2010 Hurricane/Typhoon Season Prediction with the NCEP T382 CFS CGCM

Jae-Kyung Schemm

Climate Prediction Center, NCEP/NWS/NOAA

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CPC's Hurricane Season Outlook

1. The hurricane season outlooks for the Atlantic and Eastern Pacific issued since 1998.

2. The outlooks are issued in mid-May with an update in August every year.

3. The hurricane season outlook is the only long lead prediction activity with a formal press conference held with FEMA.

4. Dynamical hurricane season prediction with the T382 CFS CGCM initiated in 2009 as one of the tools used for the outlook.

2010 T382 CFS run configuration

1. Version of CFS: 2007 operational GFS in T382L64 resolution (~40KM) coupled to MOM3

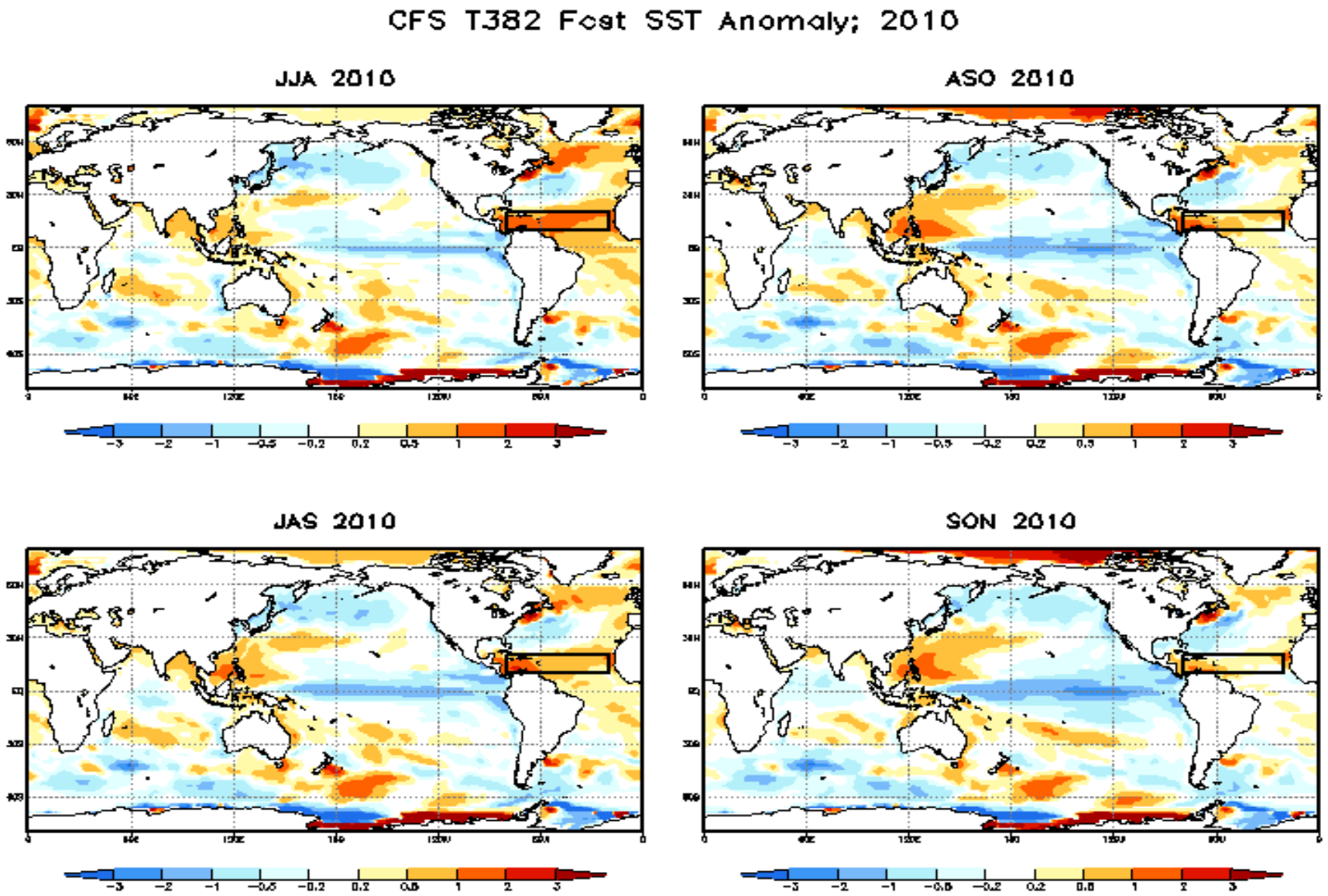
2. 14 member ensemble runs initialized at 0Z, April 10-23, 2010, forecast extending to Dec. 1, 2010, output at 6-hour interval

3. Initial conditions from the NCEP GDAS and GODAS

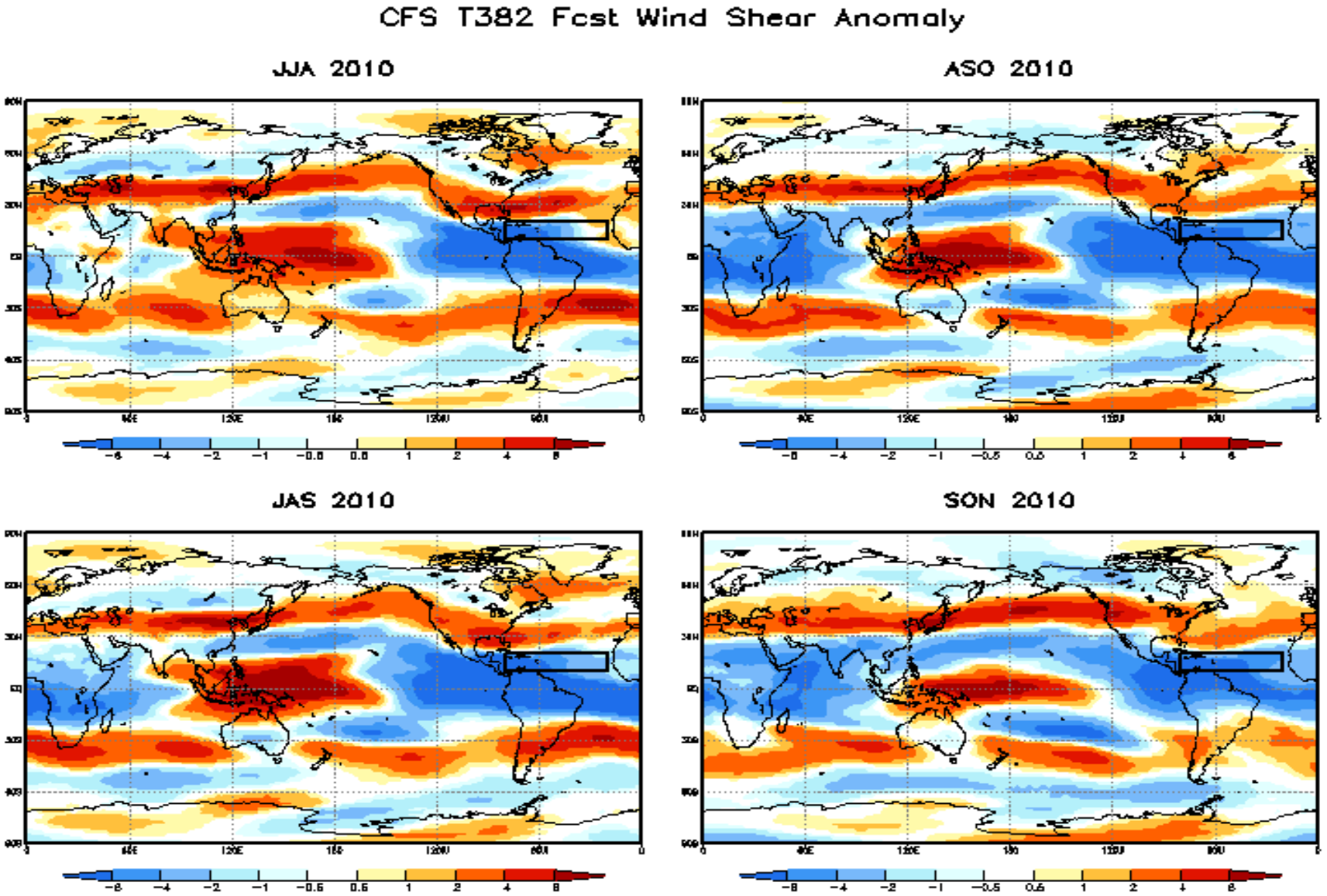
4. Detection and tracking of TCs with the method devised by Carmago and Zebiak (2002)

5. Climatology and skill assessment based on hindcast runs for 1981-2008, 5 member ensemble each year

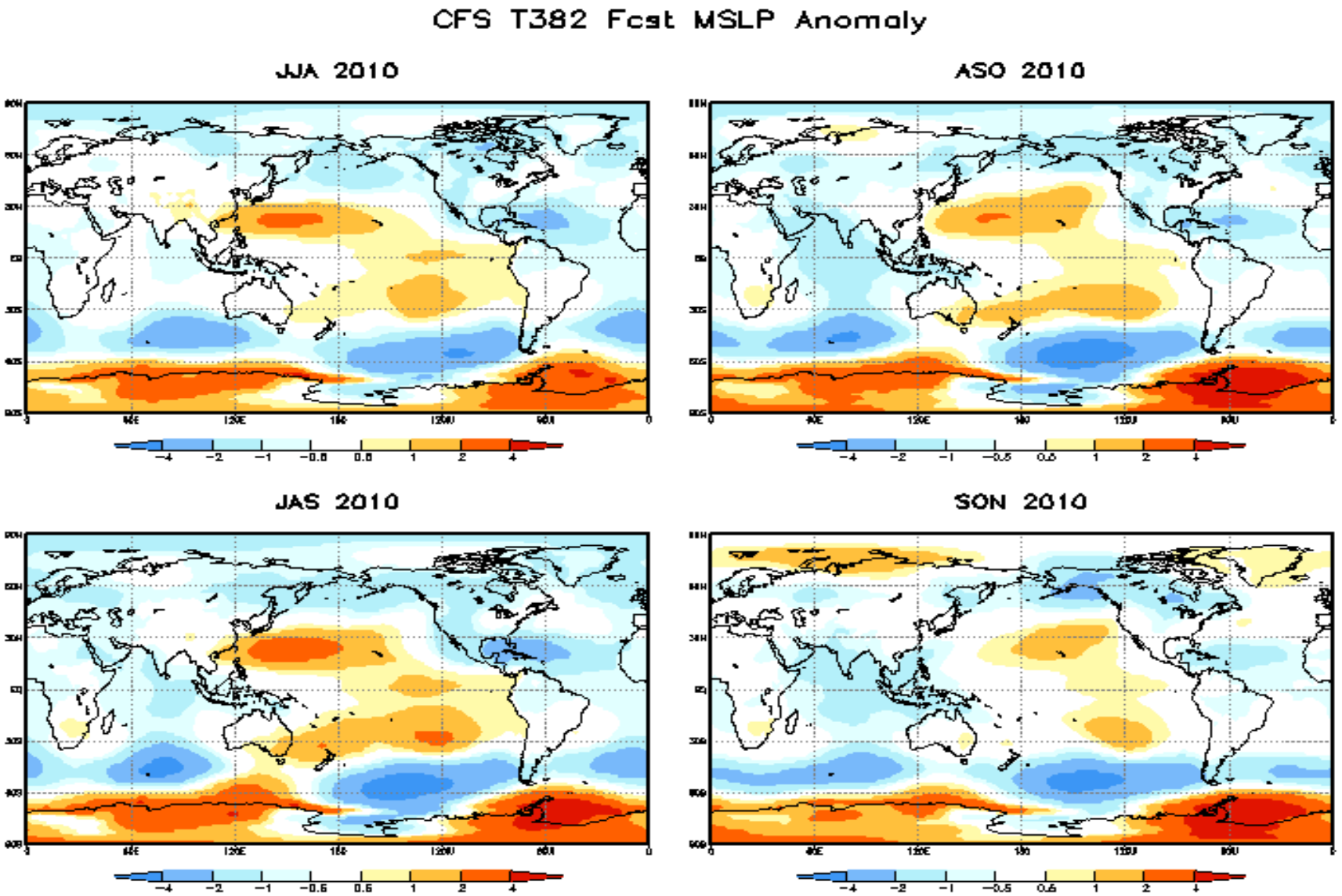
T382 CFS SST anomaly forecast



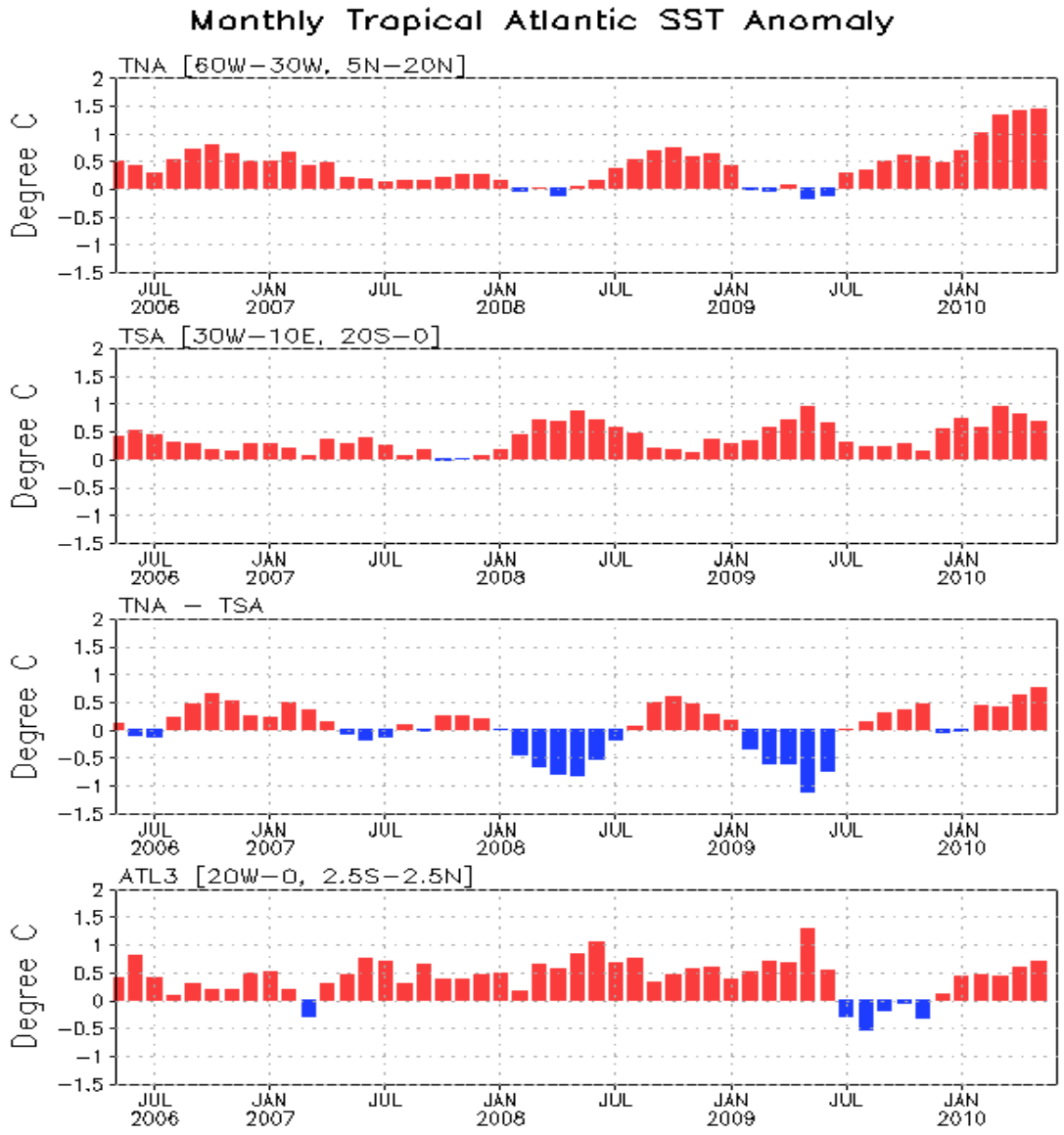
T382 CFS wind shear anomaly forecast



T382 CFS MSLP anomaly forecast

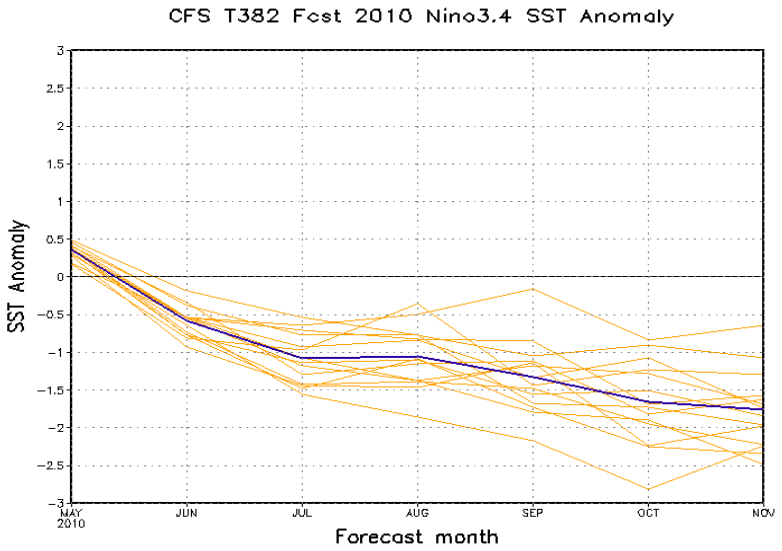


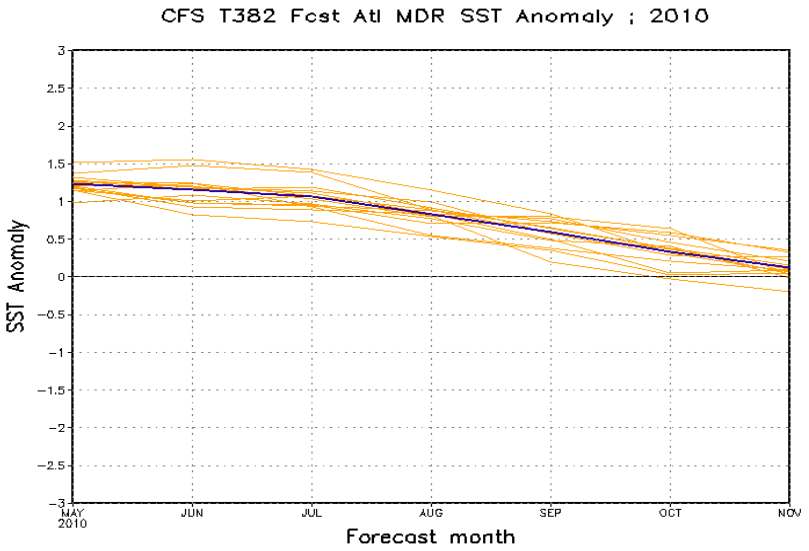
Observed preseason SST anomalies in the tropical Atlantic

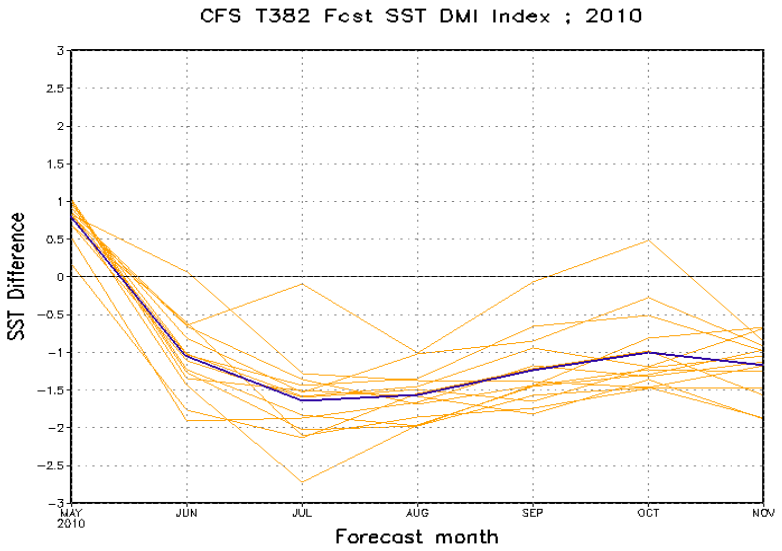


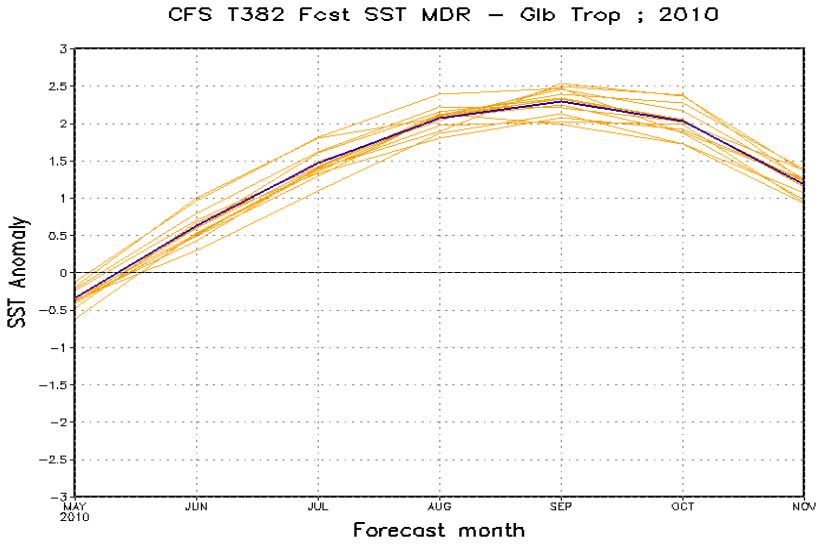
Warmest SST anomalies in record observed over the Atlantic MDR

SST Indices


CFS T382 Fcst 2010 Nino3.4 SST Anomaly
SST Anomaly
Forecast month
MAY 2010
JUN
JUL
AUG
SEP
OCT
NOV


CFS T382 Fcst Atl MDR SST Anomaly ; 2010
SST Anomaly
Forecast month
MAY 2010
JUN
JUL
AUG
SEP
OCT
NOV


CFS T382 Fcst SST DMI Index ; 2010
SST Difference
Forecast month
MAY 2010
JUN
JUL
AUG
SEP
OCT
NOV


CFS T382 Fcst SST MDR – Glb Trop ; 2010
SST Anomaly
Forecast month
MAY 2010
JUN
JUL
AUG
SEP
OCT
NOV

Tropical Storms, Hurricanes and ACE Index Forecast
Atlantic Basin

2010 Above Normal Year

	Tropical Storms	Hurricanes	ACE Index % of Normal
0410	21	9	246
0411	22	10	235
0412	20	11	218
0413	22	12	243
0414	22	7	202
0415	26	7	202
0416	23	16	267
0417	21	10	234
0418	24	9	225
0419	27	17	373
0420	19	11	233
0421	16	6	171
0422	17	11	242
0423	21	11	259
Ensemble	**21.5**	**10.5**	**239.2**
Standard Deviation	**3.0**	**3.1**	**45.5**
Range	**19 – 25**	**7 – 14**	**194 – 285**
Model Clim	**10.6**	**3.8**	**100**

Tropical Storms, Hurricanes and ACE Index Forecast
Eastern N. Pacific Basin

2010 Below Normal Year

	Tropical Storms	Hurricanes	ACE Index % of Normal
0410	16	3	110
0411	9	2	58
0412	11	4	80
0413	12	3	82
0414	10	3	67
0415	15	3	111
0416	11	4	83
0417	12	2	71
0418	11	1	54
0419	7	1	48
0420	9	1	53
0421	14	3	108
0422	17	4	98
0423	7	3	45
Ensemble	**11.5**	**2.6**	**76.2**
Standard Deviation	**3.1**	**1.1**	**23.6**
Range	**8 – 15**	**2 – 4**	**53 – 100**
Model Clim	**12.2**	**4.3**	**100**

Tropical Storms, Typhoons and ACE Index Forecast
Western North Pacific Basin

2010
Below Normal
Year

	Tropical Storms	Typhoons	ACE Index % of Normal
0410	13	4	73
0411	18	3	87
0412	14	3	80
0413	10	2	49
0414	20	5	98
0415	8	1	42
0416	9	1	46
0417	10	1	41
0418	8	2	43
0419	4	1	18
0420	8	0	29
0421	8	1	33
0422	8	2	41
0423	11	0	57
Ensemble	**10.6**	**1.9**	**53**
Standard Deviation	**4.3**	**1.5**	**29.2**
Range	**6 – 15**	**0 – 3**	**24 – 82**
Model Clim	**17**	**4.1**	**100**

The T382 CFS evaluations for hurricane season prediction based on the 1981-2008 hindcast runs

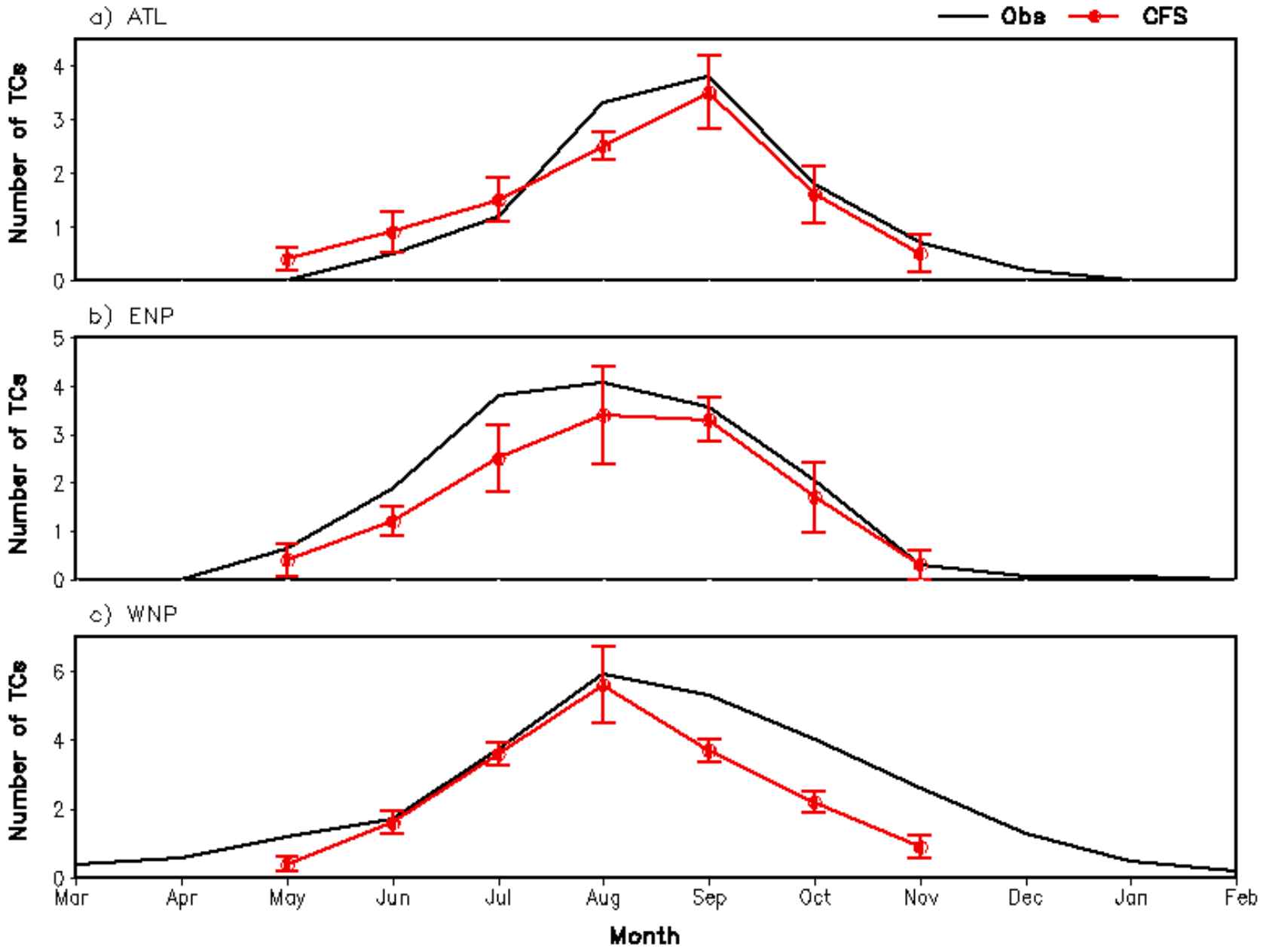
Datasets

- CFS Hindcasts at T382
  - 5 Members: April 19-23 at 00Z
  - Output every 6 hours
  - 28 Years: 1981-2008
- Observations from HURDAT Best Track Dataset
  - Tropical depressions and subtropical storms are not included in the storm count.

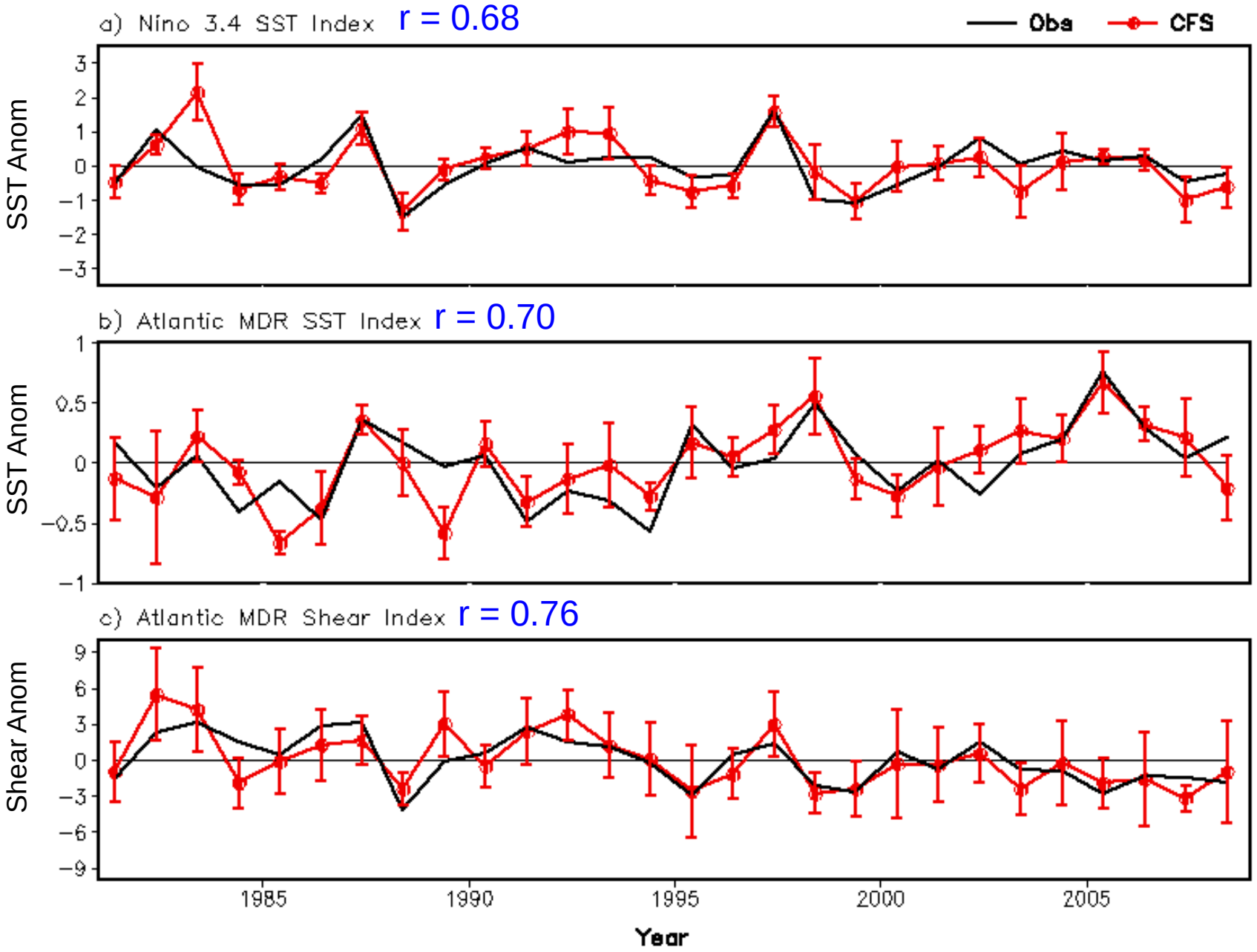
Detection & Tracking Method

- Method based on Camargo & Zebiak (2002)
  - Point must meet 7 criteria to be considered a storm
  - Tracked forward and backward in time following vorticity maxima > 3.5×10^{-5} s^{-1}
- Detection thresholds unique to CFS at T382, created using 5-member hindcasts

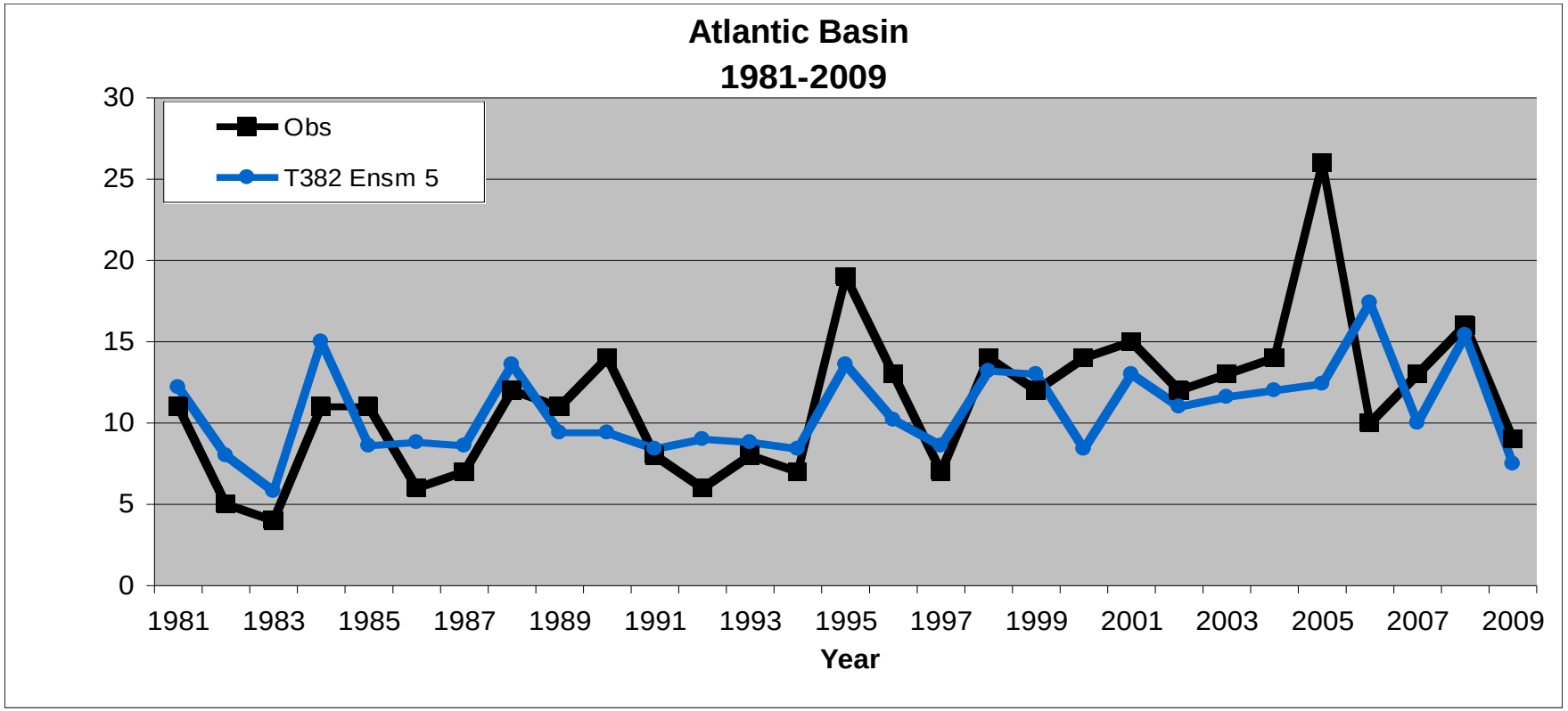
T382 CFS - Seasonal Cycle



CFS T382 – Indices for JJAS

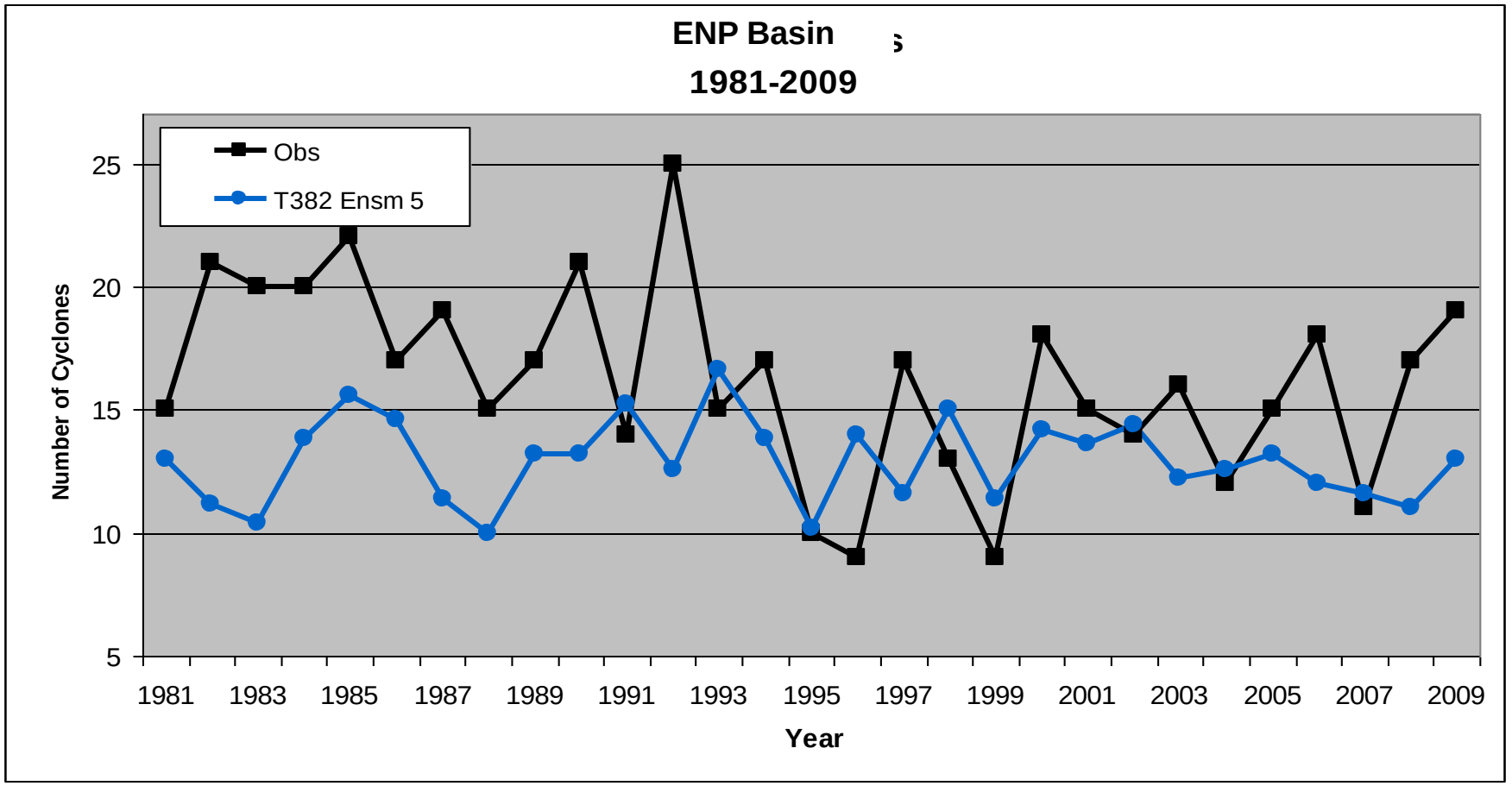


ATL Interannual Variability



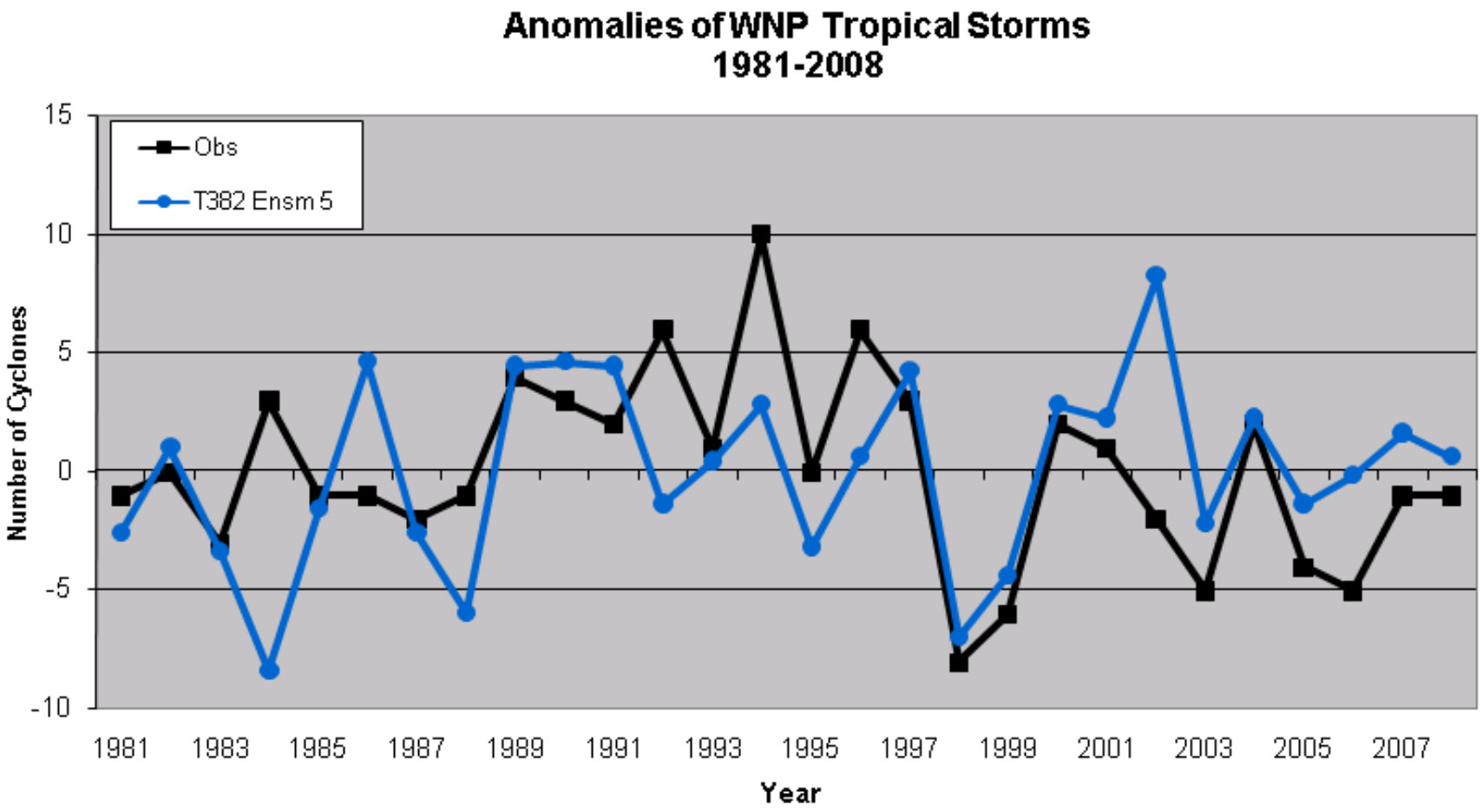
T382	Correlations
April Ensm 5	0.63

ENP Interannual Variability



T382	Correlations
April Ensm 5	-0.03

WNP Interannual Variability

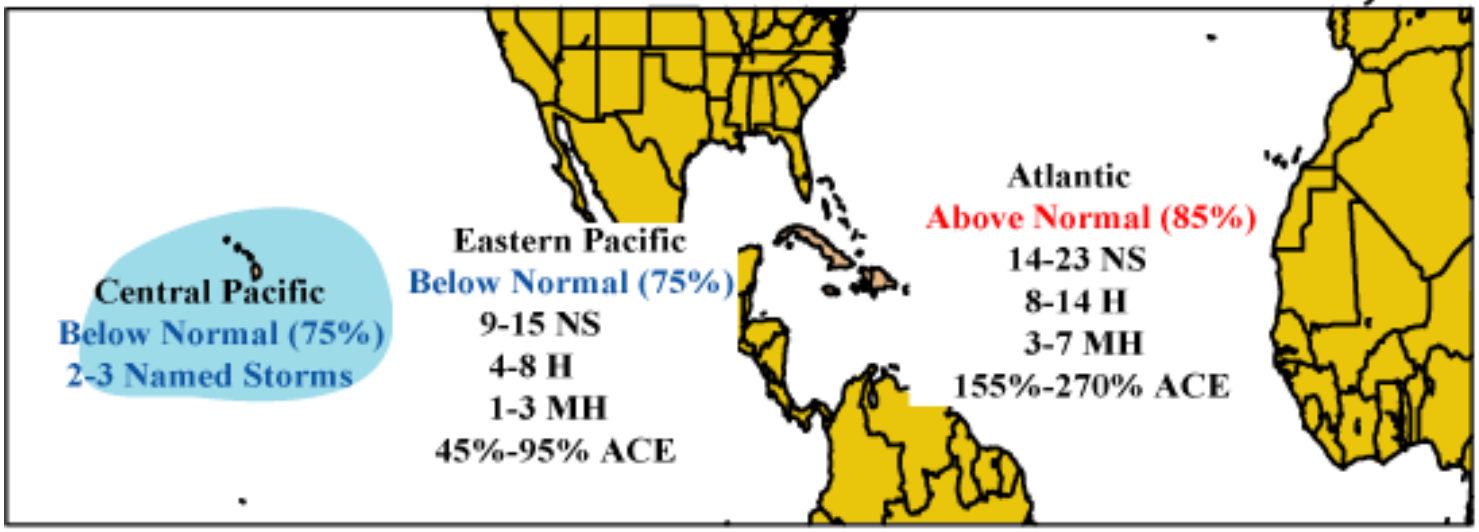


T382	Correlations
April Ensm 5	0.42

Guidance for May Atlantic 2010 Outlooks

Model	Named TS	H	MH	ACE (%)
Hi-Res CFS	19-25	7-14		194-285
ECMWF	18-28	10-17		260-490
Lo-Res CFS 1	18-24	10-14	5-7	199-283
Lo-Res CFS 2	17-23	10-13	5-7	193-270
Lo-Res CFS 3	18-24	11-16	5-7	211-312
CPC Binning 1	14-20	7-10	3-5	137-224
CPC Binning 2	10-18	7-15	3-7	138-283
EUROSIP	15-24			
UKMET	13-25			144-299
GFDL		8-15		
Mean	16-23	9-14	4-7	185-306
2010 Forecast	14-23	8-14	3-7	155-270

NOAA's 2010 Hurricane Season Outlooks Issued in May



NOAA's 2010 seasonal hurricane outlooks indicate the likely ranges (each with a 70% chance) of Named Storms (NS), Hurricanes (H), Major Hurricanes (MH), and percentage of the median Acccumulated Cyclone Energy (ACE).

For 2010 the probabilities of each season type are:

	Atlantic	Eastern Pacific	Central Pacific
Above Normal	85%	5%	5%
Near Normal	10%	20%	20%
Below Normal	5%	75%	75%

Summary

- High resolution CFS CGCM forecast runs indicate a very active hurricane season for 2010 over the North Atlantic basin and below normal season over the Eastern and Western North Pacific.

- Warmest preseason SST on record over the Atlantic MDR. Warm SST anomalies persist throughout the season over the Atlantic MDR, with tropical Pacific sector switching into La Nina phase by July.

- Easterly wind shear anomalies present throughout the MDR and the Eastern Pacific sector while contrasting westerly anomalies exist in the Western Pacific.

- Low sea level pressure anomalies over the Atlantic throughout the season while positive anomalies in the Pacific sectors.