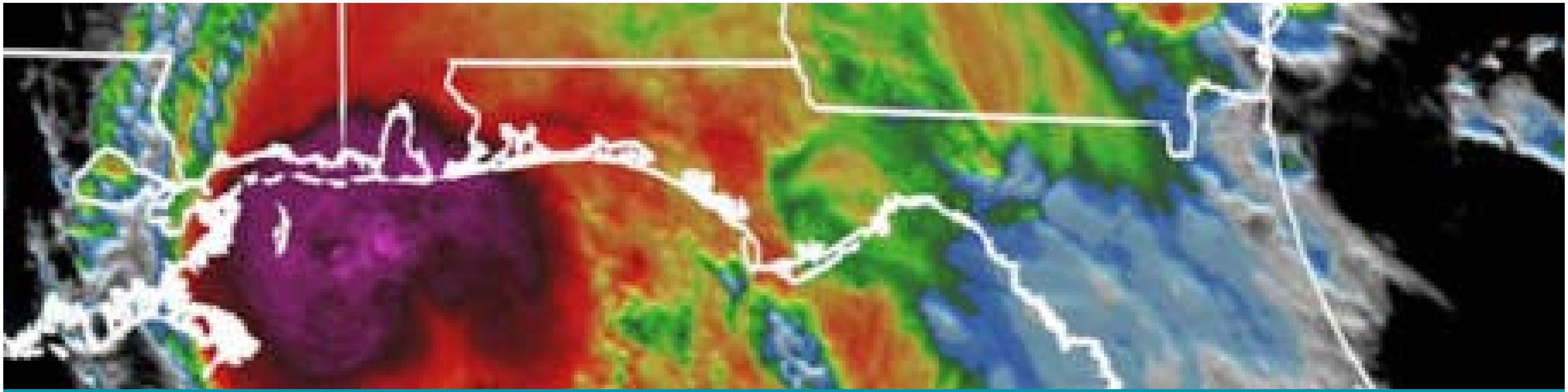


Florida Housing Coalition Hurricane Member Update Webinar

December 4, 2020
Sponsored by Fannie Mae

AGENDA

- Recap of the 2020 Hurricane Season

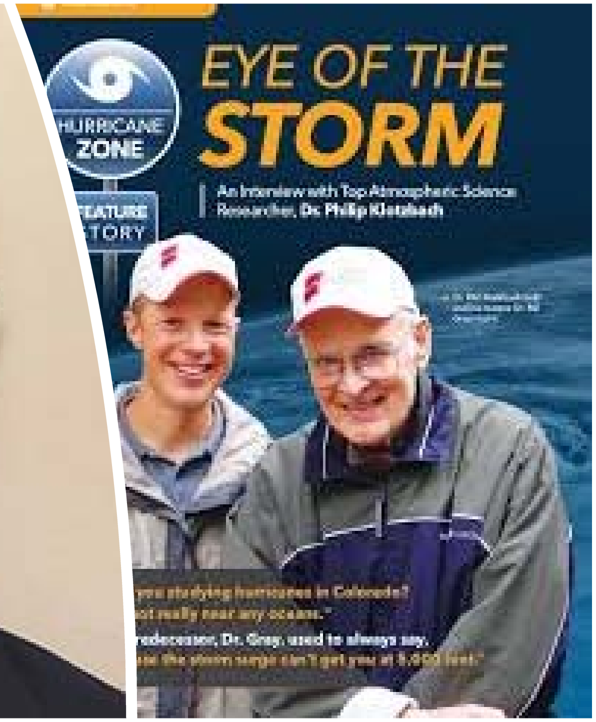
Recap of the 2020 Hurricane Season

Dr. Philip Klotzbach,

Colorado State University

philk@atmos.colostate.edu

Fannie Mae




2020 Atlantic Hurricane Season Recap
Phil Klotzbach
Department of Atmospheric Science
Colorado State University
Florida Housing Coalition
December 4, 2020
CIRA
RAMMB

2020 Atlantic Hurricane Activity vs. Historical Records

Forecast Parameter	2020 Observed	1981-2010 Average	2020 % of 1981-2010 Average	2020 Full Season Rank Since 1966 (Satellite Era)
Named Storms (NS)	30	12.1	248%	1
Named Storm Days (NSD)	118	59.4	199%	3
Hurricanes (H)	13	6.4	203%	2
Hurricane Days (HD)	34.75	24.2	144%	13
Major Hurricanes (MH)	6	2.7	222%	T-2
Major Hurricane Days (MHD)	8.75	6.2	141%	14
Accumulated Cyclone Energy (ACE)	180	106	170%	6

1981-2010 average is current NOAA 30-year climate base period. This 30-year base period will change to 1991-2020 next year.

T – Denotes tie with other years

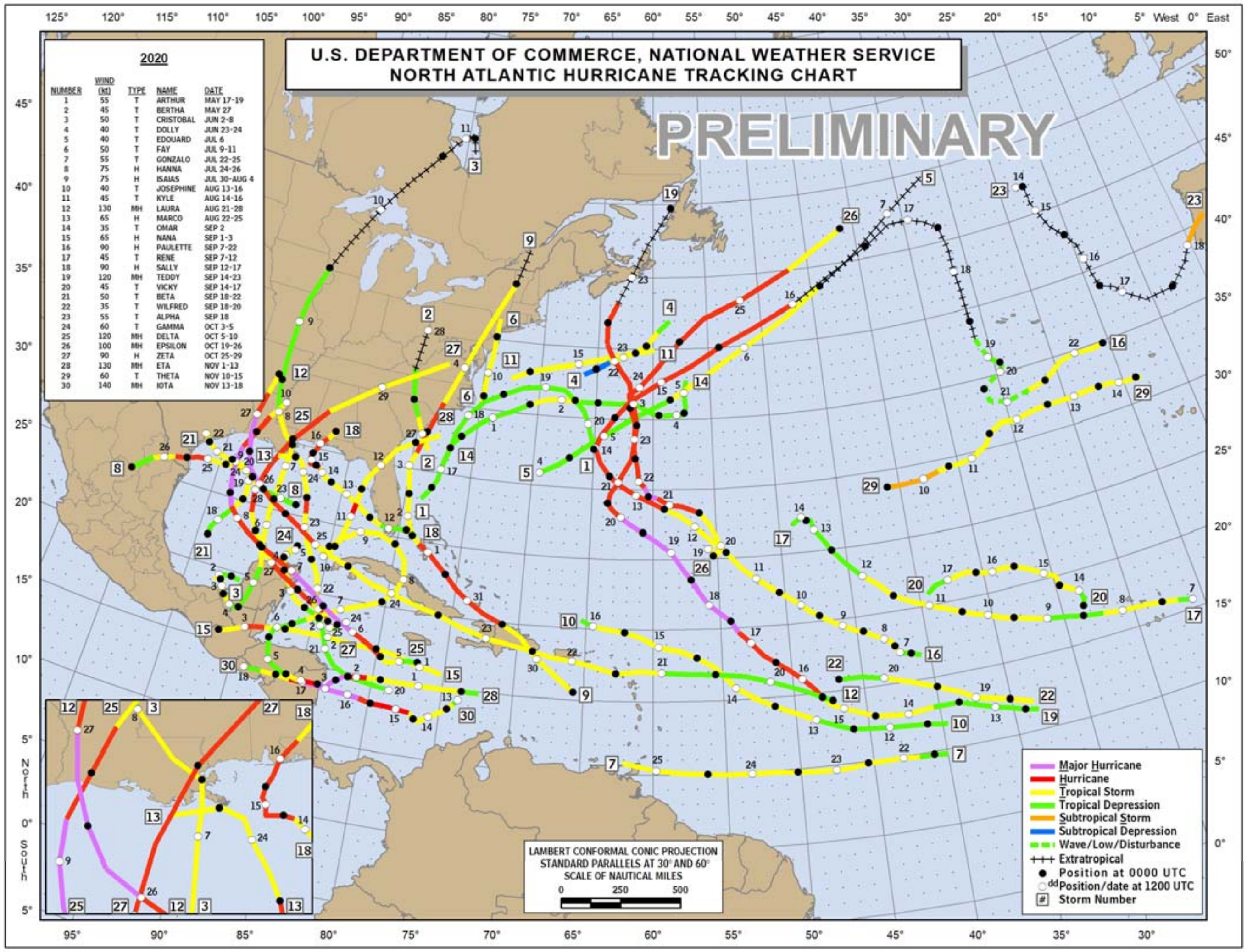
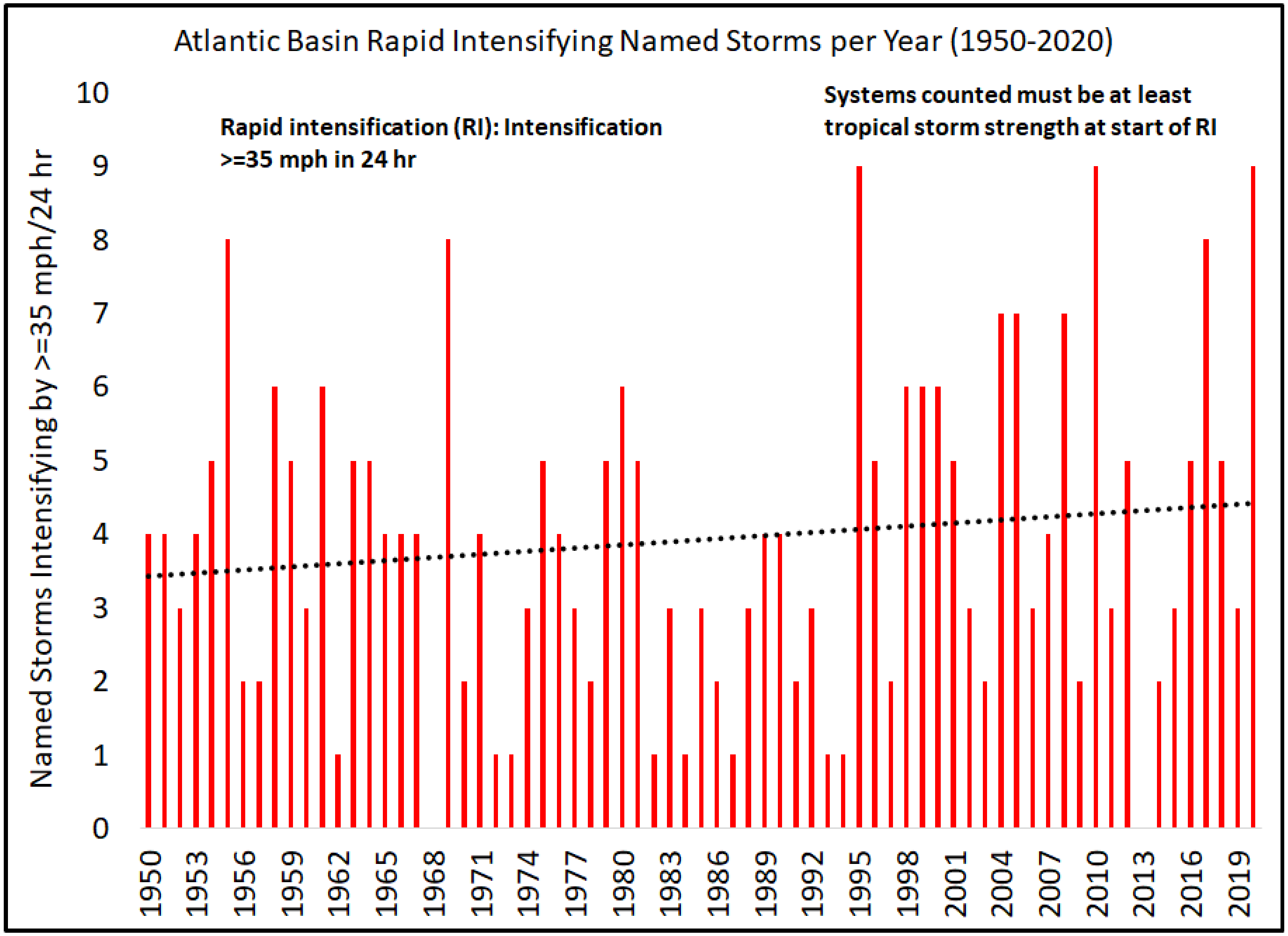


Figure courtesy of Ethan Gibney (NOAA)



Atlantic Basin Rapid Intensifying Named Storms per Year (1950-2020)
Rapid intensification (RI): Intensification >=35 mph in 24 hr
Systems counted must be at least tropical storm strength at start of RI
Named Storms Intensifying by >=35 mph/24 hr
0
1
2
3
4
5
6
7
8
9
10
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
2019

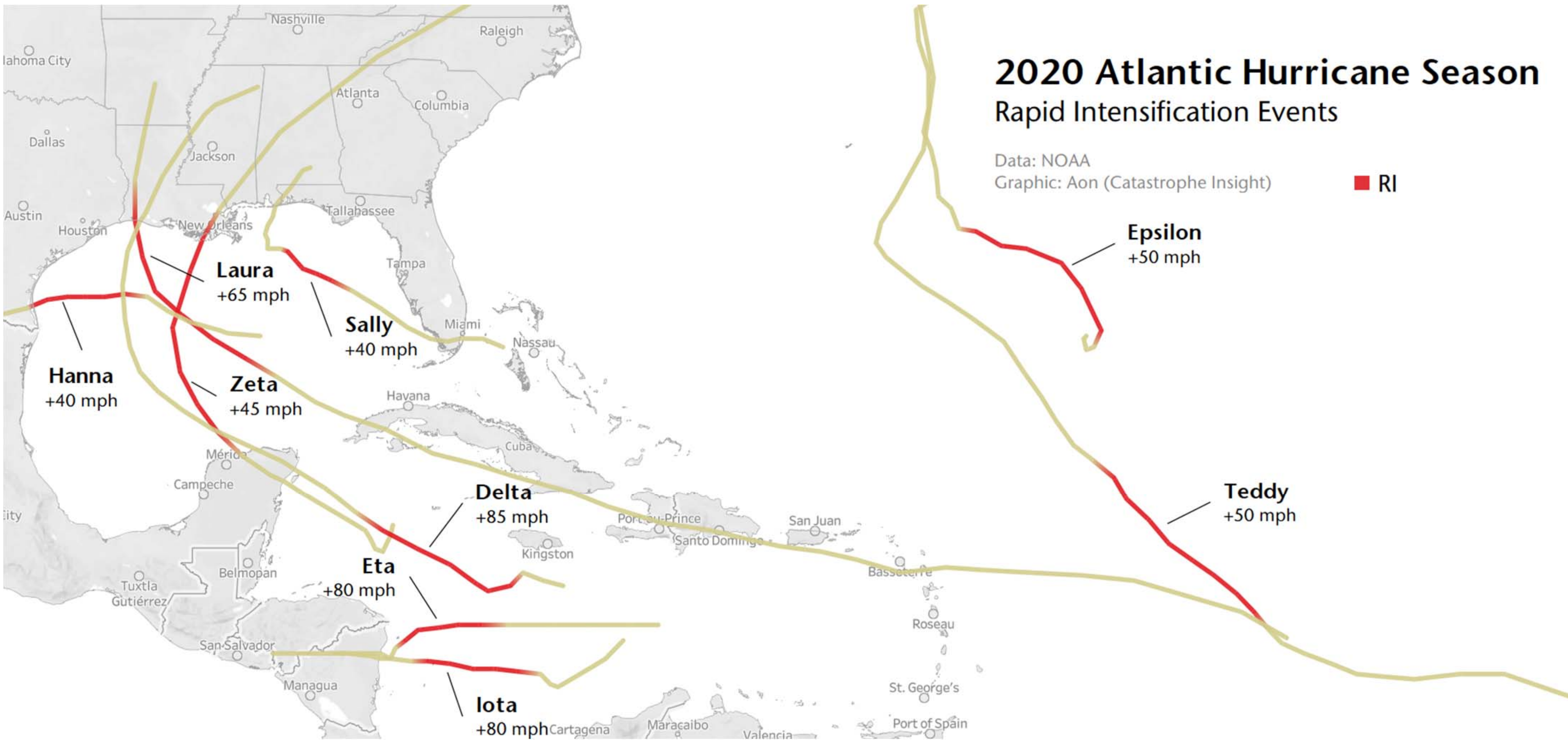
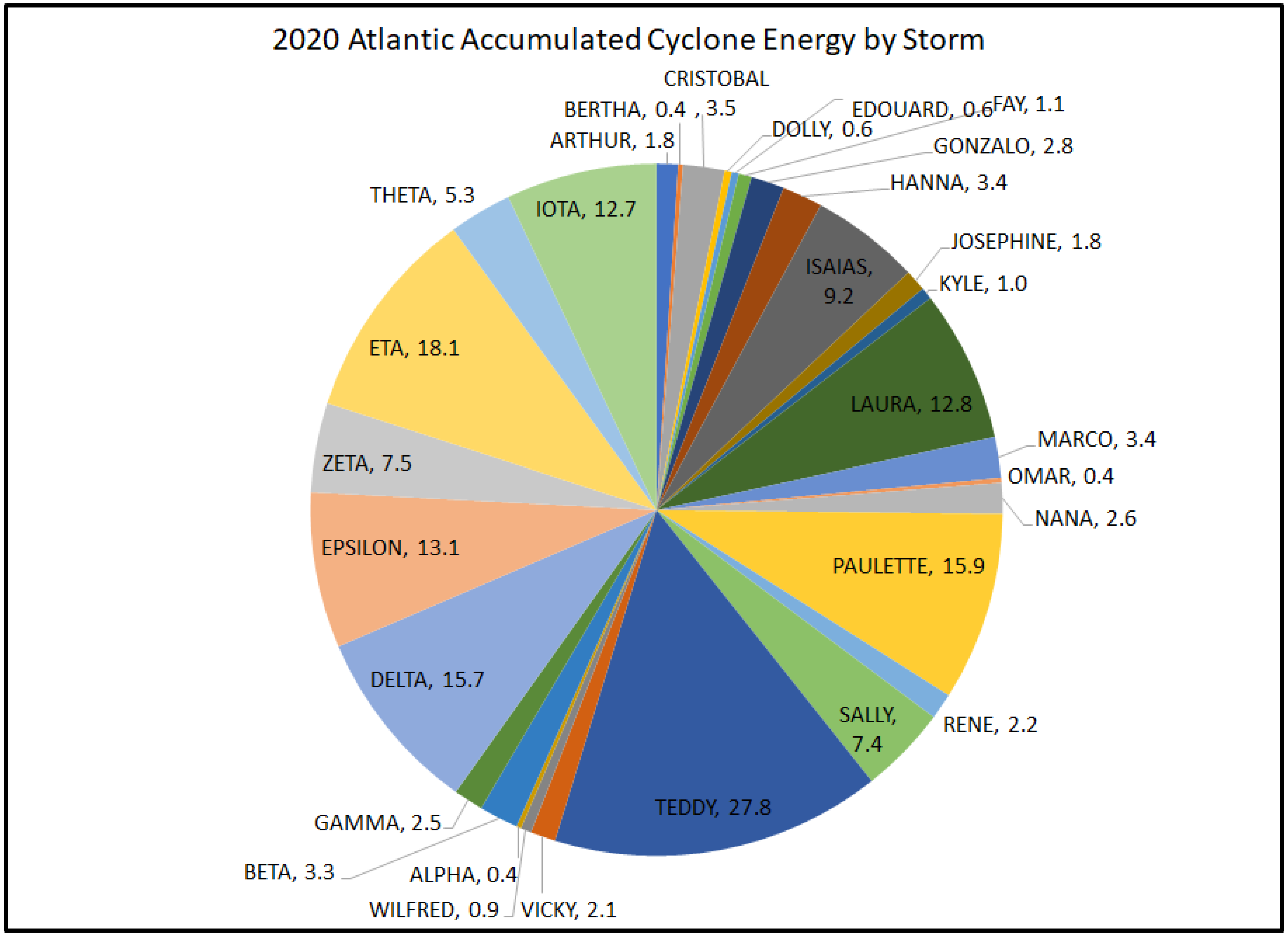
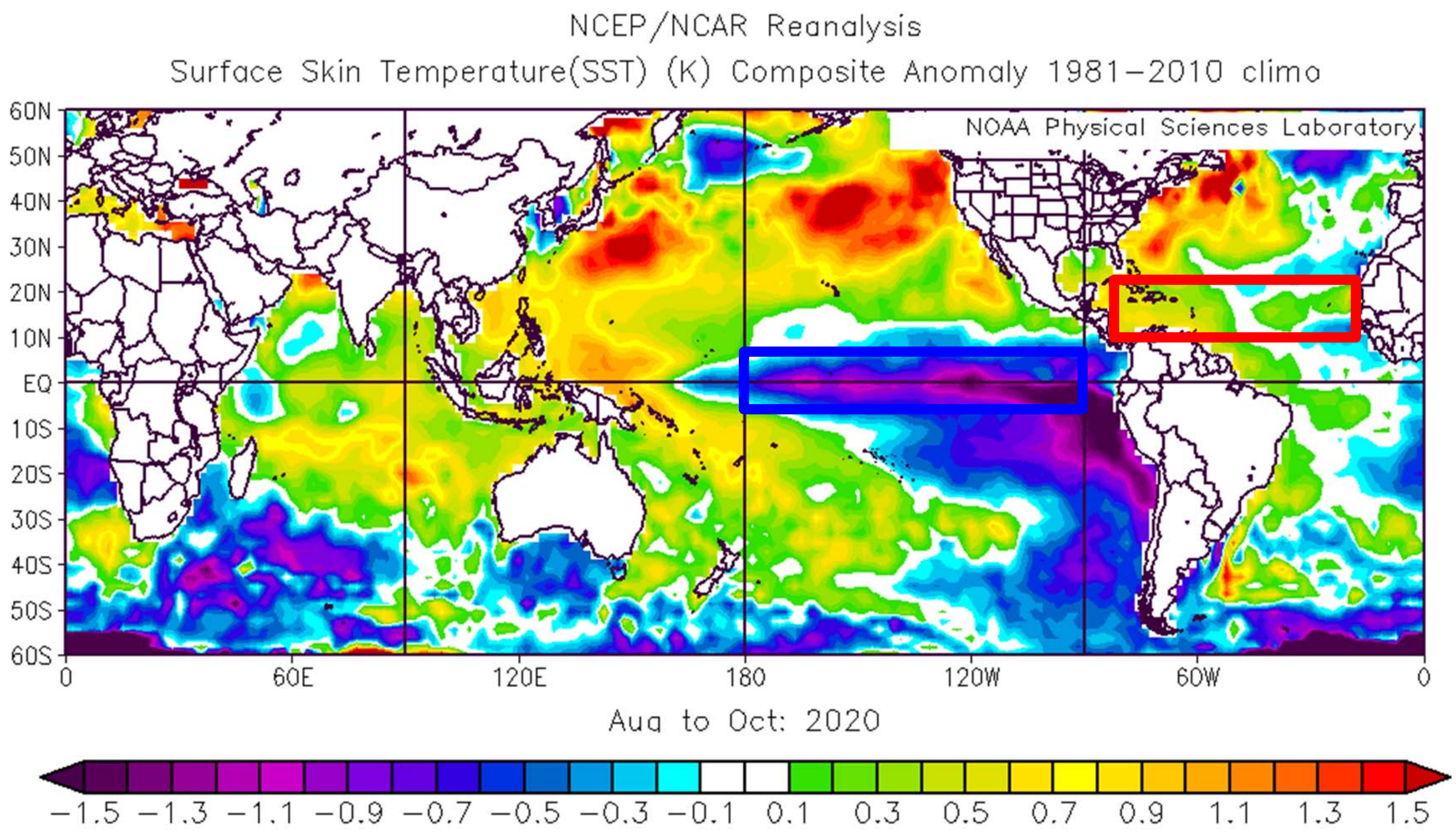
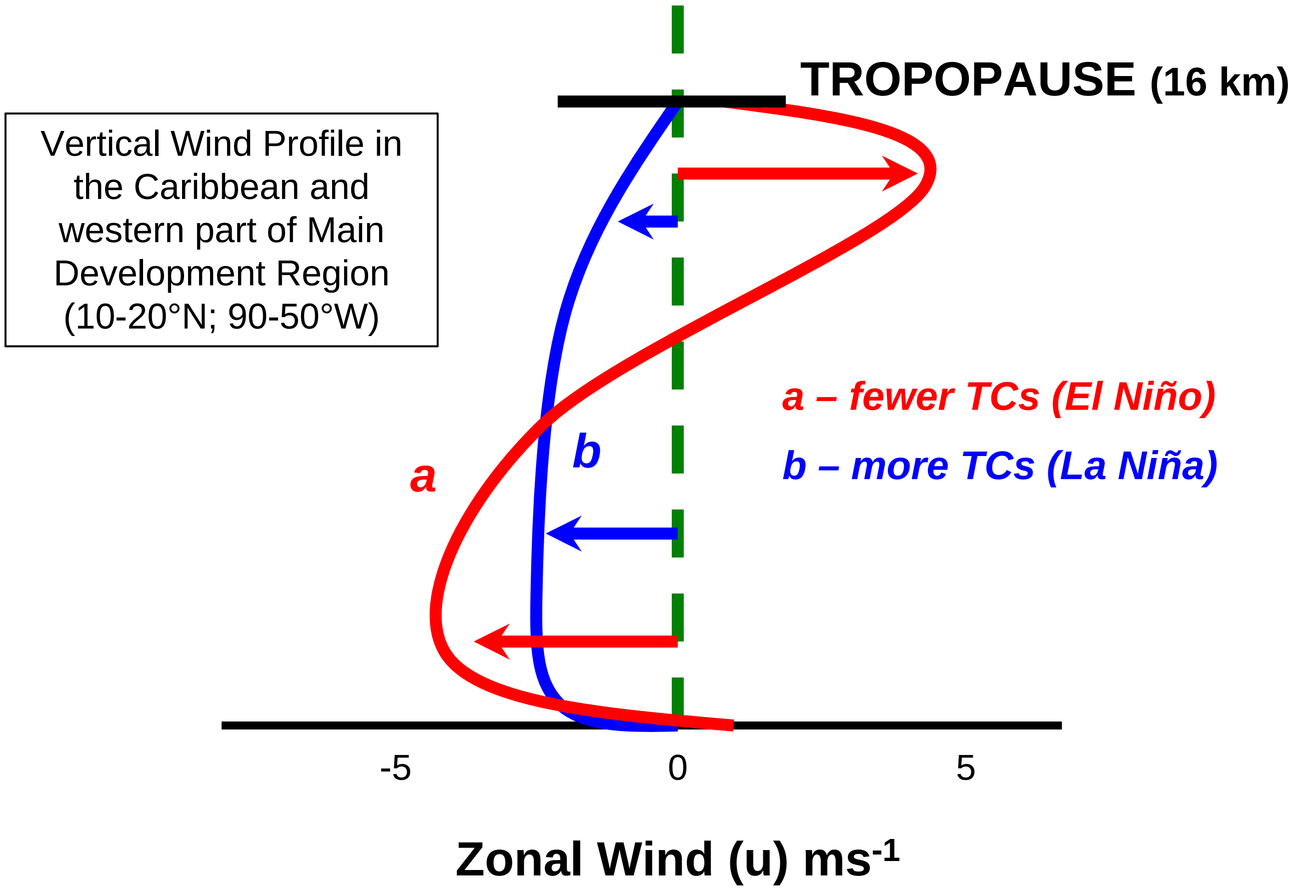


Figure courtesy of
Steve Bowen (Aon)

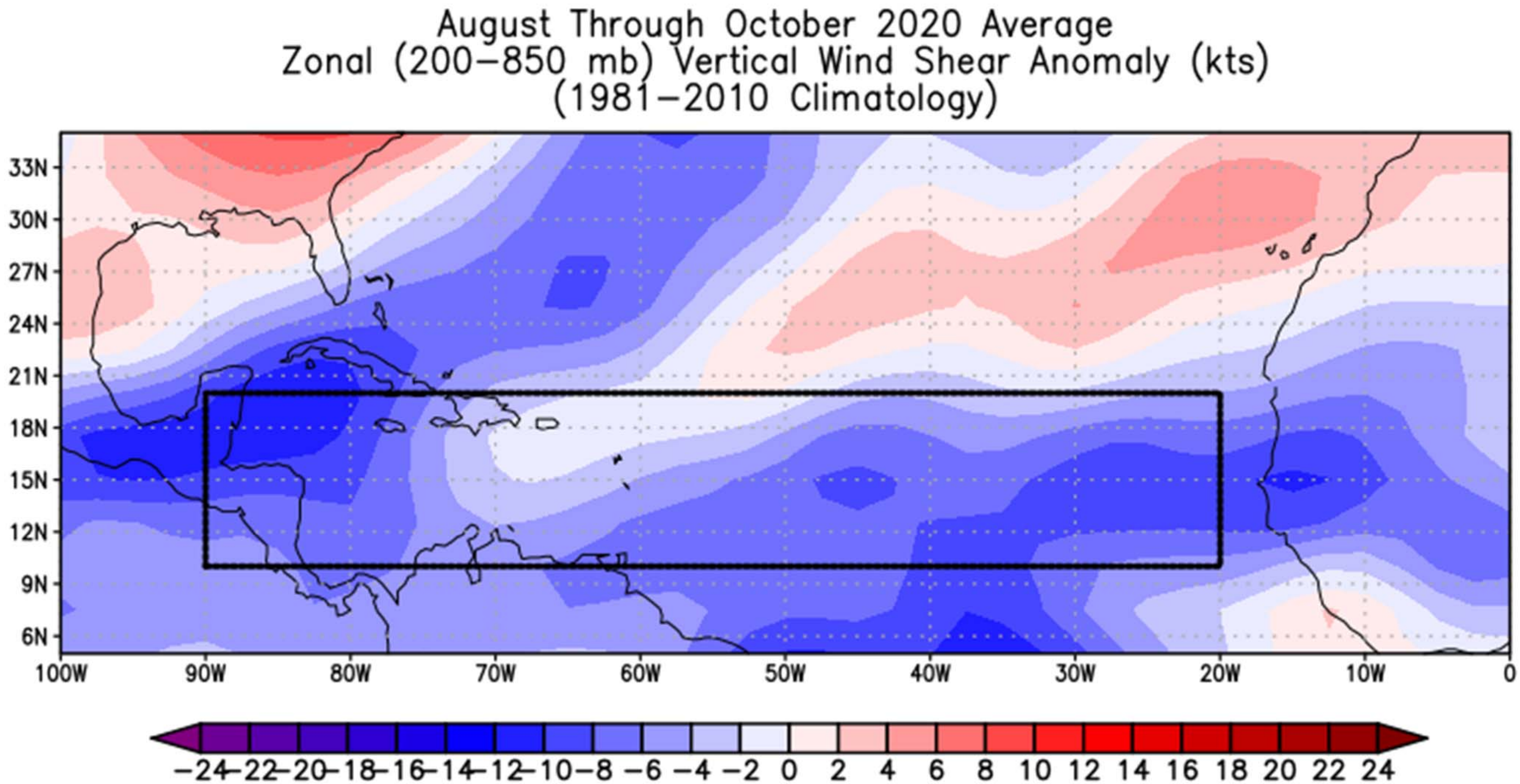

2020 Atlantic Accumulated Cyclone Energy by Storm
ARTHUR, 1.8
BERTHA, 0.4
CRISTOBAL, 3.5
DOLLY, 0.6
EDOUARD, 0.6
FAY, 1.1
GONZALO, 2.8
HANNA, 3.4
ISAIAS, 9.2
JOSEPHINE, 1.8
KYLE, 1.0
LAURA, 12.8
MARCO, 3.4
OMAR, 0.4
NANA, 2.6
PAULETTE, 15.9
RENE, 2.2
SALLY, 7.4
TEDDY, 27.8
VICKY, 2.1
WILFRED, 0.9
ALPHA, 0.4
BETA, 3.3
GAMMA, 2.5
DELTA, 15.7
EPSILON, 13.1
ZETA, 7.5
ETA, 18.1
THETA, 5.3
IOTA, 12.7

August-October 2020 Sea Surface Temperature Anomaly

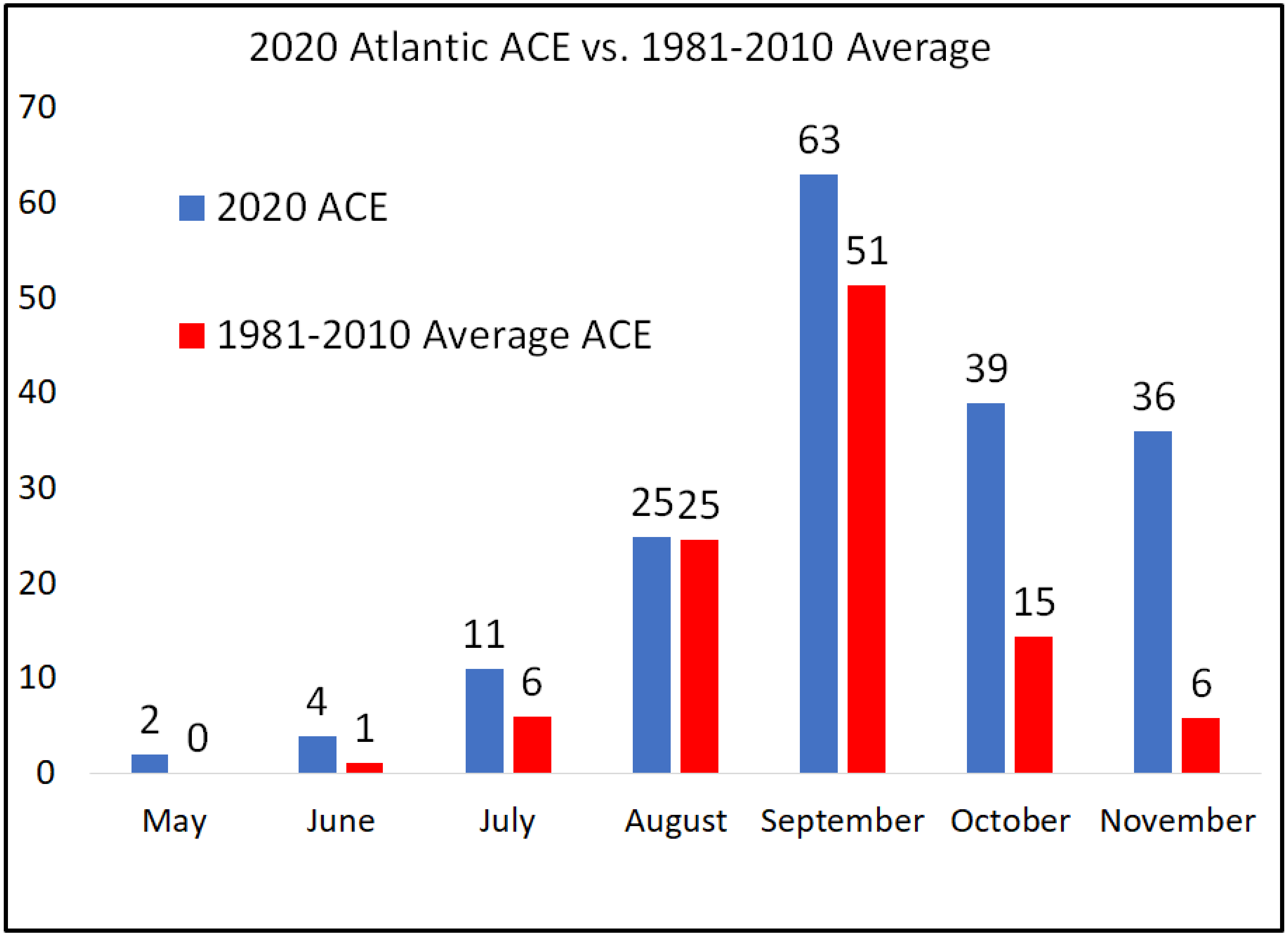




TROPOPAUSE (16 km)
Vertical Wind Profile in the Caribbean and western part of Main Development Region (10-20°N; 90-50°W)
a – fewer TCs (El Niño)
b – more TCs (La Niña)
a
b
-5
0
5
Zonal Wind (u) ms-1



August Through October 2020 Average
Zonal (200–850 mb) Vertical Wind Shear Anomaly (kts)
(1981–2010 Climatology)
33N
30N
27N
24N
21N
18N
15N
12N
9N
6N
100W
90W
80W
70W
60W
50W
40W
30W
20W
10W
0
−24 −22 −20 −18 −16 −14 −12 −10 −8 −6 −4 −2 0 2 4 6 8 10 12 14 16 18 20 22 24


2020 Atlantic ACE vs. 1981-2010 Average
2020 ACE
1981-2010 Average ACE
70
60
50
40
30
20
10
0
2
0
4
1
11
6
25
25
63
51
39
15
36
6
May
June
July
August
September
October
November

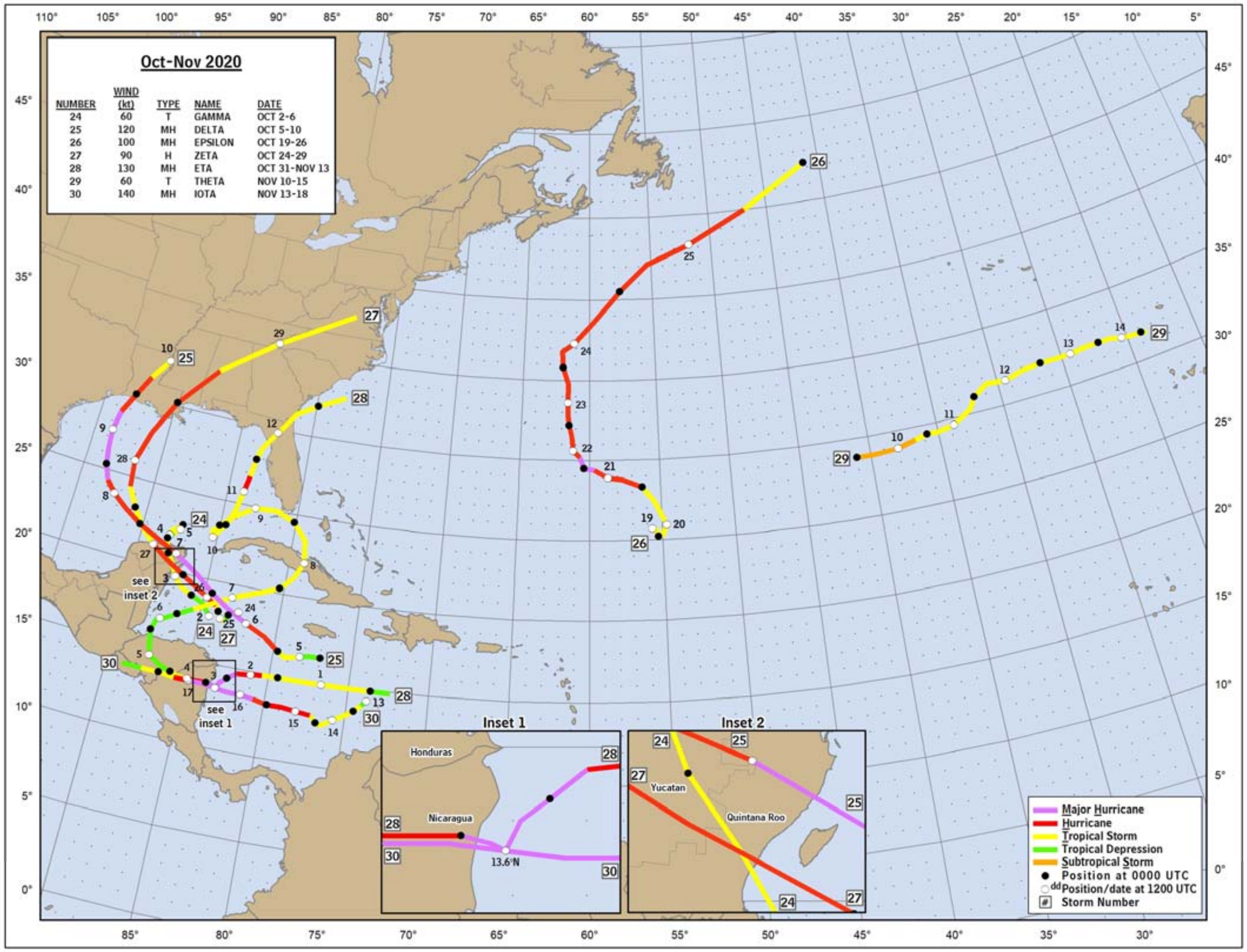
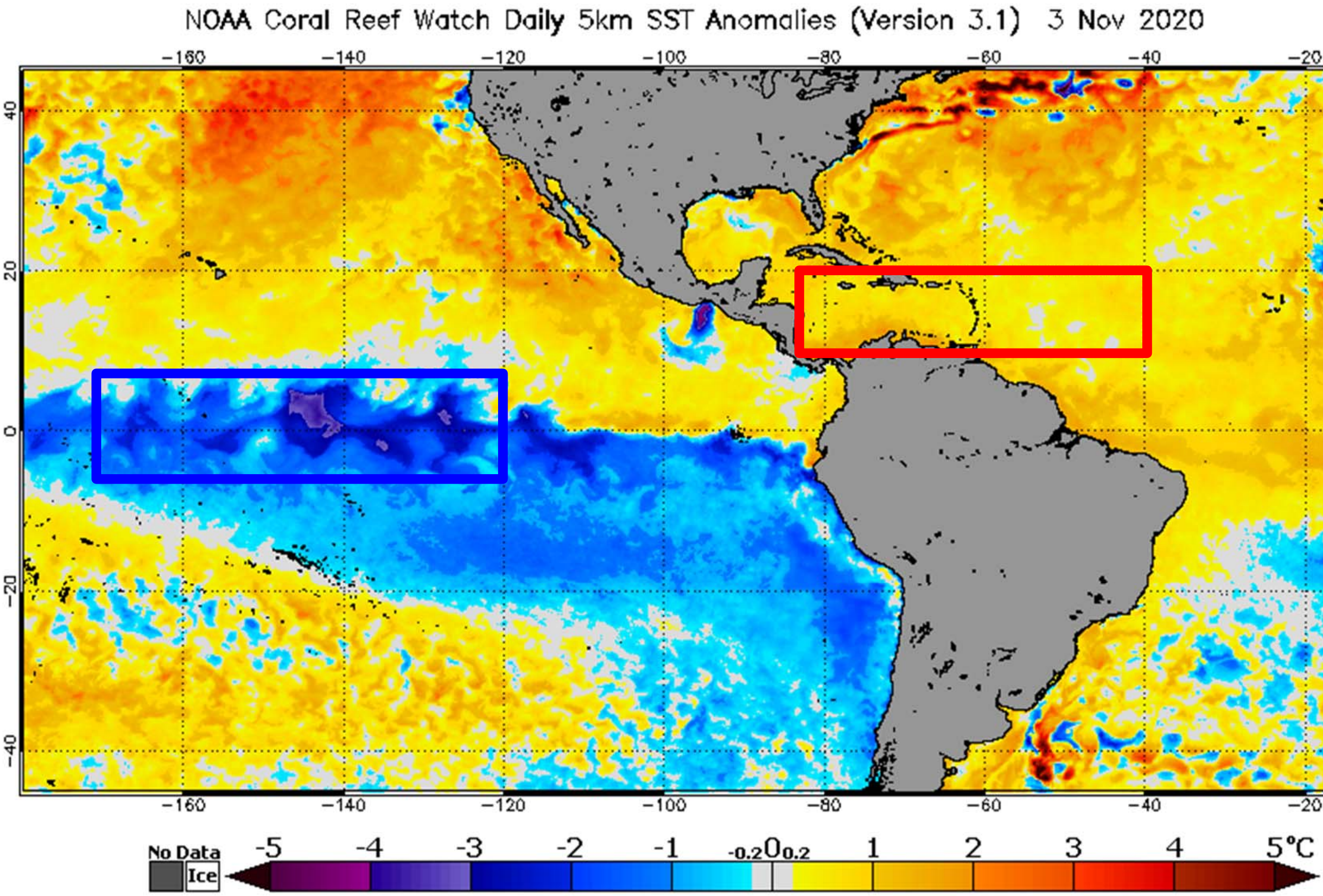
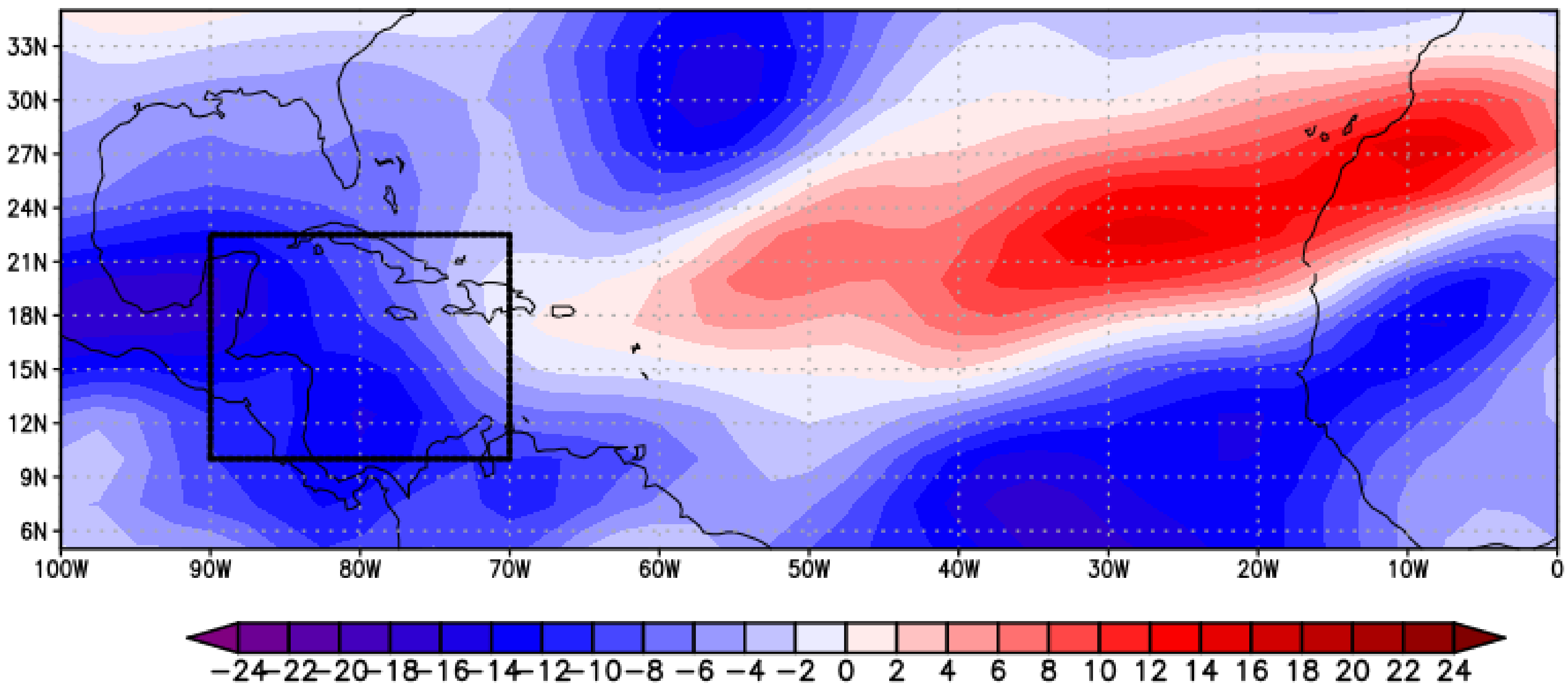


Figure courtesy of Ethan Gibney (NOAA)


NOAA Coral Reef Watch Daily 5km SST Anomalies (Version 3.1) 3 Nov 2020
−160 −140 −120 −100 −80 −60 −40 −20
40 20 0 −20 −40
No Data
Ice
-5 -4 -3 -2 -1 -0.2 0 0.2 1 2 3 4 5°C

October 1 – November 20, 2020 Average
Zonal (200–850 mb) Vertical Wind Shear Anomaly (kts)
(1981–2010 Climatology)



In Memory of Bill Gray (1929-2016)

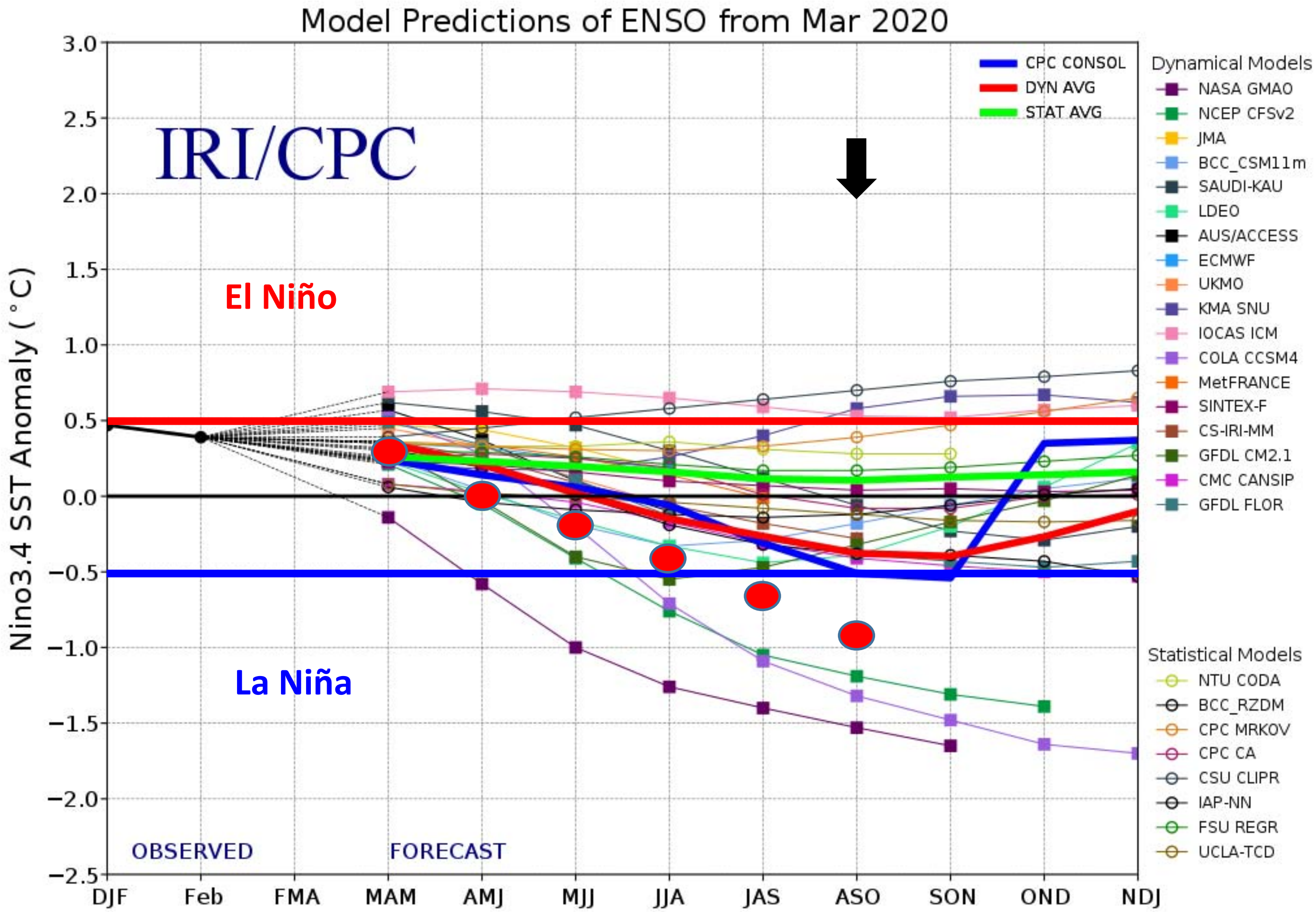
Klotzbach, P. J., J. C. L. Chan, P. J. Fitzpatrick, W. M. Frank, C. W. Landsea, and J. L. McBride, 2017: The science of William M. Gray: His contributions to the knowledge of tropical meteorology and tropical cyclones. *Bull. Amer. Meteor. Soc*, **98,** 2311-2336.

“It's tough to make predictions, especially about the future”

HOWEVER…

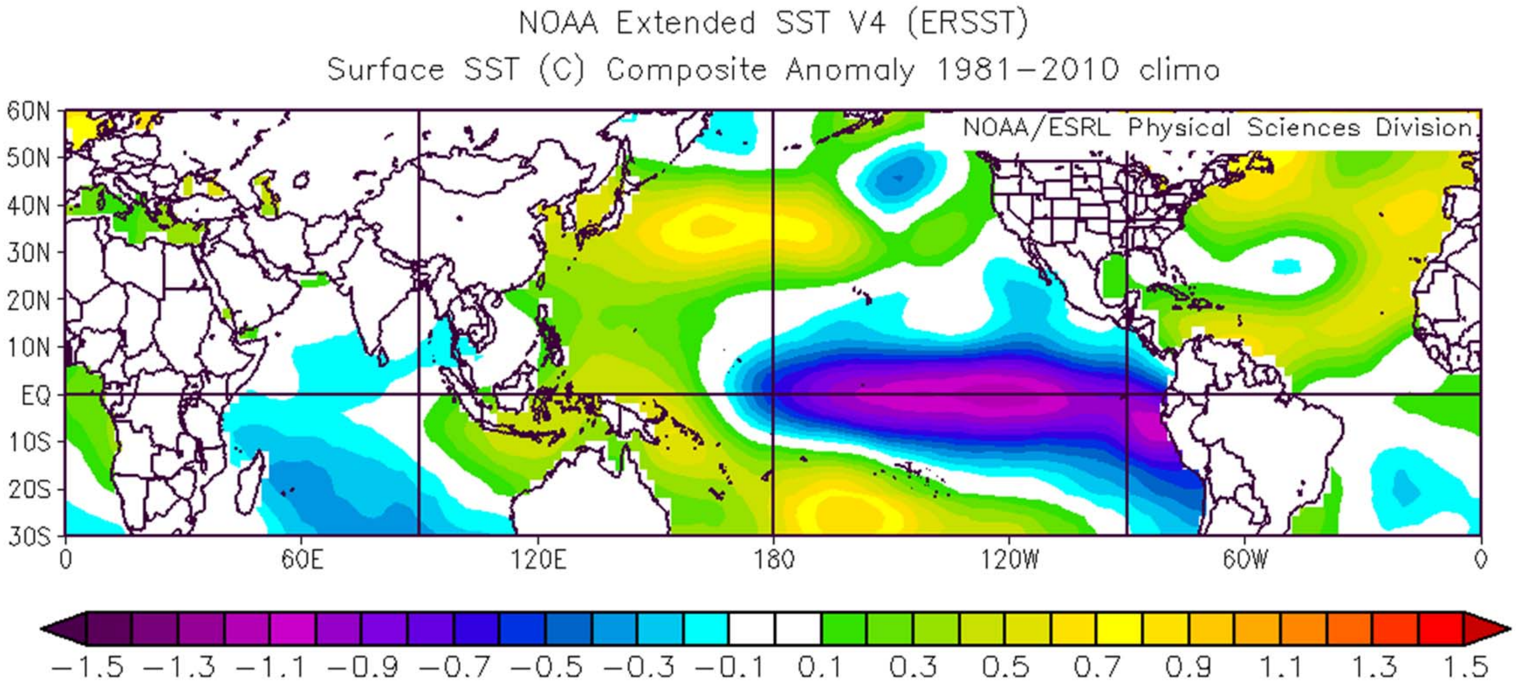
“You can see a lot by looking”

Yogi Berra

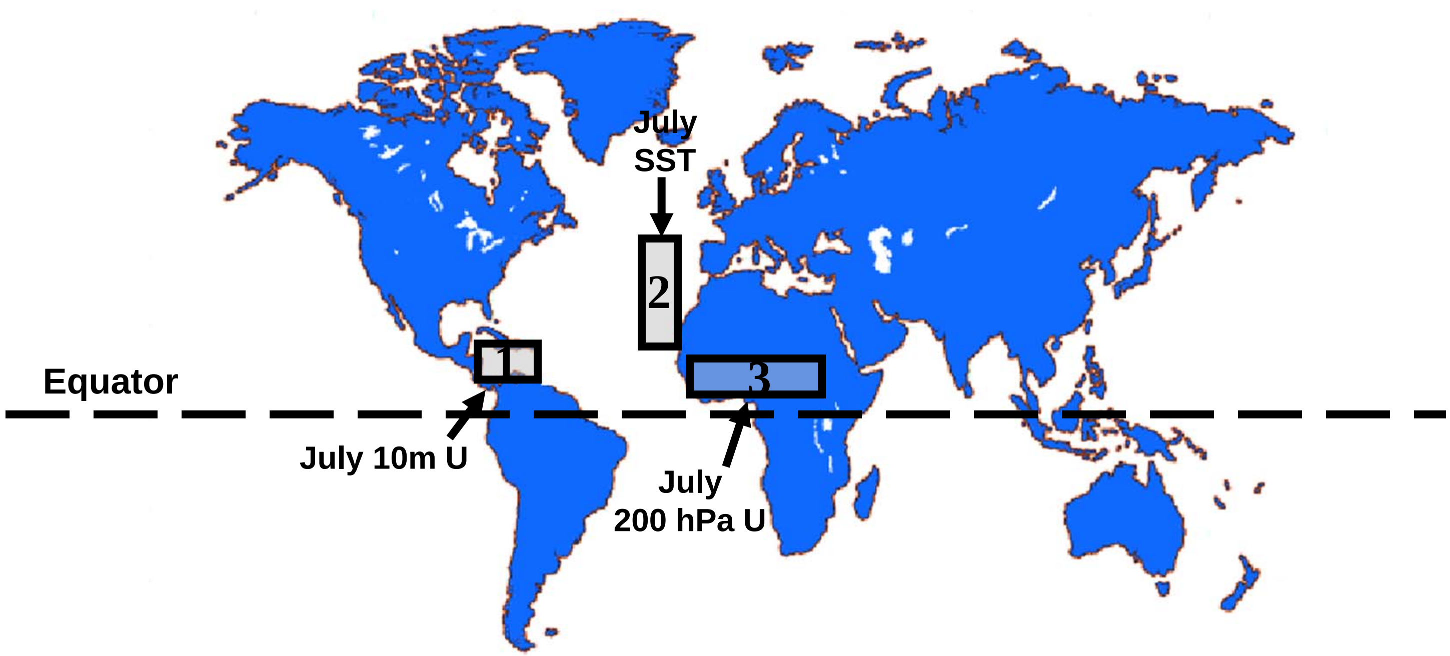


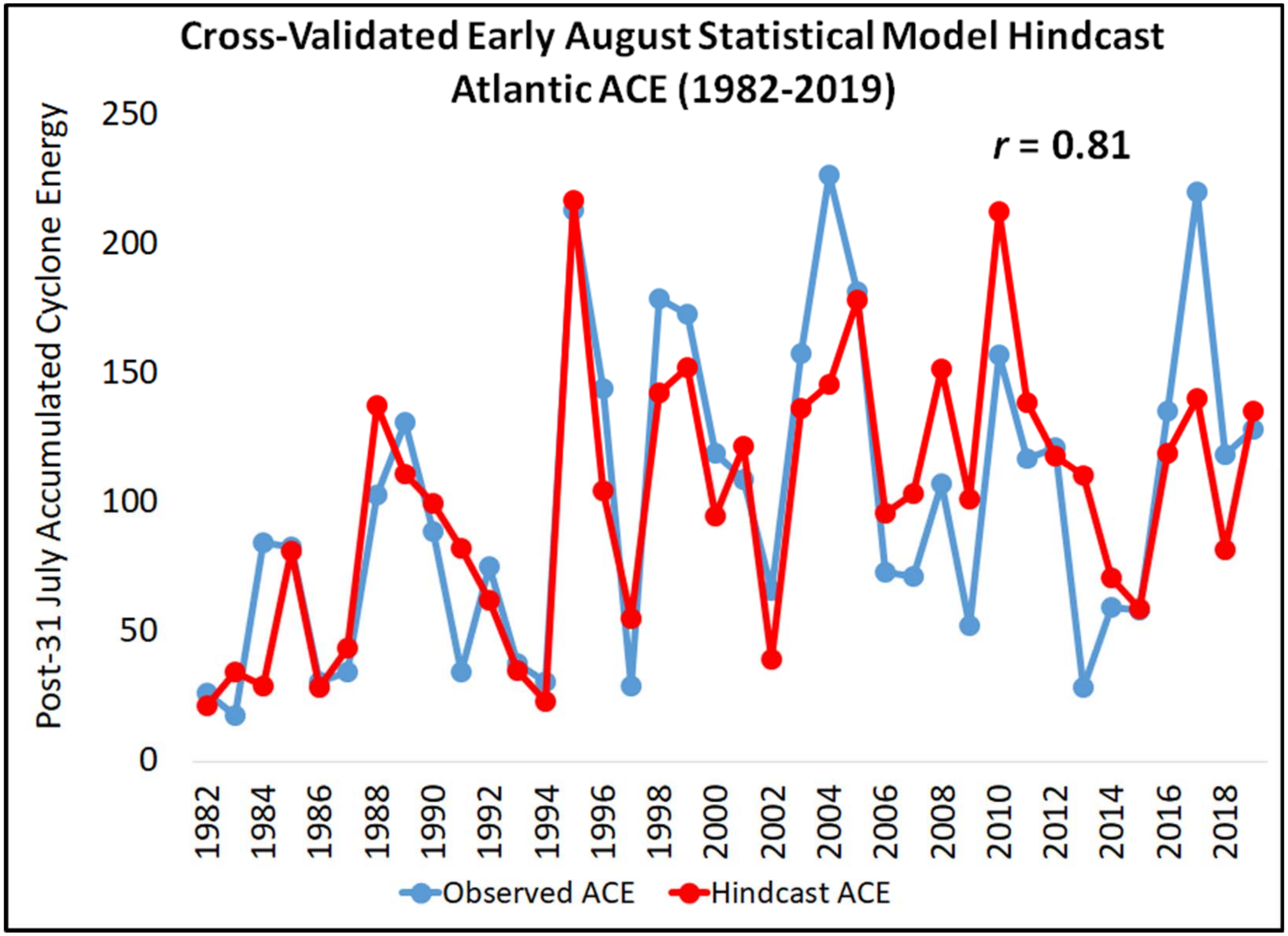
Model Predictions of ENSO from Mar 2020
IRI/CPC
El Niño
La Niña
Nino3.4 SST Anomaly (°C)
OBSERVED
FORECAST
CPC CONSOL
DYN AVG
STAT AVG
Dynamical Models
NASA GMAO
NCEP CFSv2
JMA
BCC_CSM11m
SAUDI-KAU
LDEO
AUS/ACCESS
ECMWF
UKMO
KMA SNU
IOCAS ICM
COLA CCSM4
MetFRANCE
SINTEX-F
CS-IRI-MM
GFDL CM2.1
CMC CANSIP
GFDL FLOR
Statistical Models
NTU CODA
BCC_RZDM
CPC MRKOV
CPC CA
CSU CLIPR
IAP-NN
FSU REGR
UCLA-TCD
DJF
Feb
FMA
MAM
AMJ
MJJ
JJA
JAS
ASO
SON
OND
NDJ

August – October SSTs: Ten Most Active minus Ten Least Active Atlantic Hurricane Seasons since 1950



Post-31 July Seasonal Forecast Predictors





Cross-Validated Early August Statistical Model Hindcast
Atlantic ACE (1982-2019)
r = 0.81
Post-31 July Accumulated Cyclone Energy
250
200
150
100
50
0
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
Observed ACE
Hindcast ACE

CSU ATLANTIC BASIN SEASONAL HURRICANE FORECASTS FOR 2020

Forecast Parameter and 1981-2010 Average (in parentheses)	2 April 2020	4 June 2020	7 July 2020	5 August 2020	Observed 2020 Total	% of 1981-2010 Average
Named Storms (NS) (12.1)	16	19	20	24	30	248%
Named Storm Days (NSD) (59.4)	80	85	85	100	118	199%
Hurricanes (H) (6.4)	8	9	9	12	13	203%
Hurricane Days (HD) (24.2)	35	40	40	45	34.75	144%
Major Hurricanes (MH) (2.7)	4	4	4	5	6	222%
Major Hurricane Days (MHD) (6.2)	9	9	9	11	8.75	141%
Accumulated Cyclone Energy (ACE) (106)	150	160	160	200	180	170%
Net Tropical Cyclone Activity (NTC) (116%)	160	170	170	215	225	194%

CSU – NOAA: August 2020 Atlantic Hurricane Seasonal Forecast Comparison

Forecast Parameter	CSU Forecast	NOAA Forecast	Observed 2020 Activity	1981-2010 Avg.
Named Storms (NS)	24 (21-27)	19-25	30	12.1
Hurricanes (H)	12 (10-14)	7-11	13	6.4
Major Hurricanes (MH)	5 (3-7)	3-6	6	2.7
Accumulated Cyclone Energy (ACE)	200 (149-255)	129-212*	180	106

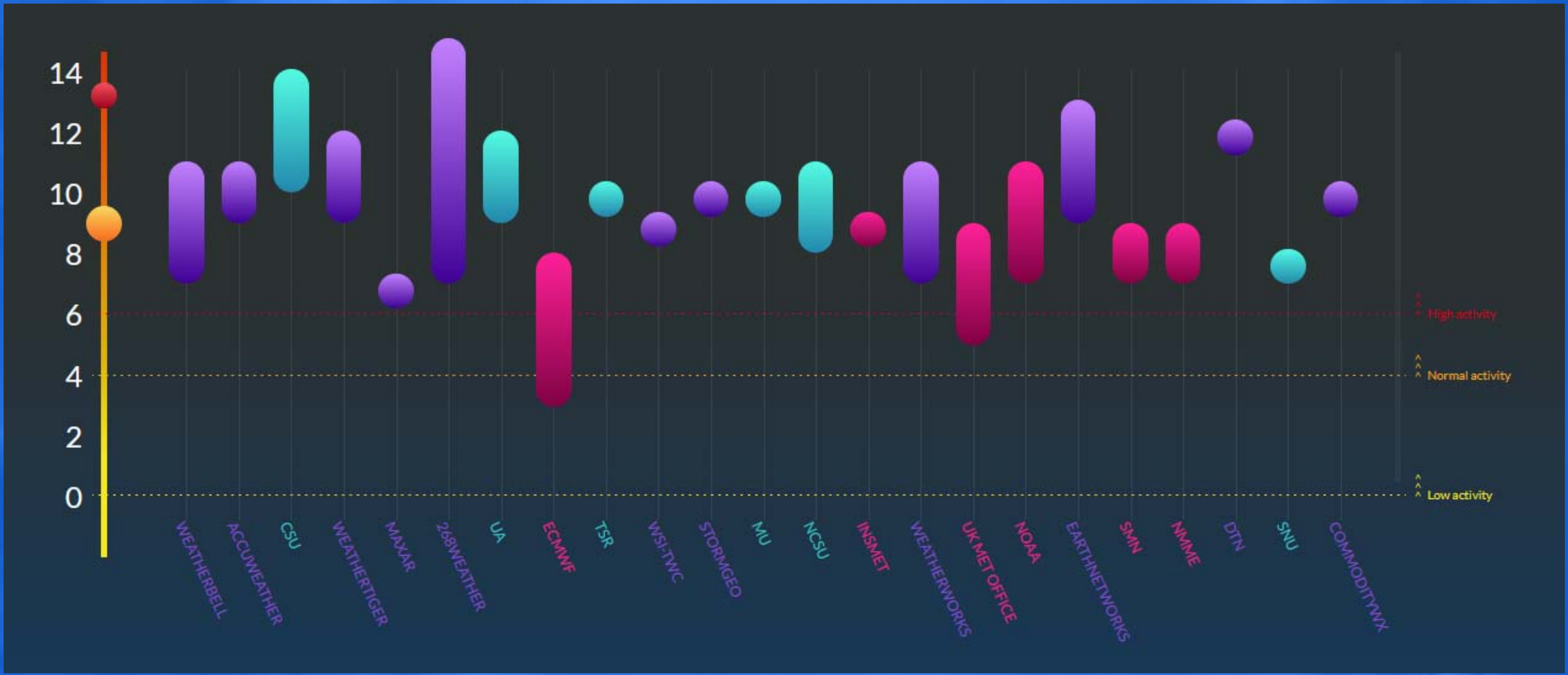
CSU 70% Confidence Intervals Included in Parentheses
**** Converted NOAA % of Median ACE Forecast to Actual ACE (10^4 kt^2)***

http://www.seasonalhurricanepredictions.org

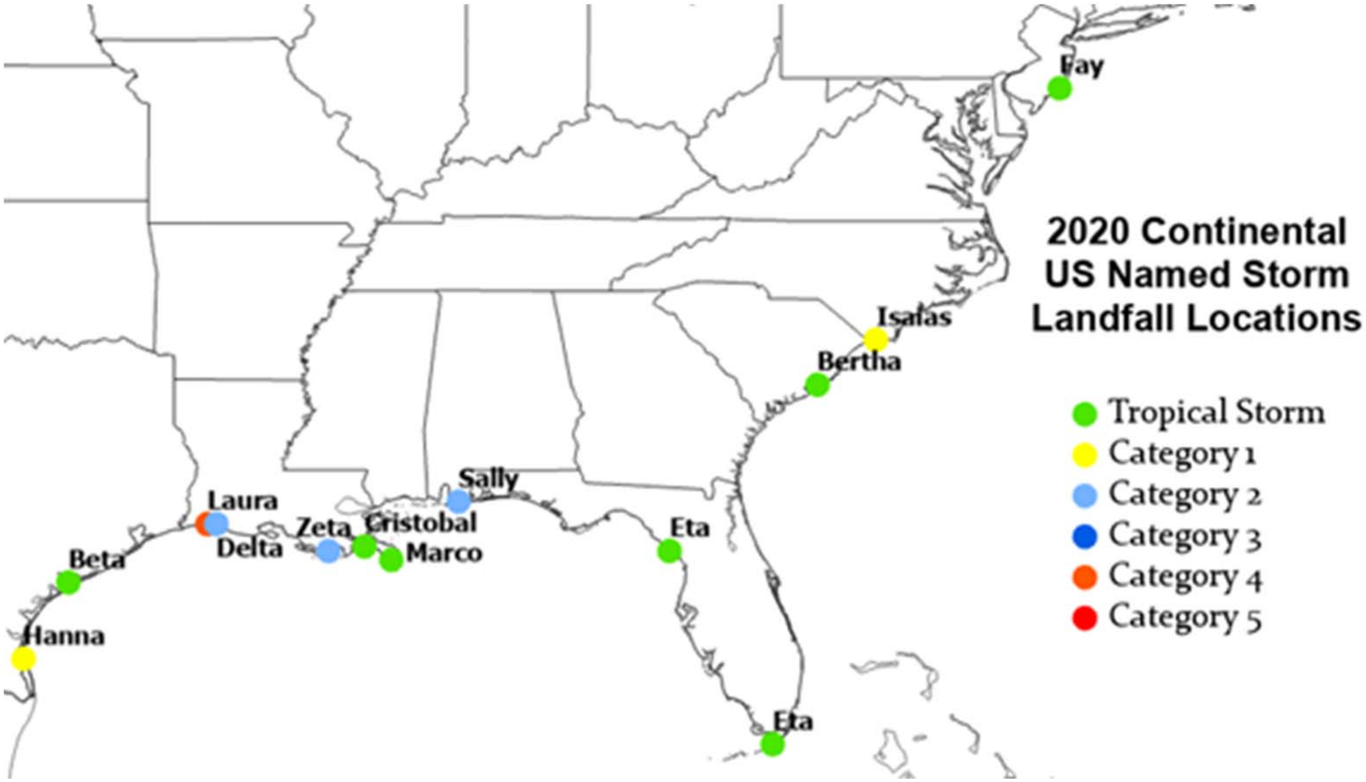
Contributing Forecast Groups

Seasonal Hurricane Forecast Compilation Website

http://seasonalhurricanepredictions.org



2020 Continental United States Named Storm Landfall Locations



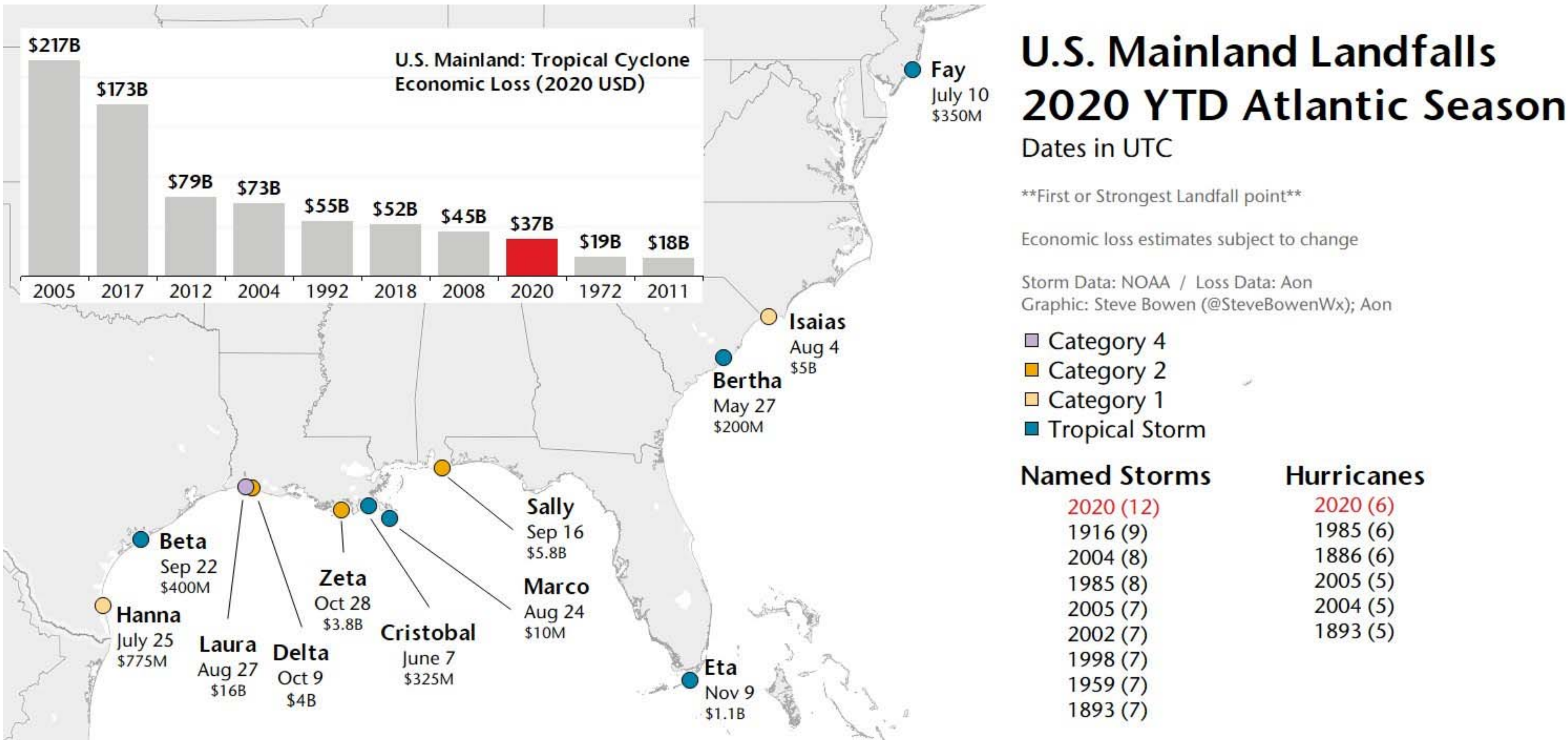
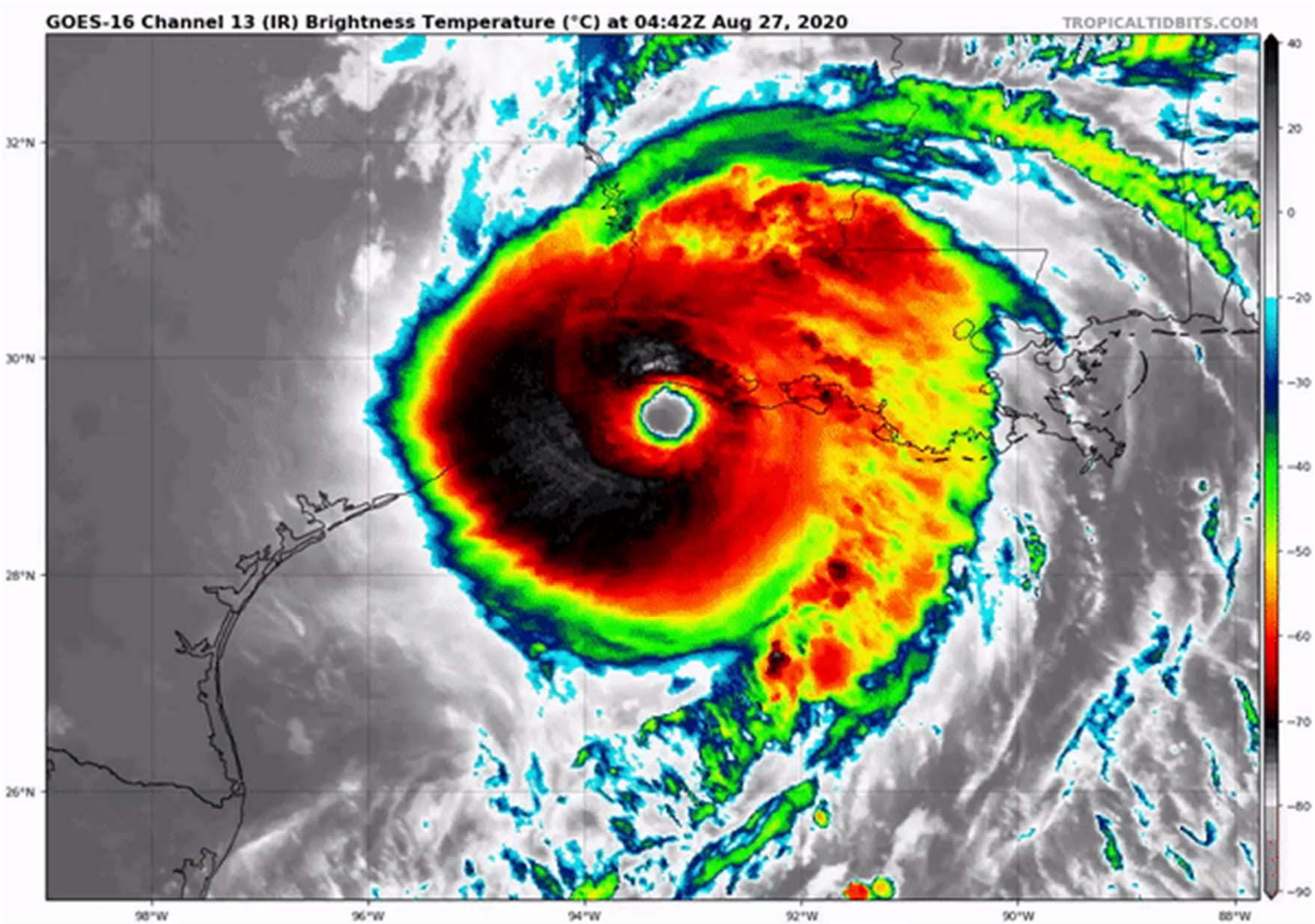


Figure Courtesy of Steve Bowen (Aon)


GOES-16 Channel 13 (IR) Brightness Temperature (°C) at 04:42Z Aug 27, 2020
TROPICALTIDBITS.COM
32°N
30°N
28°N
26°N
98°W
96°W
94°W
92°W
90°W
88°W
40
20
0
-20
-30
-40
-50
-60
-70
-80
-90

Hurricane Laura Notable Facts/Records

Cameron, Louisiana Landfall: 150 mph, 937 hPa

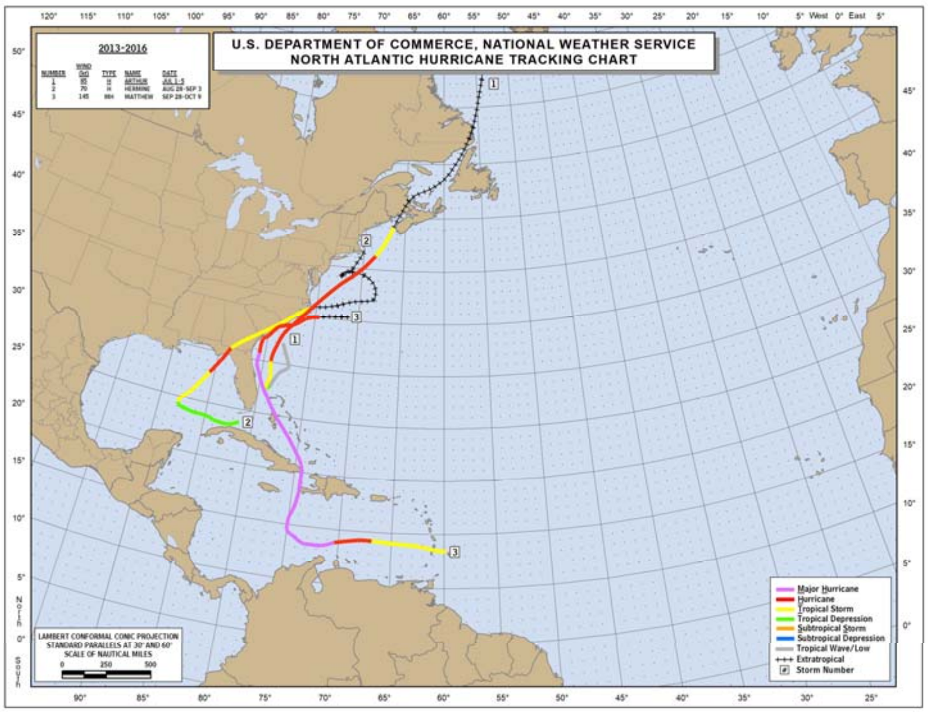
- Tied with Last Island Hurricane of 1856 for strongest hurricane (by maximum sustained wind) on record to make landfall in Louisiana

- Tied for 4th strongest hurricane on record to make landfall in Louisiana by pressure – trailing Katrina (2005), Last Island (1856) and Rita (2005)

- 42 fatalities in the United States, 31 fatalities in Haiti, 4 fatalities in Dominican Republic

- $14 Billion USD in economic damage in the United States

2013-2016 Continental US Landfalling Hurricanes: (3 Landfalling Hurricanes)



2017-2020 Continental US Landfalling Hurricanes: (14 Landfalling Hurricanes)

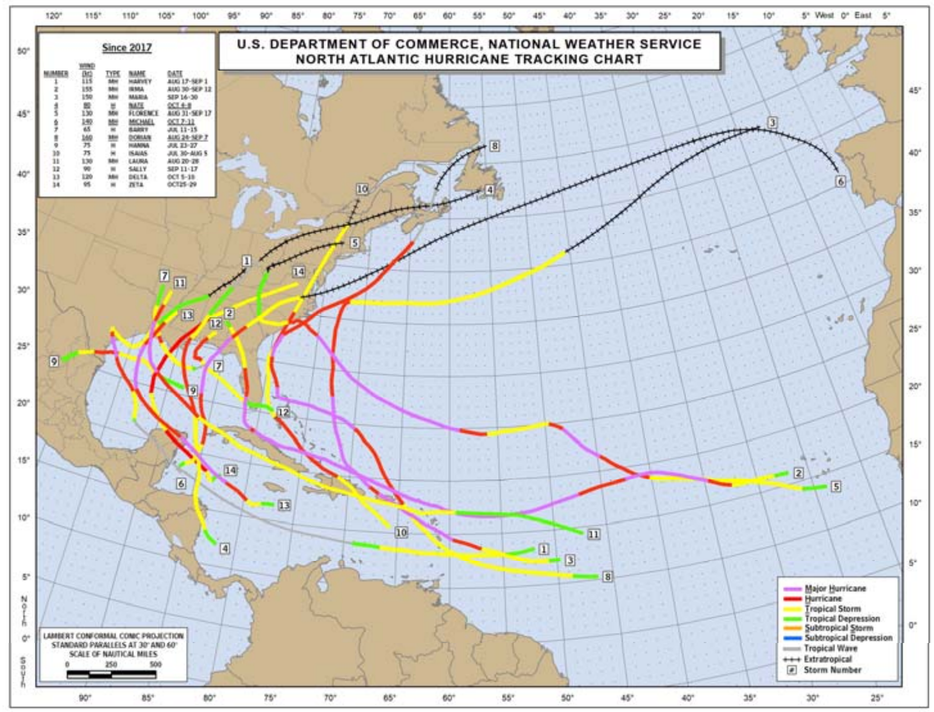
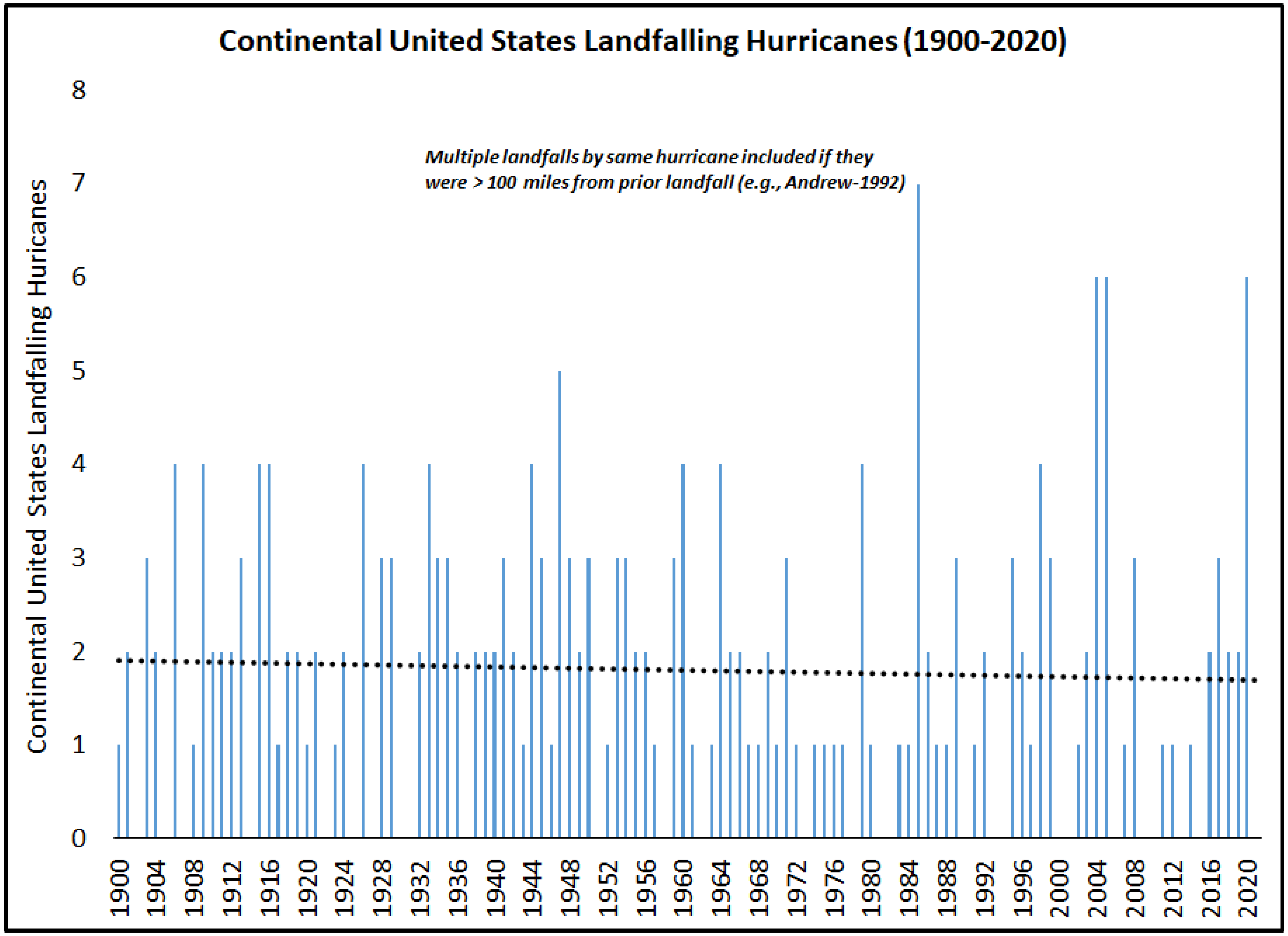
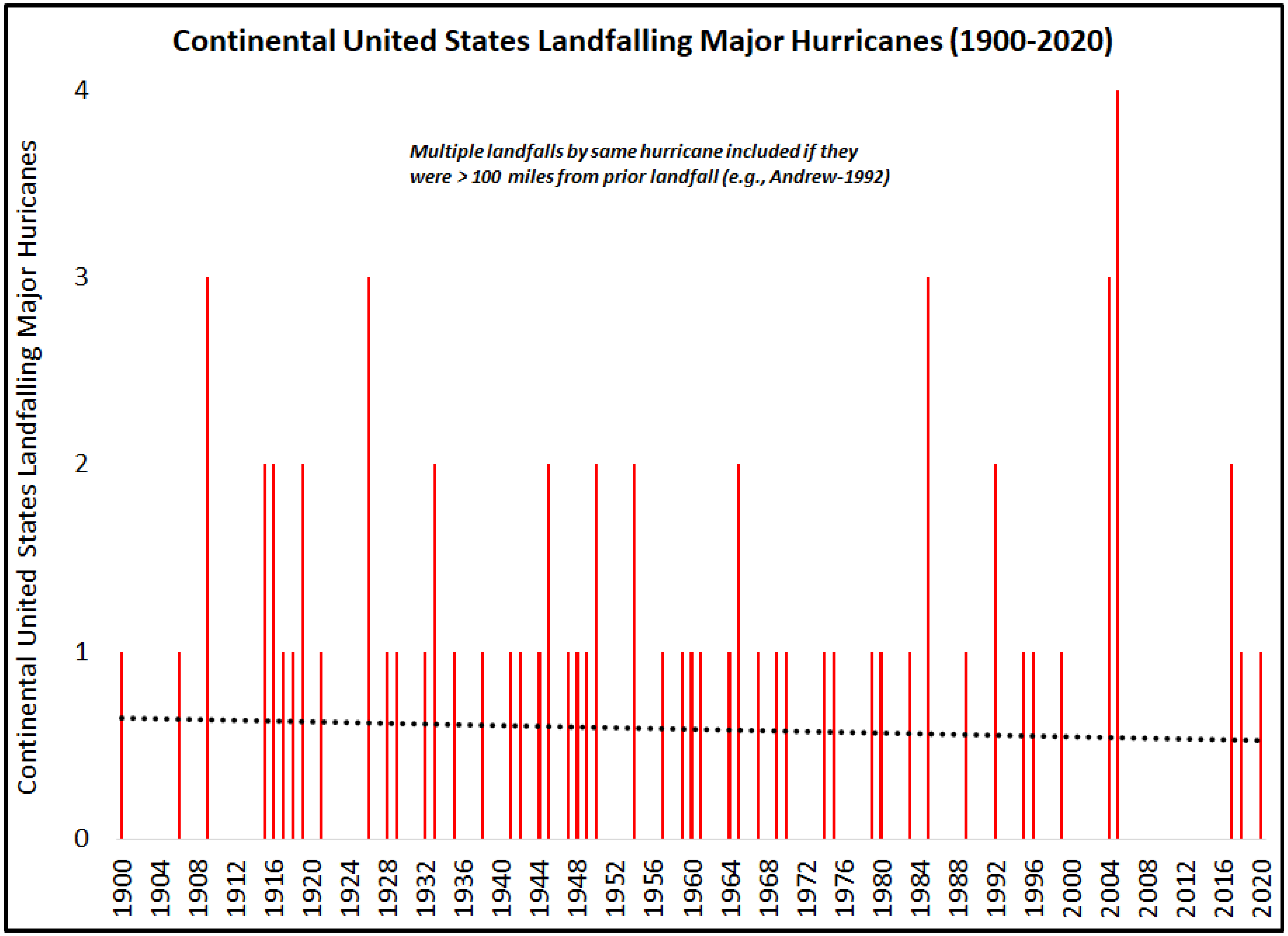


Figure Courtesy of Ethan Gibney (NOAA)


Continental United States Landfalling Hurricanes (1900-2020)
Multiple landfalls by same hurricane included if they were > 100 miles from prior landfall (e.g., Andrew-1992)
Continental United States Landfalling Huricanes
0
1
2
3
4
5
6
7
8
1900
1904
1908
1912
1916
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020



Continental United States Landfalling Major Hurricanes (1900-2020)
Multiple landfalls by same hurricane included if they were > 100 miles from prior landfall (e.g., Andrew-1992)
Continental United States Landfalling Major Huricanes
0
1
2
3
4
1900
1904
1908
1912
1916
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020

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Web: http://tropical.colostate.edu

Twitter: @philklotzbach

Upcoming Training

December 11, 2020 1:30 pm

Michele Luckett with BRACE in Pensacola

https://attendee.gotowebinar.com/register/4829859219389044750

Technical Assistance is Available

Available Daily: **1 (800) 677-4548**

Options for Further Assistance Include:

Phone and Email consultation

Site Visits

Register at www.flhousing.org for:

Workshops

Webinars

Thank you!

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cook@flhousing.org

Michael Chaney
chaney@flhousing.org