



# **2015 Hurricane Season Overview**

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# **Overview outline**

## **1. CPC Hurricane Season Outlooks**

### **1. Current status for the Atlantic and Pacific basins**

### **3. Climate factors influencing this season**

### **4. Summary**



# NOAA 2015 Atlantic Hurricane Season Outlooks

<b>Season and Activity Type</b>	<b>August Update</b>	<b>May Outlook</b>	<b>Observed(10/23)</b>
<b>Chance Above Normal</b>	<b>0%</b>	<b>10%</b>	
<b>Chance Near Normal</b>	<b>10%</b>	<b>20%</b>	
<b>Chance Below Normal</b>	<b>90%</b>	<b>70%</b>	
<b>Named Storms (NS)</b>	<b>6-10</b>	<b>6-11</b>	<b>10</b>
<b>Hurricanes (H)</b>	<b>1-4</b>	<b>3-6</b>	<b>3</b>
<b>Major Hurricanes (MH)</b>	<b>0-1</b>	<b>0-2</b>	<b>2</b>
<b>ACE (% Median)</b>	<b>25%-70%</b>	<b>40%-85%</b>	<b>58%</b>

**NOAA's Seasonal Hurricane Outlook is a general guide to the expected overall strength of the hurricane season. It is not a seasonal hurricane landfall forecast, and does not imply levels of activity for any particular region.**

**The predicted ranges of NS, H, MH, and ACE reflect a 70% probability of occurrence. Observed values are as of October 19, 2015**

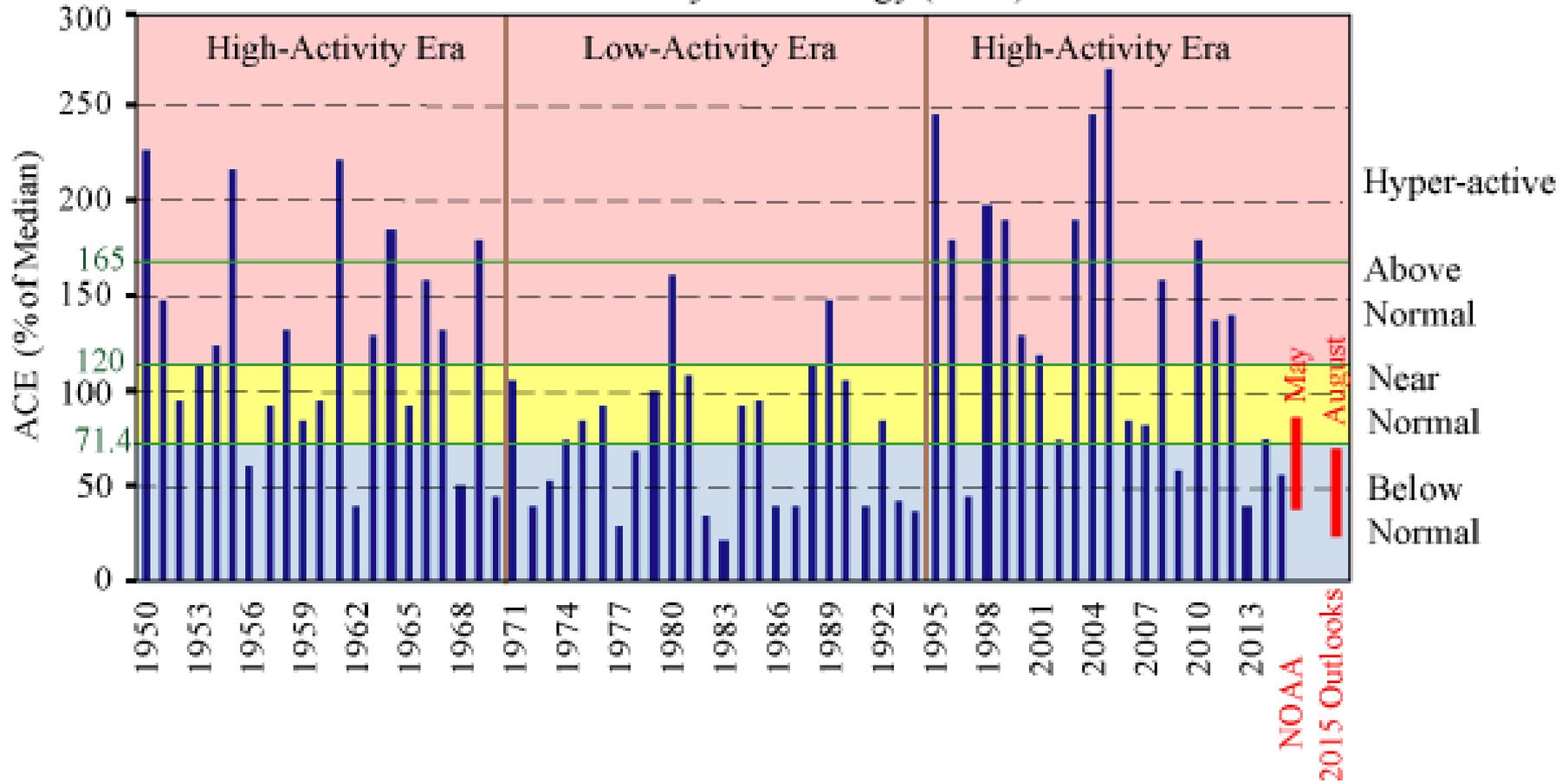


# NOAA 2015 Eastern and Central Pacific Hurricane Outlooks

<u>Season and Activity Type</u>	<u>Eastern Outlook (Normals)</u>		<u>Obs.</u>	<u>Central Outlook</u>		<u>Obs.</u>
<b>Chance Above Normal</b>	<b>50%</b>			<b>70%</b>		
<b>Chance Near Normal</b>	<b>40%</b>			<b>25%</b>		
<b>Chance Below Normal</b>	<b>10%</b>					
<b>5%</b>						
<b>Tropical Storms</b>	<b>14-20</b>	<b>(15-16)</b>	<b>16</b>	<b>5-8</b>		<b>13</b>
<b>Hurricanes</b>	<b>7-11</b>	<b>(9)</b>	<b>12</b>			<b>7</b>
<b>Major Hurricanes</b>	<b>3-6</b>	<b>(4-5)</b>	<b>10</b>			<b>4</b>
<b>ACE (% Median)</b>	<b>95%-160% (100)</b>					

Based on past seasons with similar climate conditions, we estimate a 70% probability for each range. Historically, roughly two-thirds of similar seasons had activity in these ranges. Observed values are as of October 19, 2015.

# Atlantic Hurricane Season Accumulated Cyclone Energy (ACE): 1950-2015



With this season prediction, 2013-2015 marks the first time since 1992-94 with three consecutive Atlantic hurricane seasons that were not above normal.

# Model Forecast Summary; April 2015

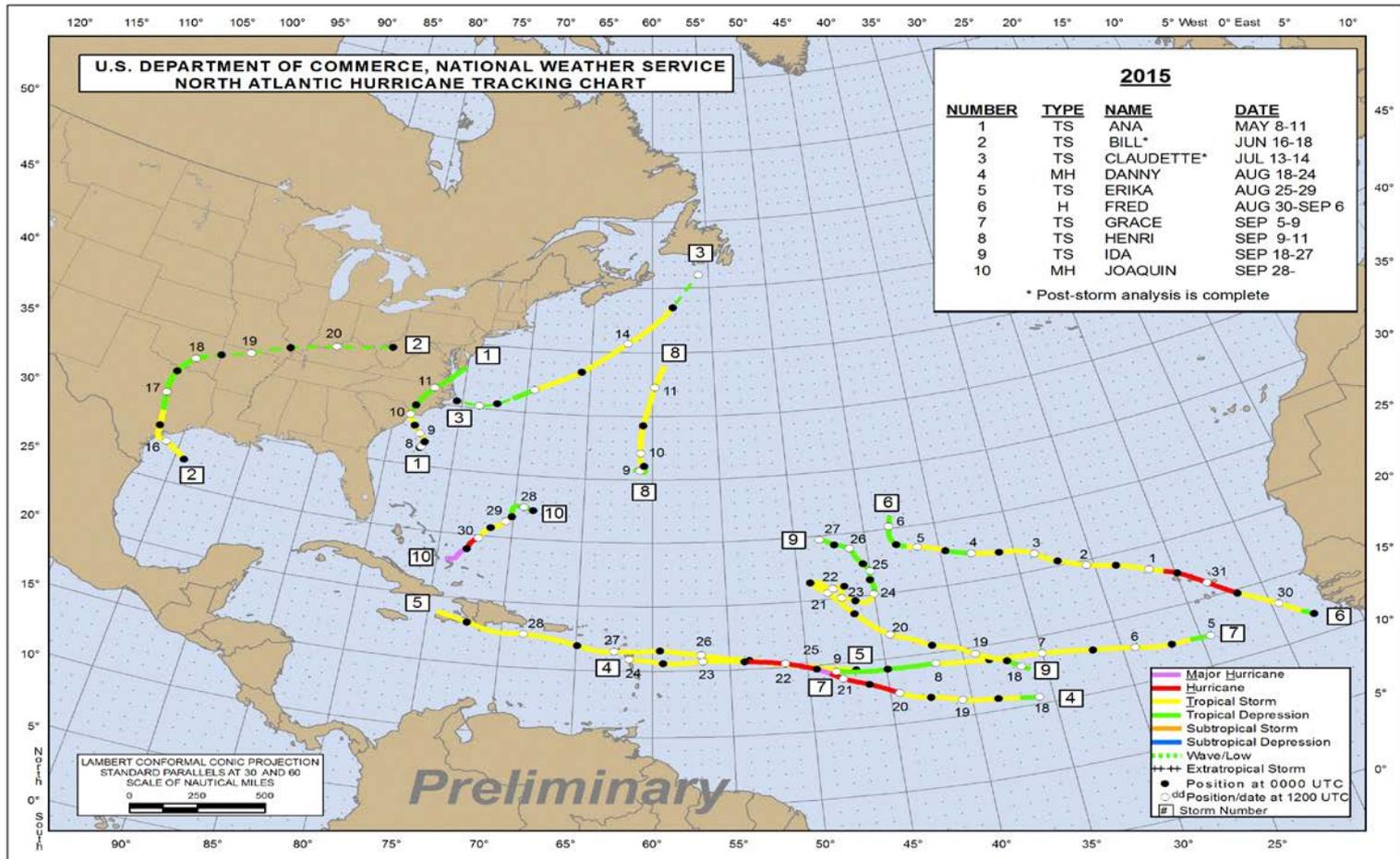
Model	Named Storms	Hurricanes	Major Hurricanes	ACE (% Median)
CPC Regression:	7-12 (9.5)	3-6 (4.5)	1-3 (2)	36-116 (76)
CPC Binning : Nino 3.4+SSTA	7.7-15.4 (11.55)	2.5-8.6 (5.55)	1.1-4.2 (2.65)	59-146 (103)
CPC Binning ENSO+SSTA	7.5-14.5 (11)	2.5-8.5 (5.5)	1-4 (2.5)	58-145 (101)
CPC ENSO only	7.5-14.5 (11)	2.5-8.5 (5.5)	1-4 (2.5)	58-145 (101)
CFS: Hi-Res (bias corrected)	7-11 (9)	1-4 (2.5)		31-62 (47)
CFS-V2 T126: 1	6-11 (8.5)	3-6 (4.5)	1-2 (1.5)	33-95 (64)
CFS-V2 T126: 2	9-14 (11.5)	4-7 (5.5)	2-3 (2.5)	63-132 (98)
CFS-V2 T126: 3	9-14 (11.5)	4-7 (5.5)	2-3 (2.5)	59-131 (95)
GFDL FLOR-FA		3-9 (6)		
NMME: 1	4-13 (8.5)	2-6 (4)	0-3 (1.5)	19-114 (67)
NMME: 2	4-14 (9)	2-8 (5)	1-4 (2.5)	19-151 (85)
NMME: 3	4-14 (9)	2-8 (5)	1-4 (2.5)	19-145 (82)
ECMWF:	6.6-11.6 (9.1)	1.6-5.6 (3.6)		38.5-89.8 (64)
EUROSIP:	7.8-14.2 (11)			
UKMET				
Guidance Mean	6.7-13.3 (10)	2.5-7.1 (4.8)	1.1-3.4 (2.3)	41-123 (82)

# Model Forecast Summary; July 2015

## (Includes June-July activity (3 named storms))

Model	Named Storms	Hurricanes	Major Hurricanes	ACE (% Median)
CPC Regression:	7-10 (8.5)	3-5 (4)	1-2 (1.5)	36-76 (56)
CPC Binning : Nino 3.4+SSTA	6.8-8.2 (7.5)	2.8-4.2 (3.5)	1-1 (1)	35-101 (68)
CPC Binning ENSO+SSTA	6.8-11.2 (9)	3.2-4.1 (3.65)	0.9-1.8 (1.35)	50-89 (69)
CFS: Hi-Res (bias corrected)	7-11 (9)	2-4 (3)		42-60 (51)
CFS-V2 T126: 1	6-9 (7.5)	2-4 (3)	0-1 (0.5)	18-66 (42)
CFS-V2 T126: 2	9-13 (11)	4-6 (5)	1-3 (2)	59-112 (86)
CFS-V2 T126: 3	9-12 (10.5)	3-6 (4.5)	1-3 (2)	48-108 (78)
GFDL HiFLOR A07	9.8-14.2 (12)	4-7 (5.5)	1.2-3 (2.1)	24-94 (59)
NMME: 1	5-9 (7)	2-5 (3.5)	1-2 (1.5)	35-74 (55)
NMME: 2	7-12 (9.5)	3-6 (4.5)	2-3 (2.5)	57-112 (85)
NMME: 3	6-11 (8.5)	3-5 (4)	1-3 (2)	44-98 (71)
ECMWF:	7.3-12.7 (10)	1.3-4.7 (3)		45-96 (70)
EUROSIP:				
UKMET				
<b>Guidance Mean</b>	<b>7.2-11.1 (9.2)</b>	<b>2.8-5.1 (3.9)</b>	<b>1-2.3 (1.6)</b>	<b>41-91 (66)</b>
May Outlook	6-11 (8.5)	3-6 (4.5)	0-2 (1)	40-85 (63)

# 2015 Atlantic Basin Storm Tracks



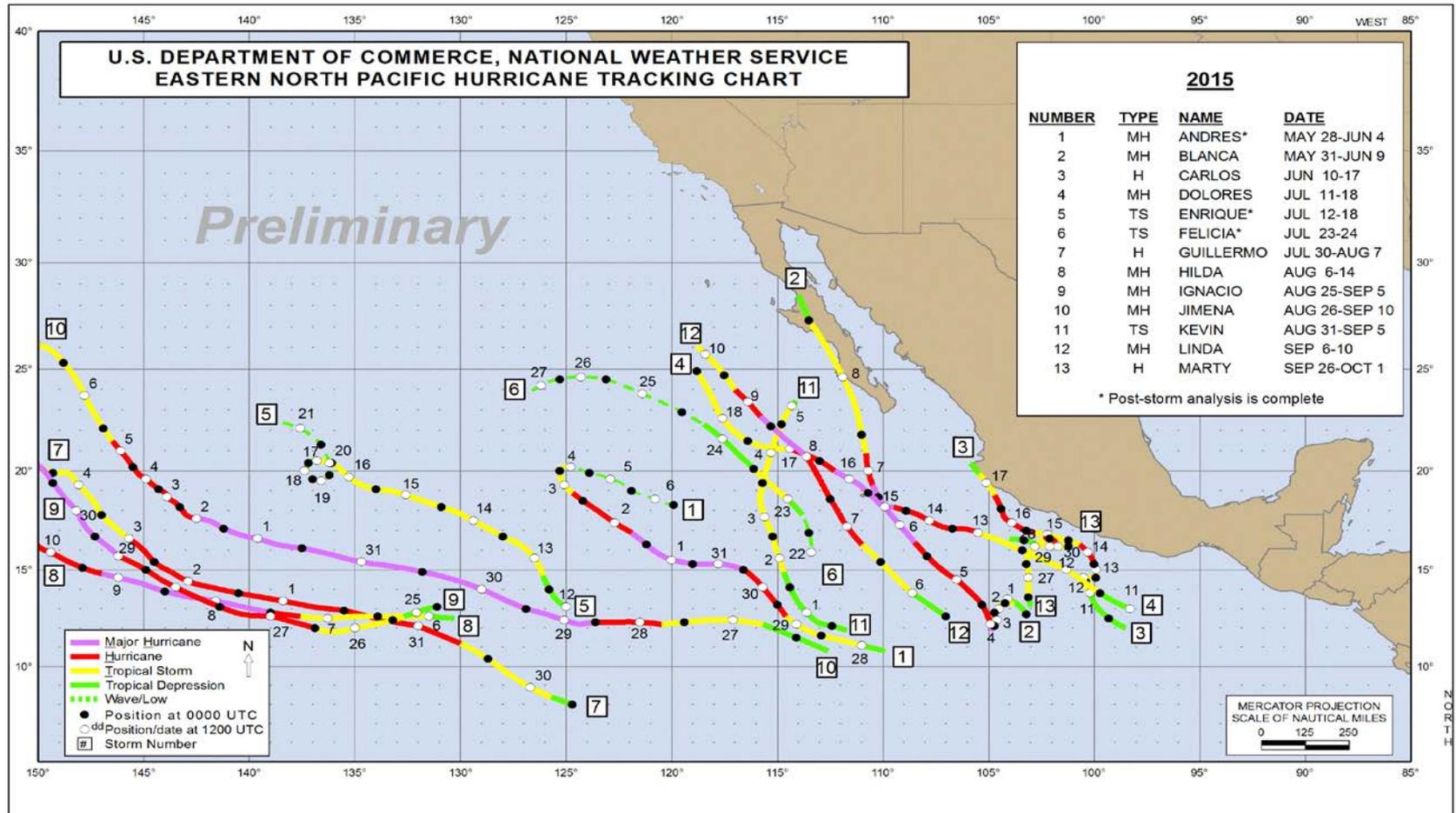
10 NS, 3 H, 2 MH, ACE=58% of median

Predictions:

May: 6-11 NS, 3-6 H, 0-2 MH, ACE 40%-85%

August: 6-10 NS, 1-4 H, 0-1 MH, ACE 25%-70%

# 2015 Eastern North Pacific Storm Tracks

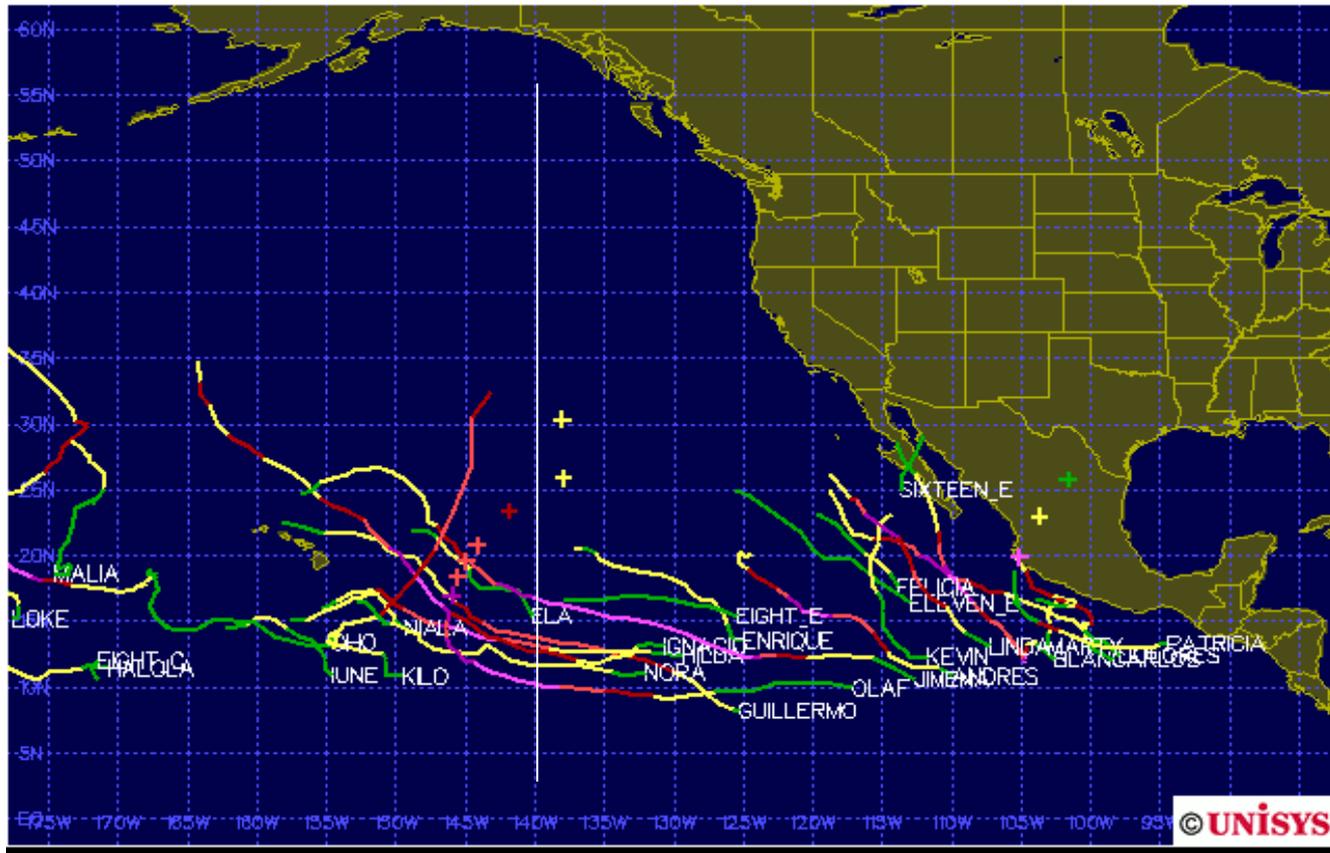


16 NS, 12 H, 10 MH (Oct. 23, 2015)

Predicted

15-22 NS, 7-12 H, 5-8 MH

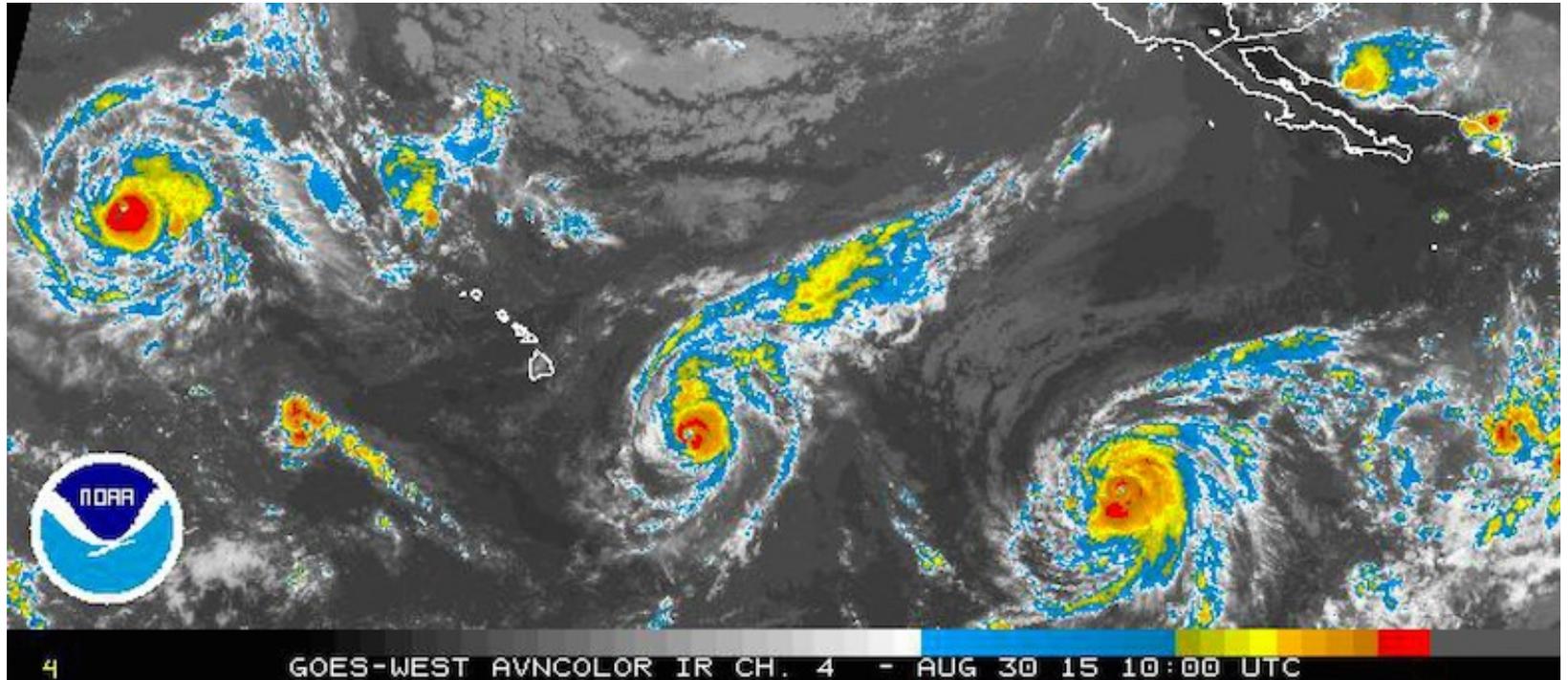
# 2015 Season Tropical Storm Tracks; Central and Eastern North Pacific



Central Pacific (Oct. 22, 2015)  
13 NS, 7H, 4 MH (all record highs)

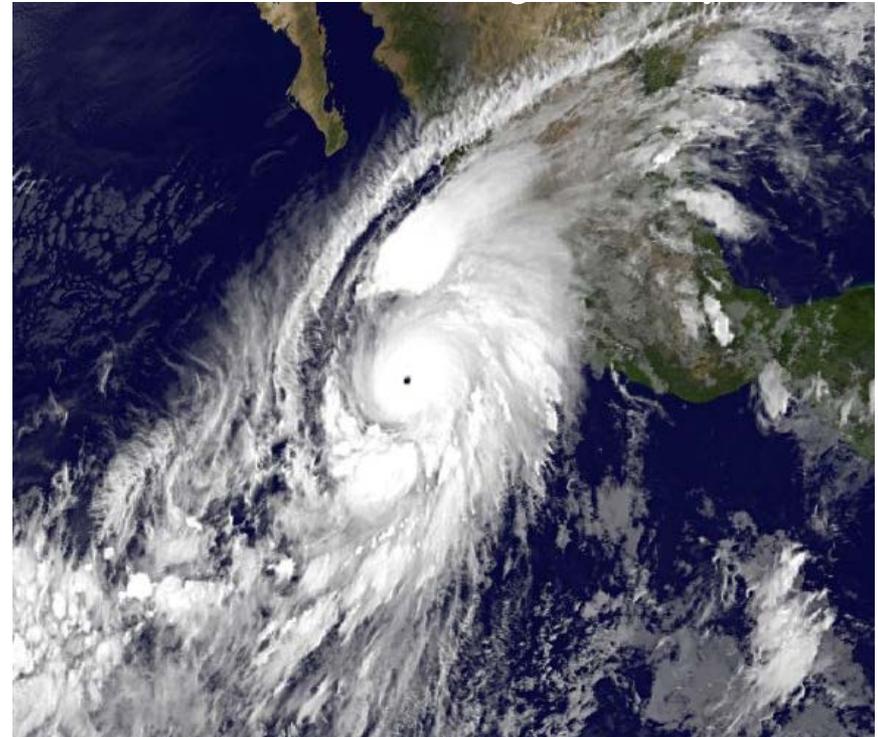
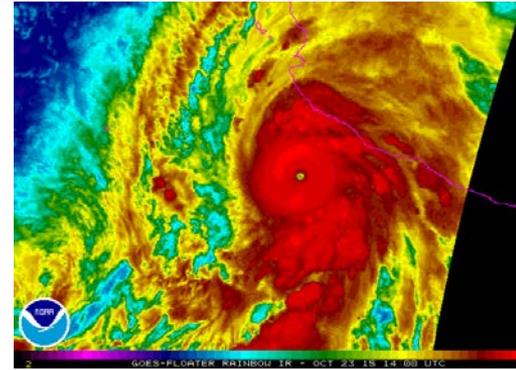
Storms formed over CPAC  
7 NS, 3H, 1 MH

# Three Category 4 Hurricanes in the North Pacific Basins Kilo, Ignacio, and Jimenia on Aug. 30, 2015

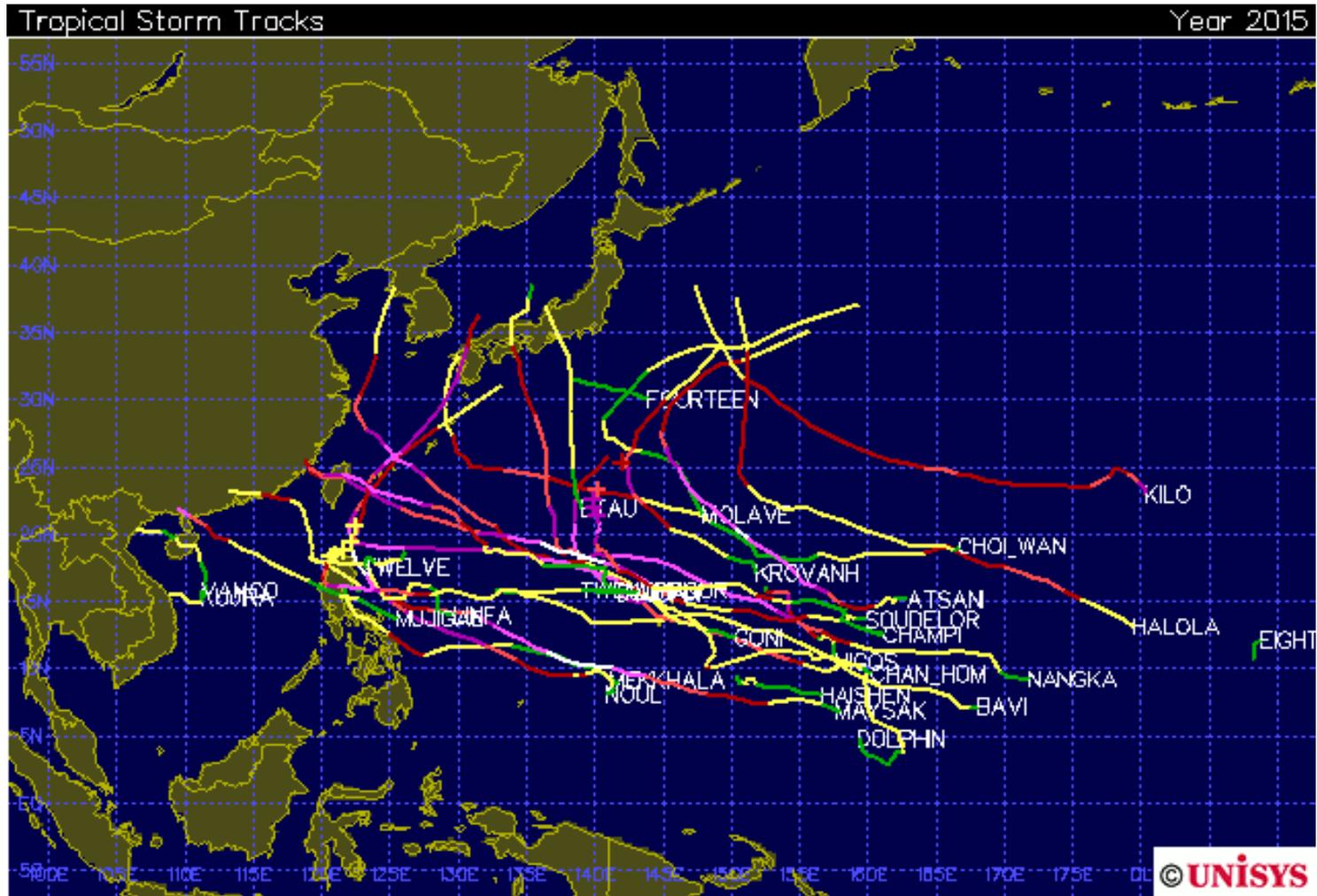


# Hurricane Patricia

- Strongest hurricane ever recorded in the Eastern Pacific.
  - Maximum sustained winds: 200mph / 175kts
  - Minimum pressure: 880mb
  - Formed on Oct 21<sup>st</sup>, rapid intensification from a weak TS to Cat 5 in ~36 hrs.
  - Only 2<sup>nd</sup> Cat 5 to ever hit the west coast of Mexico.
    - Forecasted landfall between Puerto Vallarta and Manzanillo, Mexico.
    - Other hit Manzanillo in 1959



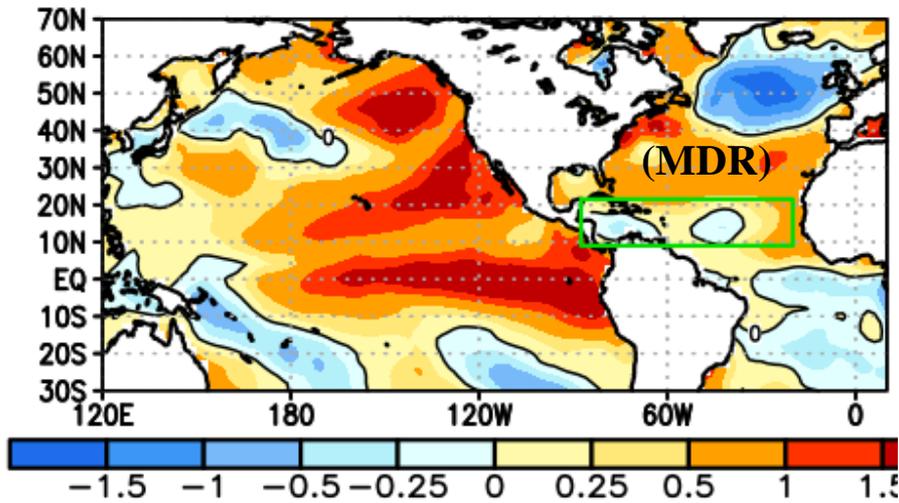
# 2015 Season Western North Pacific Storm Tracks



Season total (as of Oct. 23, 2015)  
26 (26) TCs, 19 (18) Typhoons and 9 Super Typhoons

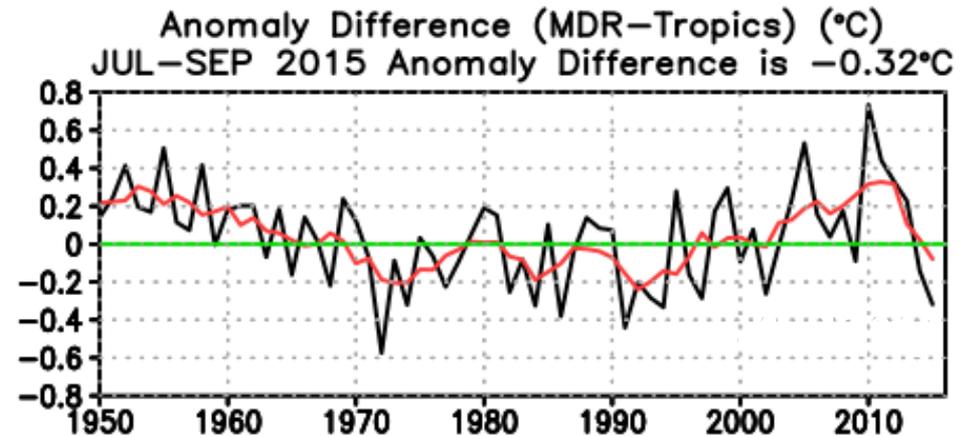
# **Environmental conditions during 2015 hurricane season**

# July-September Sea Surface Temperature Anomalies (°C)



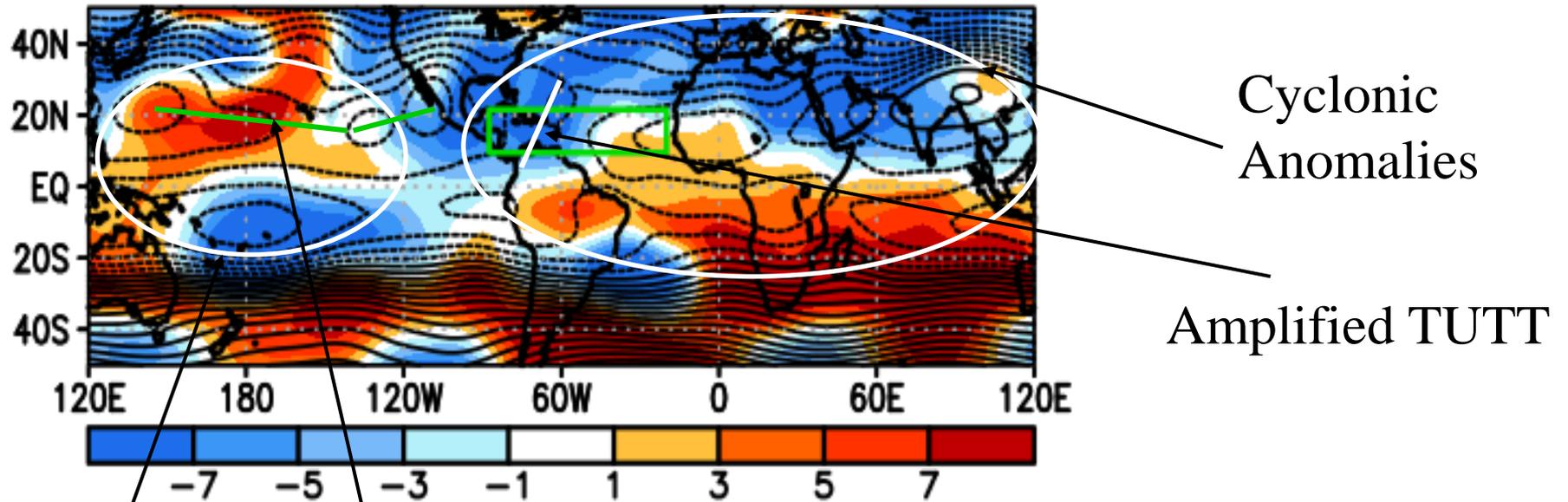
Well above-average SSTs across  
Central and East Pacific

Atlantic SST anomalies project  
onto cold phase of AMO.



MDR 2015 anomalies cooler  
than global Tropics

## July-September : 200-hPa Streamfunction



Anticyclonic  
Anomalies

Strong  
Upper-  
Level  
Ridge

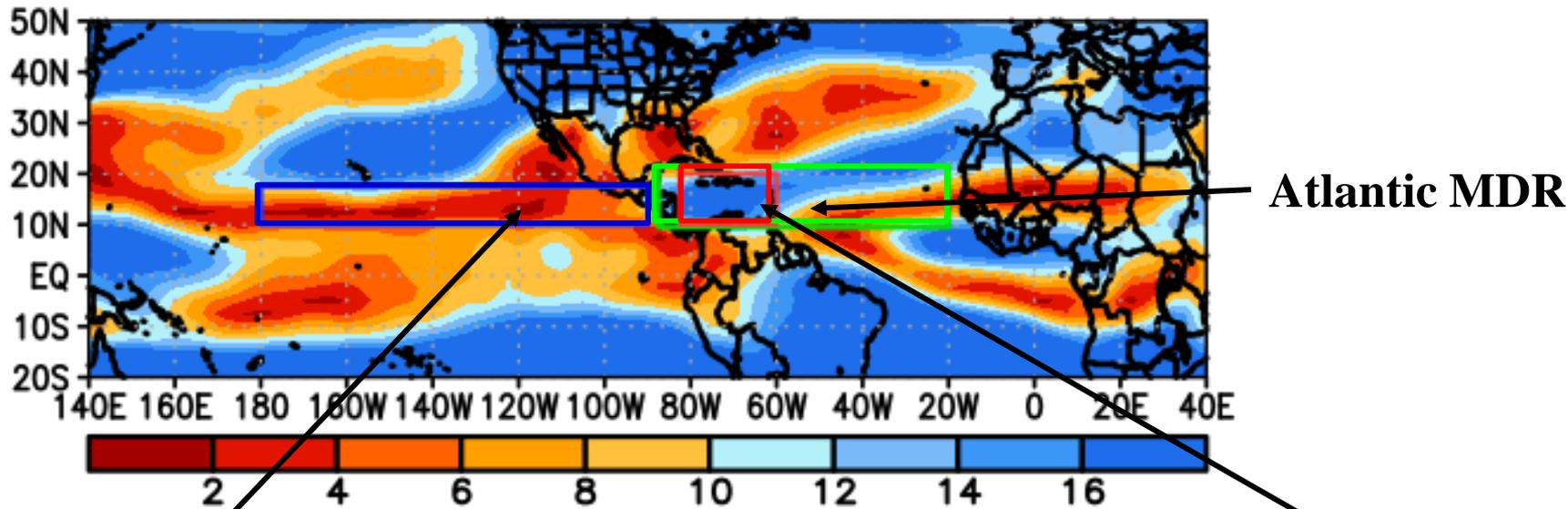
Cyclonic  
Anomalies

Amplified TUTT

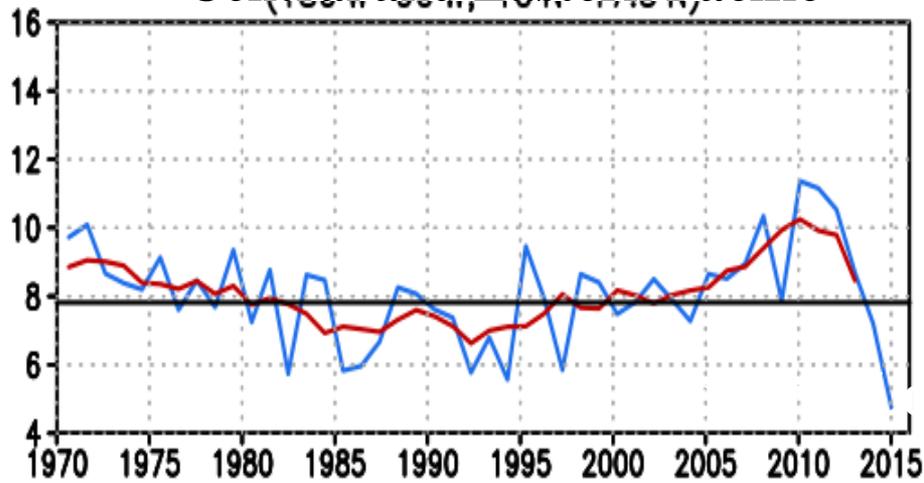
- El Niño: Well-defined zonal wave-1 anomaly pattern in Tropics/ Subtropics of both hemispheres

- Includes Amplified trough (TUTT) across western MDR (Increased vertical wind shear)

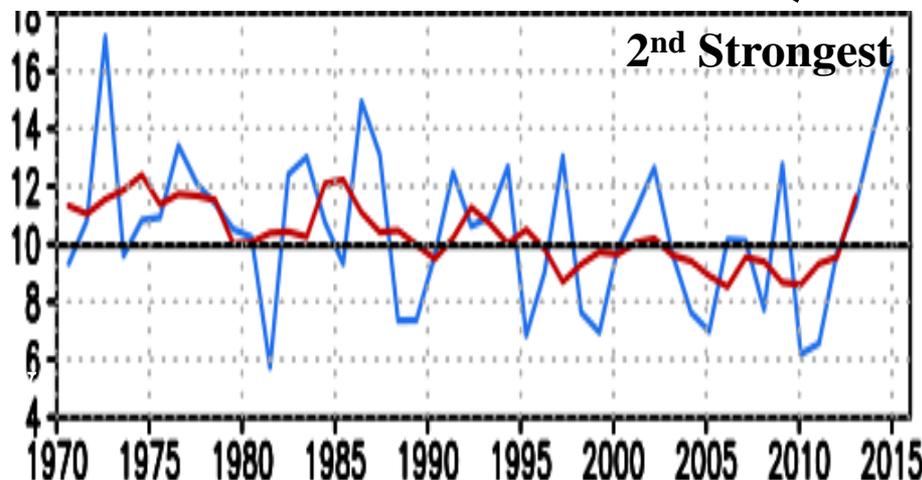
July–September 2015  
200–850–hPa Vertical Wind Shear Magnitude ( $\text{m s}^{-1}$ )



**200-850 hPa Vertical Wind Shear Magnitude**  
**Central and Eastern Pacific**      **Caribbean Sea**



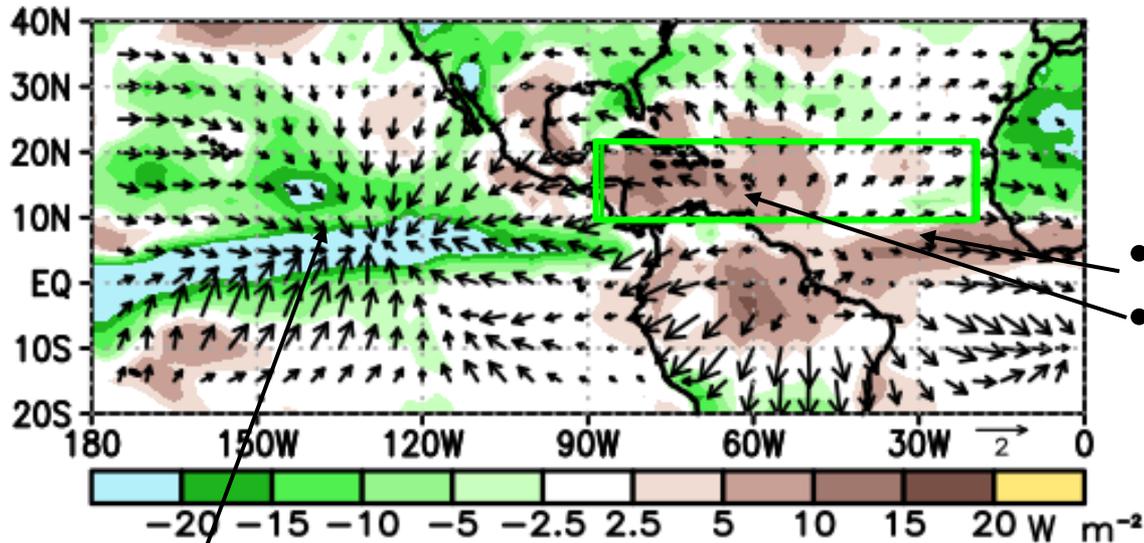
**180-90°W, 10°N-17.5°N**



**82.5°W-60°W, 10°N-20°N**

## July-September : Anomalous OLR and Divergence

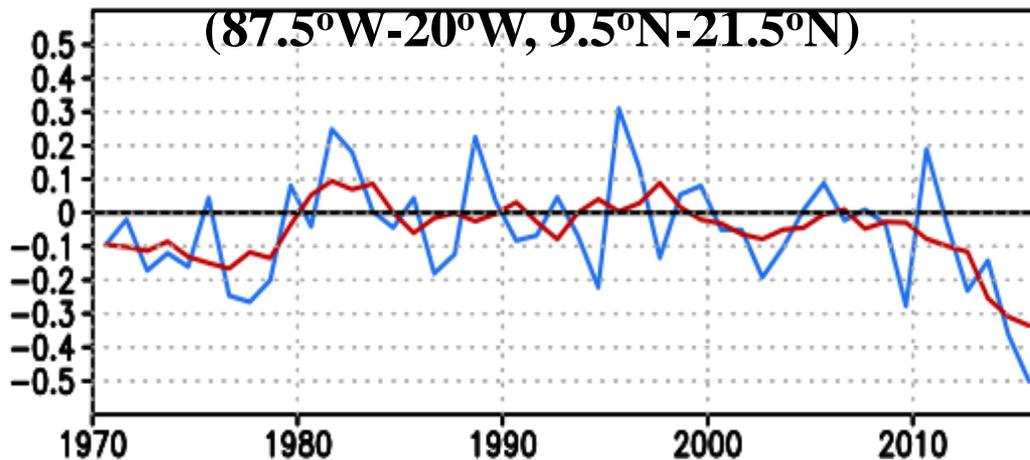
Anomalous OLR ( $\text{W m}^{-2}$ ) and 850-hPa Divergent Wind Vector ( $\text{m s}^{-1}$ )



- Weak Atlantic ITCZ
- Suppressed convection across western and central MDR

Strong ITCZ over central and eastern Pacific

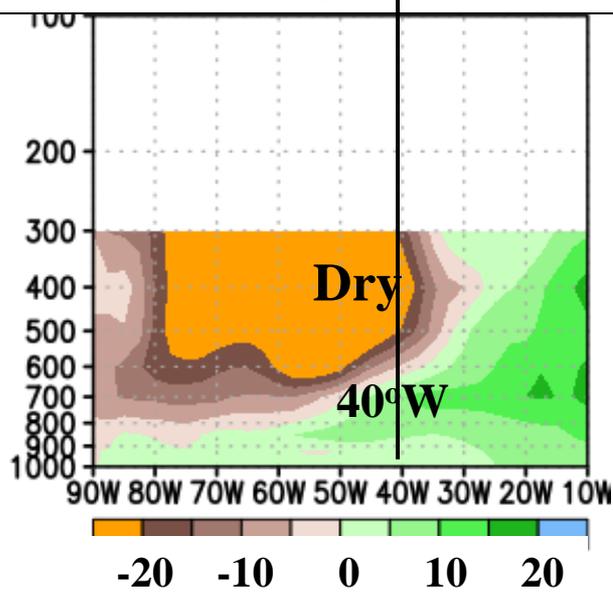
Anomalous 300-hPa Divergence across MDR



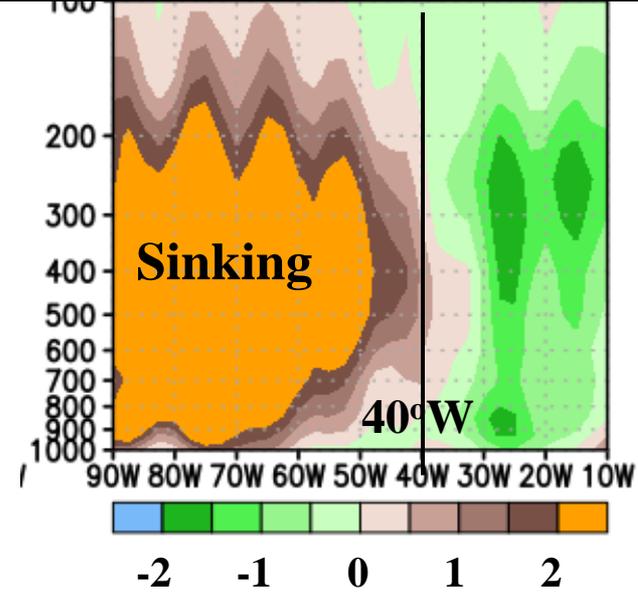
- Record anomalous upper-level convergence in MDR

# July-September: Anomaly Height-Longitude Sections Across MDR

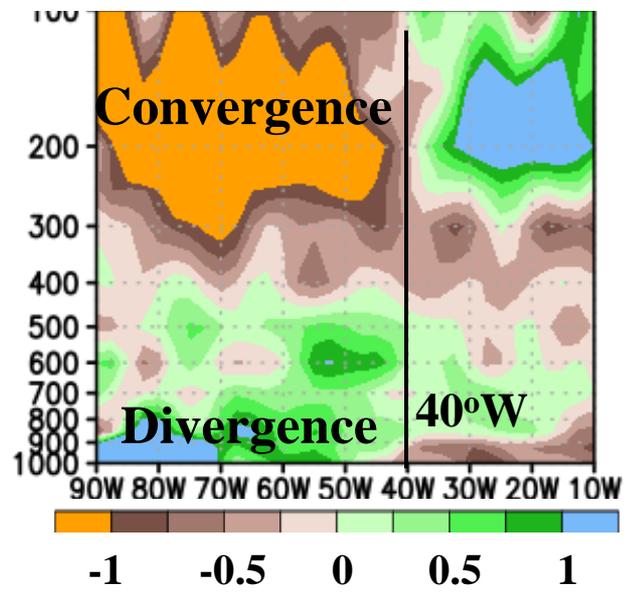
Specific Humidity (% of Normal)



Anomalous Vert. Velocity ( $\times 10^{-2}$  hPa  $s^{-1}$ )

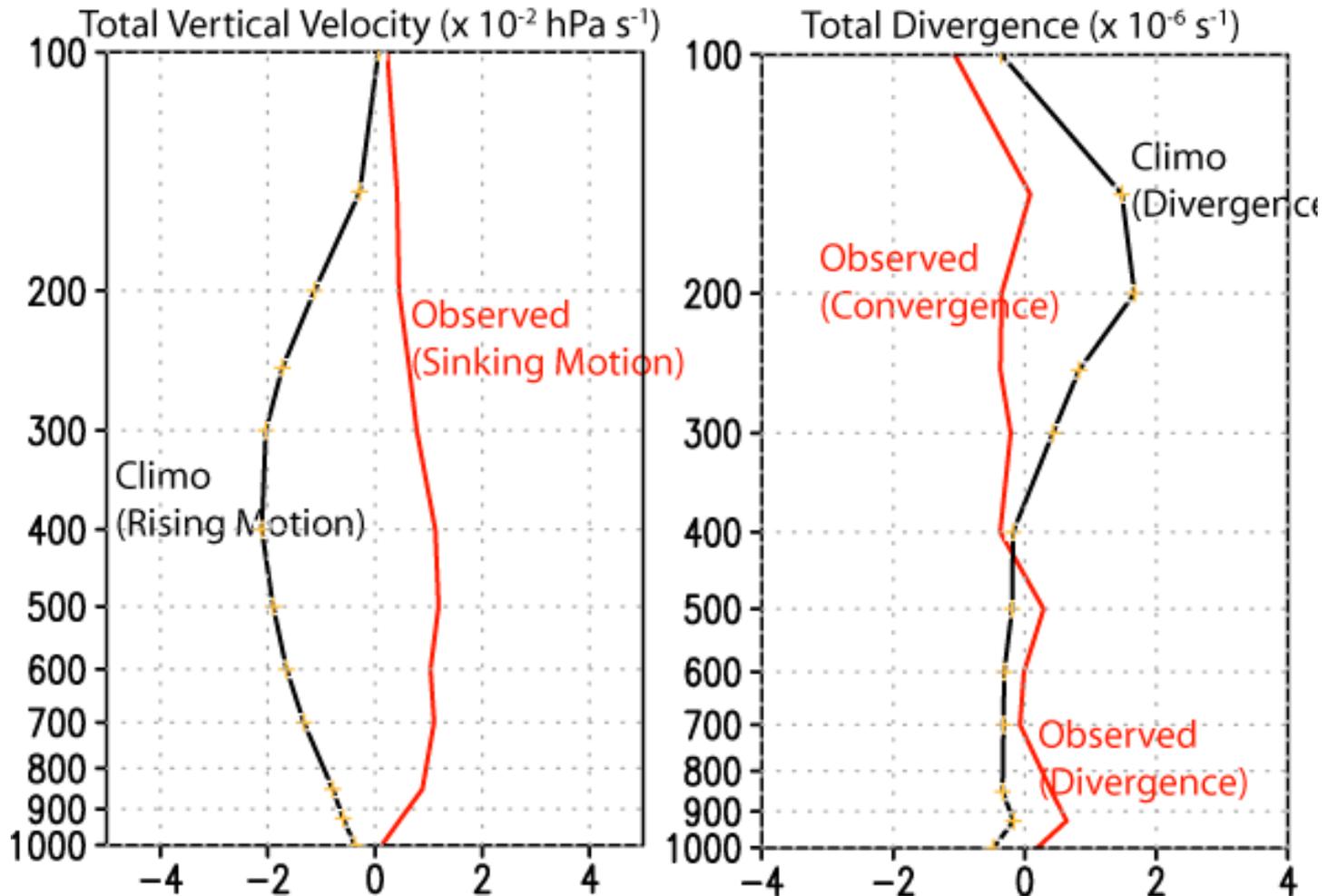


Anomalous Divergence ( $\times 10^{-6}$   $s^{-1}$ )



- Exceptionally dry, sinking air across most of MDR (west of 40°W).
- More conducive conditions confined to far eastern MDR.

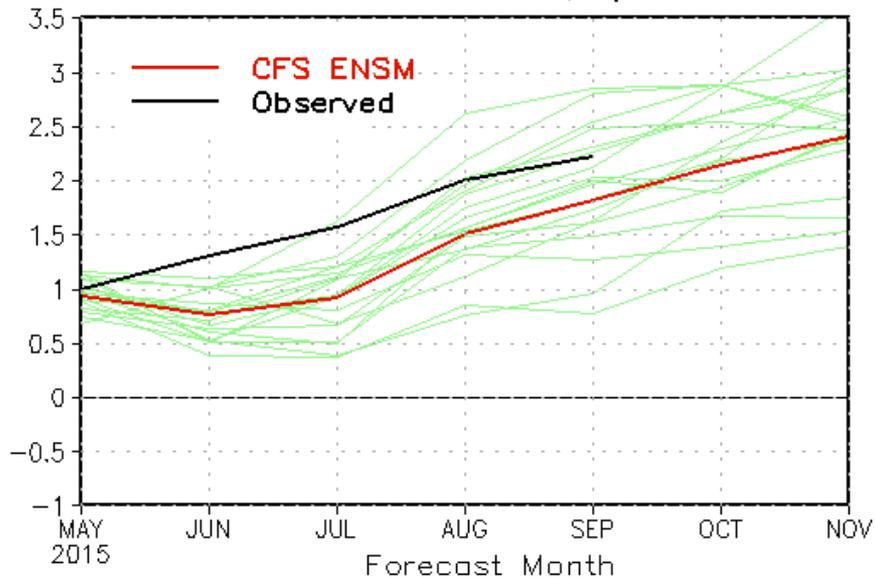
## August-September 2015: Vertical Profiles Averaged over Western/Central MDR (82.5°W-40°W, 10°N-20°N)



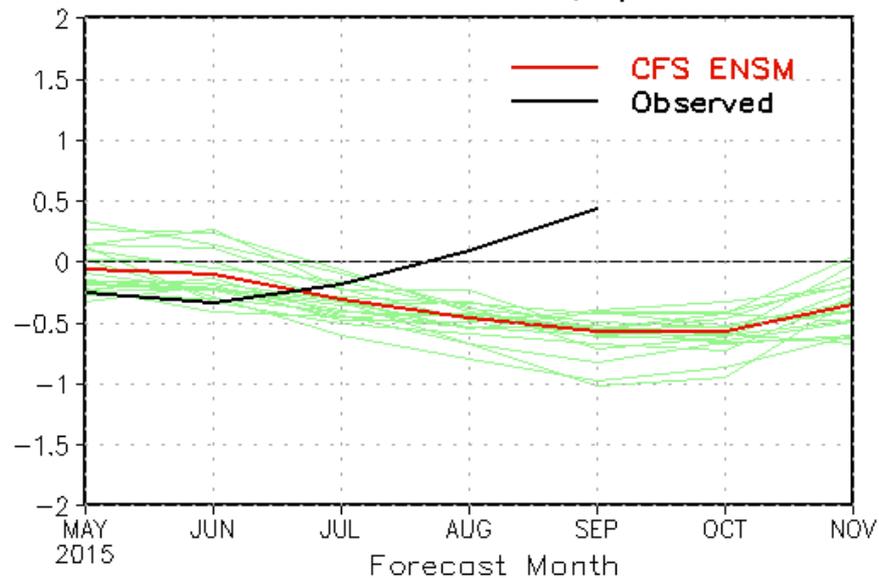
The vertical profiles of vertical motion and divergence/ convergence were opposite to climatology across the western and central MDR.

# CFSv2 T382 Fcst; SST and Shear Indices

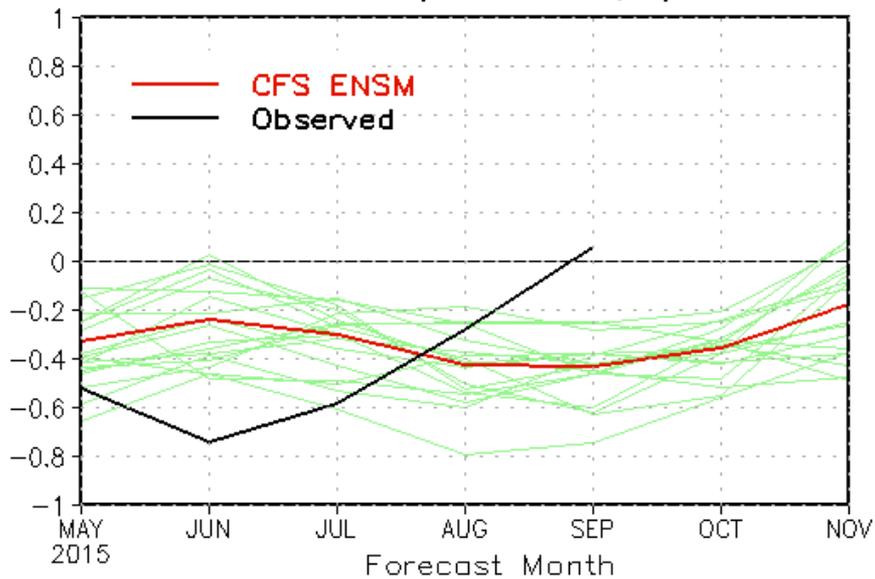
## Nino3.4 SST 2015; Apr ICs



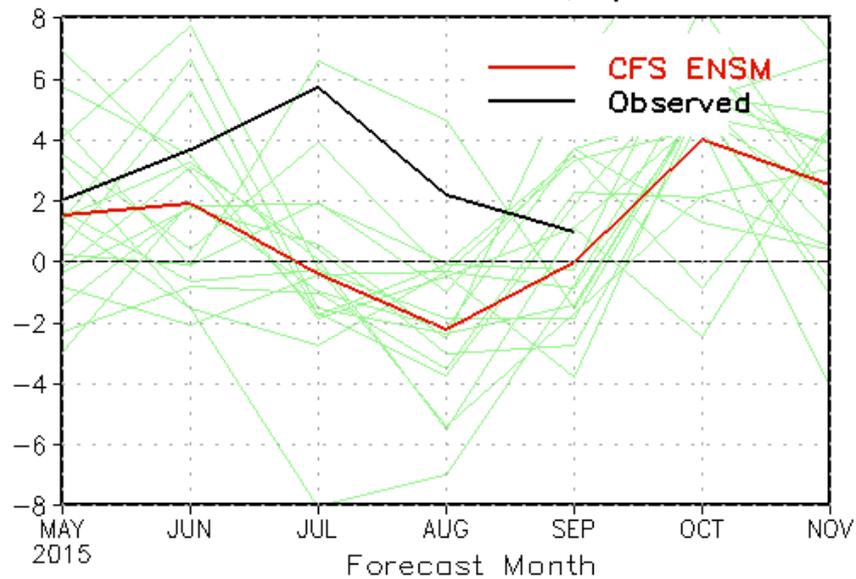
## Atl MDR SST 2015; Apr ICs



## MDR - GTrop SST 2015; Apr ICs



## Atl MDR Shear 2015; Apr ICs



# Summary

## Atlantic hurricane season to date:

Below normal season as predicted

- 10 named storms, 3 hurricanes, 2 major hurricane, ACE=58% of median  
First time since 1993-94 with three consecutive below-normal seasons.
- Five storms formed in the Main Development Region (MDR) during 2015 season so far (average is 6 NS)
- Non-conducive conditions within the MDR suppressed the season. These conditions include:

Very strong vertical wind shear (2<sup>nd</sup> strongest on record)

Strong TUTT

Dry, sinking air, with record anomalous upper-level convergence

Weak Atlantic ITCZ

Cooler MDR SST relative to global Tropics

# Summary

## **Central and Eastern North Pacific hurricane season to date:**

Above normal season as predicted

- ENP: 16 named storms, 12 hurricanes and record number of 10 major hurricanes
- CNP: 13 named storms, 7 hurricanes and 4 major hurricanes  
Record setting numbers in all categories

- Conditions for above normal season, especially for record activity in the Central Pacific hurricane basin:

Record weak vertical wind shear,  
Persistent, amplified upper-level ridge  
Very strong ITCZ,  
Anomalously warm SSTs