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2020 ATLANTIC HURRICANE OUTLOOK

PRESENTED BY: ANTHONY SAGLIANI - MAY 14, 2020

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THE 2020 HURRICANE OUTLOOK TEAM





REVIEW OF 2019 HURRICANE SEASON



2019 TOTALS

- 18 Tropical Storms
- 6 Hurricanes
- 3 Major
 - Hurricanes

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VERIFICATION OF 2019 HURRICANE OUTLOOK

	Our Forecast	2019 Actual	1981–2010 Normal
Named Storms	10 to 14	18	12
Hurricanes	4 to 7	6	6
Major Hurricanes	2 to 3	3	3



ALREADY WATCHING FOR POTENTIAL ARTHUR

- Disturbance will pass through the Florida Straits today and Friday.
- Locally heavy rain/isolated flash flooding possible over South Florida south of Port Saint Lucie on Friday.
- May become subtropical depression or storm near or north of Bahamas.
- Likely to stay well offshore and pose no significant threats to United States.





CLIMATOLOGY OF ATLANTIC TROPICAL CYCLONES



- Occasional storms develop early (before June 1)
- Peak activity in early September
- Occasional late year storms (after November 30)

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TYPICAL TROPICAL CYCLONE TRACKS, JUNE – AUGUST



TYPICAL TROPICAL CYCLONE TRACKS, SEPTEMBER – NOVEMBER





TOTAL U.S. HURRICANE LANDFALLS (1900 – 2010)

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CONTINENTAL U.S. HURRICANE STRIKES (1950 – 2019)



No hurricanes struck the U.S. in 1951, 1962, 1973, 1978, 1981, 1982, 1990, 1994, 2000, 2001, 2006, 2009, 2010, 2013, 2015

Most Recent Hurricane Landfall

- Texas Harvey 2017
- Louisiana Barry 2019
- Mississippi Nate 2017
- Alabama Ivan 2004
- Florida Michael 2018
- Georgia David 1979
- South Carolina Matthew 2016
- North Carolina Florence 2018
- Virginia None since 1950
- Maryland None since 1950
- Delaware None since 1950
- New Jersey Sandy* 2012
- New York Gloria 1985
- New England Bob 1991

ELEMENTS OF THE 2020 ATLANTIC HURRICANE OUTLOOK

KEY PREDICTORS	OTHER KEY FACTORS
 El Niño / La Niña (ENSO) 	
 Atlantic Multi-decadal Oscillation (AMO) 	Our New Statistical ModelAnalog Years

 Ocean Water Temperature (Deep Tropical Atlantic, Gulf-Mex, Caribbean)

• African Dust Potential



ENSO – A PERIODIC CYCLICAL WARMING AND COOLING OF THE EQUATORIAL PACIFIC OCEAN



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LATEST ENSO MODEL FORECASTS

Most models forecast Neutral ENSO for the 2020 Hurricane Season. Some get close to La Niña conditions. Overall large spread and range of possibilities.





TYPICAL IMPACT OF LA NINA – LOWER WIND SHEAR IN THE ATLANTIC SUPPORTS DEVELOPMENT OF STORMS



ACCUMULATED CYCLONE ENERGY INDEX (ACE)

- ACE measures total overall seasonal activity.
- Factors in both intensity and duration of named storms.
- Mean ACE from 1950-2019 is 104.
- 2005 and 2017 most recent years with >200 ACE.
- 2013, 2014 and 2015 most recent years with less than 100 ACE.







HISTORIC ATLANTIC ACTIVITY DURING DIFFERENT ENSO CONDITIONS



When considering just ENSO, La Niña events favor higher ACE (more active seasons) than El Niño.

Note that "Neutral" does not mean "not important." It is a spectrum from Niña to Niño.

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ATLANTIC MULTIDECADAL OSCILLATION (AMO)



• NOTE: This forecast will focus on the NOAA AMO version, which is better correlated to Atlantic tropical storm activity,

- AMO cycles typically last 20-30 years.
- Since 1995, AMO has been mainly positive (warm SST).

2020 AMO VALUES (NOAA, CSU): Jan. = 0.09, -0.66 Feb. = 0.35, -1.30 Mar. = 0.36, -1.90



COMBINING HISTORICAL AMO AND ENSO CONDITIONS



- Both AMO and ENSO modulate Atlantic tropical activity.
- When ENSO phase is combined with AMO phase, a clear pattern emerges.
- Stronger La Niñas and positive AMOs favor more active hurricane seasons.
- Stronger El Niños and negative AMOs favor more inactive hurricane seasons.

EARTH NETWORKS 2020 FORECAST METHODOLOGY

ANALOGS

- Continued use of analogs for 2020.
- Choose 5 or more years where similar expected atmospheric and oceanic conditions for June to November occurred.
- Use chosen analog years to compute average of ACE, number of named storms, hurricanes and major hurricanes.

STATISTICAL MODEL

- New for our 2020 Forecast.
- Statistical model developed to increase forecast methodology diversity and aid forecast success.
- Model based on 40 years of data spanning 1980 to 2019.
- Utilizes several global atmospheric and oceanic predictors (e.g. AMO, among others) from November to March.
- Model predicts seasonal ACE, number of named storms, hurricanes and major hurricanes.

<u>KEY FINAL STEP</u>: Combine statistical model forecast with analog averages and make final adjusted prediction as needed.

LATEST OCEAN WATER TEMPERATURE ANOMALIES



GULF OF MEXICO Most areas above average

CARIBBEAN Generally above average

ATLANTIC

Above average most areas. Well above average off SE US coast, Equatorial Atlantic.

CENTRAL/ EASTERN PACIFIC

Near Normal to slightly warm reflecting Neutral ENSO.

FORECAST SUMMER OCEAN WATER TEMPERATURE ANOMALIES



C3S multi-system seasonal forecast Mean forecast SST anomaly

ECMWF/Met Office/Meteo-France/CMCC/DWD/NCEP July-August-September 2020

SAHARAN DUST TRANSPORT

THE TRANSPORT OF SAND PARTICULATES

- Stabilizes atmosphere
- Reduces incoming solar radiation
- Inhibits thunderstorm growth





WEST AFRICAN RAINFALL

The risk posed by Saharan dust appears to be near average.

Soil moisture in the lower Sahel could be lower than normal in some areas, possibly enhancing dust transport from those areas.

Wet conditions just off the coast of West Africa suggest active monsoon trough, and persistent effects may negate any dust.





ANALOG YEARS – YEARS WITH SIMILAR WEATHER PATTERNS TO 2020

Year	ACE	Named Storms	Hurricanes	Major Hurricanes
1952	69.1	11	5	2
1959	77.1	14	7	2
1961	205.4	12	8	5
2005	245.3	28	15	7
2008	145.7	16	8	5
2013	36.1	14	2	0
2017	224.9	17	10	6
2019	129.9	18	6	3
Mean of	142.40	15.67	7 70	2 5 6
Analog Years	142.49	12.07	1.18	5.50
Normal Tropical	104	12	6	3
Season (1950-2019)	TOA	14	U	5

• Years where Cool Neutral ENSO developed through the Summer and Fall

- A Positive AMO
- Analog years point to ABOVE NORMAL tropical activity for the upcoming season.



COMBINING ANALOGS WITH STATISTICAL MODEL FORECAST

CATEGORY	STATISTICAL MODEL FORECAST	MEAN OF ANALOGS	MEAN OF MODEL AND ANALOGS
ACE	156	143	150
Named Storms	15	16	16
Hurricanes	8	8	8
Major Hurricanes	4	4	4

SUMMARY OF FORECAST FACTORS FOR 2020 ATLANTIC ACTIVITY

Forecast Factor	Seasonal Impact
ENSO	Neutral
AMO	Enhance
Statistical Model	Enhance
Analog Years	Enhance
African Dust	Neutral

ENSO NEUTRAL CONDITIONS LIKELY, WEAK LA NINA POSSIBLE.

AMO LIKELY TO CONTINUE IN POSITIVE PHASE.

STATISTICAL MODEL AND ANALOG YEARS SHOWING ACTIVE SEASON POTENTIAL.

AFRICAN DUST POTENTIAL NEAR NORMAL, THOUGH SOME EXTENDED BOUTS ARE POSSIBLE EARLY.



EARTH NETWORKS – 2020 ATLANTIC HURRICANE OUTLOOK:

ABOVE NORMAL: 67% chance | NORMAL: 25% chance | BELOW NORMAL: 8% chance

CATEGORY	NORMAL (1950-2019)	FINAL FORECAST
ACE	71 to 125	150 (+/- 57)
Named Storms	12 (+/- 4)	16 (+/- 4)
Hurricanes	6 (+/- 3)	9 (+/- 3)
Major Hurricanes	3 (+/- 2)	4 (+/- 2)



2020 EXPECTED FORECAST SPACE



 Red shading indicates region where actual observed ACE and number of named storms should verify by the end of the season given our forecast values and uncertainty.

- Orange dashed bars indicate average ACE and annual named storms from 1950 to 2019.
- You can see that much of the forecast space is above normal.
- Lower bound numbers most probable if African dust is an issue. Upper bound numbers most likely if weak La Nina occurs.

TECHNICAL DEFINITIONS AND TERMINOLOGY EXPLANATIONS

KEY DEFINITIONS

- Accumulated Cyclone Energy (ACE): 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 intensity.
- Named Tropical Storm: 1 Minute Sustained Winds > 33 kt (39 mph).
- Hurricane: 1 Minute Sustained Wind > 63 kt (74 mph).
- Major Hurricane: 1 Minute Sustained Wind > 95 kt (110 mph).

COMMENTARY ON OUR NEW STATISTICAL MODEL

- Our statistical prediction forecast is based on multiple regression modeling incorporating several predictors in the Atlantic ocean basin that have shown skill in seasonal ACE forecasting.
- Model is designed to run in April.
- Correlation coefficient, r, was calculated to be 0.60 for the 1980-2019 ACE hindcast period the model was developed on, suggesting significant skill.

FORECAST PROBABILITY

- Final forecast probability is determined by the likelihood ACE will fall into a given tercile.
- Tercile groupings correspond to 1/3 (33.3%) of observed seasonal values in 1950 to 2019 climatology.
- Above normal seasonal ACE is therefore the highest 1/3 of recorded values, or >125.
- Normal seasonal ACE values are the middle 1/3 which are between 71 and 125.
- Below normal seasonal ACE values are <71.





THANK YOU

QUESTIONS AND COMMENTS?

