UNIVERSITY OF MIAMI
COOPERATIVE INSTITUTE for
MARINE & ATMOSPHERIC STUDIES

CIMAS

Current Status of the NMME Project

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Center for Computational Science

UNIVERSITY OF MIAMI
CENTER for
COMPUTATIONAL
SCIENCE

UNIVERSITY
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ROSENSTIEL
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ATMOSPHERIC SCIENCE

Current Status of the NMME Project

- Operational Effective May 2016
- NMME Reminder – Why Multi-Model
- Warm ENSO Predictions of 2014-15 vs. 2015-16
- Cold ENSO Phase 2016-17
- Evolution of ENSO Forecast Skill and Predictability (Correlation, RMSE)
  - CCSM4

www.nws.noaa.gov

National Weather Service

Climate Prediction Center

Home Site Map News Organization Search Go

HOME > NMME Forecasts of Monthly Climate Anomalies

NMME

The U.S. National Multi-Model Ensemble

Welcome to the National Multi-Model Ensemble home!

Data and Current Forecasts

- 3-month mean spatial anomalies
- 1-month mean spatial anomalies
- Niño3.4 Plumes
- International MME
- Experimental: Probability forecasts

NMME Realtime Forecasts **Archive**
NMME Phase-I Hindcast Data

About the NMME

Description of the NMME
Phase-I Forecast Models
CTB Activities & Documents
Join the NMME mailing list

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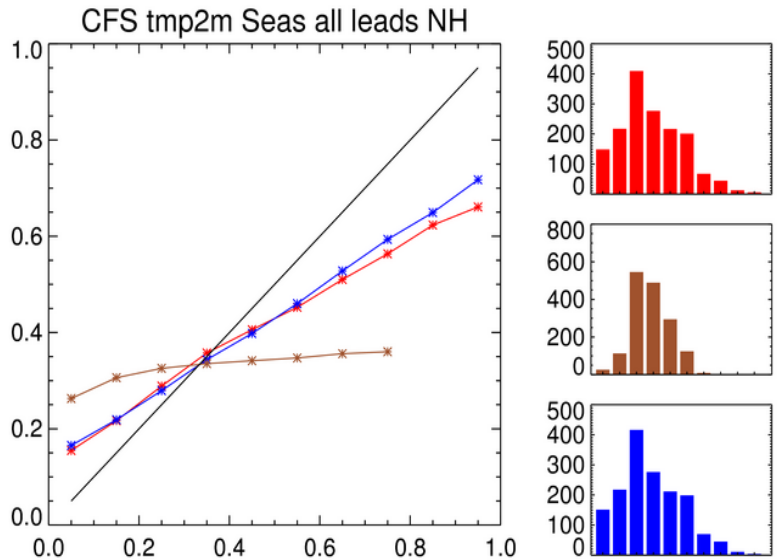
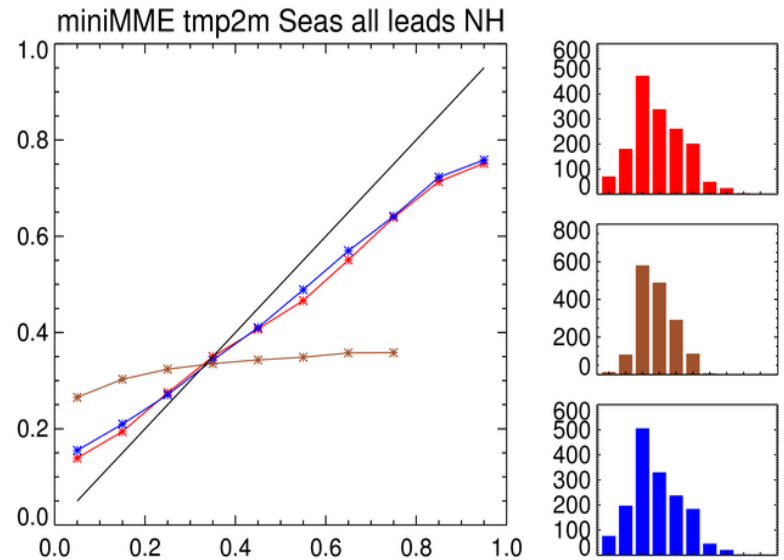
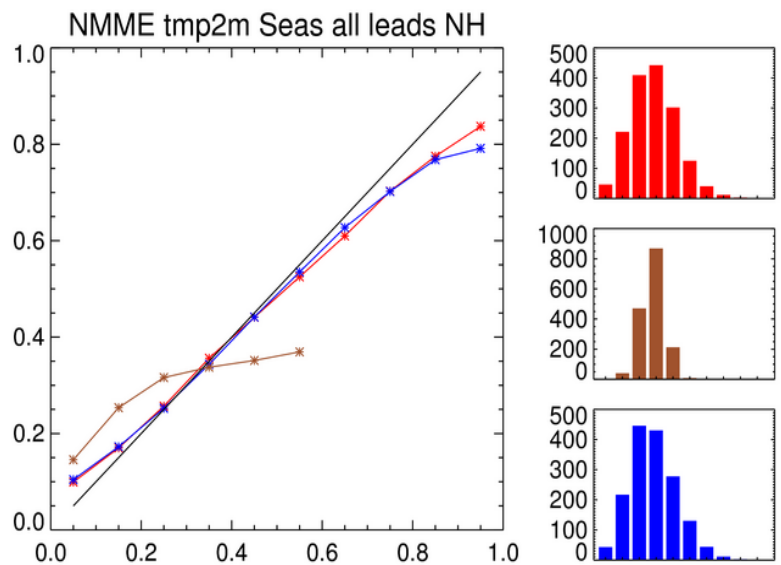
Model	Hindcast Period	No. of Members	Arrangement of Members	Lead (month)	Model resolution (atmosphere)	Model resolution (ocean)	Reference
NCEP/CFSv2	1982-2010	24 (20)	4 members (0, 6, 12, 18z)	0-9	T126L64	MOM4L40 .25deg Eq	Saha et al (2010)
GFDL/CM2.1	1982-2010	10	All 1st of the month 0Z	0-11	2x2.5degL24	MOM4L50 .3deg Eq	Delworth (2006)
GFDL/CM2.5 (FLOR)	1982-present	24	All 1st of the month 0Z	0-11	C18L32 (50km)	MOM5 L50 0.30 deg Eq 1degPolar1.5	Vecchi et al (2014)
CMC1-CanCM3	1981-2010	10	All 1st of the month 0Z	0-11	CanAM3 T63L31	CanOM4L40 .94deg Eq	Merryfield et al (2013)
CMC1-CanCM4	1981-2010	10	All 1st of the month 0Z	0-11	CanAM4 T63L35	CanOM4L40 .94deg Eq	Merryfield et al (2013)
NCAR/CCSM3	1982-2010	6	All 1st of the month 0Z	0-11	T85L26	POPL42 0.3deg Eq	Kirtman and Min2009)
NCAR/CCSM4	1982-2010	10	All 1st of the month 0Z	0-11	0.9x1.25degL26	POPL60 .25deg Eq	Kirtman et al. (in prep)
NCAR/CESM1	1982-2010	10	All 1st of the month 0Z	0-11	0.9x1.25degL30	POPL60 .25deg Eq	
NASA/GEOS5	1981-2010	11	4 members every 5th days; 7 members on the last day of last month	0-9	1x1.25 deg L72	MOM4L40 .25deg Eq	Vernieres et al (2012)
IRI-ECHAM4f	1982-2010	12	All 1st of the month 0Z	0-7	T42L19	MOM3L25(1.5x0.5)	DeWitt (2005)
IRI-ECHAM4a	1982-2010	12	All 1st of the month 0Z	0-7	T42L19	MOM3L25 (1.5x0.5)	DeWitt (2005)


CFS tmp2m Seas all leads NH


miniMME tmp2m Seas all leads NH


NMME tmp2m Seas all leads NH

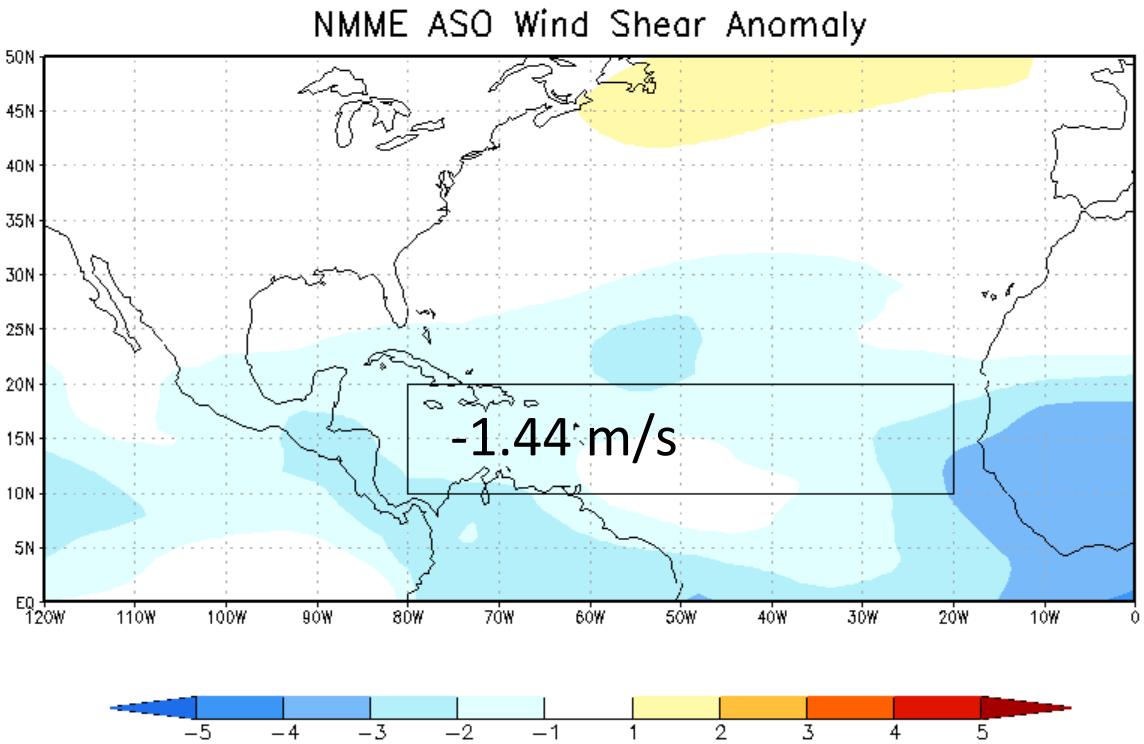
Brier Skill Score for T2m Northern Hemisphere Extra-tropics Land (23N-75N)

	A/N/B	Lead 0	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5
CFS (24 Members)	Above	0.10	0.03	0.01	0.01	0.01	0.01
	Normal	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04
	Below	0.10	0.04	0.03	0.02	0.02	0.02
Mini-NMME (24 Members)	Above	0.12	0.05	0.03	0.03	0.02	0.02
	Normal	-0.02	-0.04	-0.04	-0.04	-0.04	-0.04
	Below	0.11	0.05	0.04	0.03	0.03	0.03
Full NMME	Above	0.14	0.07	0.06	0.06	0.05	0.05
	Normal	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
	Below	0.14	0.08	0.06	0.06	0.06	0.05

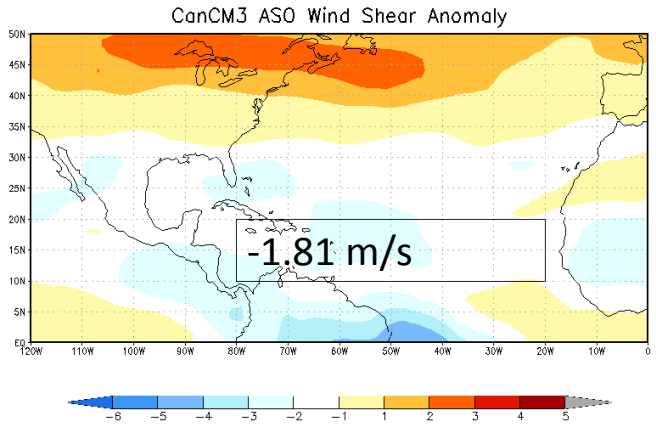
Brier Skill Score for Nino3.4

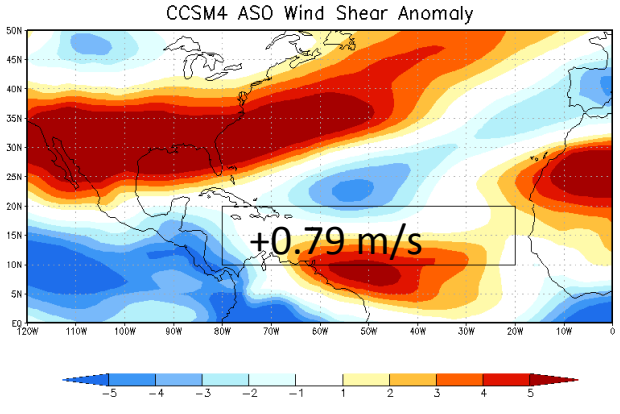
	A/N/B	Lead 0	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5
CFS (24 Members)	Above	0.54	0.45	0.39	0.33	0.28	0.25
	Normal	0.10	0.05	0.03	0.03	0.03	0.02
	Below	0.49	0.43	0.40	0.38	0.36	0.35
Mini-NMME (24 Members)	Above	0.68	0.60	0.55	0.48	0.42	0.37
	Normal	0.34	0.24	0.18	0.15	0.13	0.09
	Below	0.66	0.59	0.56	0.53	0.49	0.45
Full NMME	Above	0.68	0.61	0.55	0.49	0.43	0.38
	Normal	0.35	0.25	0.19	0.16	0.14	0.11
	Below	0.65	0.58	0.54	0.52	0.49	0.46

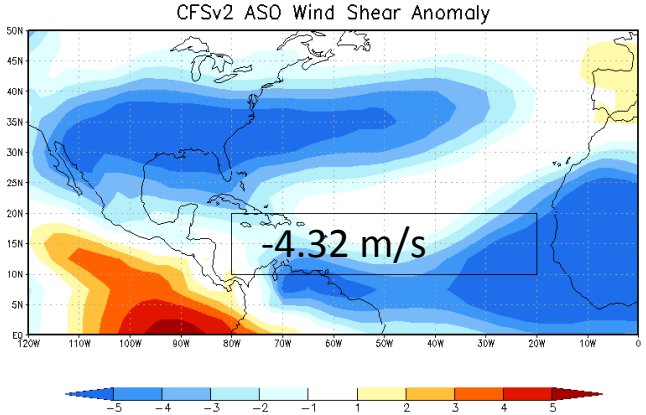
ASO Wind Shear Anomalies with April 2016 IC runs

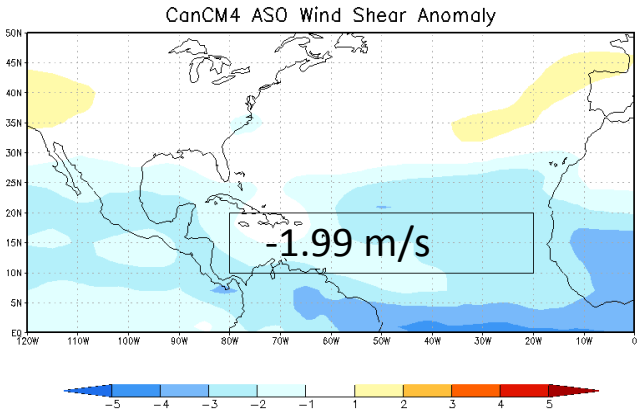


- Forecast wind shear anomalies for the 4 individual members and the NMME ensemble mean.
- Contours in 1 m/s interval









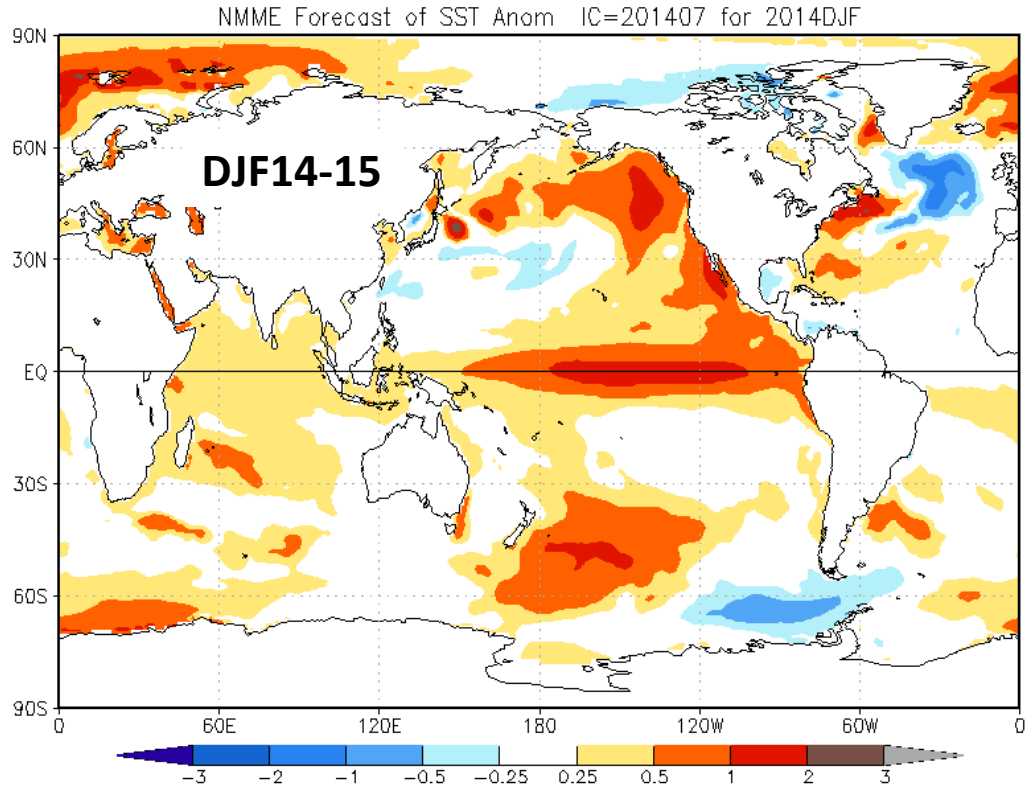
Method 1 Prediction for 2016 (NMME 4 Members)

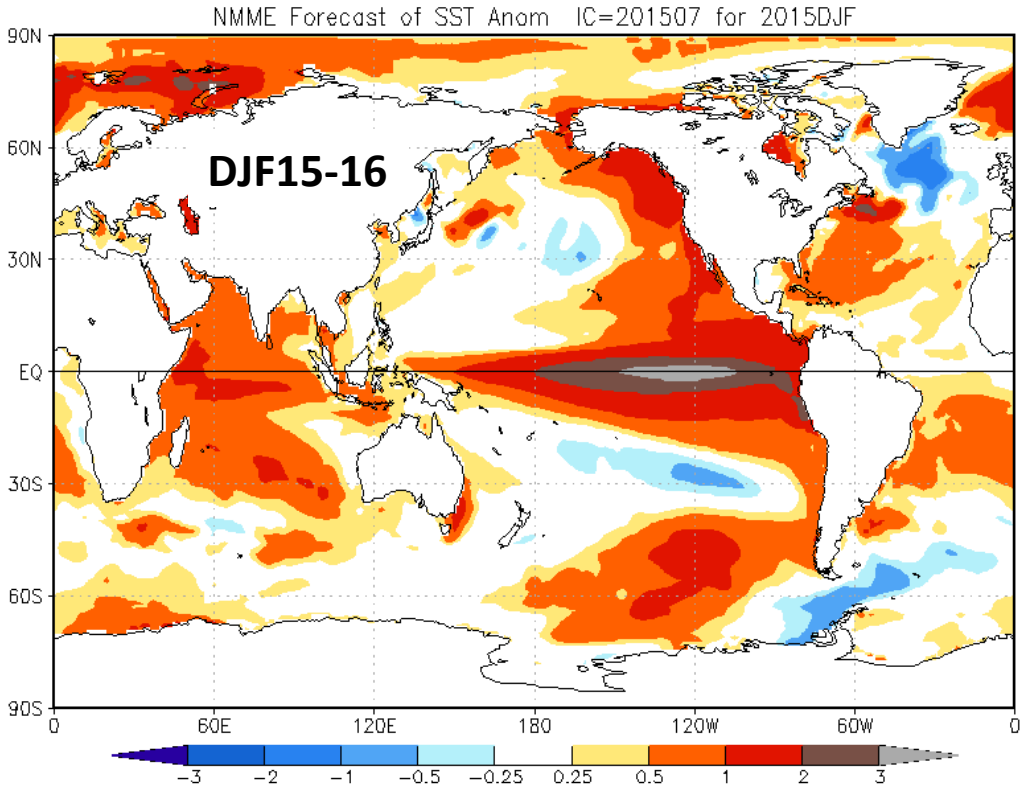
Predictors: Forecast ASO shear anomaly and observed JFM NATL SST

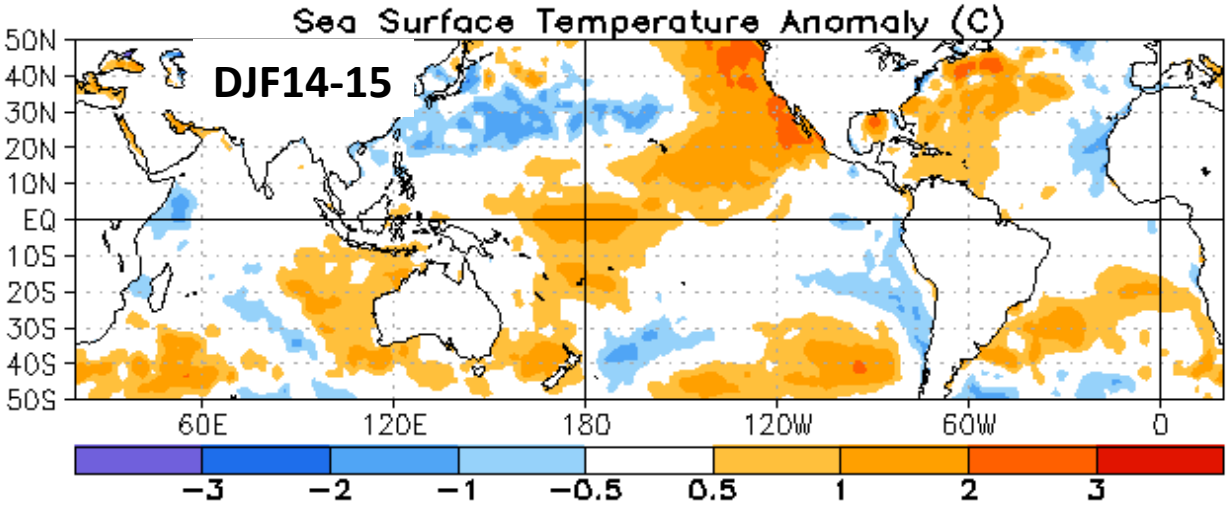
	Hurricanes	Tropical Storms	M. Hurricanes	% Median ACE
CanCM3 (10)	7 (6-8)	14 (11-16)	3 (2-4)	133 (108-158)
CanCM4(10)	8 (7-9)	14 (13-15)	3 (3-4)	140 (123-157)
CFSv2 (32)	8 (7-9)	14 (13-15)	3 (3-3)	148 (130-166)
CCSM4 (10)	6 (5-6)	10 (9-11)	2 (2-2)	94 (78-110)
NMME (4)	7 (6-8)	13 (12-14)	3 (3-3)	129 (110-148)

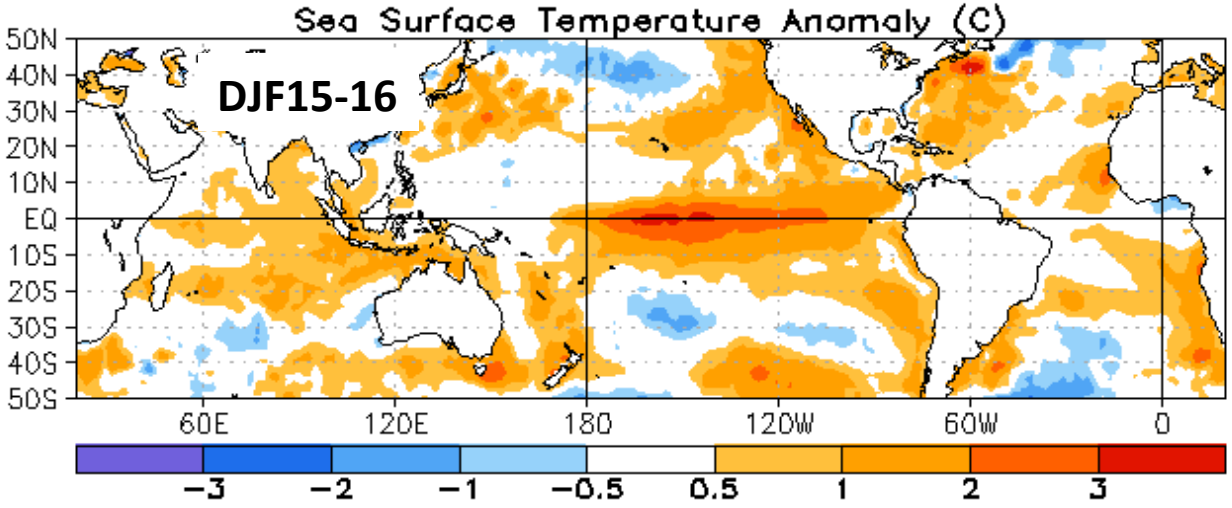
	Hurricanes	Tropical Storms	M. Hurricanes	% Median ACE
CanCM3 (10)	0 20 80	0 40 60	0 20 80	0 40 60
CanCM4 (10)	0 10 90	0 20 80	0 0 100	0 20 80
CFSv2 (32)	0 4 96	0 10 90	0 0 100	0 7 93
CCSM4 (10)	10 80 10	0 100 0	0 80 20	10 90 0
NMME (4)	2 29 69	0 43 57	0 25 75	3 39 58

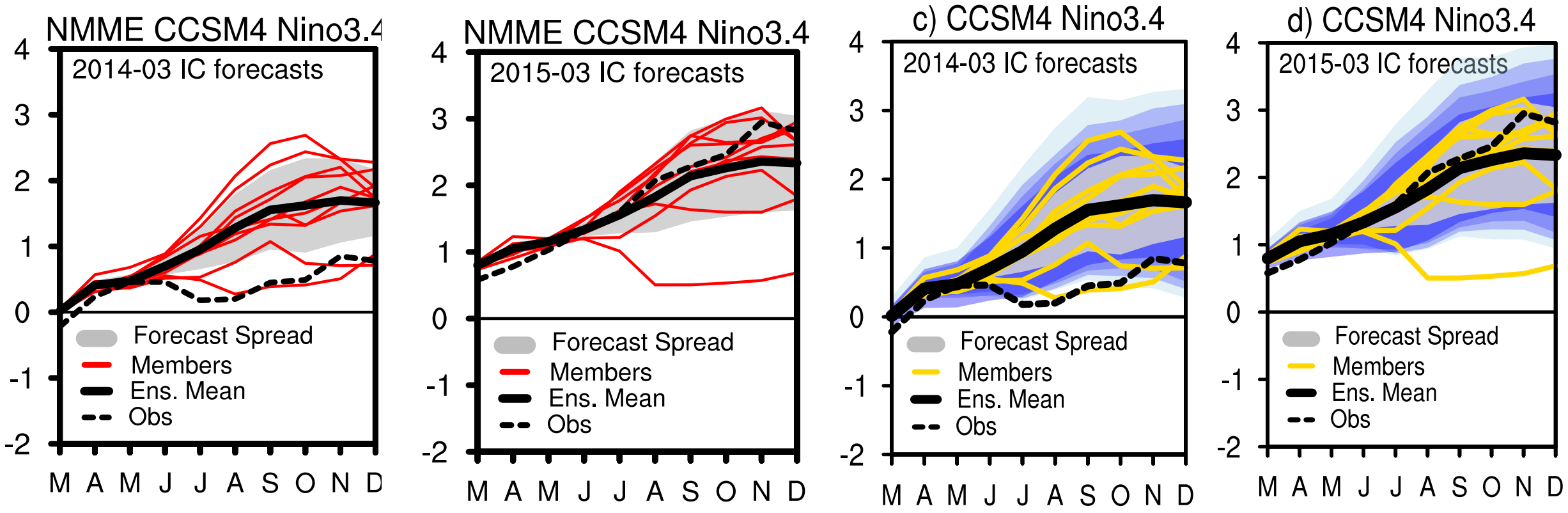
%Below normal %Near normal %Above normal

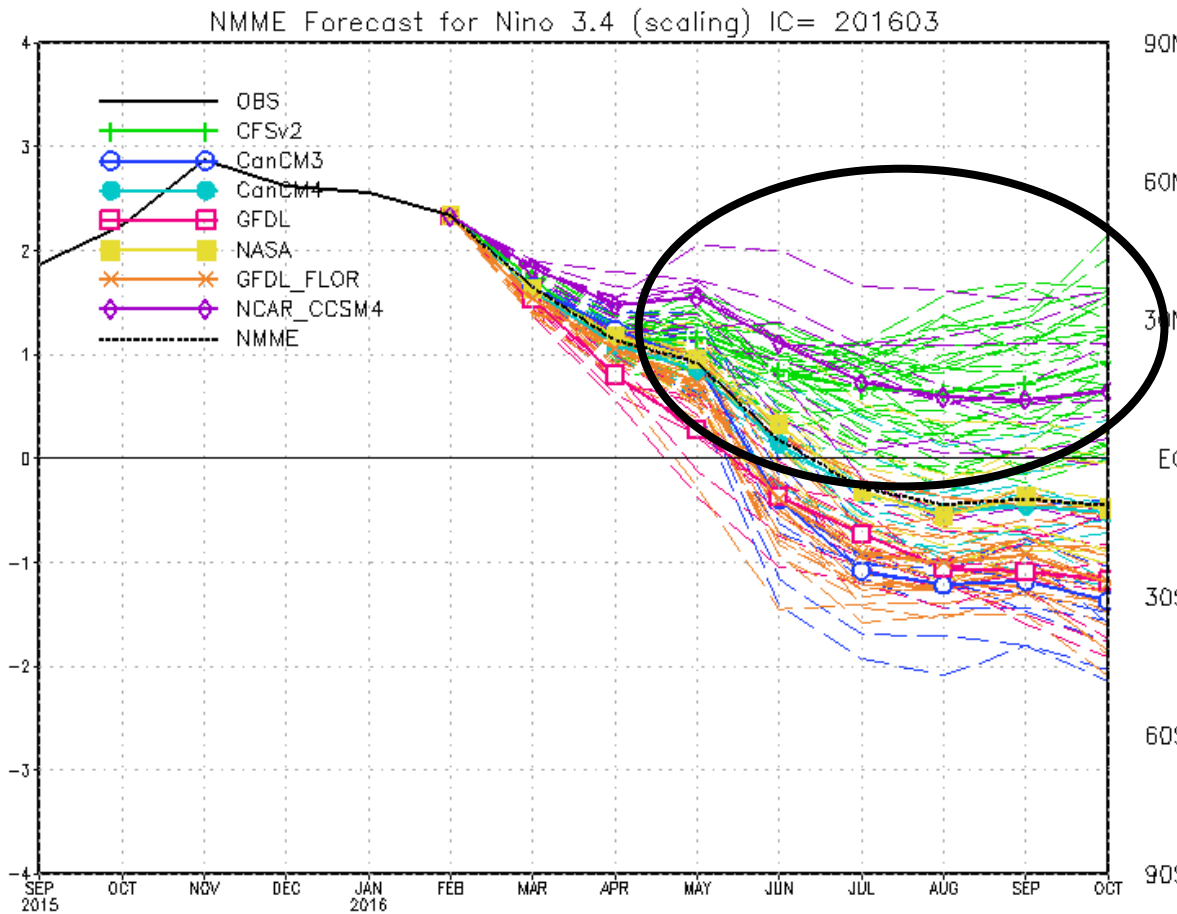

NMME Forecast of SST Anom IC=201407 for 2014DJF
DJF14-15
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
−3
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3

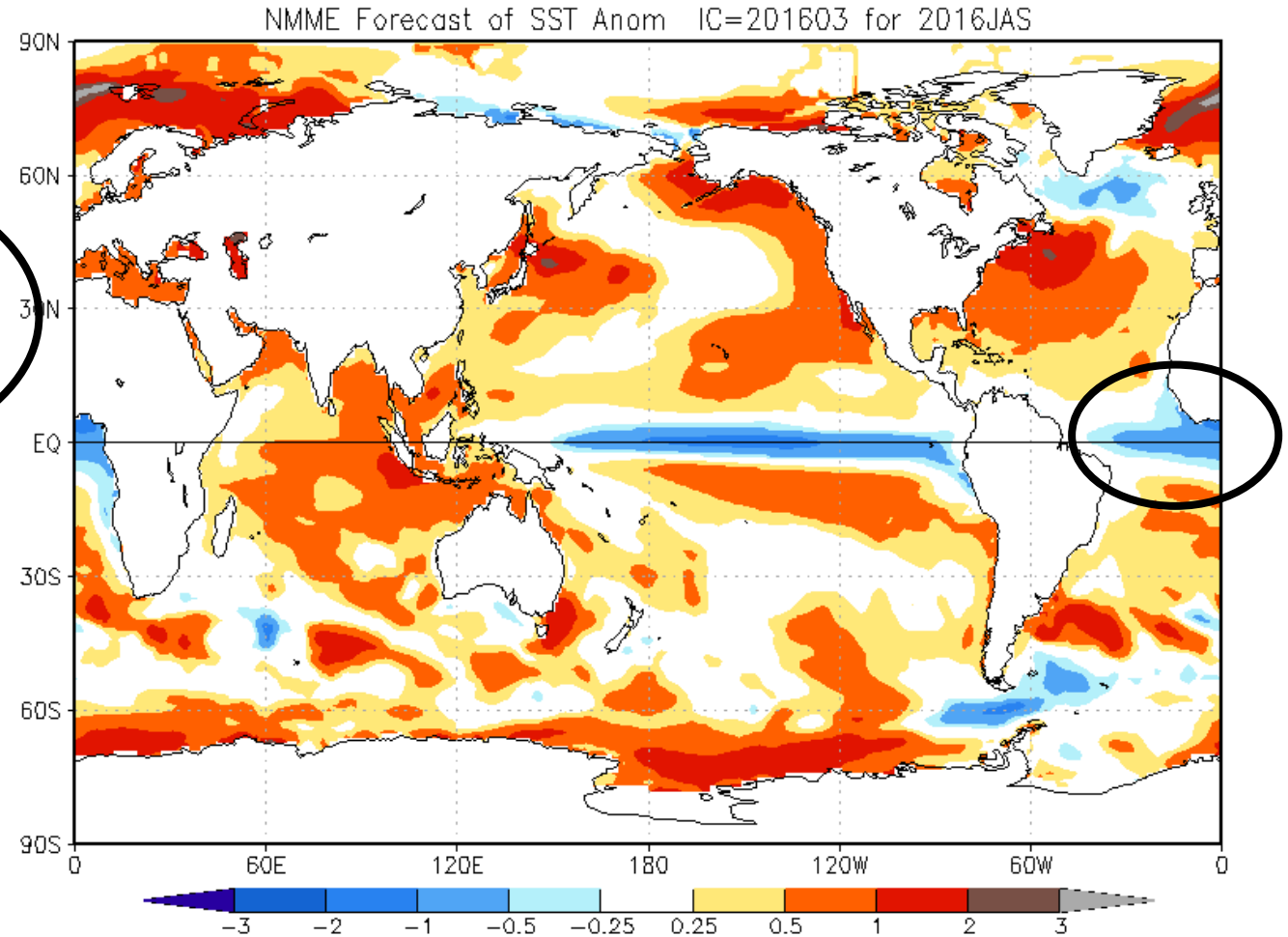

NMME Forecast of SST Anom IC=201507 for 2015DJF
DJF15-16
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
−3
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3


Sea Surface Temperature Anomaly (C)
DJF14-15
50N
40N
30N
20N
10N
EQ
10S
20S
30S
40S
50S
60E
120E
180
120W
60W
0
−3
−2
−1
−0.5
0.5
1
2
3

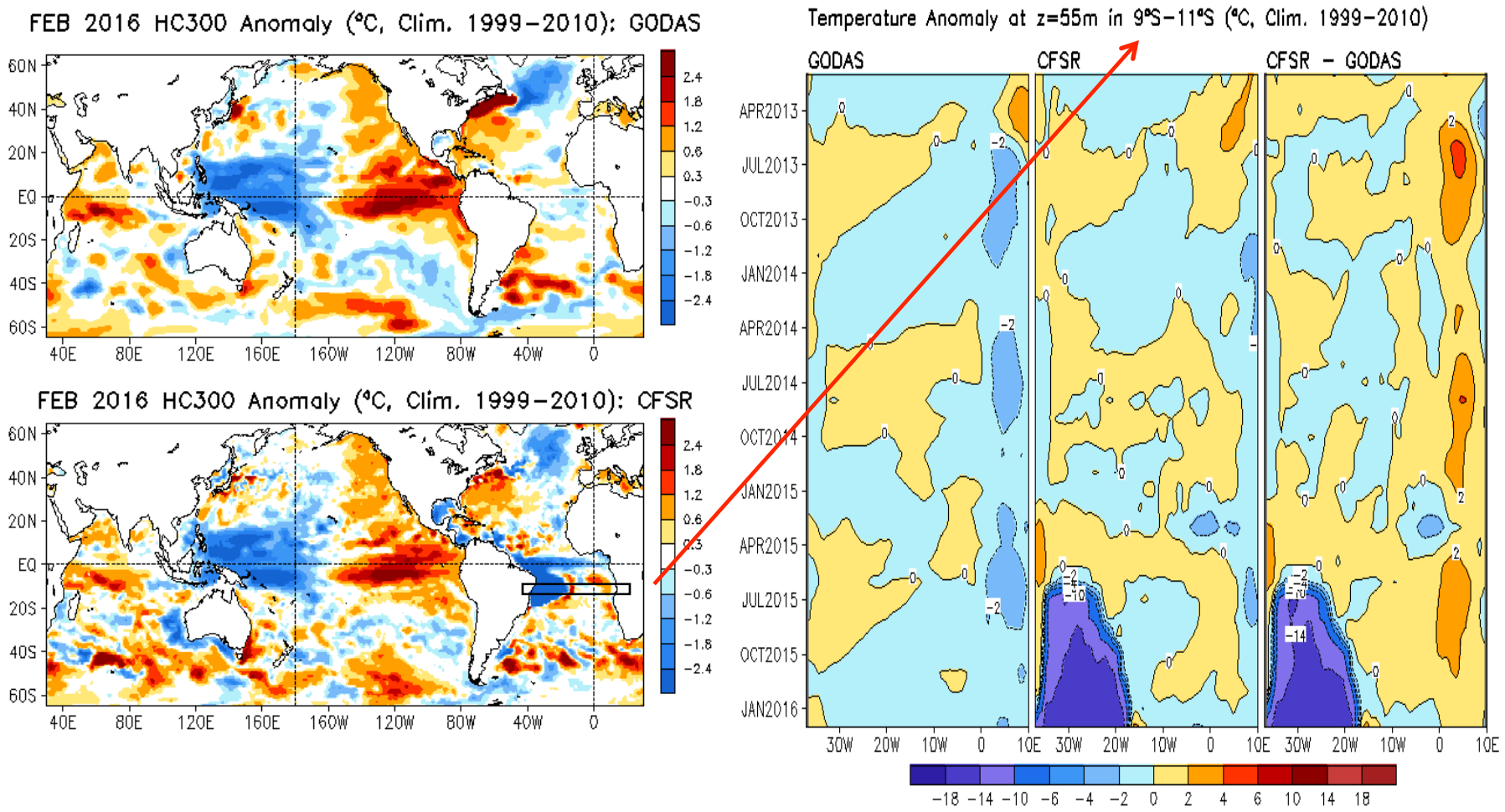

Sea Surface Temperature Anomaly (C)
DJF15-16
50N
40N
30N
20N
10N
EQ
10S
20S
30S
40S
50S
60E
120E
180
120W
60W
0
−3
−2
−1
−0.5
0.5
1
2
3


NMME CCSM4 Nino3.4
2014-03 IC forecasts
NMME CCSM4 Nino3.4
2015-03 IC forecasts
c) CCSM4 Nino3.4
2014-03 IC forecasts
d) CCSM4 Nino3.4
2015-03 IC forecasts
Forecast Spread
Members
Ens. Mean
Obs
4
3
2
1
0
-1
-2
M A M J J A S O N D

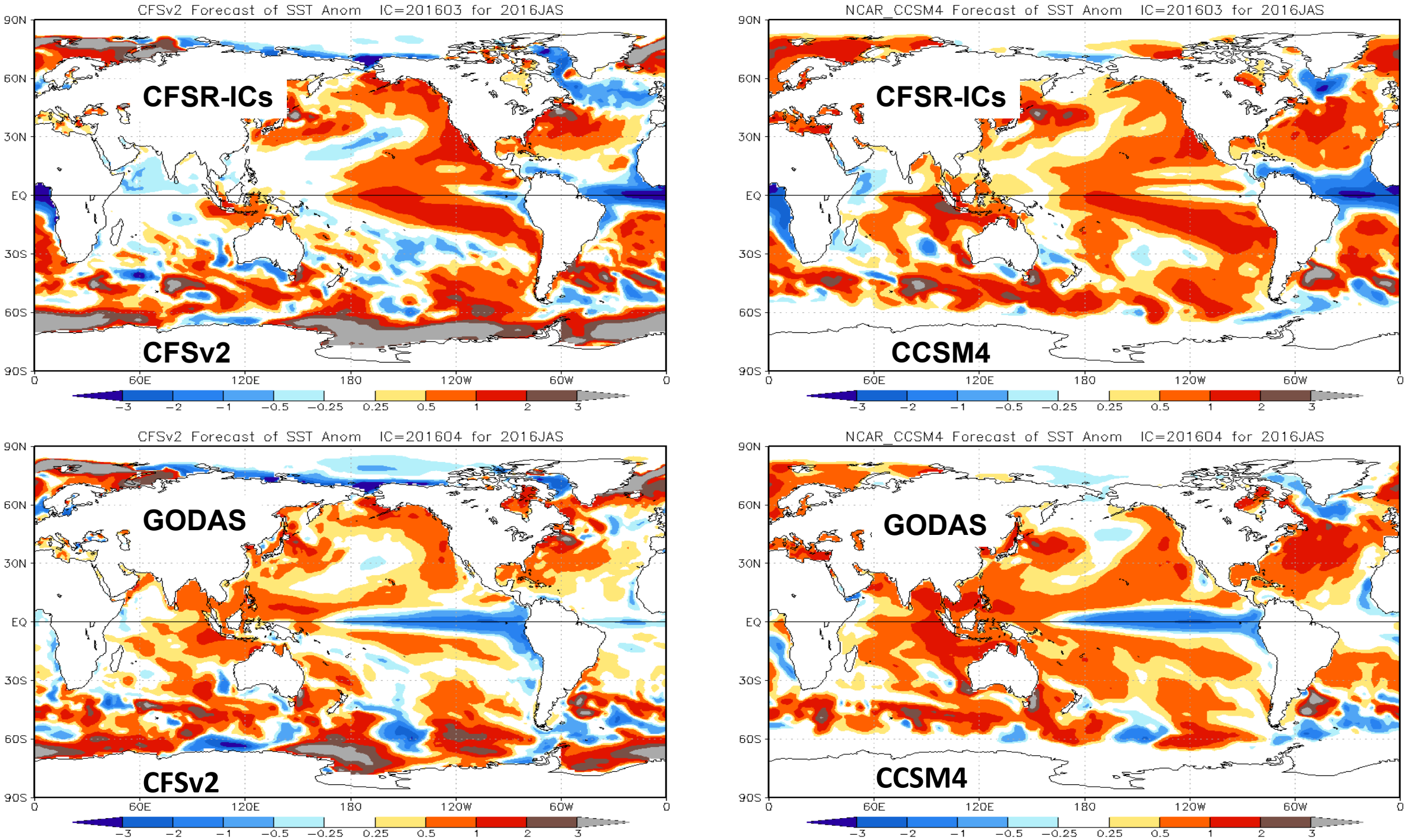

NMME Forecast for Nino 3.4 (scaling) IC= 201603
OBS
CFSv2
CanCM3
CanCM4
GFDL
NASA
GFDL_FLOR
NCAR_CCSM4
NMME
4
3
2
1
0
−1
−2
−3
−4
SEP 2015
OCT
NOV
DEC
JAN 2016
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT


NMME Forecast of SST Anom IC=201603 for 2016JAS
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
−3
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3

Recent CFSv2 Cold Biases in Tropical South Atlantic



- **A cold bias emerged around 10S in the South Atlantic around Jul 2015 and enhanced quickly with time.**
- **It reached -18 degree at 55m depth since Oct 2015.**


CFSv2 Forecast of SST Anom IC=201603 for 2016JAS
CFSR-ICs
CFSv2
NCAR_CCSM4 Forecast of SST Anom IC=201603 for 2016JAS
CFSR-ICs
CCSM4
CFSv2 Forecast of SST Anom IC=201604 for 2016JAS
GODAS
CFSv2
NCAR_CCSM4 Forecast of SST Anom IC=201604 for 2016JAS
GODAS
CCSM4
90N
60N
30N
EQ
30S
60S
90S
0
60E
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180
120W
60W
0
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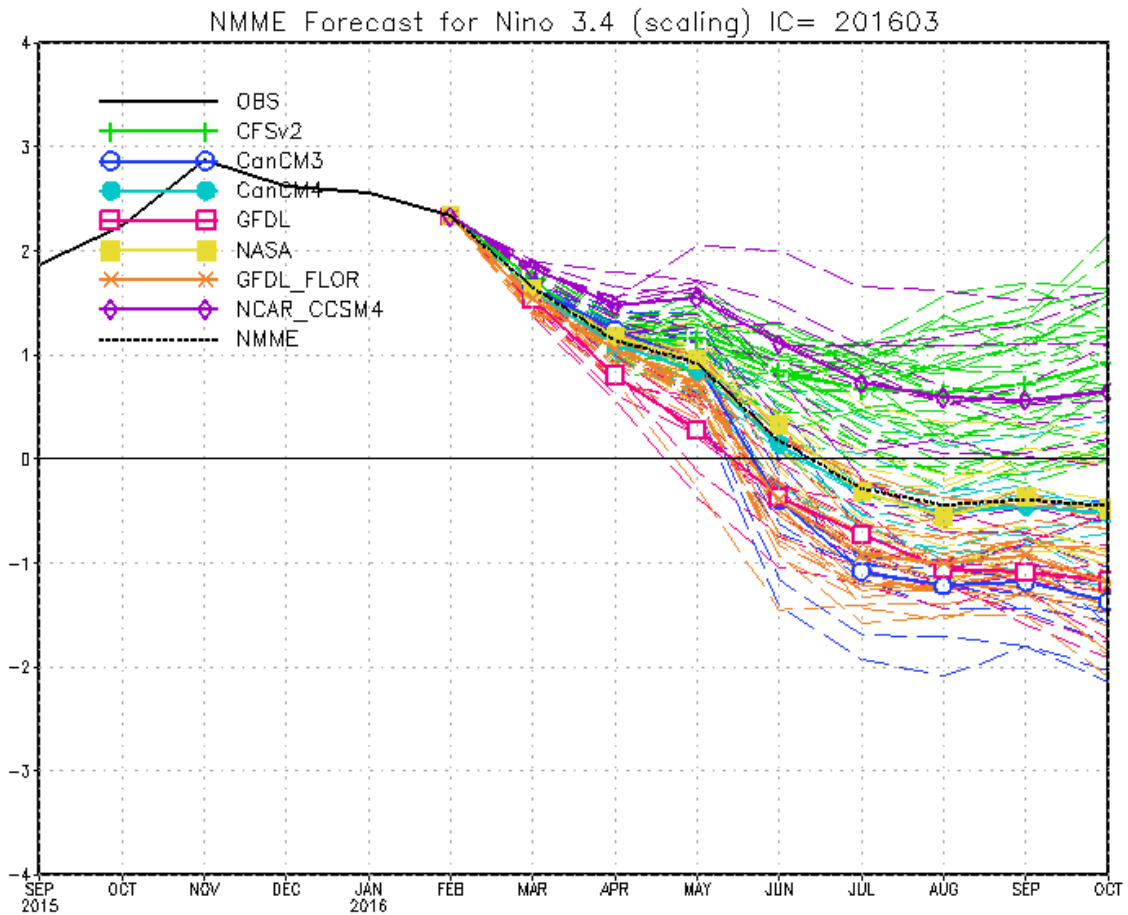
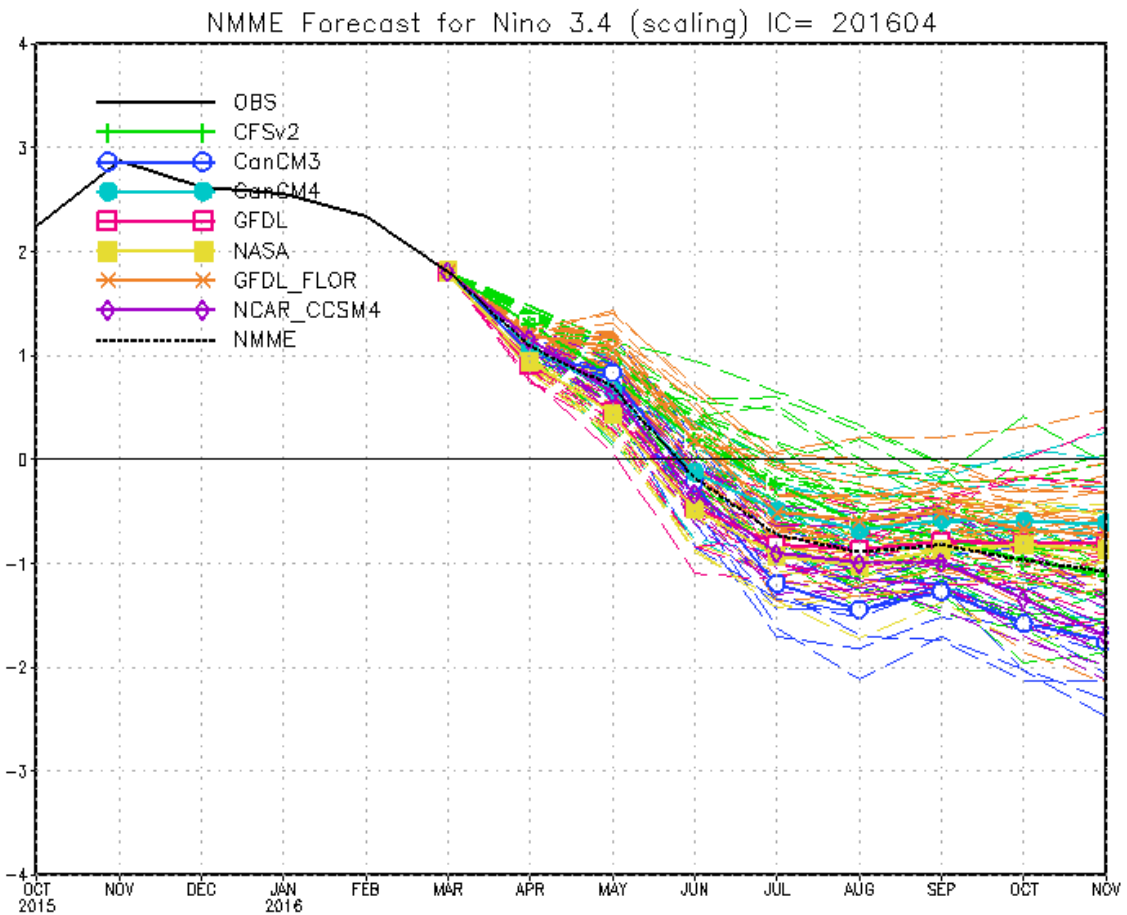
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3

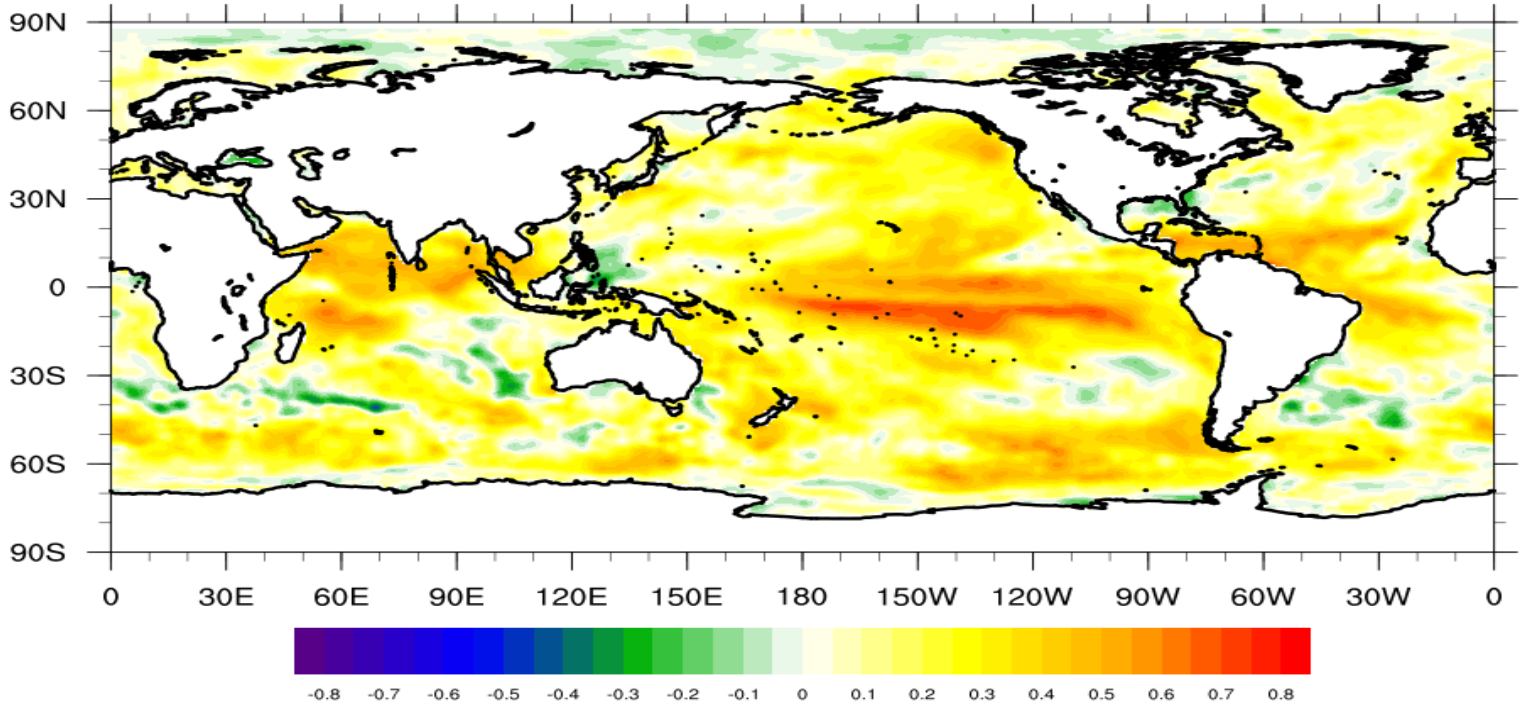

NMME Forecast for Nino 3.4 (scaling) IC= 201603
OBS
CFSv2
CanCM3
CanCM4
GFDL
NASA
GFDL_FLOR
NCAR_CCSM4
NMME
4
3
2
1
0
−1
−2
−3
−4
SEP 2015
OCT
NOV
DEC
JAN 2016
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT


NMME Forecast for Nino 3.4 (scaling) IC= 201604
OBS
CFSv2
CanCM3
CanCM4
GFDL
NASA
GFDL_FLOR
NCAR_CCSM4
NMME
4
3
2
1
0
−1
−2
−3
−4
OCT 2015
NOV
DEC
JAN 2016
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV

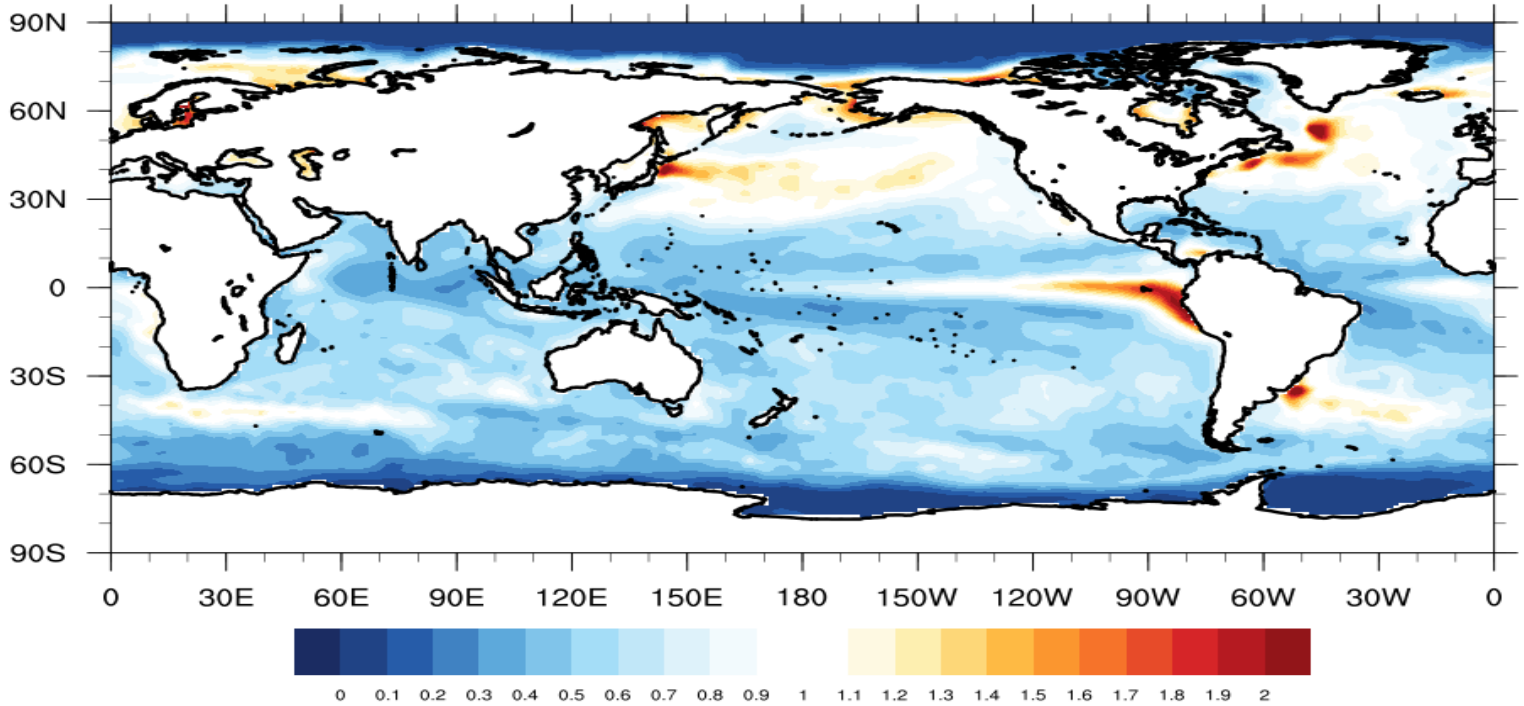
Is Real-Time Skill/Predictability Comparable to Retrospective?

- SSTA
- January Initial Conditions Only
- Lead-Time 5-months Only (June Verification)
- All Data Detrended
- CCSM4 Only (Will Expand)
- Skill and Predictability Calculated on 5-year Chunks
- Skill Measured with Correlation and RMSE vs Observations
- Predictability Measured with Correlation and RMSE Holding one Ensemble Member as “Truth”
- Correlation and RMSE Calculated Individually for Each Ensemble Member and Aggregated Over All Ensemble Members

- **SSTA Correlation vs. Observational Estimates**
- **January ICs: 1982-2015**
- **June Verification Month**



- **SSTA RMSE vs. Observational Estimates**
- **January ICs: 1982-2015**
- **June Verification Month**



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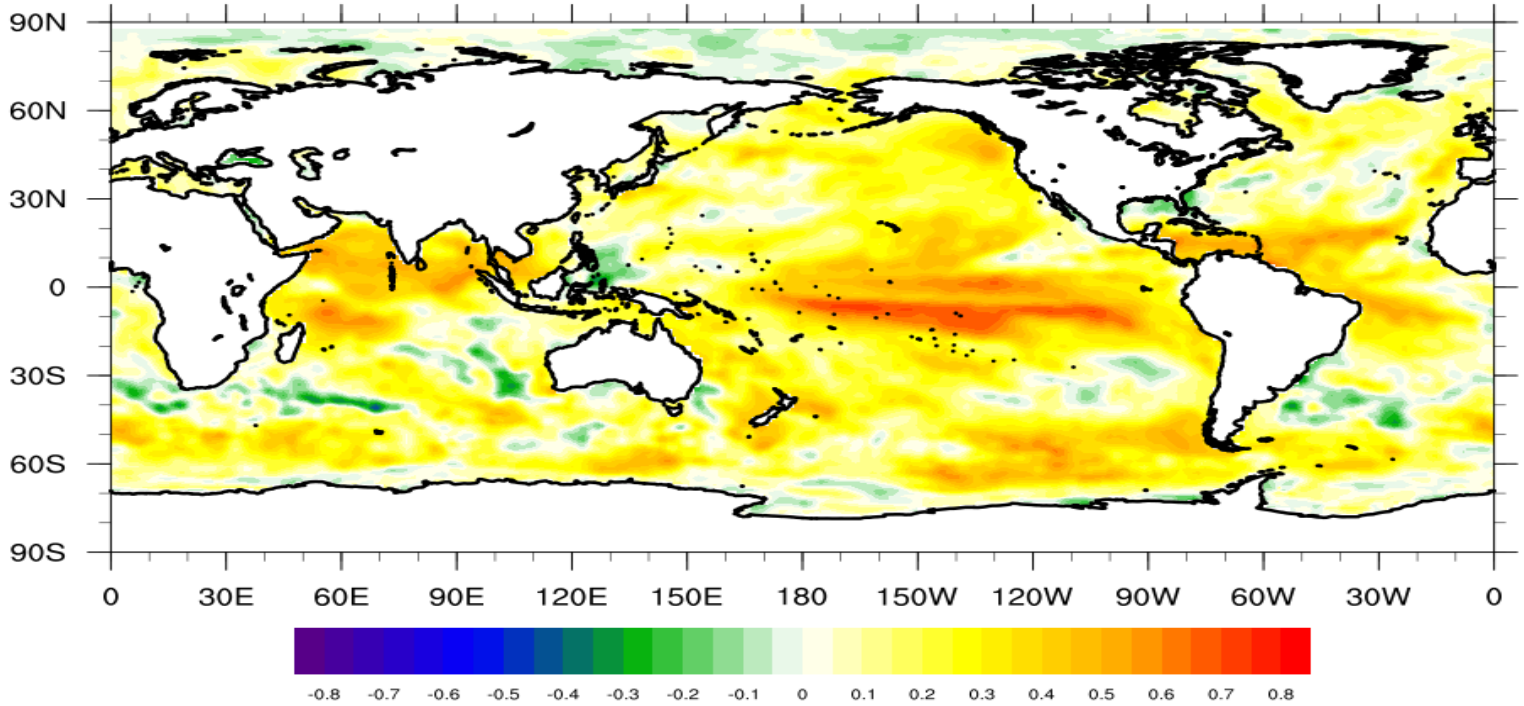
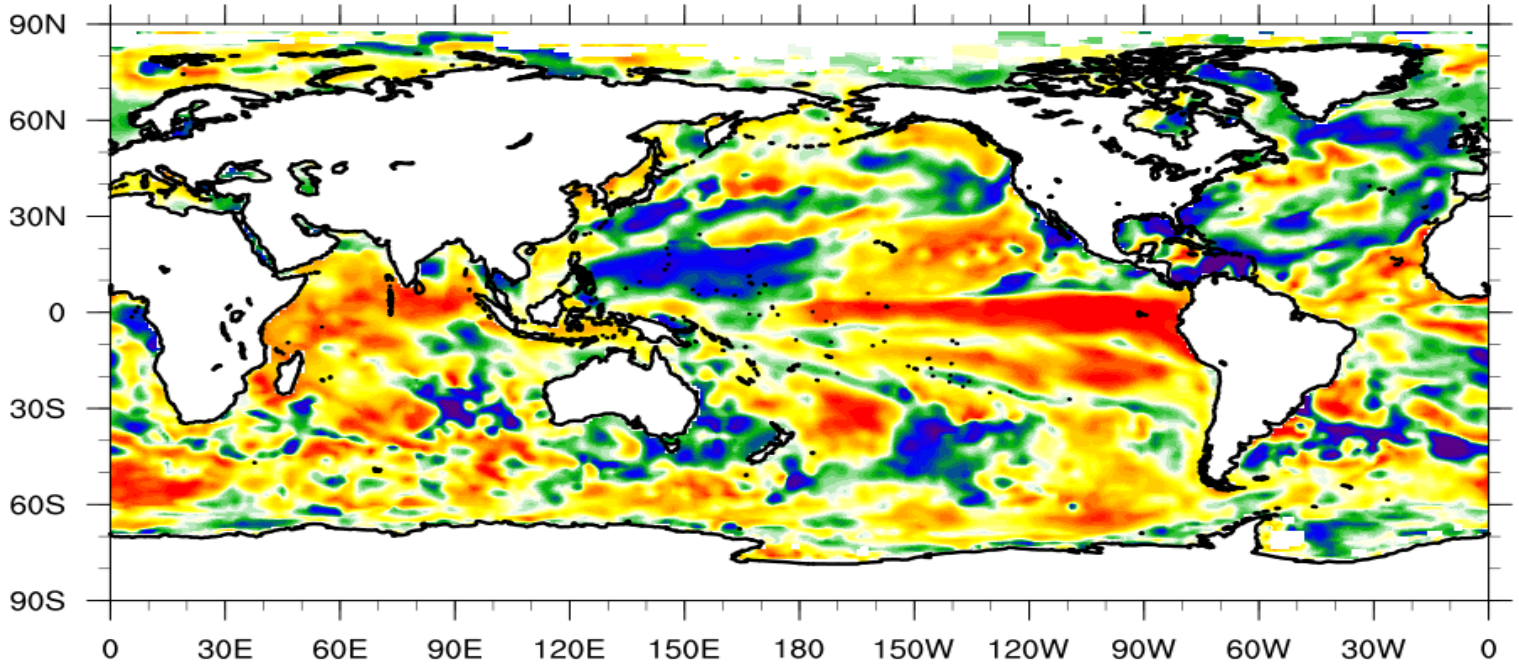
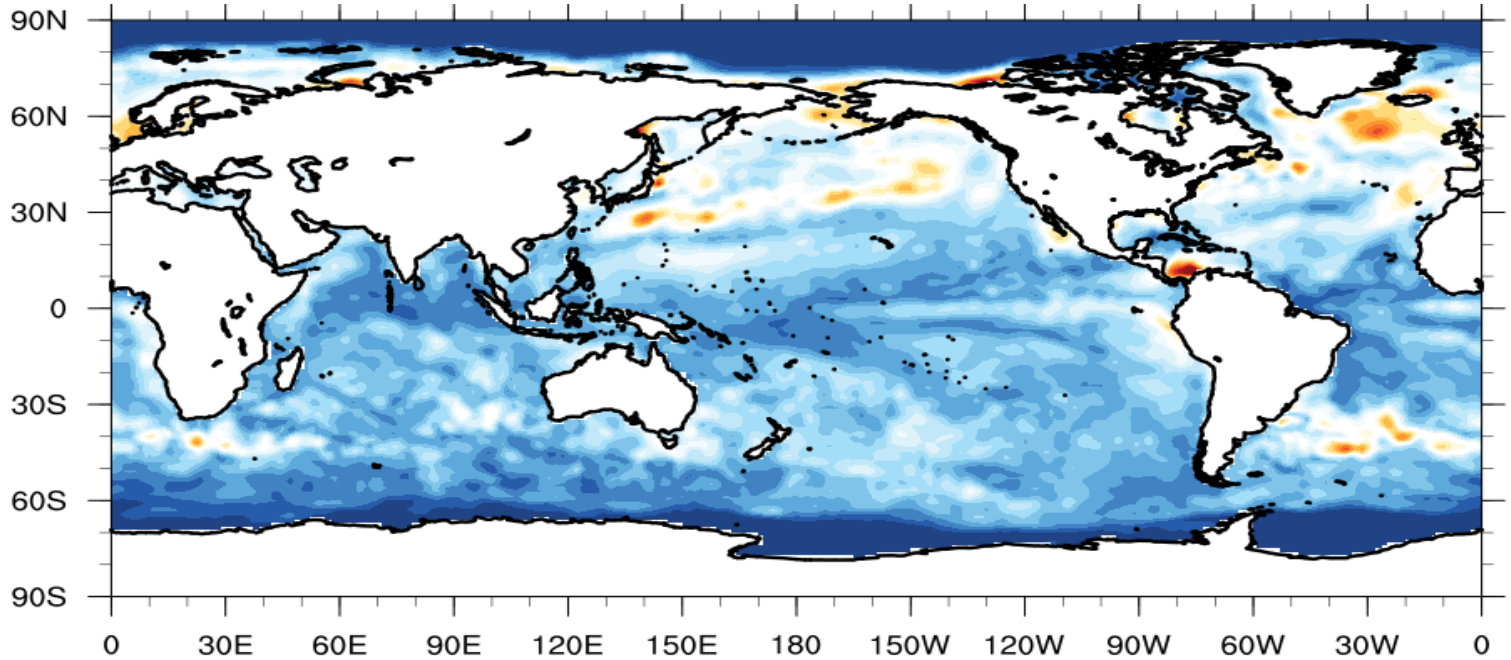
- **January ICs: 1982-2015**
- **June Verification Month**



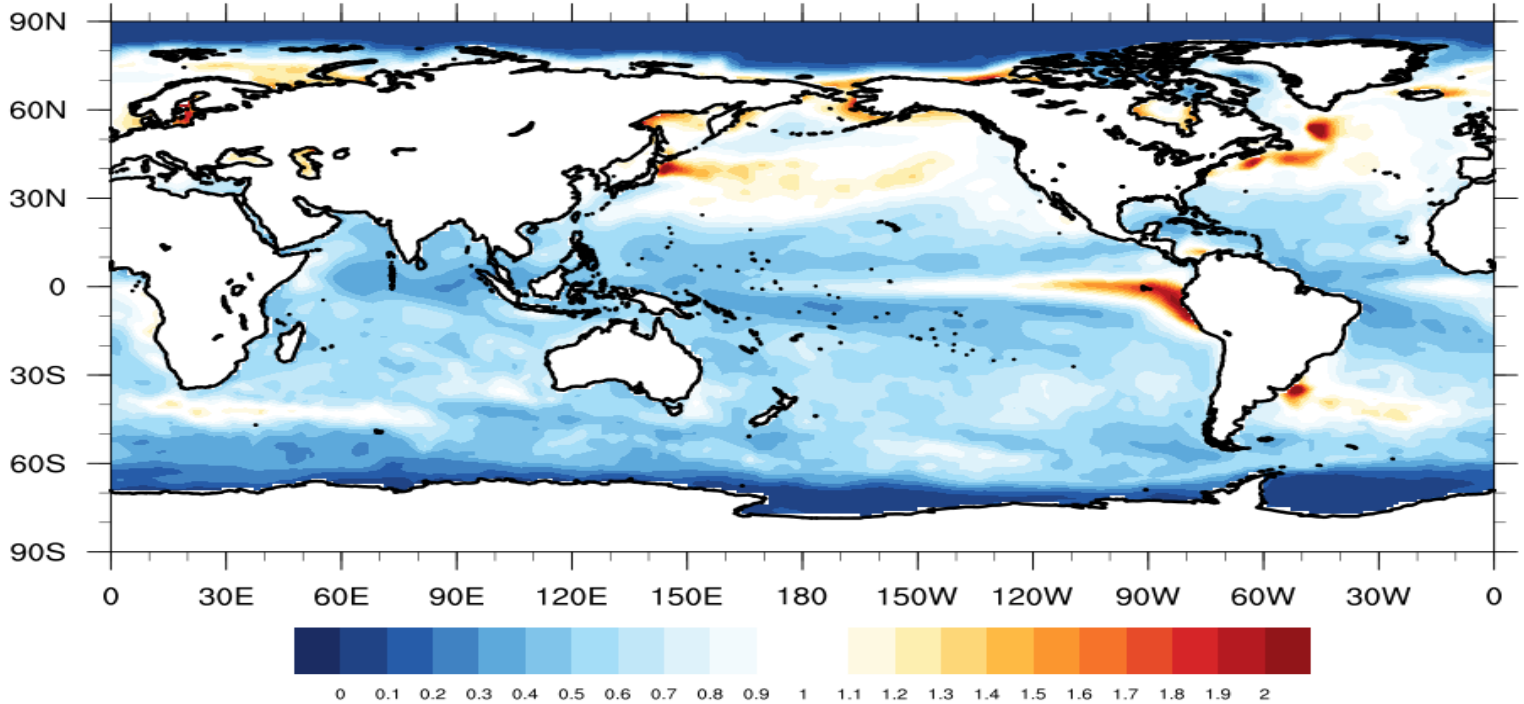
- **SSTA Correlation vs. Observational Estimates**
- **January ICs: <u>2011-2015</u>**
- **June Verification Month**



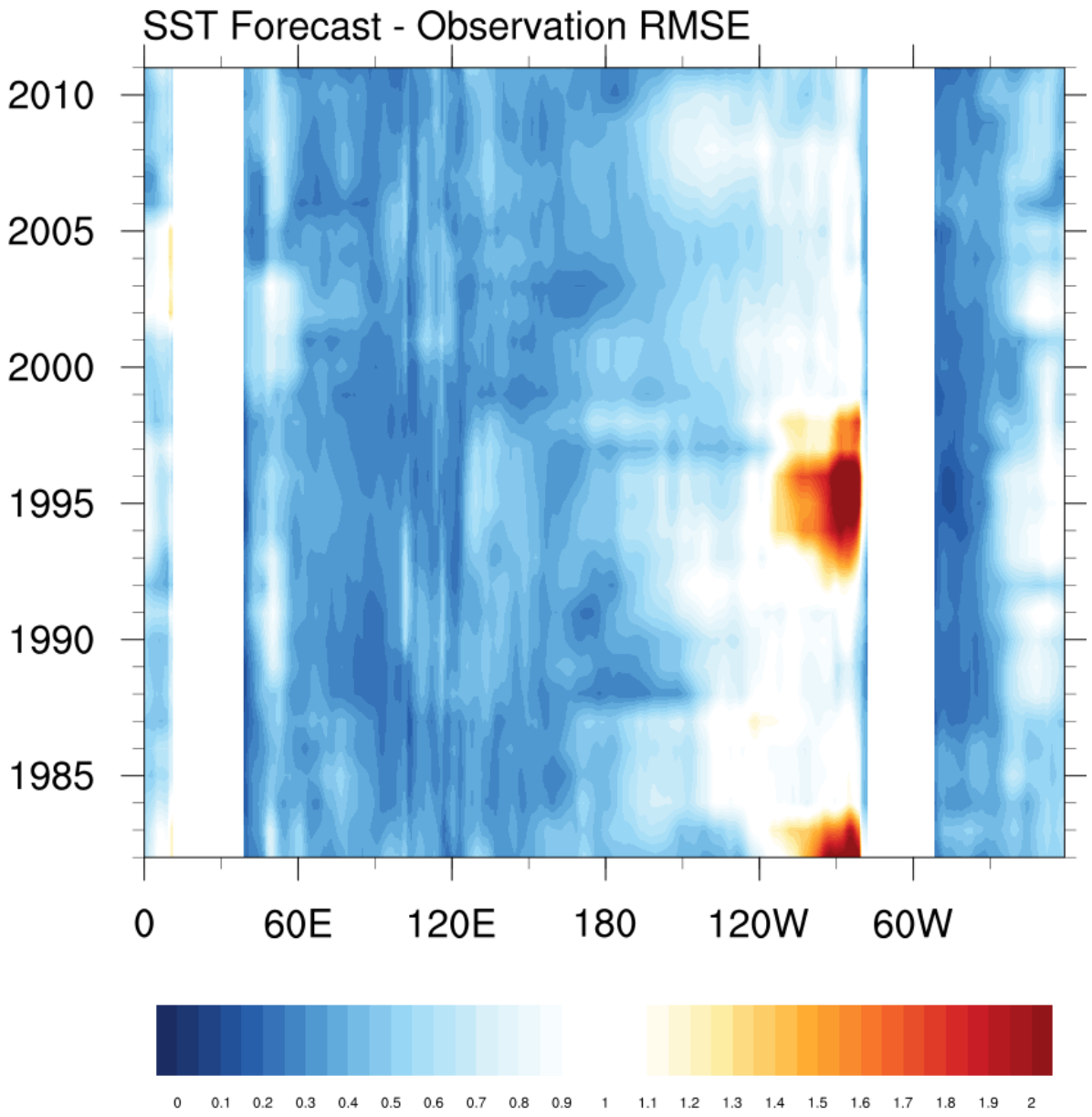
- **SSTA RMSE vs. Observational Estimates**
- **January ICs: <u>2011-2015</u>**
- **June Verification Month**

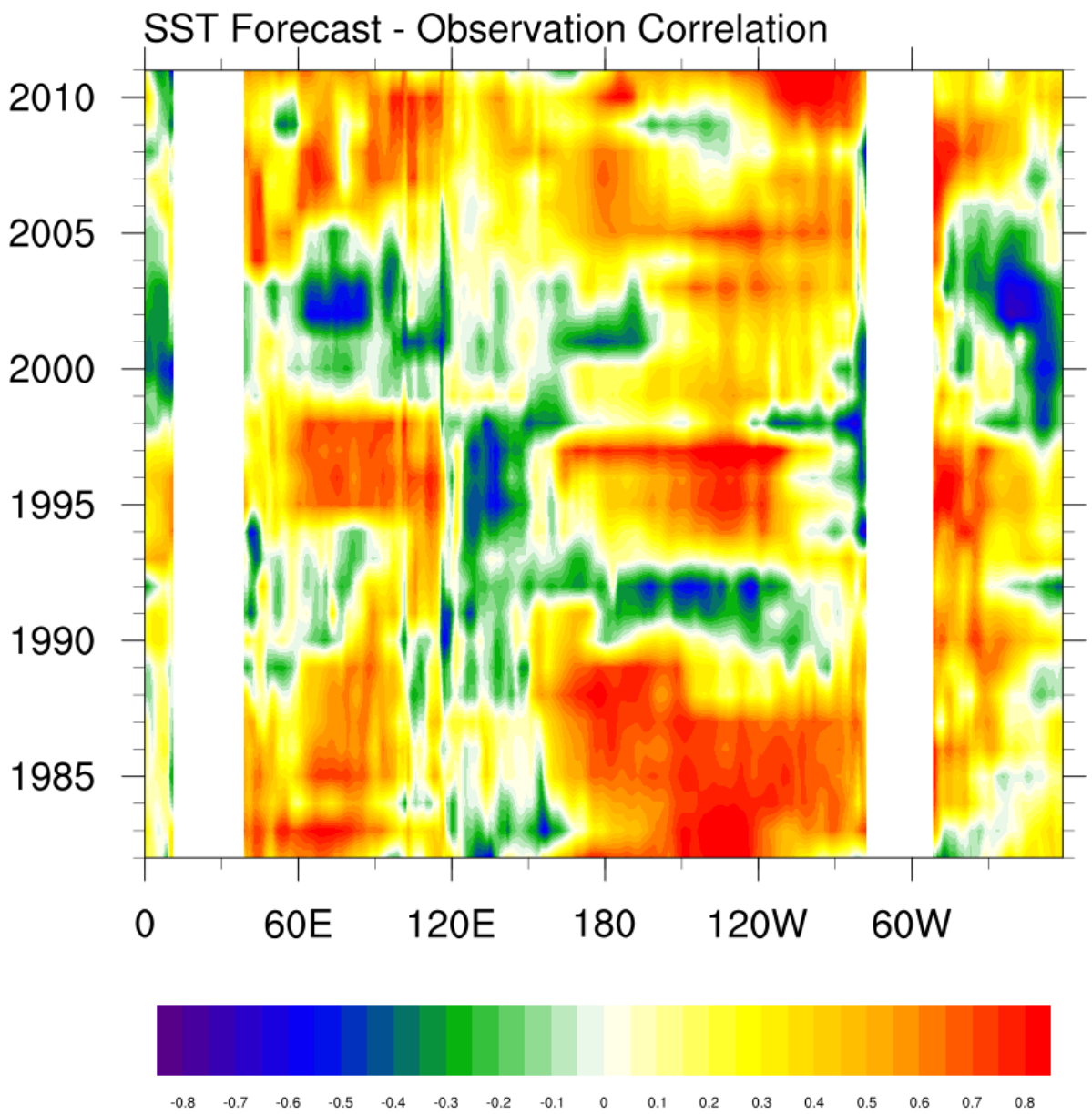


- **SSTA RMSE vs. Observational Estimates**
- **January ICs: 1982-2015**
- **June Verification Month**

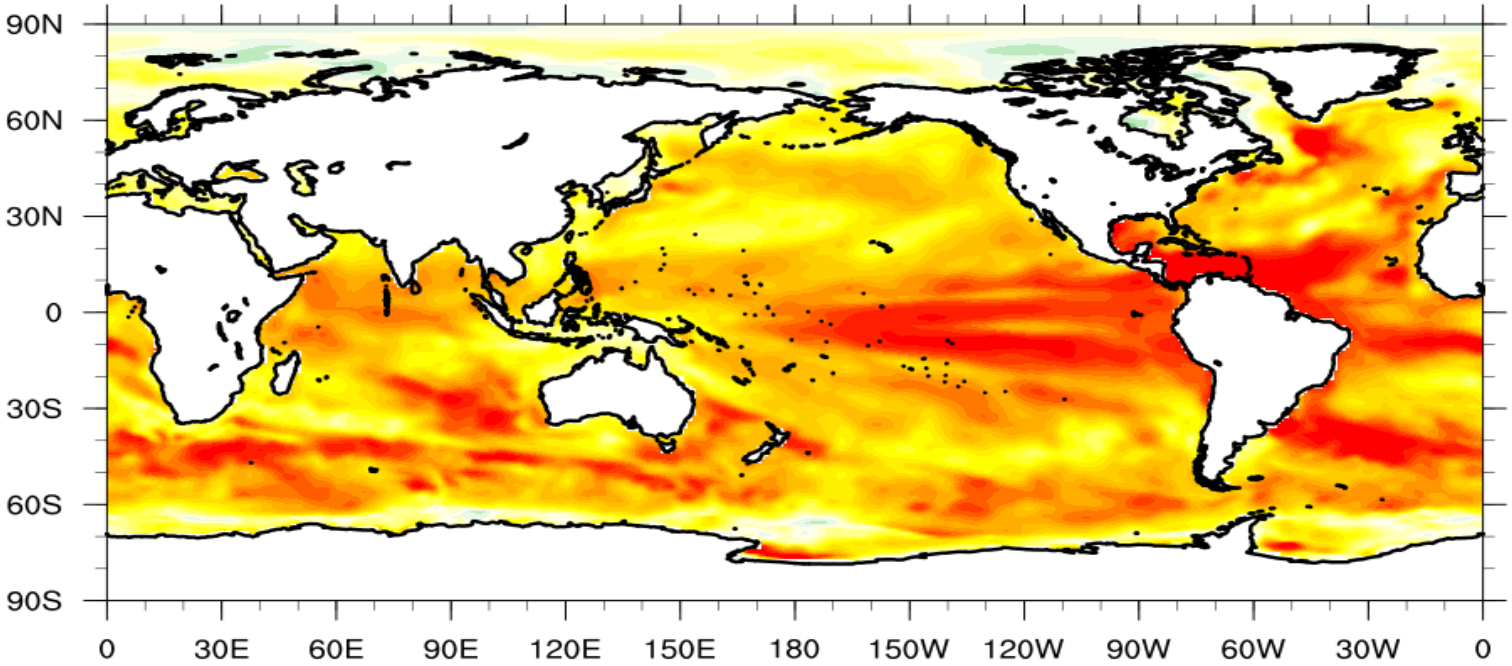


Equatorial Skill Scores in 5-year Chunks

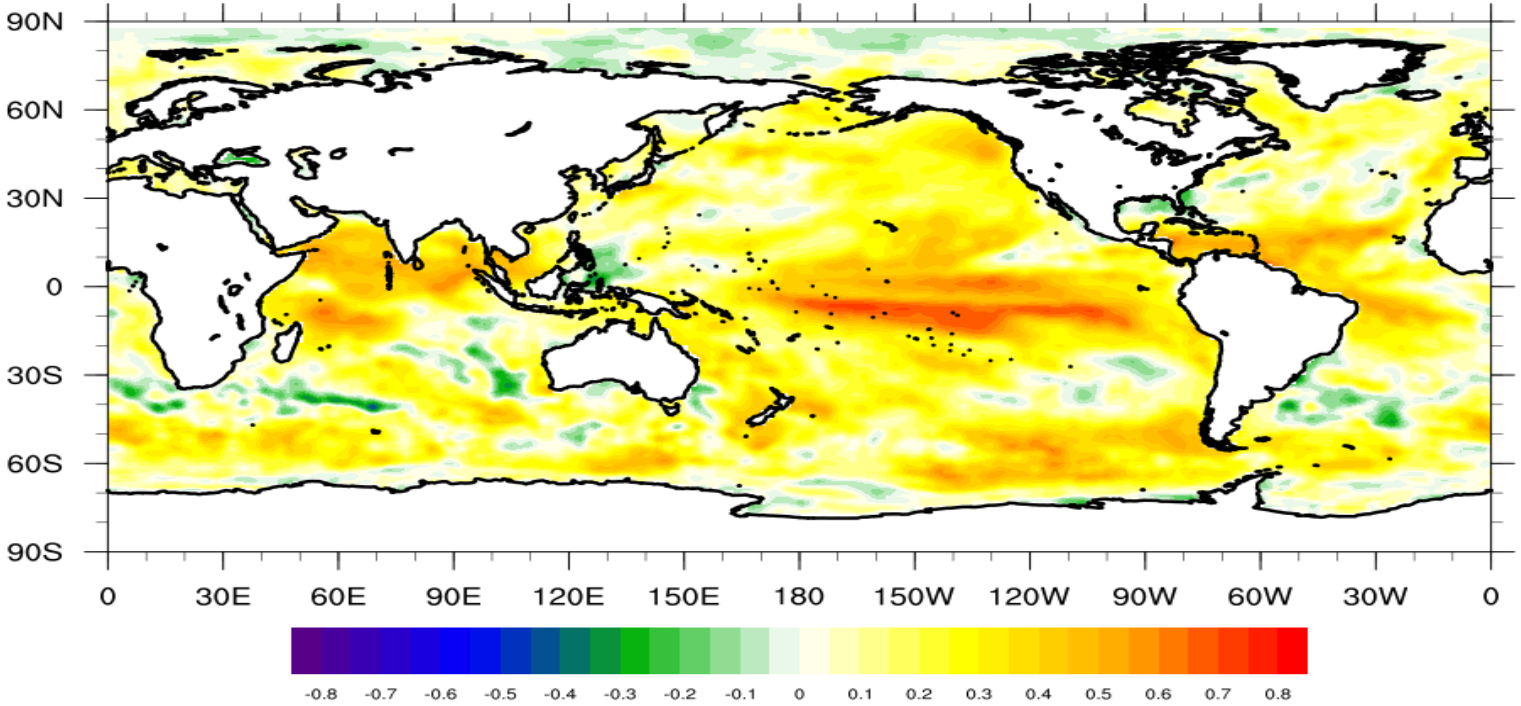




- **SSTA Correlation vs. Ensemble Member 10 - <u>Predictability</u>**
- **January ICs: 1982-2015**
- **June Verification Month**

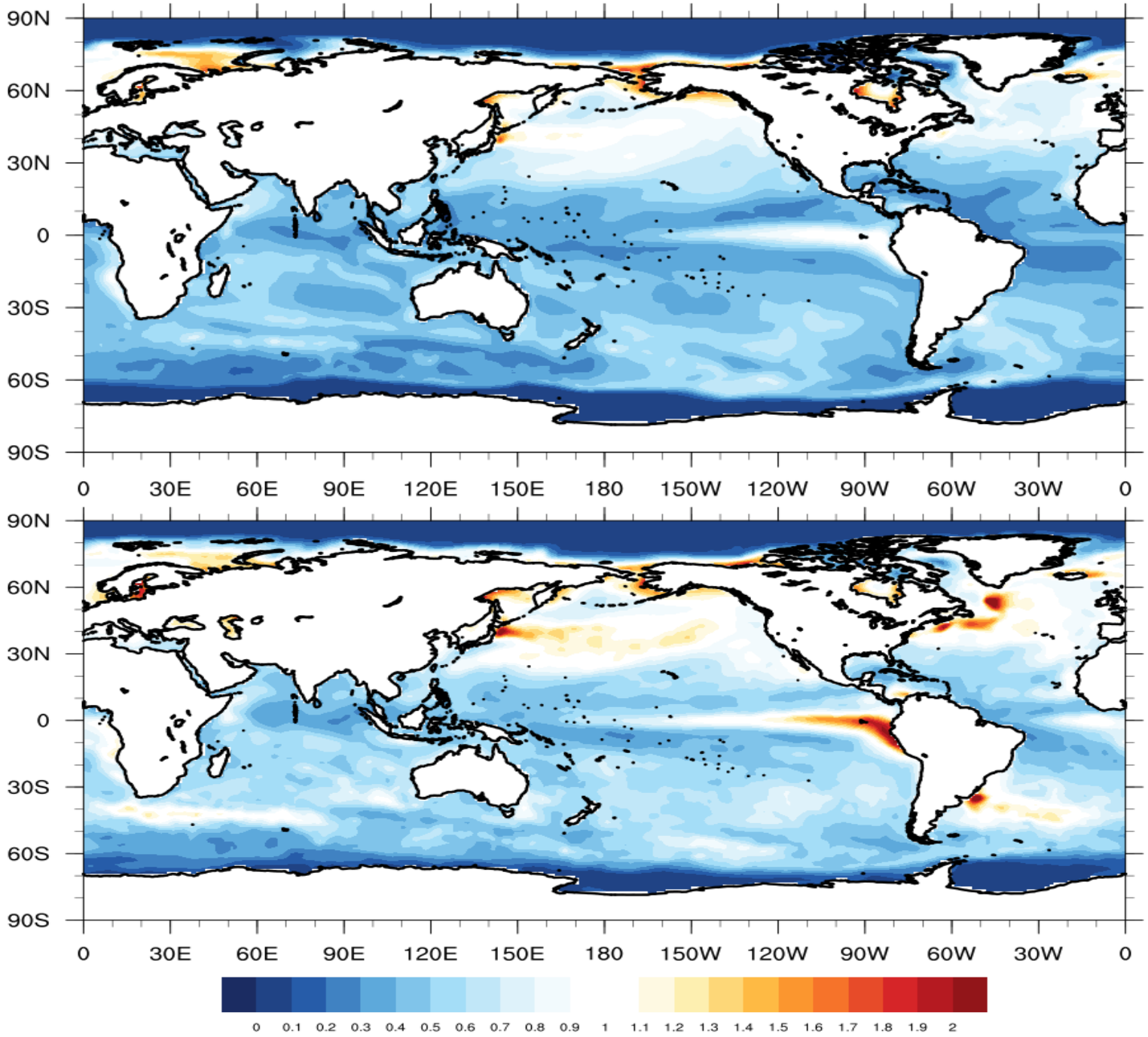


- **SSTA Correlation vs. Observational Estimates**
- **January ICs: 1982-2015**
- **June Verification Month**

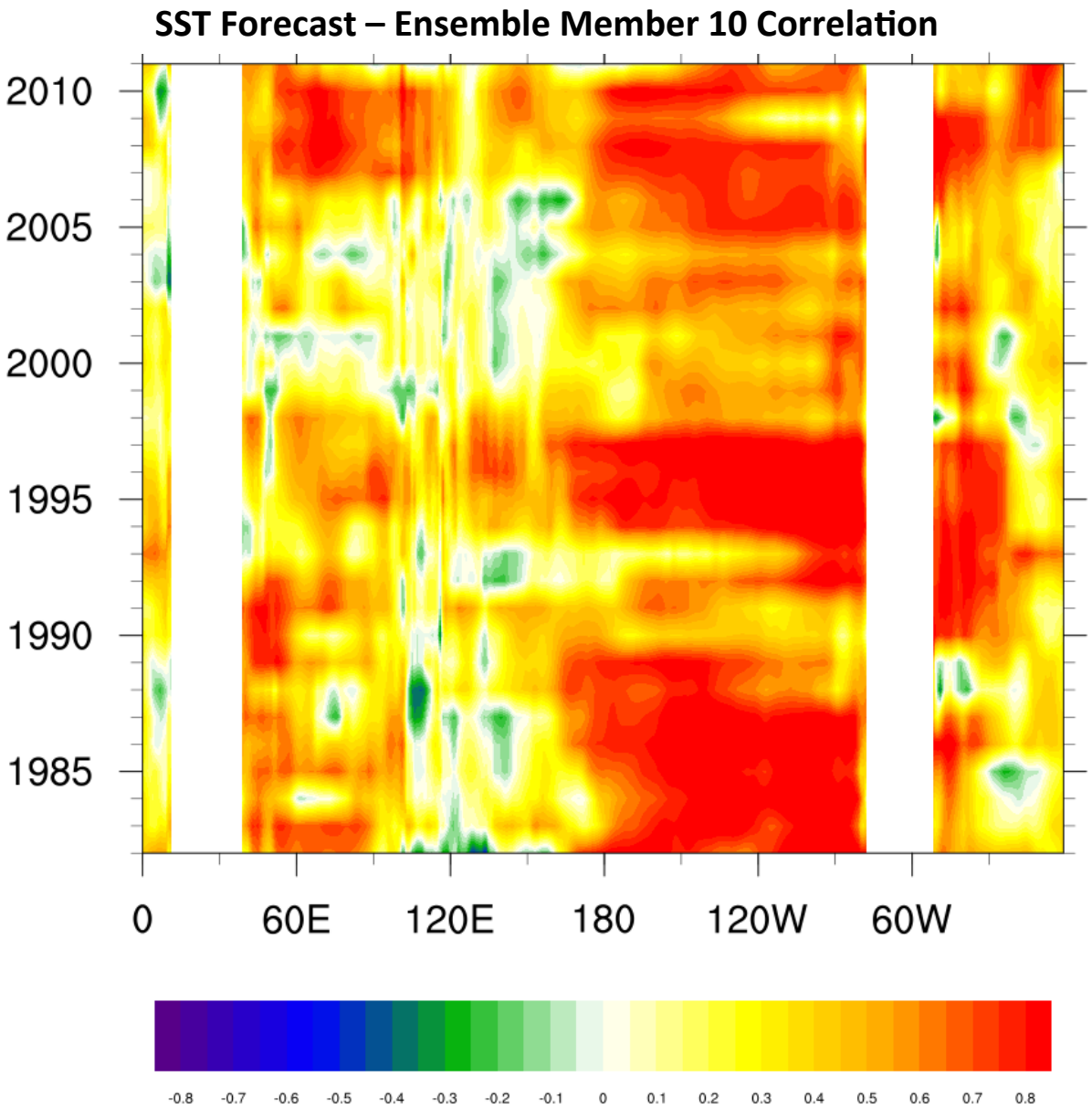


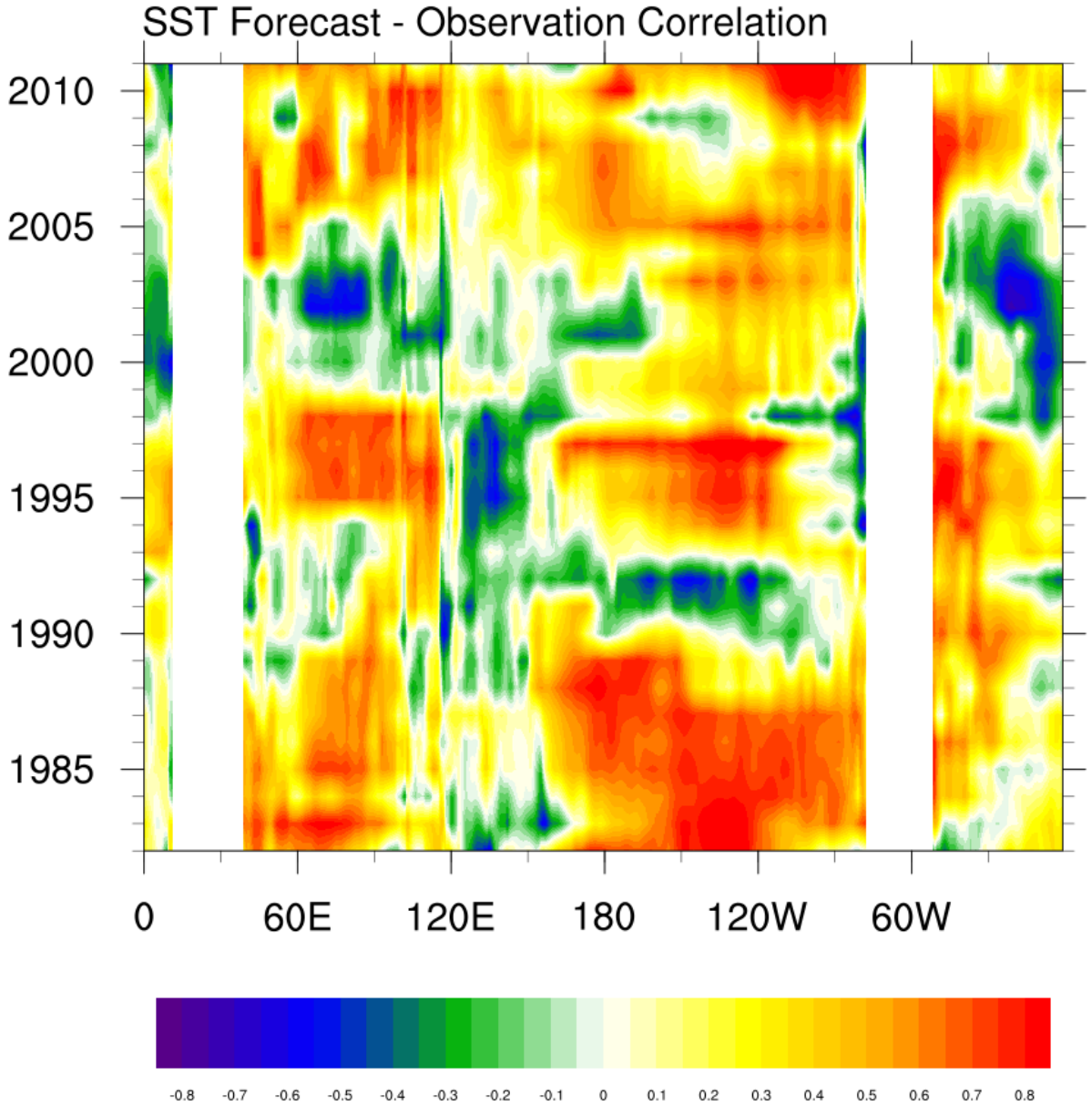
- **SSTA RMSE vs. Ensemble Member 10 - <u>Predictability</u>**
- **January ICs: 1982-2015**
- **June Verification Month**

- **SSTA RMSE vs. Observational Estimates**
- **January ICs: 1982-2015**
- **June Verification Month**

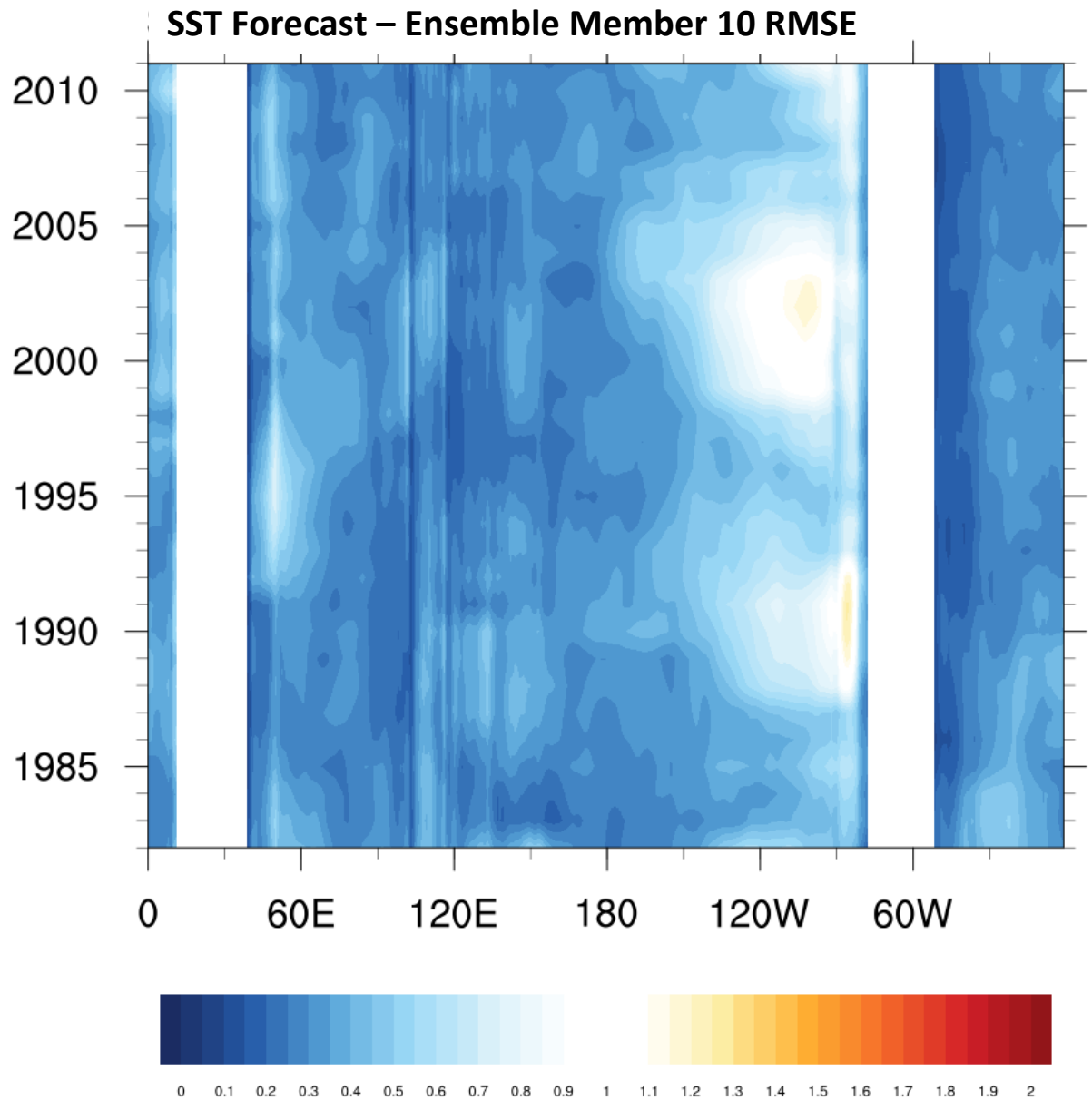


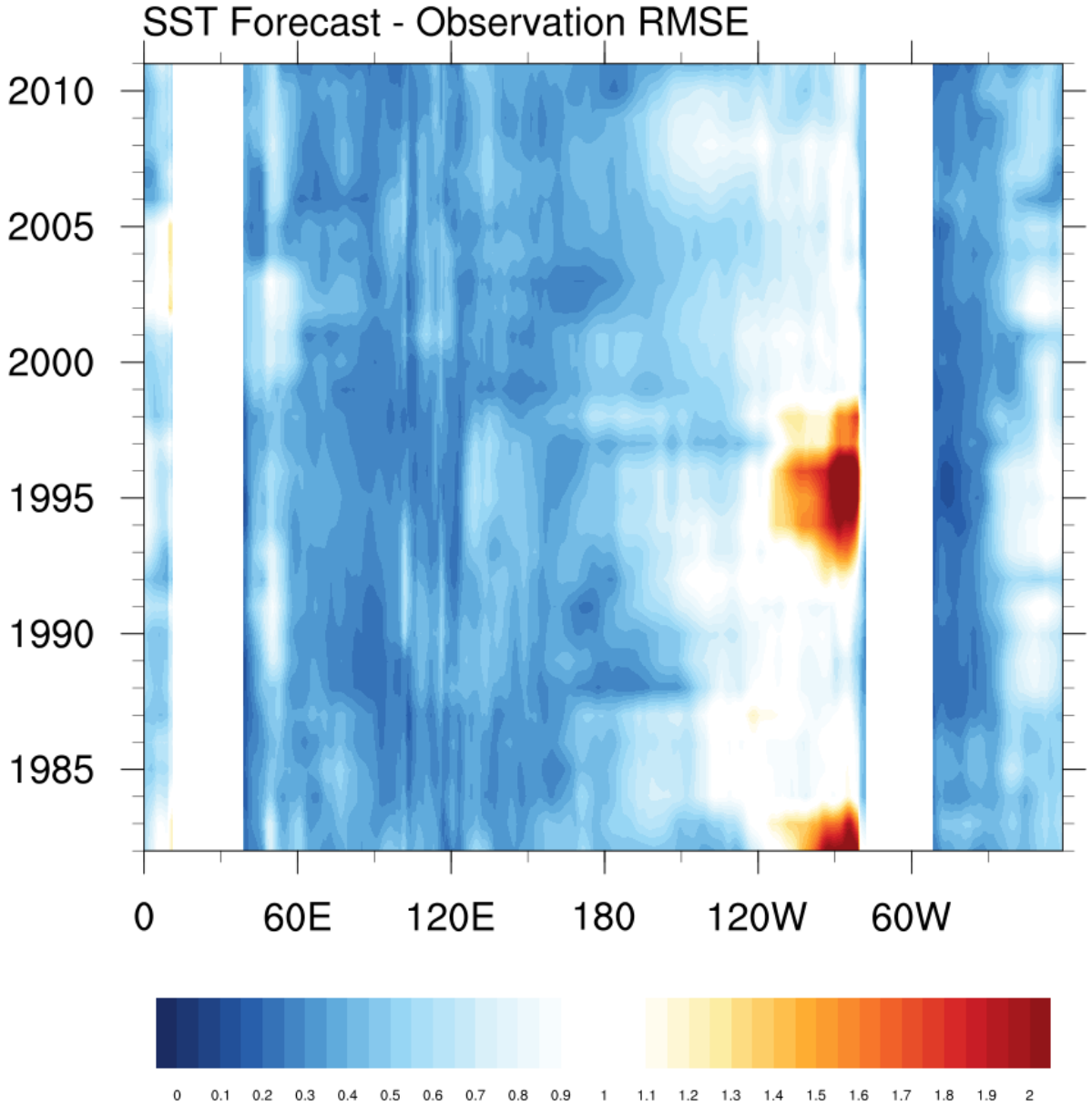
Equatorial Correlation in 5-year Chunks





Equatorial RMSE in 5-year Chunks





Current Status of the NMME Project

- Operational Effective May 2016
- NMME Reminder – Why Multi-Model
- Warm ENSO Predictions of 2014-15 vs. 2015-16
- Cold ENSO Phase 2016-17
- Evolution of ENSO Forecast Skill and Predictability (Correlation, RMSE)
  - CCSM4