindcast NTC and climatological NTC predictions are given without respect to sign. Red bold-faced years in the "Hindcast NTC" column are years that we did not go the right way, while red bold-faced years in the "Hindcast improvement over Climatology" column are years that we did not beat climatology.

| Year | Observed NTC | Hindcast NTC | Observed minus Hindcast | Observed minus Climatology | Hindcast improvement over Climatology |
|---|---|---|---|---|---|
| 1979 | 86 | 85 | 1 | -9 | 8 |
| 1980 | 130 | 117 | 14 | 35 | 22 |
| 1981 | 108 | 132 | -24 | 13 | **-11** |
| 1982 | 30 | 22 | 7 | -65 | 58 |
| 1983 | 31 | 38 | -7 | -64 | 57 |
| 1984 | 80 | 60 | 21 | -15 | **-6** |
| 1985 | 97 | **88** | 9 | 2 | **-7** |
| 1986 | 28 | 35 | -7 | -67 | 60 |
| 1987 | 46 | 43 | 3 | -49 | 46 |
| 1988 | 117 | 155 | -38 | 22 | **-16** |
| 1989 | 123 | 115 | 8 | 28 | 20 |
| 1990 | 90 | **111** | -21 | -5 | **-16** |
| 1991 | 55 | 86 | -31 | -40 | 9 |
| 1992 | 65 | 59 | 5 | -30 | 25 |
| 1993 | 50 | 39 | 11 | -45 | 35 |
| 1994 | 33 | 7 | 26 | -62 | 36 |
| 1995 | 205 | 201 | 4 | 110 | 106 |
| 1996 | 163 | 111 | 53 | 68 | 16 |
| 1997 | 33 | 61 | -27 | -62 | 34 |
| 1998 | 166 | 156 | 10 | 71 | 61 |
| 1999 | 178 | 162 | 16 | 83 | 67 |
| 2000 | 134 | 112 | 22 | 39 | 17 |
| 2001 | 133 | 138 | -5 | 38 | 33 |
| 2002 | 81 | 57 | 24 | -14 | **-10** |
| 2003 | 155 | 143 | 12 | 60 | 48 |
| 2004 | 232 | 170 | 62 | 137 | 75 |
| 2005 | 204 | 185 | 19 | 109 | 90 |
| 2006 | 77 | **101** | -23 | -18 | **-6** |
| 2007 | 92 | **120** | -28 | -3 | **-25** |
| 2008 | 125 | 158 | -33 | 30 | **-3** |
| 2009 | 69 | 95 | -26 | -26 | 0 |
| 2010 | 187 | 209 | -22 | 92 | 69 |
| 2011 | 134 | 148 | -14 | 39 | 25 |
| 2012 | 106 | 121 | -15 | 11 | **-4** |
| 2013 | 36 | 121 | -85 | -59 | **-26** |
| 2014 | 60 | 52 | 8 | -35 | 27 |
| | | | | | |
| **Average** | **104** | **106** | **\|21\|** | **\|46\|** | **+25*** |

* This shows that we obtain a net (25/46) or 54 percent improvement over the year-to-year variance from climatology.

## 2.2 Physical Associations among Predictors Listed in Table 2

The locations and brief descriptions of the three predictors for our new August statistical forecast are now discussed. It should be noted that all forecast parameters correlate significantly with physical features during August through October that are known to be favorable for elevated levels of TC activity. For each of these predictors, we display a four-panel figure showing linear correlations between values of each predictor and August-October values of SST, sea level pressure (SLP), 850 mb (~1.5 km altitude) zonal wind (U), and 200 mb (~12 km altitude) zonal wind (U), respectively.

Predictor 1. July Surface U in the Caribbean (+)

(10-17.5°N, 60-85°W)

Low-level trade wind flow has been utilized as a predictor in seasonal forecasting systems for the Atlantic basin (Lea and Saunders 2004). When the trades are weaker-than-normal, SSTs across the tropical Atlantic tend to be elevated, and consequently a larger-than-normal Atlantic Warm Pool (AWP) is typically observed (Wang and Lee 2007) (Figure 4). A larger AWP also correlates with reduced vertical shear across the tropical Atlantic. Weaker trade winds are typically associated with higher pressure in the tropical eastern Pacific (a La Niña signal) and lower pressure in the Caribbean and tropical Atlantic. Both of these conditions generally occur when active hurricane seasons are observed. Predictor 1 also has a strong negative correlation with August-October-averaged 200-850-mb zonal shear.

Predictor 2. July Surface Temperature in the Northeastern Subtropical Atlantic (+)

(20°-40°N, 15-35°W)

A similar predictor was utilized in earlier August seasonal forecast models (Klotzbach 2007, Klotzbach 2011). Anomalously warm SSTs in the subtropical North Atlantic are associated with a positive phase of the Atlantic Meridional Mode (AMM), a northward-shifted Intertropical Convergence Zone, and consequently, reduced trade wind strength (Kossin and Vimont 2007). Weaker trade winds are associated with less surface evaporative cooling and less mixing and upwelling. This results in warmer tropical Atlantic SSTs during the August-October period (Figure 5).

Predictor 3. July 200 mb U over Northern Tropical Africa (-)

(5-15°N, 0-40°E)

Anomalous easterly flow at upper levels over northern tropical Africa provides an environment that is more favorable for easterly wave development into TCs. This anomalous easterly flow tends to persist through August-October, which reduces shear over the Main Development Region (MDR). This predictor also correlates with SLP and SST anomalies over the tropical eastern Pacific that are typically associated with cool ENSO conditions (Figure 6).

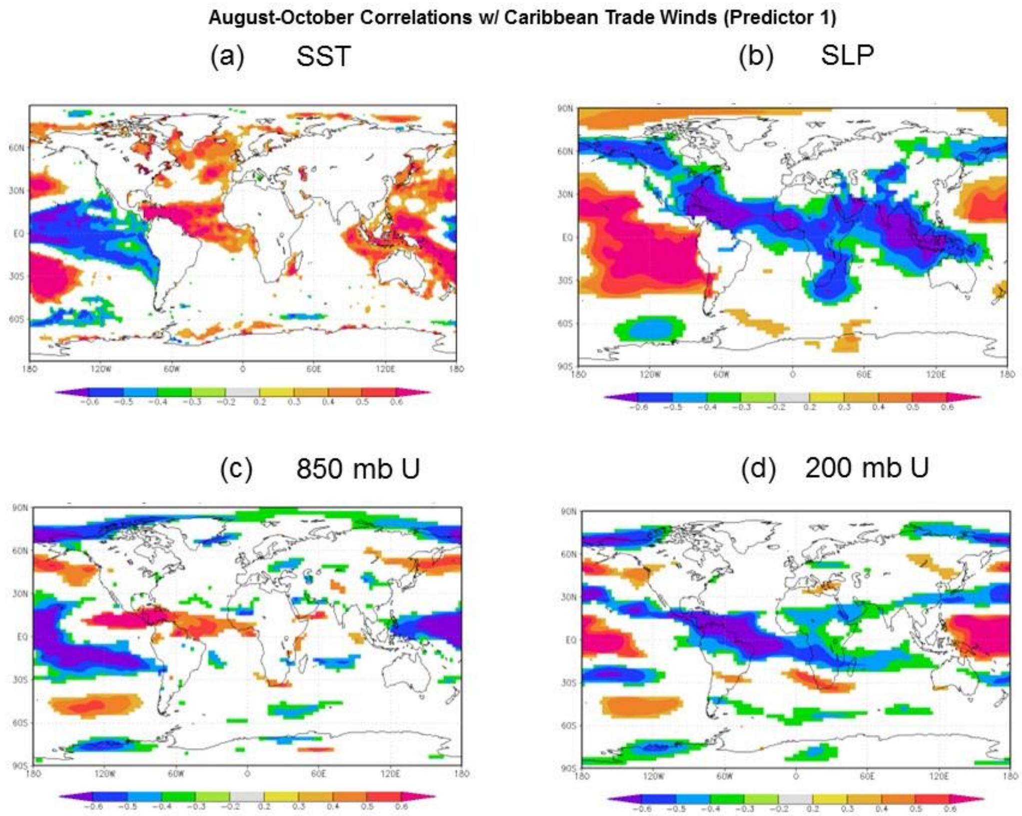


Figure 4: Linear correlations between <u>July Surface U</u> in the Caribbean <u>(Predictor 1)</u> and August-October sea surface temperature (panel a), August-October sea level pressure (panel b), August-October 850 mb zonal wind (panel c) and August-October 200 mb zonal wind (panel d) over the period from 1979-2011.

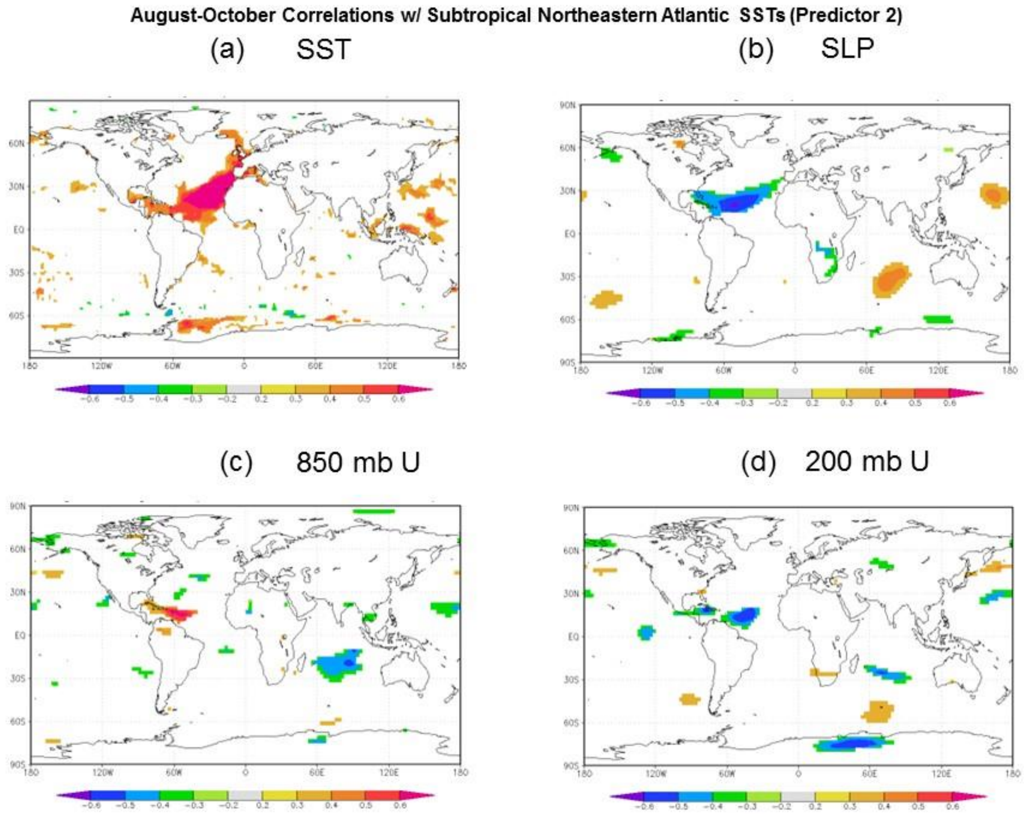


Figure 5: Linear correlations between July Surface Temperature in the Subtropical Northeastern Atlantic (Predictor 2) and August-October sea surface temperature (panel a), August-October sea level pressure (panel b), August-October 850 mb zonal wind (panel c) and August-October 200 mb zonal wind (panel d) over the period from 1979-2011.

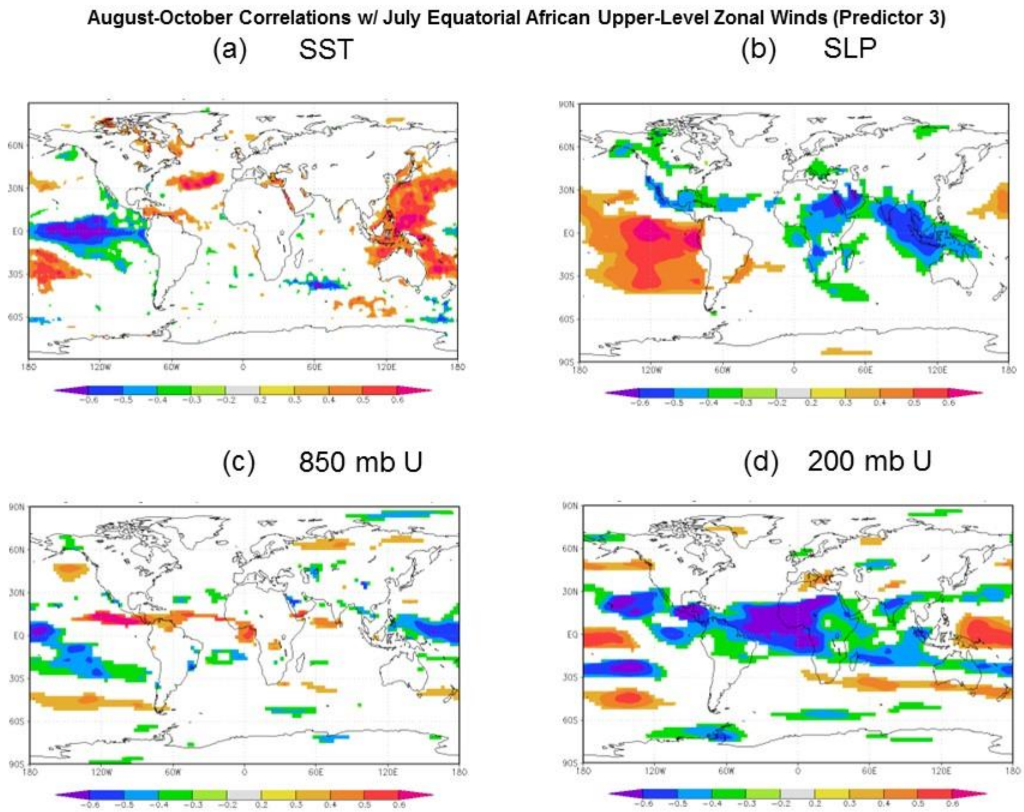


Figure 6: Linear correlations between July 200 MB Zonal Wind over tropical north Africa (Predictor 3) and August-October sea surface temperature (panel a), August-October sea level pressure (panel b), August-October 925 mb zonal wind (panel c) and August-October 200 mb zonal wind (panel d) over the period from 1979-2011. The color scale has been reversed so that the correlations match up with those in Figures 4 and 5.

## 3 Forecast Uncertainty

One of the questions that we are asked regarding our seasonal hurricane predictions is the degree of uncertainty that is involved. Obviously, our predictions are our best estimate, but there is with all forecasts an uncertainty as to how well they will verify.

Table 5 provides our post-31 July forecast, with error bars (based on one standard deviation of absolute errors) as calculated from hindcasts/forecasts of the Klotzbach (2007) scheme over the 1990-2009 period, using equations developed over the 1950-1989 period. We typically expect to see 2/3 of our forecasts verify within one standard deviation of observed values, with 95% of forecasts verifying within two standard deviations of observed values.

Table 5: Model hindcast error and our post-31 July 2015 hurricane forecast. Uncertainty ranges are given in one standard deviation (SD) increments.

| Parameter | Hindcast Error (SD) | Post-31 July 2015 Forecast | Uncertainty Range – 1 SD (67% of Forecasts Likely in this Range) |
|---|---|---|---|
| Named Storms (NS) | 2.3 | 5 | 2.7 - 7.3 |
| Named Storm Days (NSD) | 17.4 | 19.5 | 2.1 – 36.9 |
| Hurricanes (H) | 1.6 | 2 | 0.4 - 3.6 |
| Hurricane Days (HD) | 8.6 | 8 | 0 - 16.6 |
| Major Hurricanes (MH) | 0.9 | 1 | 0.1 - 1.9 |
| Major Hurricane Days (MHD) | 3.5 | 0.5 | 0 – 4 |
| Accumulated Cyclone Energy (ACE) | 36 | 31 | 0 – 67 |
| Net Tropical Cyclone (NTC) Activity | 34 | 35 | 0 - 69 |

# 4 Analog-Based Predictors for 2015 Hurricane Activity

Certain years in the historical record have global oceanic and atmospheric trends which are substantially similar to 2015. These years also provide useful clues as to likely trends in activity that the 2015 hurricane season may bring. For this early August forecast we determine which of the prior years in our database have distinct trends in key environmental conditions which are similar to current June-July 2015 conditions. Table 6 lists the best analog selections from our historical database.

We select prior hurricane seasons since 1950 which have similar atmospheric-oceanic conditions to those currently being experienced. We searched for years that had strong El Niño conditions along with generally TC-unfavorable tropical Atlantic conditions.

There were five hurricane seasons with characteristics most similar to what we observed in June-July 2015. The best analog years that we could find for the 2015 hurricane season were 1965, 1972, 1982, 1987, and 1997. We anticipate that 2015 seasonal hurricane activity will have activity that is slightly less than the average of these five analog years due to the fact that this year's El Niño strength has seldom been reached. We believe that the remainder of 2015 will have well below-average activity in the Atlantic basin.

Table 6: Best analog years for 2015 with the associated hurricane activity listed for each year.

| Year | NS | NSD | H | HD | MH | MHD | ACE | NTC |
|---|---|---|---|---|---|---|---|---|
| 1965 | 6 | 39.50 | 4 | 27.25 | 1 | 7.50 | 84 | 86 |
| 1972 | 7 | 30.75 | 3 | 6.25 | 0 | 0.00 | 36 | 35 |
| 1982 | 6 | 18.50 | 2 | 5.75 | 1 | 1.25 | 32 | 38 |
| 1987 | 7 | 37.25 | 3 | 5.00 | 1 | 0.50 | 34 | 46 |
| 1997 | 8 | 30.00 | 3 | 9.50 | 1 | 2.25 | 41 | 54 |
| | | | | | | | | |
| **Mean (Full Season)** | **6.8** | **31.2** | **3** | **10.75** | **0.8** | **2.3** | **45** | **52** |
| **2015 Forecast (Full Season)** | **8** | **25** | **2** | **8** | **1** | **0.5** | **35** | **40** |
| **1981-2010 Median (Full Season)** | **12.0** | **60.1** | **6.5** | **21.3** | **2.0** | **3.9** | **92** | **103** |

## 5 ENSO

Strong El Niño conditions currently exist across the tropical Pacific. SST anomalies are at near-record high levels across the tropical Pacific. Table 7 displays July and May SST anomalies for several Nino regions. The eastern tropical Pacific has warmed considerably over the past two months, consistent with the development of a strong El Niño.

Table 7: May and July 2015 SST anomalies for Nino 1+2, Nino 3, Nino 3.4, and Nino 4, respectively. July-May SST anomaly differences are also provided.

| Region | May SST Anomaly (°C) | July SST Anomaly (°C) | July minus May SST Change (°C) |
|---|---|---|---|
| Nino 1+2 | +2.4 | +3.0 | +0.6 |
| Nino 3 | +1.2 | +2.1 | +0.9 |
| Nino 3.4 | +1.0 | +1.6 | +0.6 |
| Nino 4 | +1.1 | +1.0 | -0.1 |

We are very confident that a strong El Niño will persist through the remainder of the Atlantic hurricane season. Typically, a strong El Niño is defined when the Nino 3.4 region records SST anomalies >= 1.5°C. As was shown in Table 6, this threshold was reached in July. The amount of upper-ocean heat content in the eastern and tropical Pacific remains well above-average, indicating that there is still a large amount of warmer-than-normal water near the surface of the ocean (Figure 7). In addition, low-level westerly wind flow has prevailed across the tropical Pacific over the past several months (Figure 8), triggering downwelling Kelvin waves which have generated the significant warming that has been observed to occur during this timeframe (Figure 9).

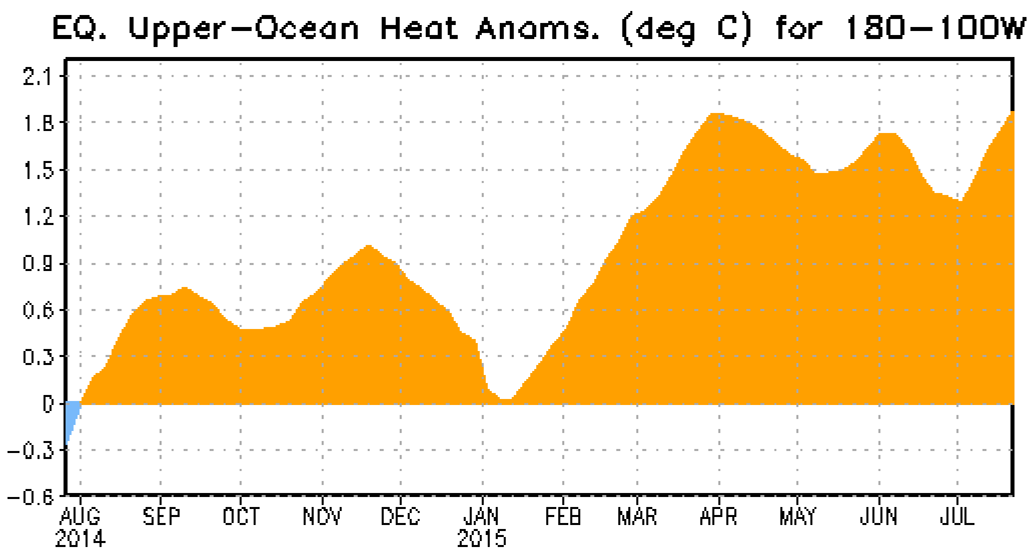


Figure 7: Upper-ocean (0-300 meters depth) heat content anomalies in the eastern and central Pacific since August 2014. Upper ocean heat content increased rapidly through April, and while fluctuating somewhat over the past few months, has remained at well above-average levels.

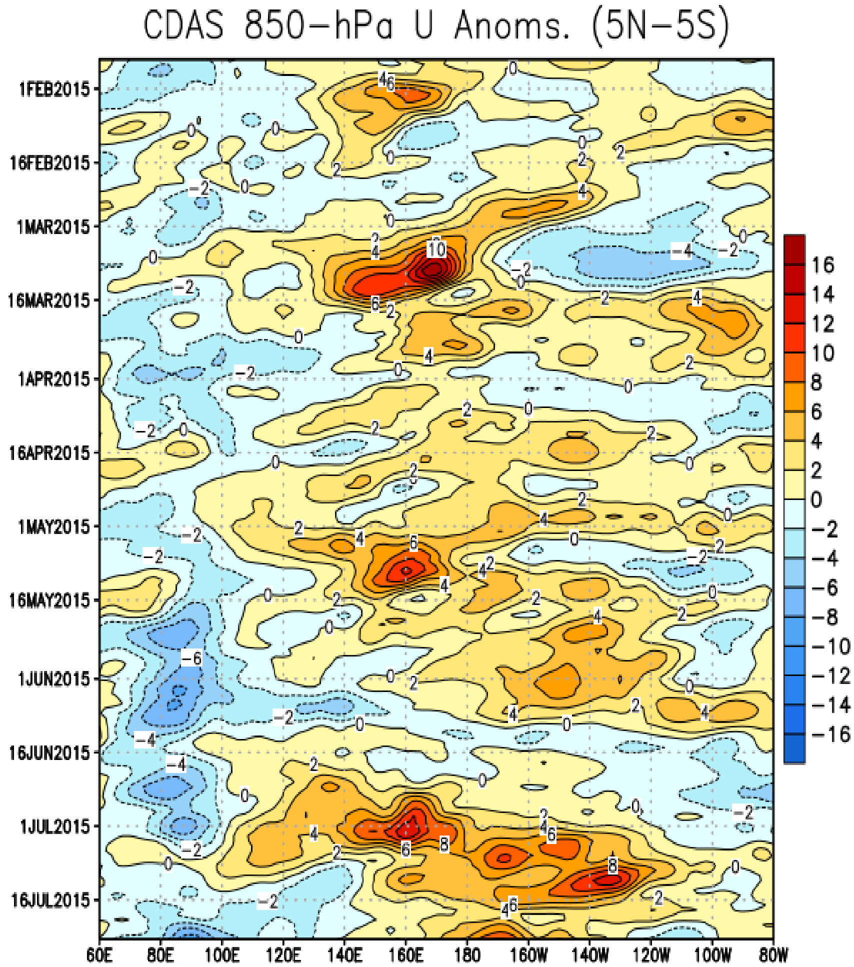


Figure 8: Anomalous 850-mb winds across the tropical Indian and Pacific Oceans from 12°E-80°W. Note the preponderance of anomalous westerly flow that has prevailed across the tropical Pacific for the past several months.

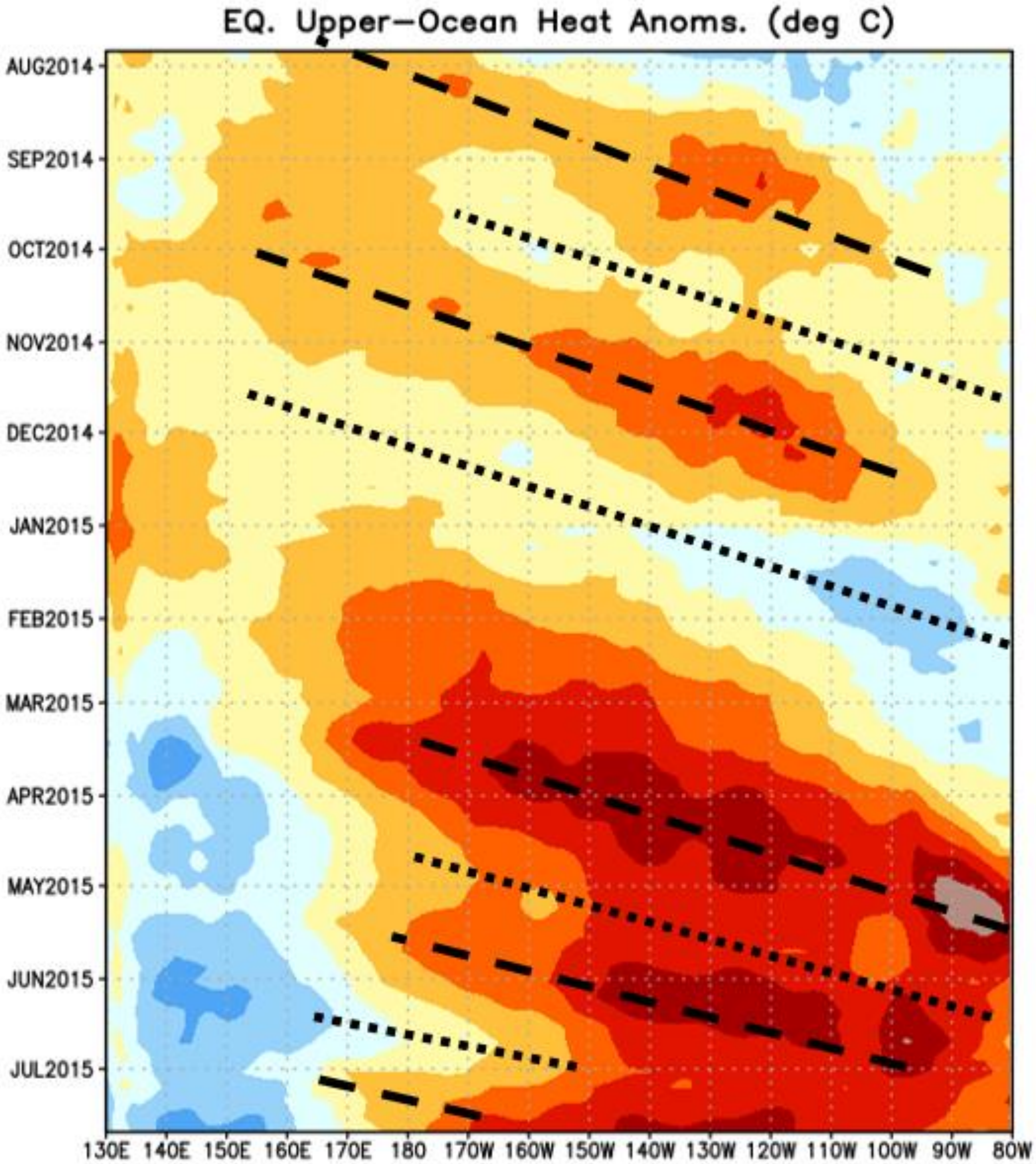


Figure 9: Upper-ocean heat content anomalies across the tropical Pacific. Dashed lines indicate downwelling (warming) Kelvin waves, while dotted lines indicate upwelling (cooling) Kelvin waves. A downwelling (warming) wave is current propagating across the tropical Pacific.

The European Centre for Medium-Range Weather Forecasts (ECMWF) typically shows the best prediction skill of the various ENSO models. The correlation skill between a 1 July forecast from the ECMWF model and the observed September Nino 3.4 anomaly is 0.89, based on hindcasts/forecasts from 1982-2010, explaining approximately 79% of the variance in Nino 3.4 SST. For reference, the correlation skill of a 1 May forecast from the ECMWF model was 0.82, indicating that approximately 15% additional variance can be explained by shortening the lead time of the forecast from 1 May to 1 July. The ECMWF model has recently been upgraded to system 4, indicating that improved ENSO skill may be possible. The average of the various ECMWF ensemble members is calling for a September Nino 3.4 SST anomaly of greater than 2.0°C (Figure 10). The warmest El Niño since 1950 (1997) had a September Nino 3.4 SST anomaly of approximately 2.0°C.

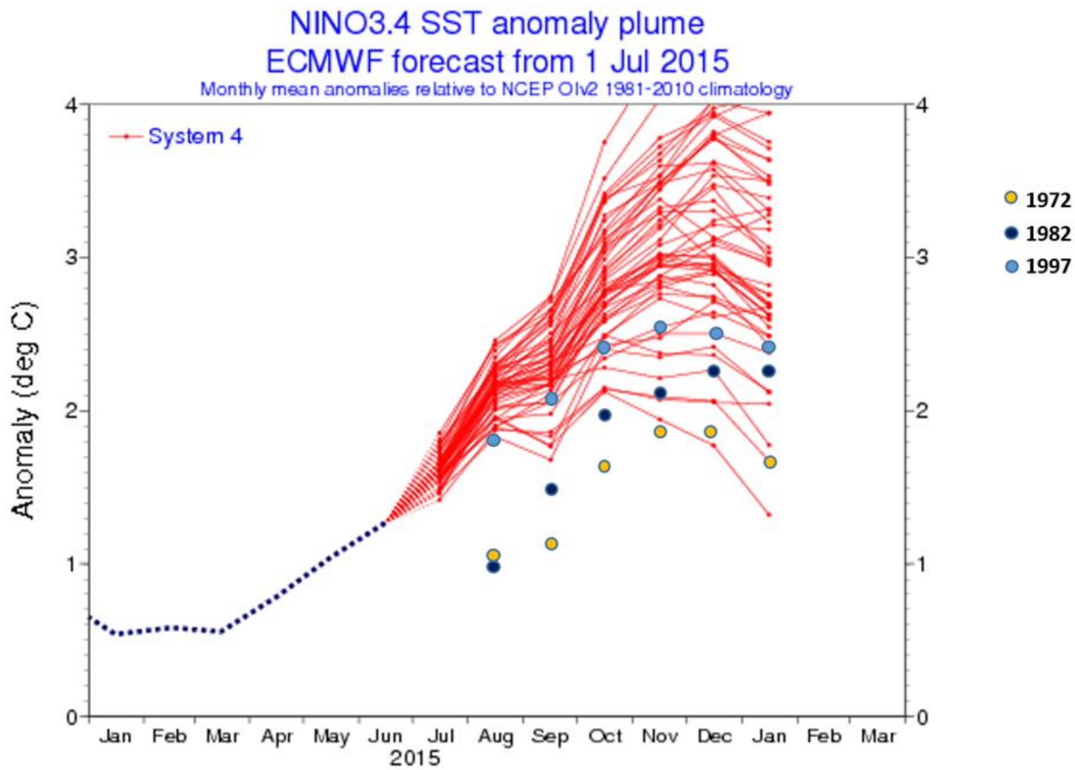


Figure 10: ECMWF ensemble model forecast for the Nino 3.4 region. All members call for strong El Niño conditions throughout the August-October period. The 1972, 1987 and 1997 El Niño events are plotted for reference, as they are the 3rd strongest, 2nd strongest and strongest El Niño events since 1950, respectively.

Based on this information, our best estimate is that we will likely have one of the strongest El Niño events since 1950 for the remainder of this summer and fall.

# 6 Current Atlantic Basin Conditions

Conditions in the tropical Atlantic remain unfavorable at the present time. Figure 11 displays Atlantic basin SST anomalies during the month of July. The Main Development Region (10-20°N, 60-20°W) (MDR) is approximately 0.5°C cooler than normal. Currently, SST anomalies in the MDR are at levels comparable to what was experienced in both 2002 and 2014, which were both relatively quiet Atlantic hurricane seasons.

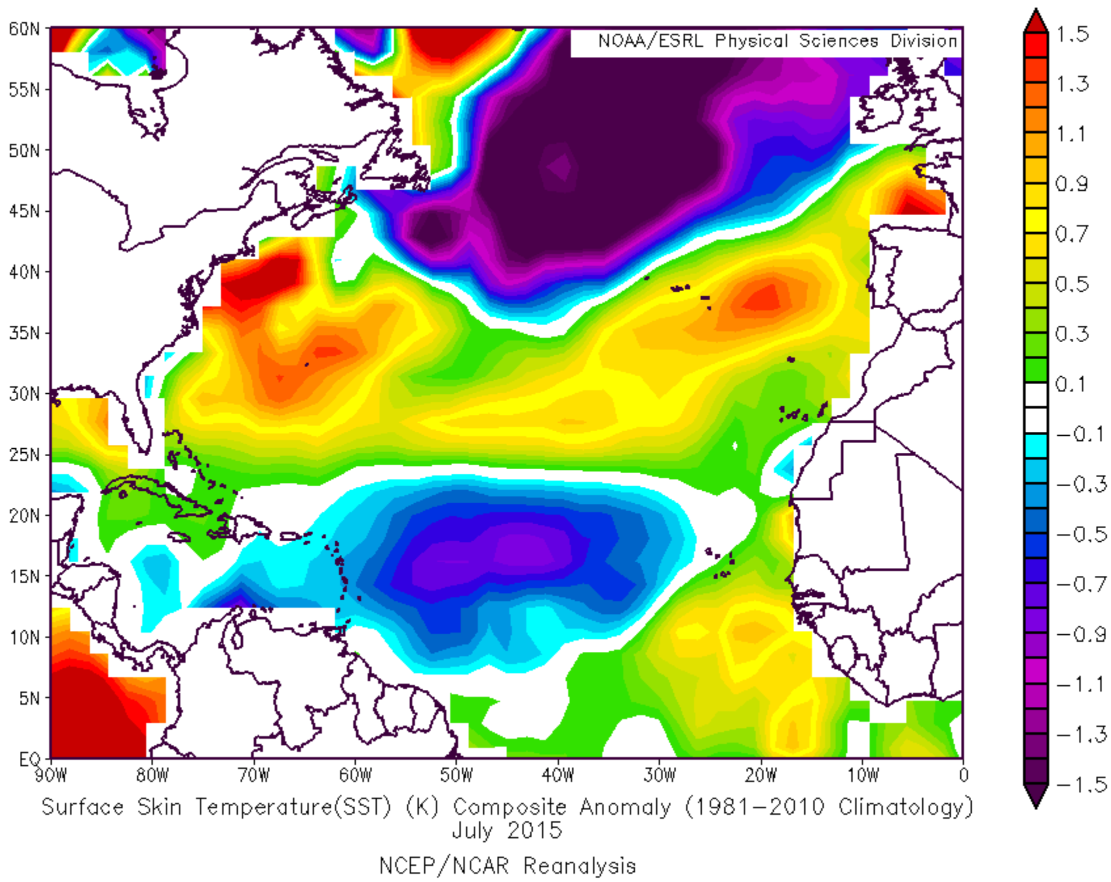


Figure 11: July 2015 SST anomalies. Note the anomalously cool conditions across the tropical eastern and central Atlantic.

Sea level pressure anomalies over the past month have been relatively high, implying that the trade winds across the Main Development Region are strong and the Tropical Upper Tropospheric Trough (TUTT) is enhanced (Figure 12). A strong TUTT typically relates to increased vertical wind shear across the tropical Atlantic and Caribbean (Knaff 1997). Sea level pressure anomalies in July 2015 were slightly lower than what was experienced in 1986 and 2014. Both of those seasons had below-average Atlantic TC activity.

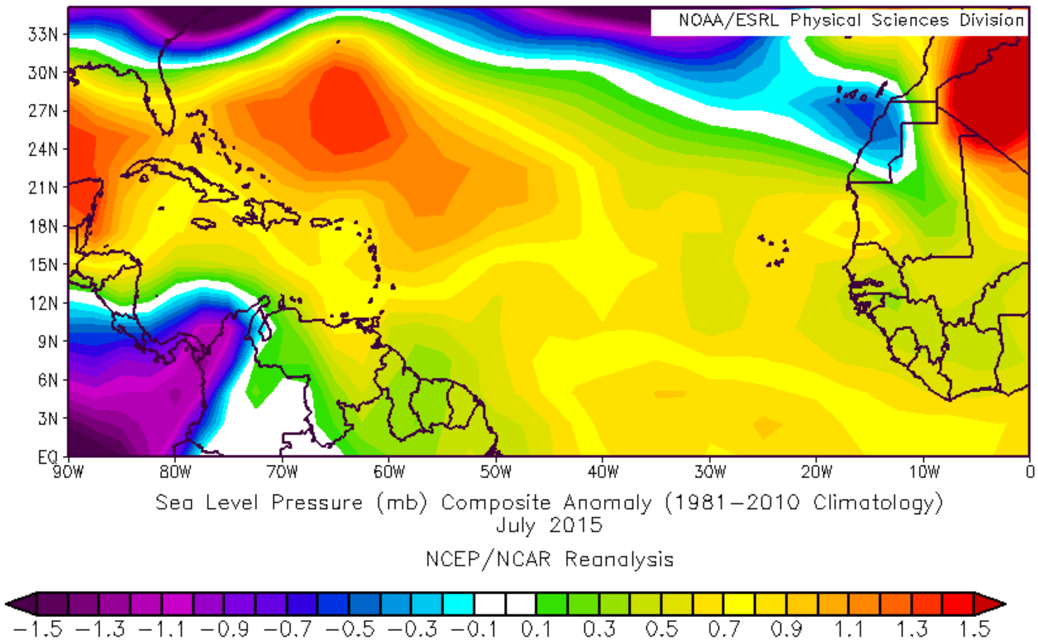


Figure 12: July 2015 Atlantic SLP anomaly. Strongly positive anomalies have predominated across the tropical Atlantic and most of the Caribbean throughout the month.

Vertical wind shear has been much stronger than normal over the past few weeks. The 200-850 mb zonal wind shear has been above-average across the tropical Atlantic, with well-above average shear prevailing across the Caribbean (Figure 13). Vertical shear for July 2015 is the strongest ever observed in the Caribbean (reliable records date back to 1979) (Figure 14).

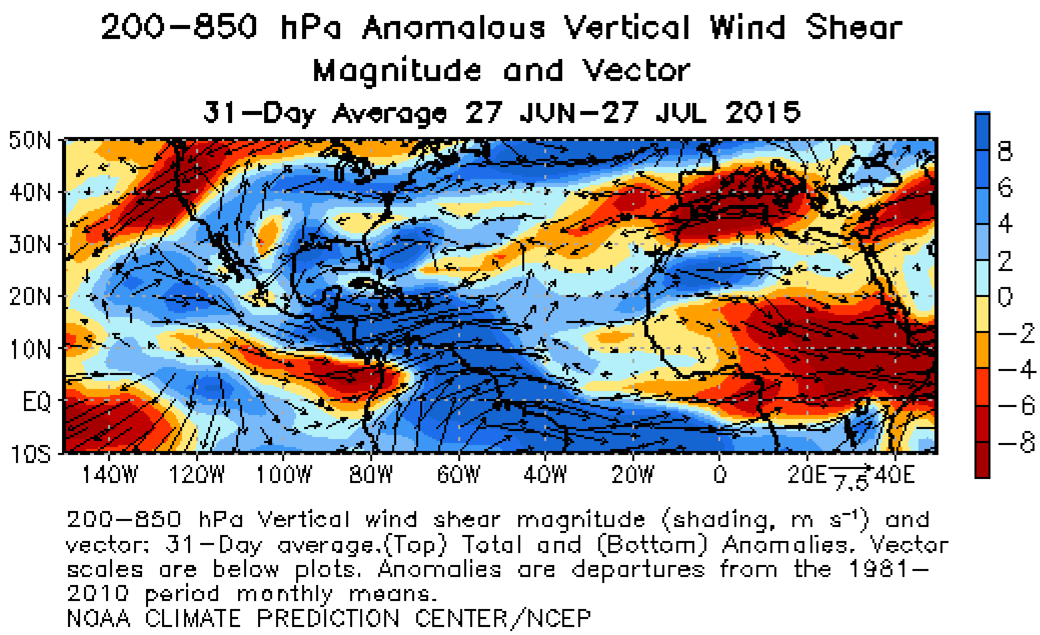


Figure 13: Late June – late July-averaged 2015 200-850-mb zonal wind anomalies across the tropical Atlantic. Note the strongly positive anomalous shear (as evidenced by the dark blue colors) across the Caribbean.

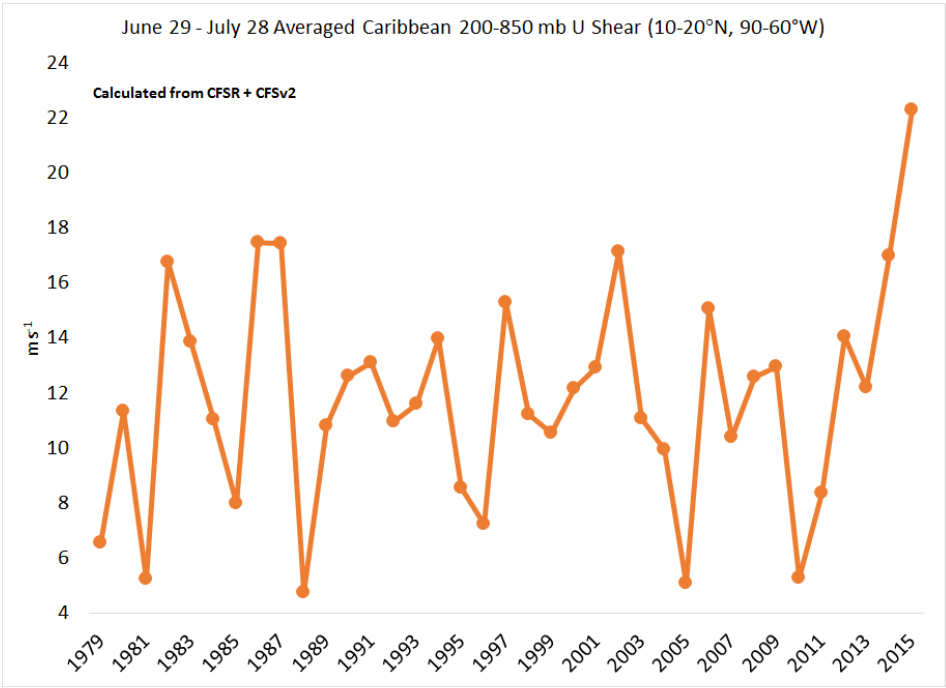


Figure 14: 30-day-averaged shear anomalies across the Caribbean. The values experienced during the past 30 days in 2015 are much higher than any other year since the Climate Forecast System Reanalysis began in 1979.

As was the case the past couple of years, the tropical Atlantic has been drier than normal. The dryness across the Caribbean has been even more pronounced (Figure 15).

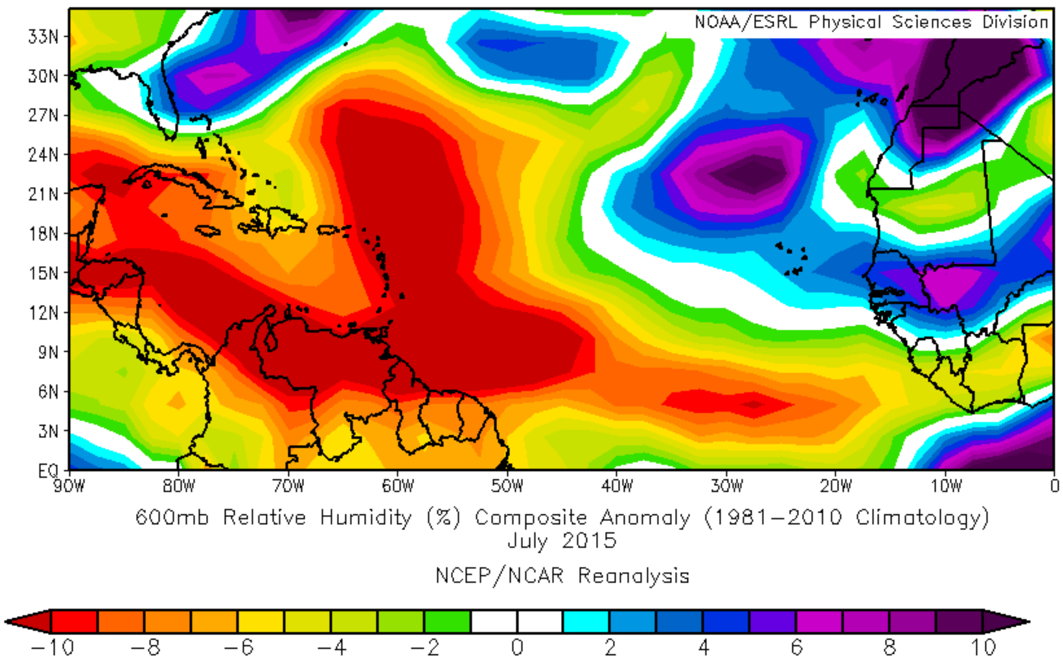


Figure 15: July 2015 600-mb relative humidity anomalies across the tropical Atlantic. Very dry conditions have been observed across the Caribbean

According to AOML's Jason Dunion (personal communication), African dust outbreaks have been quite strong this year as well. The Cooperative Research Institute for the Atmosphere (CIRA) monitors real-time conditions for genesis in the tropical Atlantic, and according to their analysis, vertical instability is significantly below normal this year (Figure 16). Positive deviations from the curve displayed below indicate a more unstable atmosphere than normal. In general, the atmosphere has been much more stable than normal since the start of the hurricane season.

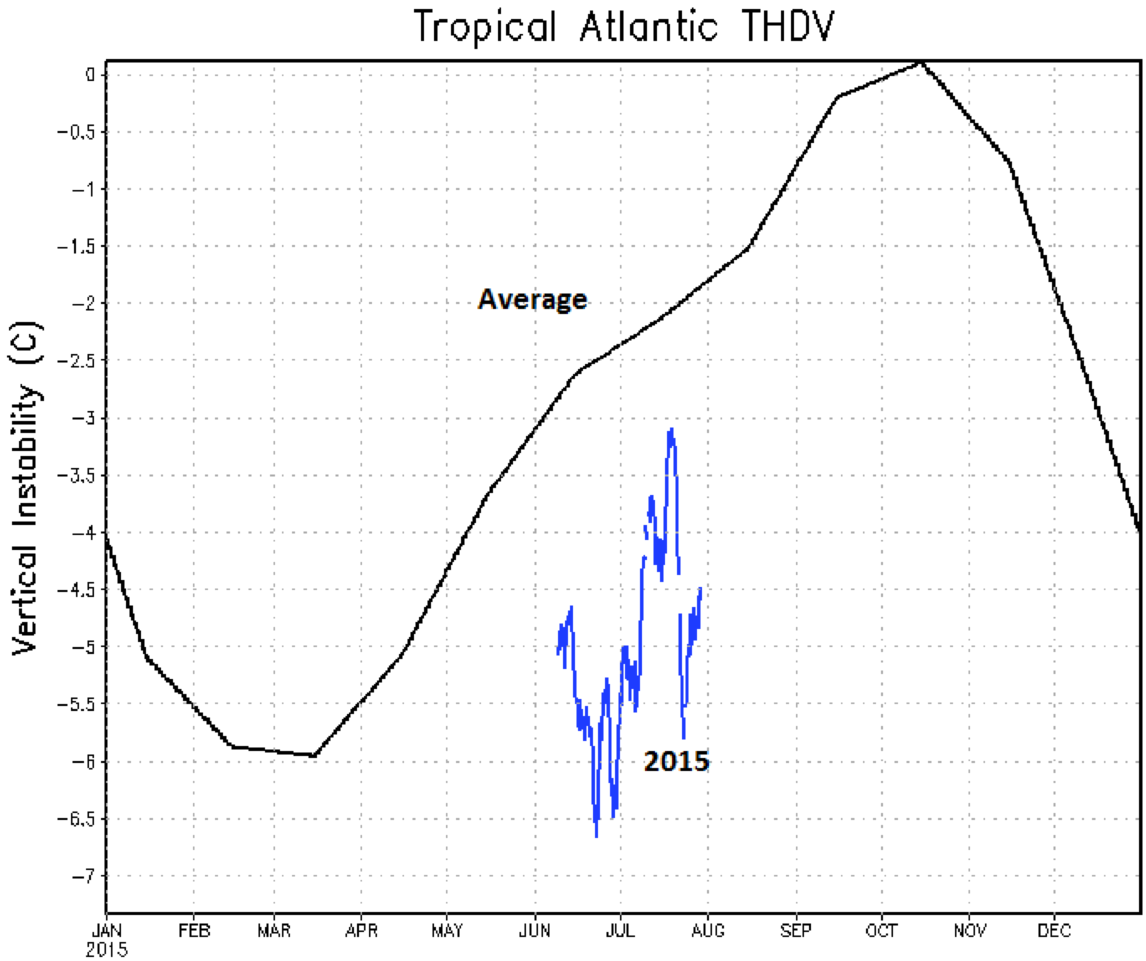


Figure 16: Vertical instability across the tropical Atlantic since June 2015 (blue line). The average season is represented by the black line.

## 7 West Africa Conditions

Enhanced rainfall in the Sahel region of West Africa during the June-July time period has been associated with active hurricane seasons (Landsea and Gray 1992). Figure 17 displays a satellite/rain gauge combined estimate of African rainfall known as ARCv2. Rainfall in the far western part of the Sahel appears to be well below-average, while rainfall totals farther to the east appear to be near to slightly above average.

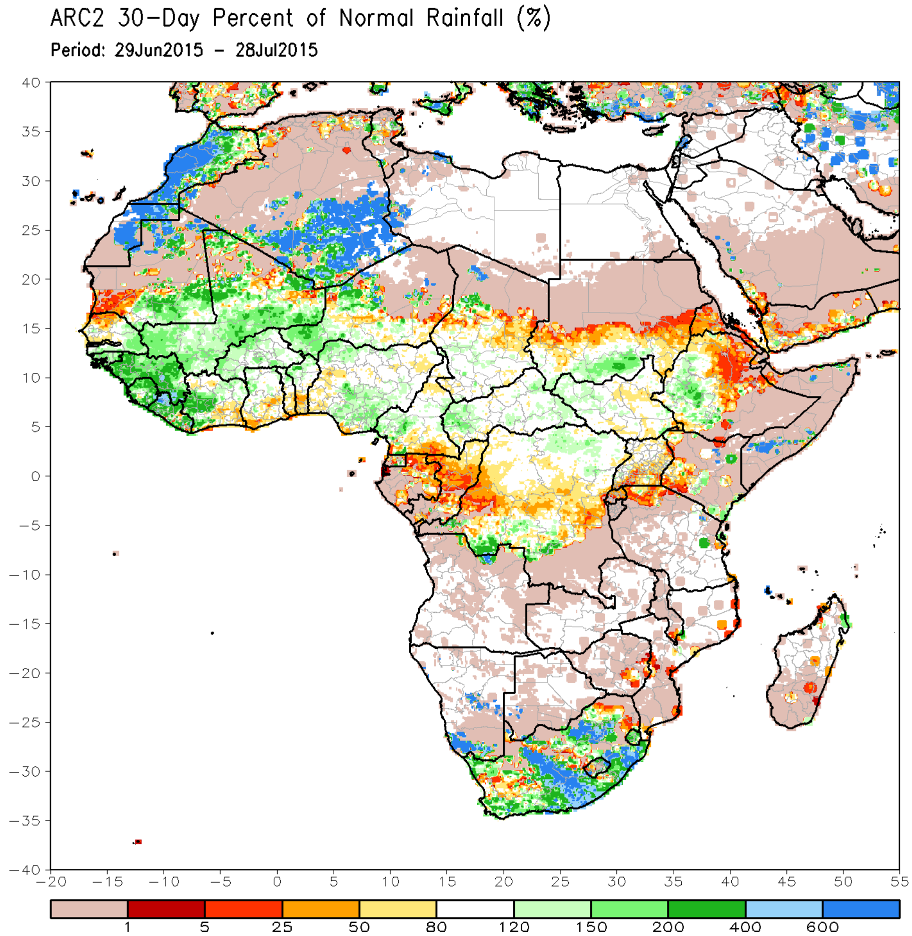


Figure 17: Rainfall Estimation Algorithm Version 2.0 (RFE) estimate of percent of normal rainfall for late June – late July 2015.

## 8 Atlantic Thermohaline Circulation (THC) Conditions

One of the big questions that has been asked given the quiet Atlantic hurricane seasons the past two years is if the active era of Atlantic basin storm activity that began in 1995 has come to an end. We currently monitor the strength of the Atlantic Multidecadal Oscillation (AMO) and Atlantic thermohaline circulation (THC) using a combined proxy measure of SST in the region from 50-60°N, 50-10°W and SLP in the region from 0-50°N, 70-10°W (Figure 18). This index was discussed in detail in Klotzbach and Gray (2008).

We currently weigh standardized values of the index by using the following formula: 0.6*SST – 0.4*SLP. Twelve-month running average values of the index are currently at their lowest levels since 1994, when the AMO was in a negative phase (Figure 19). The values have been especially low since January 2015.

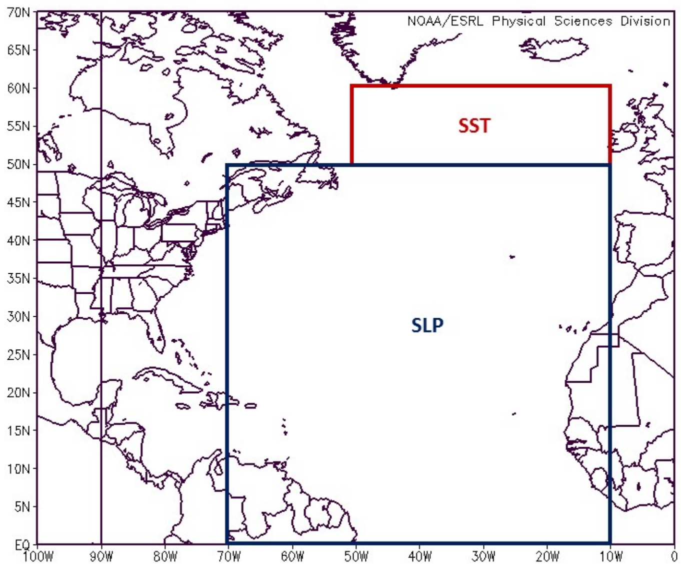


Figure 18: Regions which are utilized for calculations of our THC/AMO index.

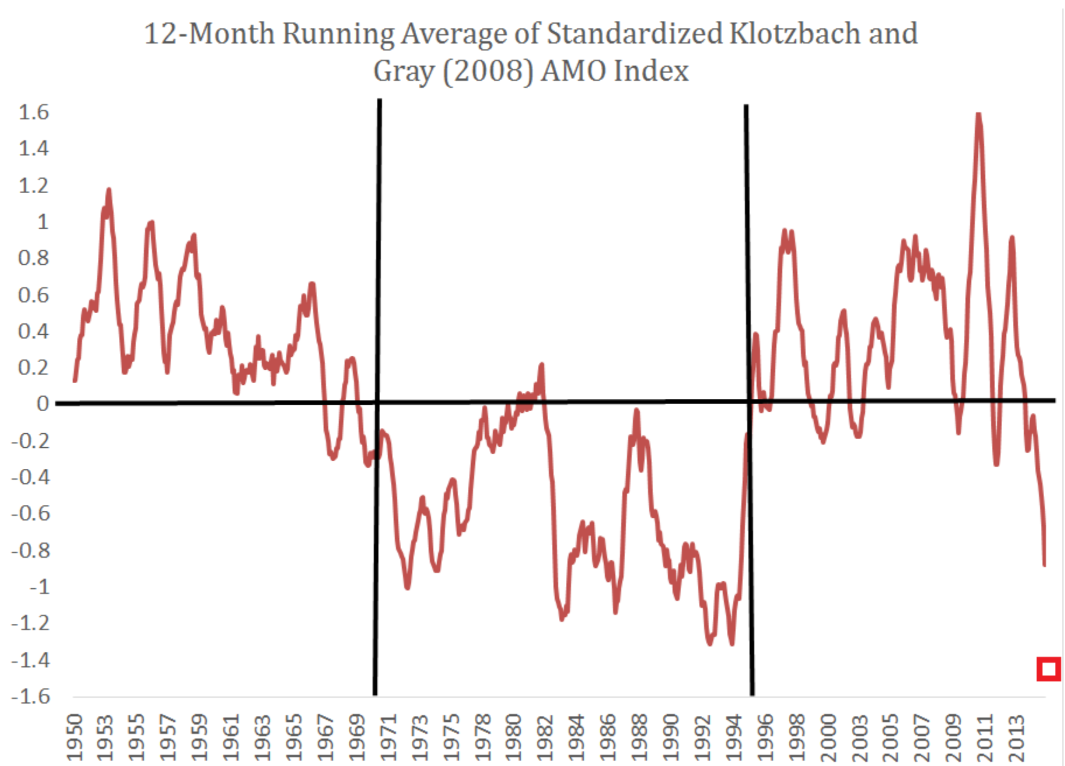


Figure 19: 12-month running average values of our standardized index of the AMO/THC. Current 12-month running average values are at their lowest since 1994. The red rectangle represents the January-July value for 2015.

## 9 Adjusted 2015 Forecast

Table 8 shows our final adjusted early August forecast for the 2015 season which is a combination of our statistical scheme (with June-July activity added in), our analog forecast and qualitative adjustments for other factors not explicitly contained in any of these schemes. Our statistical forecast, analog forecast and final qualitative outlook are in good agreement that the remainder of the 2015 Atlantic hurricane season should be very quiet.

Table 8: June-July 2015 observed activity, our August full season statistical forecast (with June-July 2015 activity added in), our analog forecast and our adjusted final forecast for the 2015 hurricane season.

| Forecast Parameter and 1981-2010 Median (in parentheses) | June-July 2015 Observed Activity | Statistical Scheme | Analog Scheme | Adjusted Final Forecast (Whole Season) |
|---|---|---|---|---|
| Named Storms (12.0) | 3 | 9.9 | 6.8 | **8** |
| Named Storm Days (60.1) | 5.5 | 30.0 | 31.2 | **25** |
| Hurricanes (6.5) | 0 | 3.2 | 3 | **2** |
| Hurricane Days (21.3) | 0 | 6.9 | 10.8 | **8** |
| Major Hurricanes (2.0) | 0 | 0.4 | 0.8 | **1** |
| Major Hurricane Days (3.9) | 0 | 0.0 | 2.3 | **0.5** |
| Accumulated Cyclone Energy Index (92) | 4 | 32 | 45 | **35** |
| Net Tropical Cyclone Activity (103%) | 5 | 40 | 52 | **40** |

## 10 Landfall Probabilities for 2015

A significant focus of our recent research involves efforts to develop forecasts of the probability of hurricane landfall along the U.S. coastline and in the Caribbean. Whereas individual hurricane landfall events cannot be forecast months in advance, the total seasonal probability of landfall can be forecast with statistical skill. With the observation that landfall is a function of varying climate conditions, a probability specification has been developed through statistical analyses of all U.S. hurricane and named storm landfall events during the 20$^{th}$ century (1900-1999). Specific landfall probabilities can be given for all tropical cyclone intensity classes for a set of distinct U.S. coastal regions.

Net landfall probability is shown linked to the overall Atlantic basin Net Tropical Cyclone activity (NTC; see Table 9). NTC is a combined measure of the year-to-year mean of six indices of hurricane activity, each expressed as a percentage difference from the long-term average. Long-term statistics show that, on average, the more active the overall Atlantic basin hurricane season is, the greater the probability of U.S. hurricane landfall.

Table 9: NTC activity in any year consists of the seasonal total of the following six parameters expressed in terms of their long-term averages. A season with 10 NS, 50 NSD, 6 H, 25 HD, 3 MH, and 5 MHD would then be the sum of the following ratios: 10/9.6 = 104, 50/49.1 = 102, 6/5.9 = 102, 25/24.5 = 102, 3/2.3 = 130, 5/5.0 = 100, divided by six, yielding an NTC of 107.

| | 1950-2000 Average | |
|---|---|---|
| 1) | Named Storms (NS) | 9.6 |
| 2) | Named Storm Days (NSD) | 49.1 |
| 3) | Hurricanes (H) | 5.9 |
| 4) | Hurricane Days (HD) | 24.5 |
| 5) | Major Hurricanes (MH) | 2.3 |
| 6) | Major Hurricane Days (MHD) | 5.0 |

Table 10 lists strike probabilities for the 2015 hurricane season for different TC categories for the entire U.S. coastline, the Gulf Coast and the East Coast including the Florida peninsula. We also issue probabilities for various islands and landmasses in the Caribbean and in Central America. Note that Atlantic basin post-1 August NTC activity in 2015 is expected to be well below its long-term average, and therefore, landfall probabilities are well below their long-term average.

Table 10: Estimated probability (expressed in percent) of one or more landfalling tropical storms (TS), category 1-2 hurricanes (HUR), category 3-4-5 hurricanes, total hurricanes and named storms along the entire U.S. coastline, along the Gulf Coast (Regions 1-4), and along the Florida Peninsula and the East Coast (Regions 5-11) for the remainder of the 2015 Atlantic hurricane season. Probabilities of a tropical storm, hurricane and major hurricane tracking into the Caribbean are also provided. The long-term mean annual probability of one or more landfalling systems during the 20th century is given in parentheses.

| Region | TS | Category 1-2 HUR | Category 3-4-5 HUR | All HUR | Named Storms |
|---|---|---|---|---|---|
| Entire U.S. (Regions 1-11) | 42% (79%) | 33% (68%) | 23% (52%) | 48% (84%) | 70% (97%) |
| Gulf Coast (Regions 1-4) | 27% (59%) | 18% (42%) | 12% (30%) | 27% (60%) | 47% (83%) |
| Florida plus East Coast (Regions 5-11) | 22% (50%) | 18% (44%) | 12% (31%) | 28% (61%) | 44% (81%) |
| Caribbean (10-20°N, 60-88°W) | 45% (82%) | 26% (57%) | 17% (42%) | 38% (75%) | 66% (96%) |

**Please also visit the Landfalling Probability Webpage at http://www.e-transit.org/hurricane for landfall probabilities for 11 U.S. coastal regions and 205 coastal and near-coastal counties from Brownsville, Texas to Eastport, Maine as well as probabilities for every island in the Caribbean. We suggest that all coastal residents visit the Landfall Probability Webpage for their individual location probabilities.**

## 11 Summary

An analysis of a variety of different atmosphere and ocean measurements (through July) which are known to have long-period statistical relationships with the upcoming season's Atlantic tropical cyclone activity indicate that 2015 should be a very quiet season. A very strong El Niño combined with a relatively unfavorable Atlantic basin should combine to produce one of the quietest Atlantic hurricane seasons since 1950.

## 12 Forthcoming Updated Forecasts of 2015 Hurricane Activity

We will be issuing two-week forecasts for Atlantic TC activity during the climatological peak of the season from August-October, beginning today, Tuesday, August 4 and continuing every other Tuesday (August 18, September 1, etc.). We will be issuing an October-November Caribbean basin forecast on **Thursday, 1 October**. A verification and discussion of all 2015 forecasts will be issued in late November 2015. All of these forecasts will be available on the web at: http://hurricane.atmos.colostate.edu/Forecasts.

## 13 Acknowledgments

Besides the individuals named on page 7, there have been a number of other meteorologists that have furnished us with data and given valuable assessments of the current state of global atmospheric and oceanic conditions. These include Brian McNoldy, Art Douglas, Ray Zehr, Mark DeMaria, Todd Kimberlain, Paul Roundy and Amato Evan. In addition, Barbara Brumit and Amie Hedstrom have provided excellent manuscript, graphical and data analysis and assistance over a number of years. We have profited over the years from many in-depth discussions with most of the current and past NHC hurricane forecasters. The second author would further like to acknowledge the encouragement he has received for this type of forecasting research application from Neil Frank, Robert Sheets, Robert Burpee, Jerry Jarrell, Max Mayfield, and Bill Read former directors of the National Hurricane Center (NHC), and the current director, Rick Knabb.

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# 15 Verification of Previous Forecasts

Table 11: Summary verification of the authors' five previous years of seasonal forecasts for Atlantic TC activity between 2010-2014. Verifications of all seasonal forecasts back to 1984 are available here: http://tropical.atmos.colostate.edu/Includes/Documents/Publications/forecast_verifications.xls

| 2010 | 9 Dec. 2009 | Update 7 April | Update 2 June | Update 4 August | Obs. |
|---|---|---|---|---|---|
| Hurricanes | 6-8 | 8 | 10 | 10 | 12 |
| Named Storms | 11-16 | 15 | 18 | 18 | 19 |
| Hurricane Days | 24-39 | 35 | 40 | 40 | 38.50 |
| Named Storm Days | 51-75 | 75 | 90 | 90 | 89.50 |
| Major Hurricanes | 3-5 | 4 | 5 | 5 | 5 |
| Major Hurricane Days | 6-12 | 10 | 13 | 13 | 11 |
| Accumulated Cyclone Energy | 100-162 | 150 | 185 | 185 | 165 |
| Net Tropical Cyclone Activity | 108-172 | 160 | 195 | 195 | 196 |

| 2011 | 8 Dec. 2010 | Update 6 April | Update 1 June | Update 3 August | Obs. |
|---|---|---|---|---|---|
| Hurricanes | 9 | 9 | 9 | 9 | 7 |
| Named Storms | 17 | 16 | 16 | 16 | 19 |
| Hurricane Days | 40 | 35 | 35 | 35 | 26 |
| Named Storm Days | 85 | 80 | 80 | 80 | 89.75 |
| Major Hurricanes | 5 | 5 | 5 | 5 | 4 |
| Major Hurricane Days | 10 | 10 | 10 | 10 | 4.50 |
| Accumulated Cyclone Energy | 165 | 160 | 160 | 160 | 126 |
| Net Tropical Cyclone Activity | 180 | 175 | 175 | 175 | 145 |

| 2012 | 4 April | Update 1 June | Update 3 August | Obs. |
|---|---|---|---|---|
| Hurricanes | 4 | 5 | 6 | 10 |
| Named Storms | 10 | 13 | 14 | 19 |
| Hurricane Days | 16 | 18 | 20 | 28.50 |
| Named Storm Days | 40 | 50 | 52 | 101.25 |
| Major Hurricanes | 2 | 2 | 2 | 2 |
| Major Hurricane Days | 3 | 4 | 5 | 0.50 |
| Accumulated Cyclone Energy | 70 | 80 | 99 | 133 |
| Net Tropical Cyclone Activity | 75 | 90 | 105 | 131 |

| 2013 | 10 April | Update 3 June | Update 2 August | Obs. |
|---|---|---|---|---|
| Hurricanes | 9 | 9 | 8 | 2 |
| Named Storms | 18 | 18 | 18 | 14 |
| Hurricane Days | 40 | 40 | 35 | 3.75 |
| Named Storm Days | 95 | 95 | 84.25 | 42.25 |
| Major Hurricanes | 4 | 4 | 3 | 0 |
| Major Hurricane Days | 9 | 9 | 7 | 0 |
| Accumulated Cyclone Energy | 165 | 165 | 142 | 36 |
| Net Tropical Cyclone Activity | 175 | 175 | 150 | 47 |

| 2014 | 10 April | Update 2 June | Update 1 July | Update 31 July | Obs. |
|---|---|---|---|---|---|
| Hurricanes | 3 | 4 | 4 | 4 | 6 |
| Named Storms | 9 | 10 | 10 | 10 | 8 |
| Hurricane Days | 12 | 15 | 15 | 15 | 17.75 |
| Named Storm Days | 35 | 40 | 40 | 40 | 35 |
| Major Hurricanes | 1 | 1 | 1 | 1 | 2 |
| Major Hurricane Days | 2 | 3 | 3 | 3 | 3.75 |
| Accumulated Cyclone Energy | 55 | 65 | 65 | 65 | 67 |
| Net Tropical Cyclone Activity | 60 | 70 | 70 | 70 | 82 |