UNIVERSITY OF MIAMI
COOPERATIVE INSTITUTE for
MARINE & ATMOSPHERIC STUDIES

Issues with Current ENSO Forecasts: Interpreting it and how to us it

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HOME > NMME Forecasts of Monthly Climate Anomalies

Welcome to the National Multi-Model Ensemble home!

UM Lead Multi-Agency Multi-Institutional Effort to Improve NOAA Operational Forecasts

Data and Current Forecasts

month mean spatial anomalies
month mean spatial anomalies
Niño3.4 Plumes
International MME
perimental: 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
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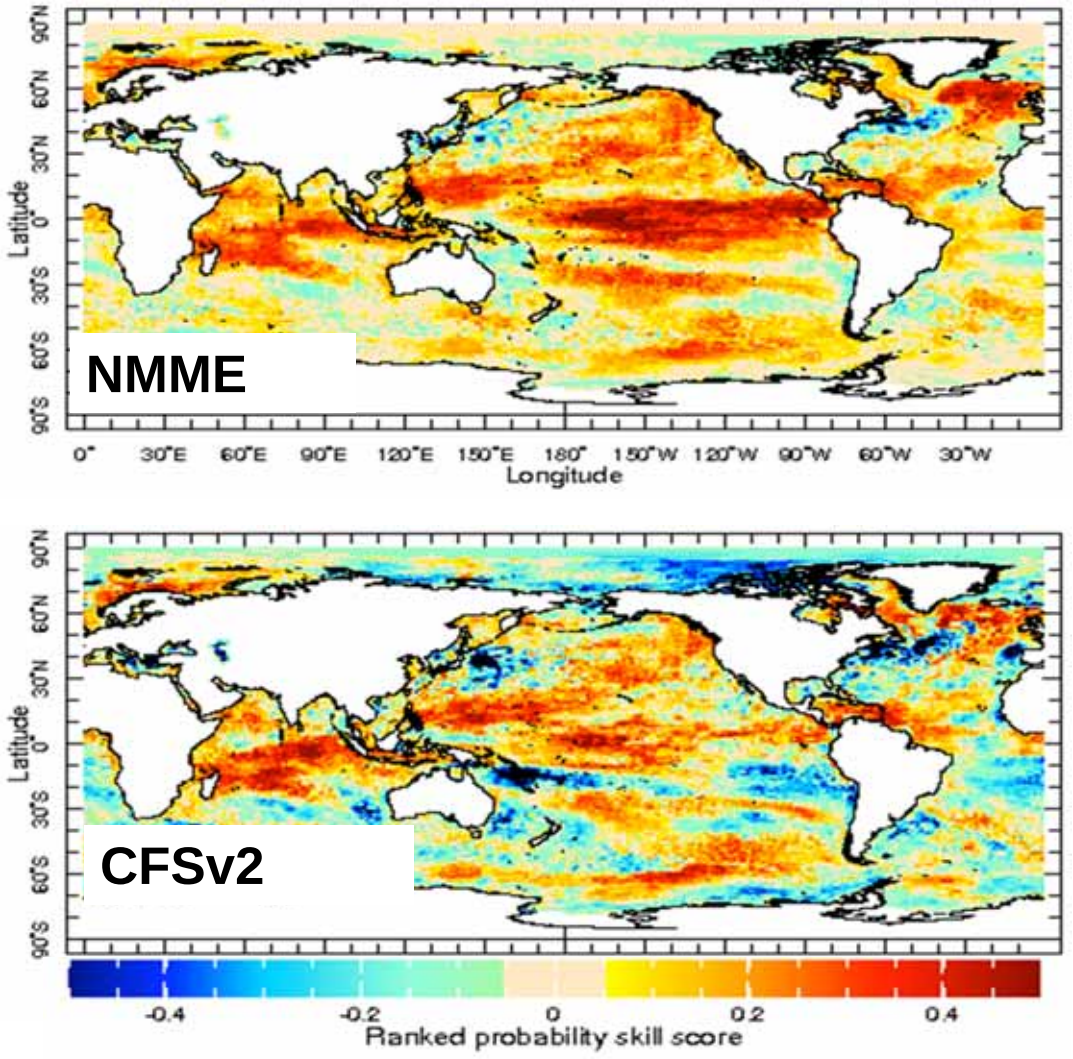
Model	Hindcast Period	No. of Members	Arrangement of Members	Lead (month)	Model resolution (atmosphere)	Model resolution (ocean)	Reference
NCEP/CFSv2	1982-2010	24 (20)	4 members (0, 6, 12, 18z)	0-9	T126L64	MOM4L40 .25deg Eq	Saha et al (2010)
GFDL/CM 2.1	1982-2010	10	All 1st of the month 0Z	0-11	2x2.5degL24	MOM4L50 .3deg Eq	Delworth (2006)
GFDL/CM 2.5 (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)

Model Diversity

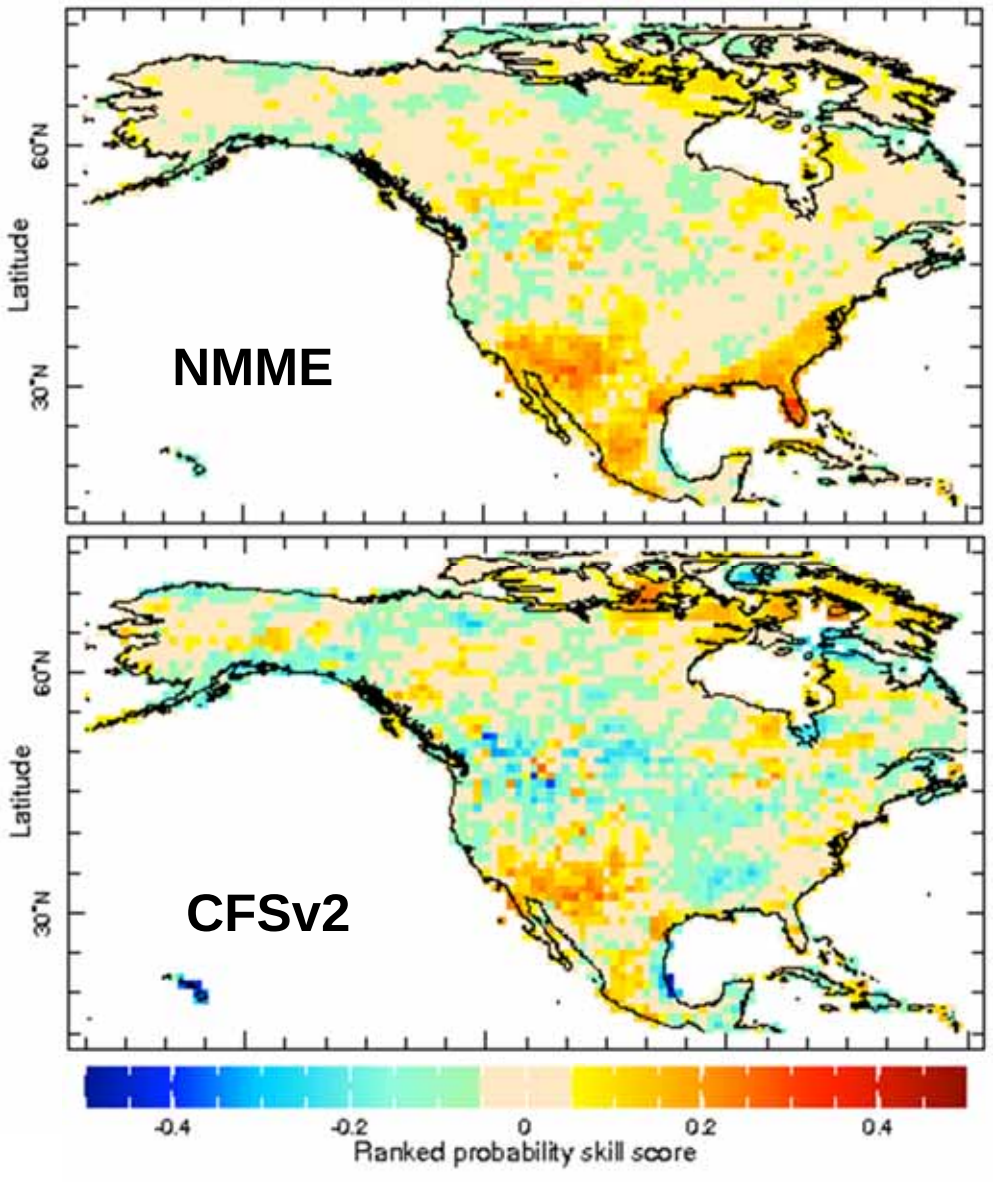
- **Comparing CFSv2 with NMME**
  - **Skill Comparison: Model Diversity or Ensemble Size**
- **Comparing Any Model with NMME**
  - **Skill Comparison: Model Diversity or Ensemble Size**

Comparison of CFSv2 skill vs NMME

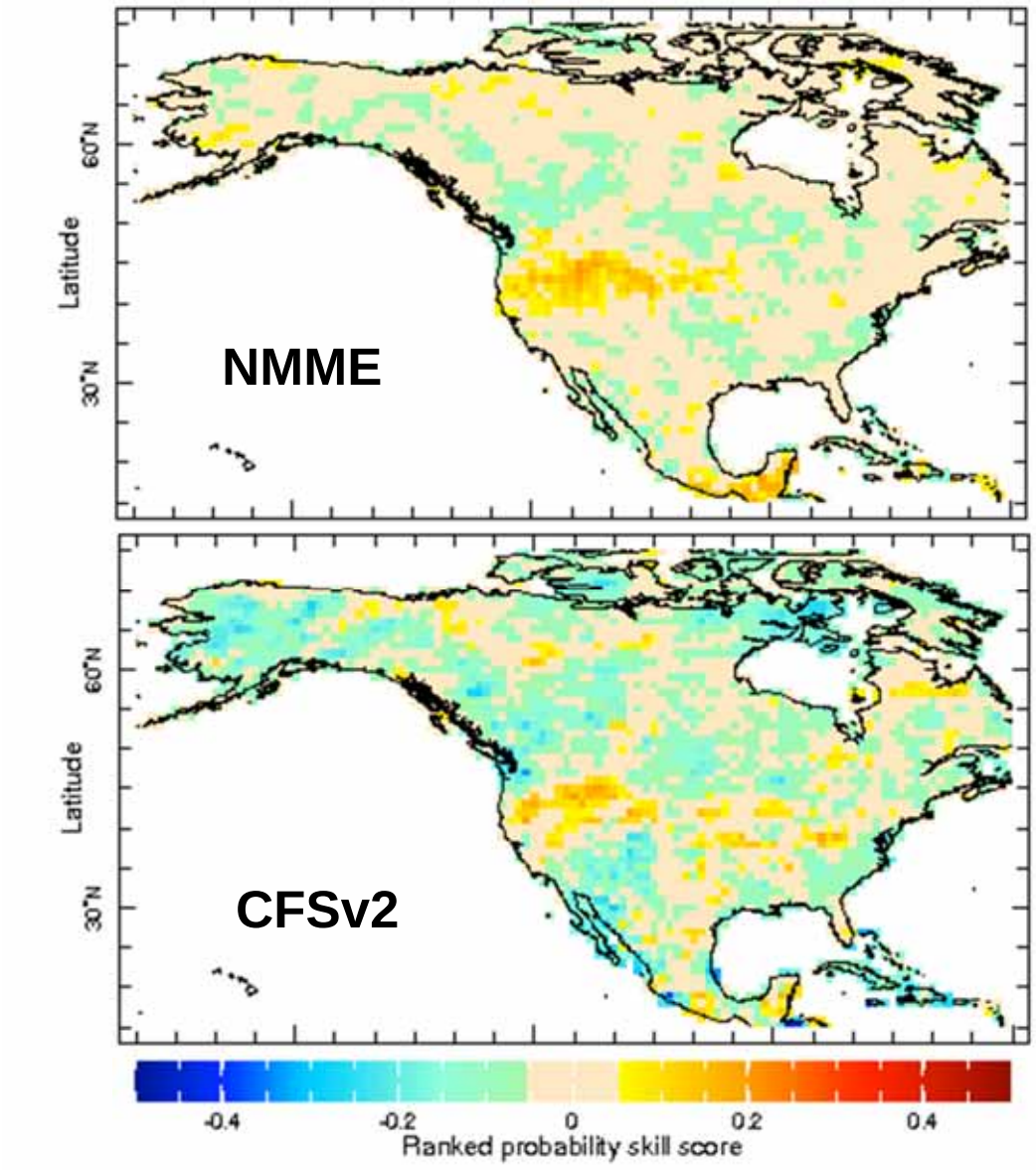
July 1 start
DJF SST forecast
Ranked Probability Skill Score



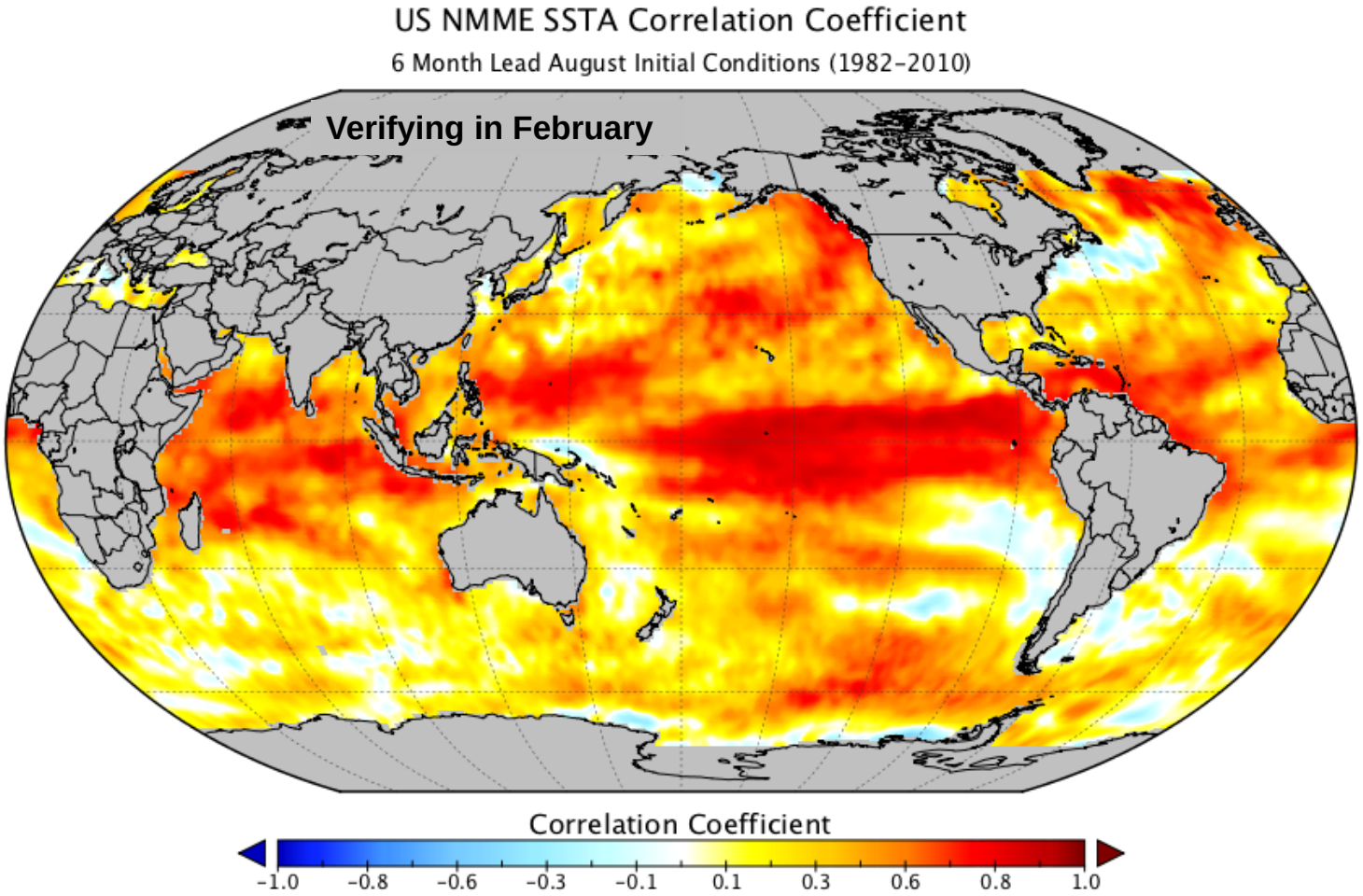
July 1 start DJF prec forecast RPSS



Jan 1 start
JJA prec
forecast
RPSS



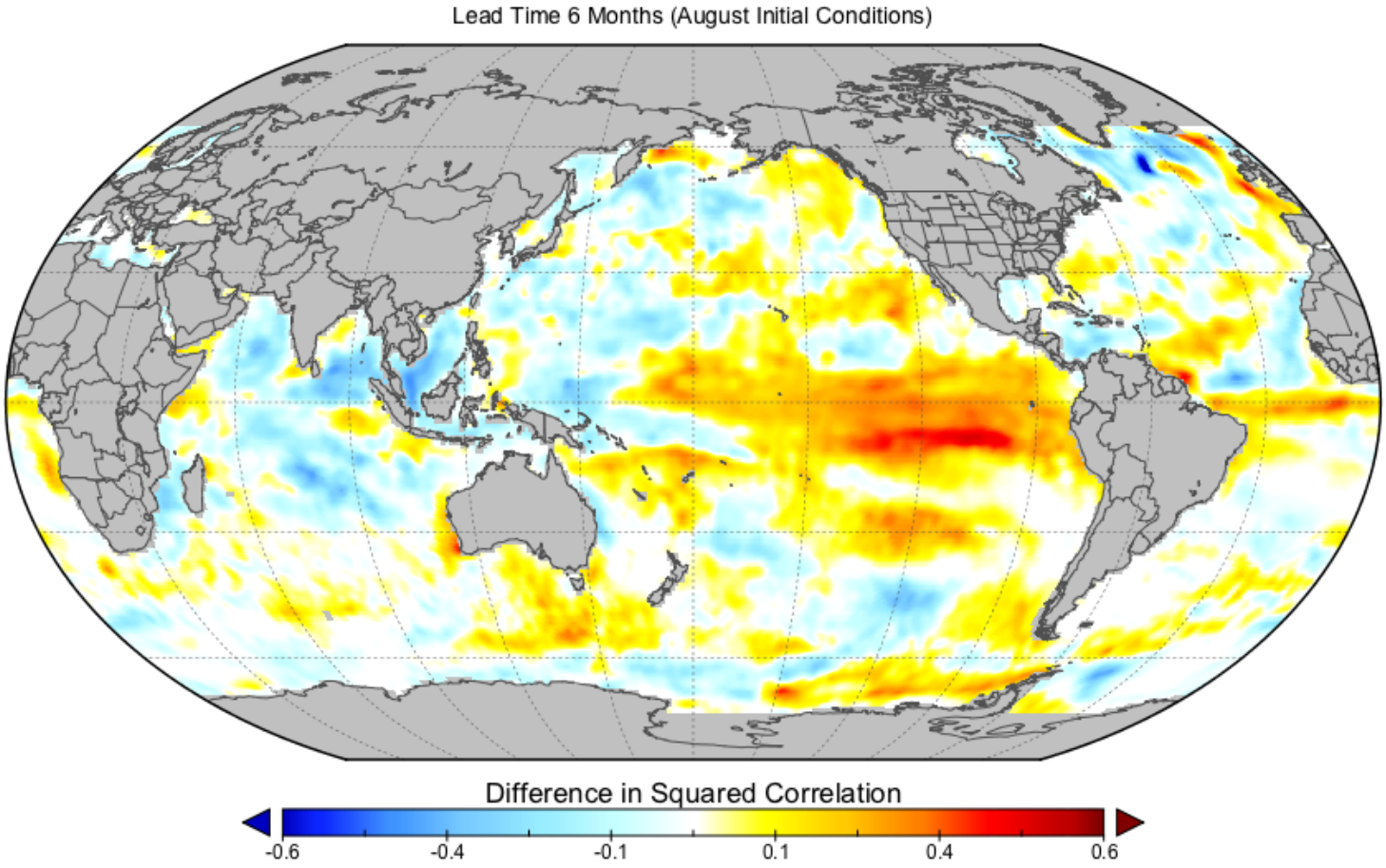
Multi-Model: Complementary Skill



Each Ensemble Member from Each Model Weighted Equally – 83 Ensemble Members

Complementary Correlation

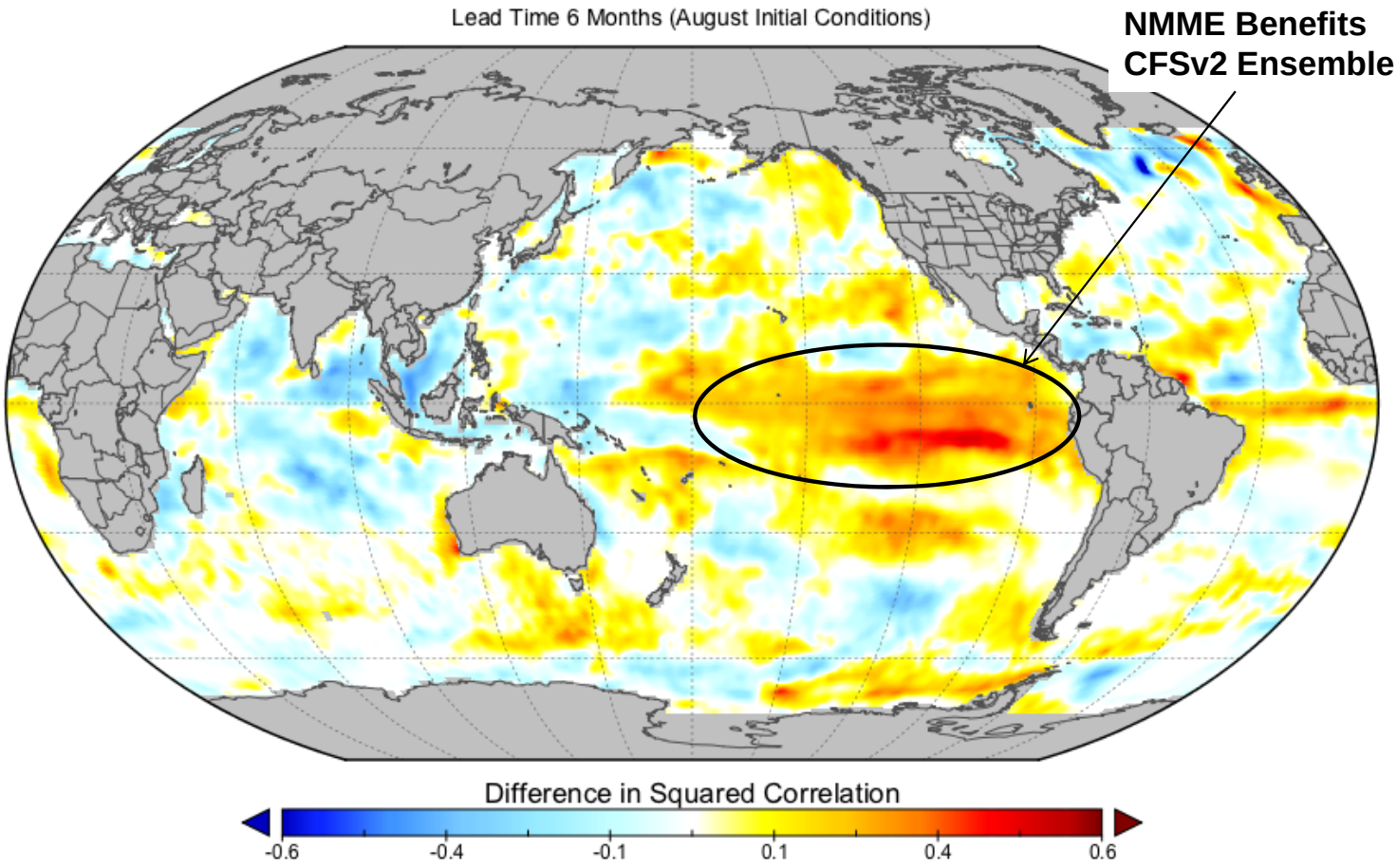
All Others (24 Member Ensemble) vs. CFSv2



CCSM3(4)+IRIa(4)+IRId(4)+CM2.1(4)+GEOS5(4)+CFSv1(4) vs. CFSv2(24)

Complementary Correlation

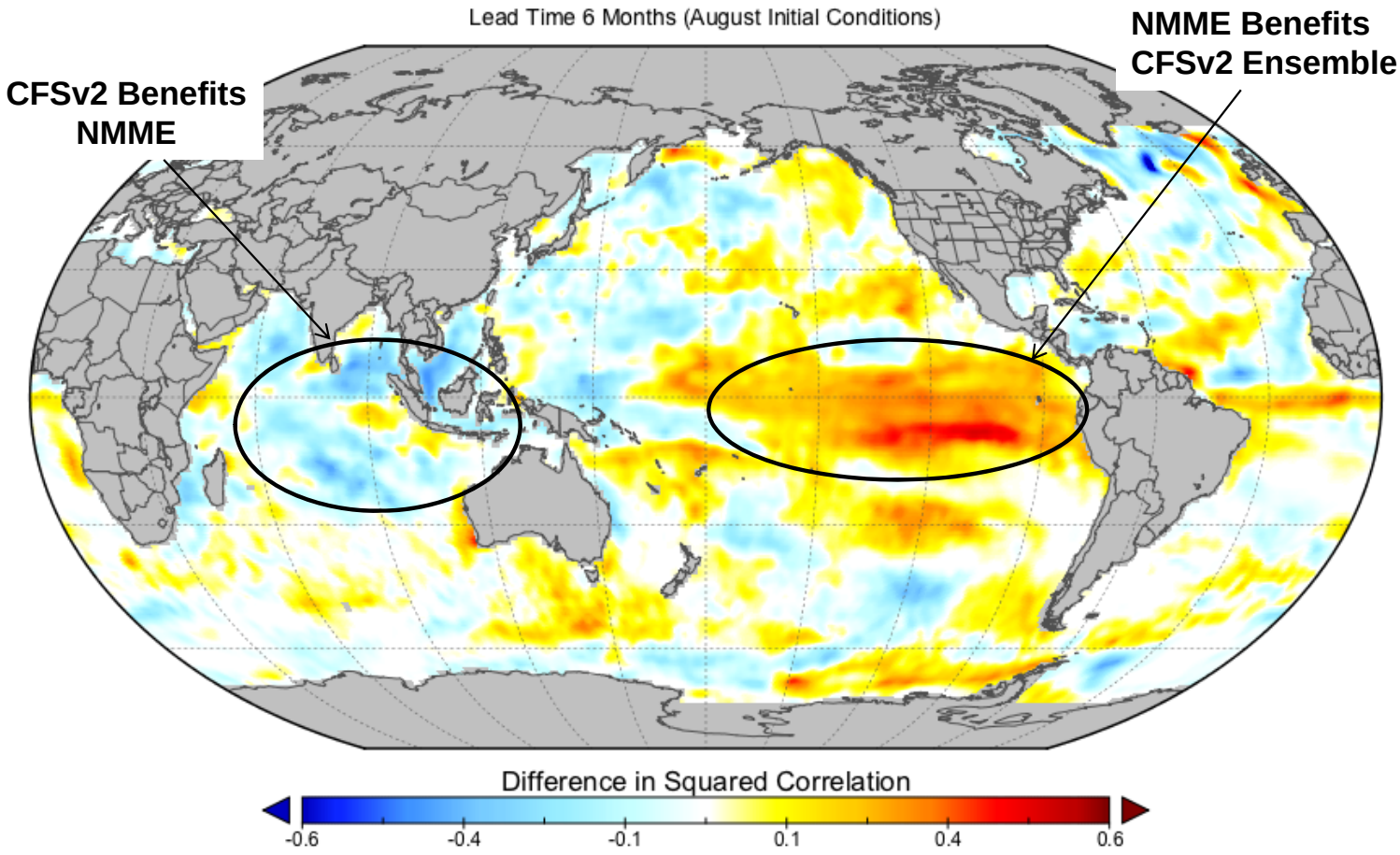
All Others (24 Member Ensemble) vs. CFSv2



CCSM3(4)+IRIa(4)+IRId(4)+CM2.1(4)+GEOS5(4)+CFSv1(4) vs. CFSv2(24)

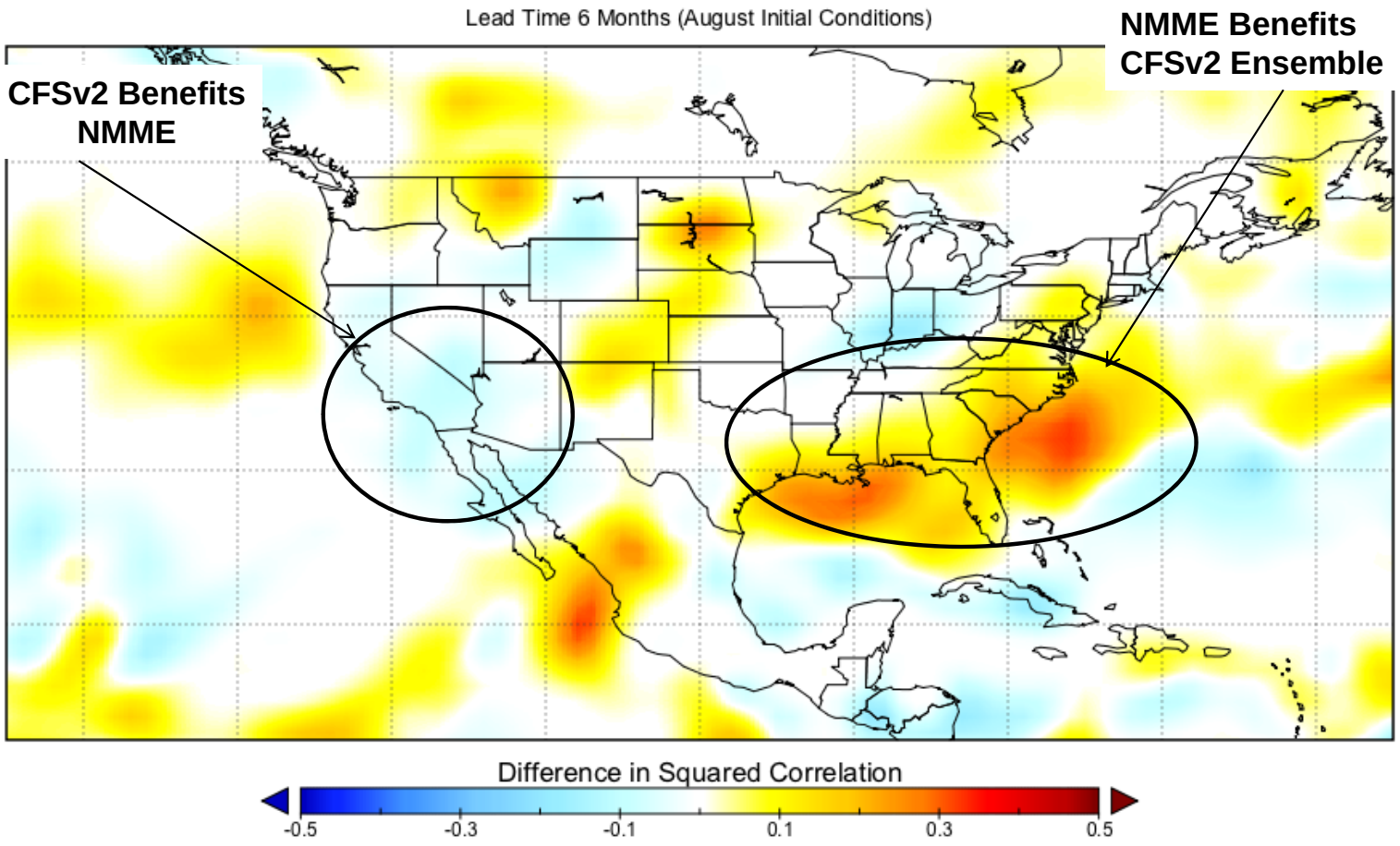
Complementary Correlation

All Others (24 Member Ensemble) vs. CFSv2

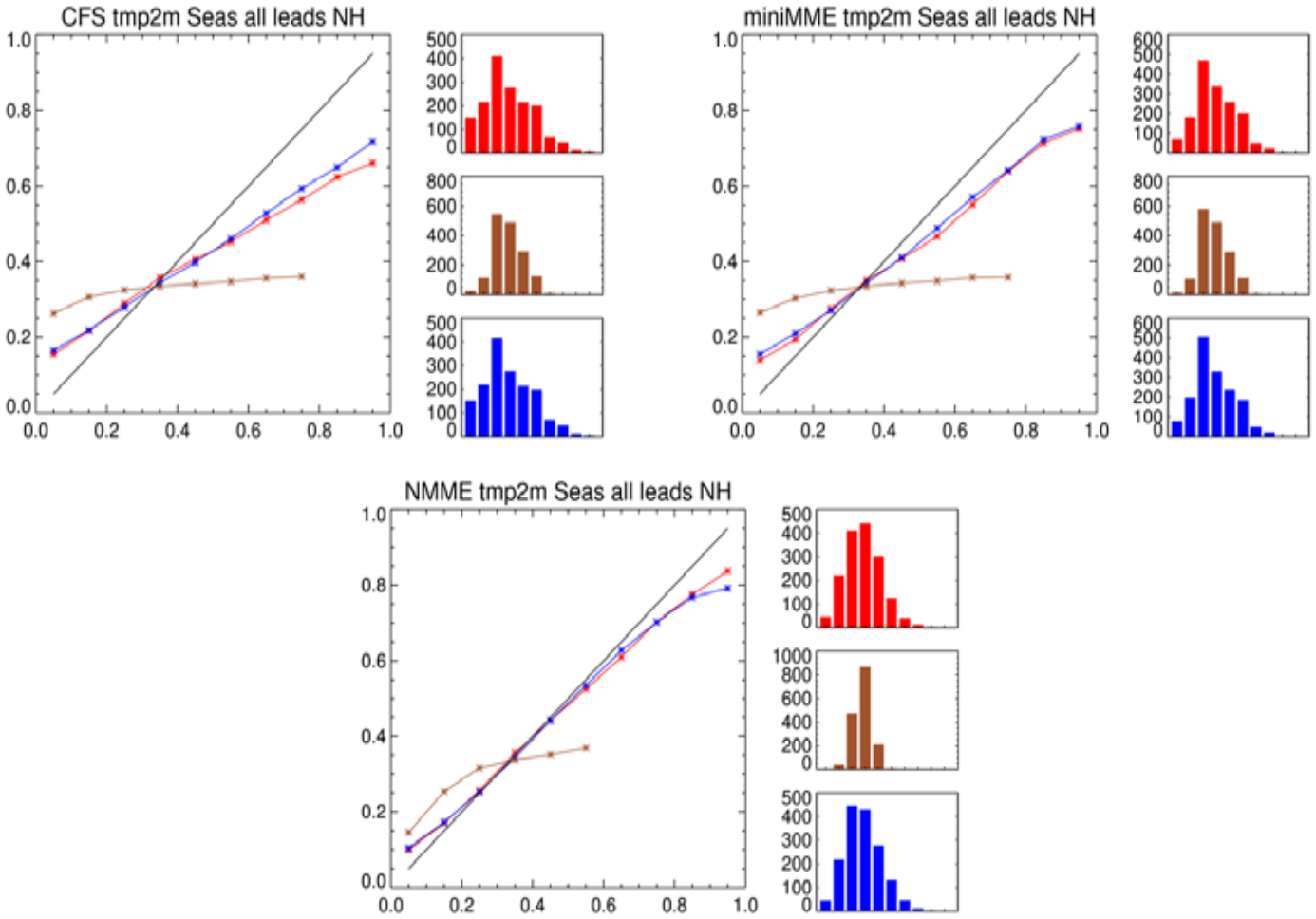


CCSM3(4)+IRIa(4)+IRId(4)+CM2.1(4)+GEOS5(4)+CFSv1(4) vs. CFSv2(24)

All Others (24 Member Ensemble) vs. CFSv2



CCSM3(4)+IRIa(4)+IRId(4)+CM2.1(4)+GEOS5(4)+CFSv1(4) vs. CFSv2(24)

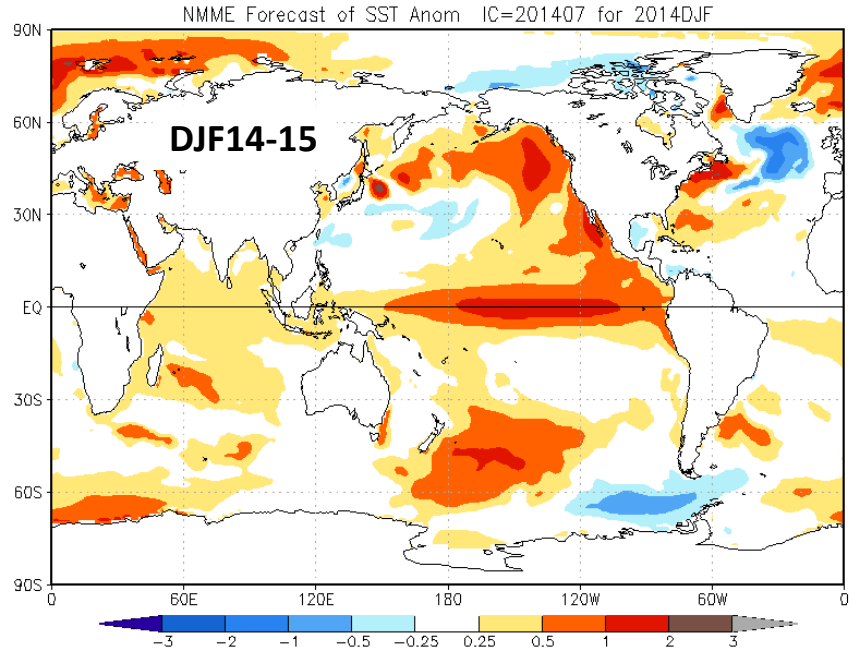

CFS tmp2m Seas all leads NH
miniMME tmp2m Seas all leads NH
NMME tmp2m Seas all leads NH

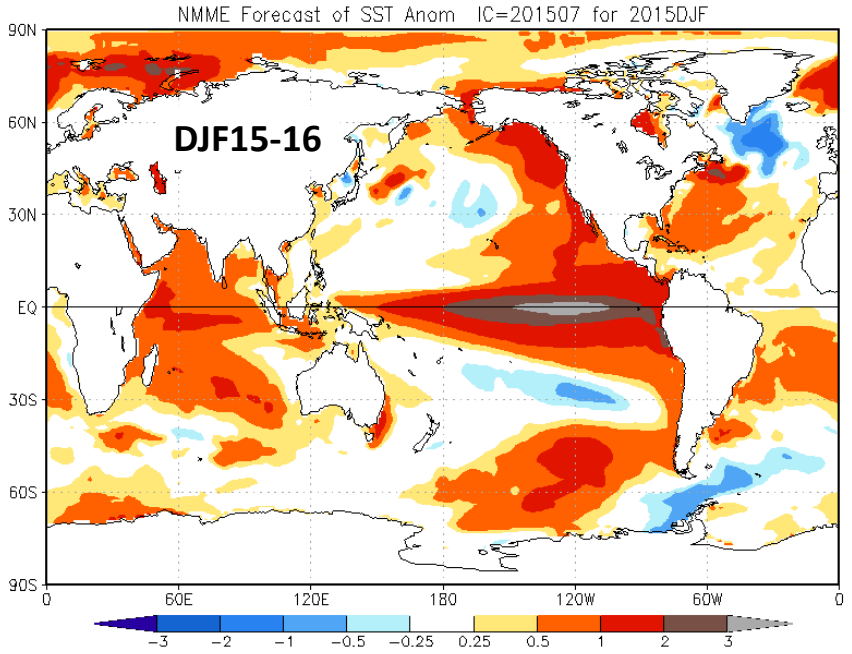
Brier Skill Score for T2m Northern Hemisphere Extra-tropics Land (23N-75N)

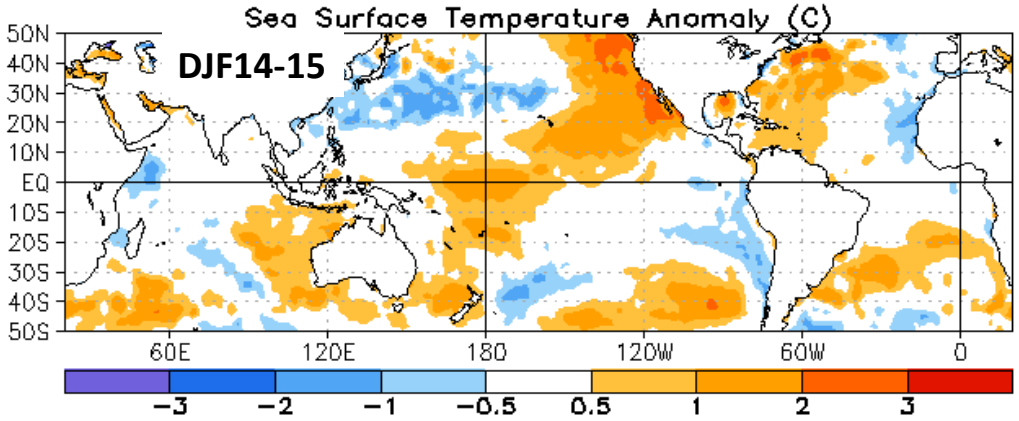
	A/N/B	Lead 0	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5
CFS (24 Members)	Above	0.10	0.03	0.01	0.01	0.01	0.01
	Normal	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04
	Below	0.10	0.04	0.03	0.02	0.02	0.02
Mini-NMME (24 Members)	Above	0.12	0.05	0.03	0.03	0.02	0.02
	Normal	-0.02	-0.04	-0.04	-0.04	-0.04	-0.04
	Below	0.11	0.05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

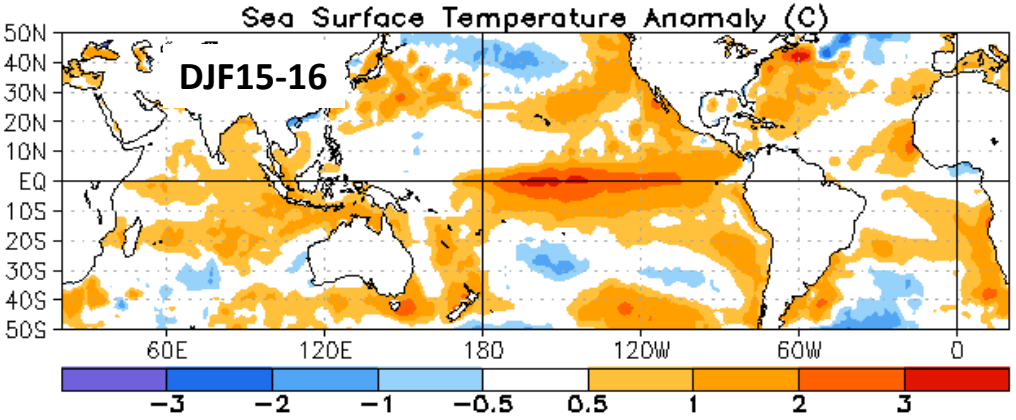
Brier Skill Score for Nino3.4

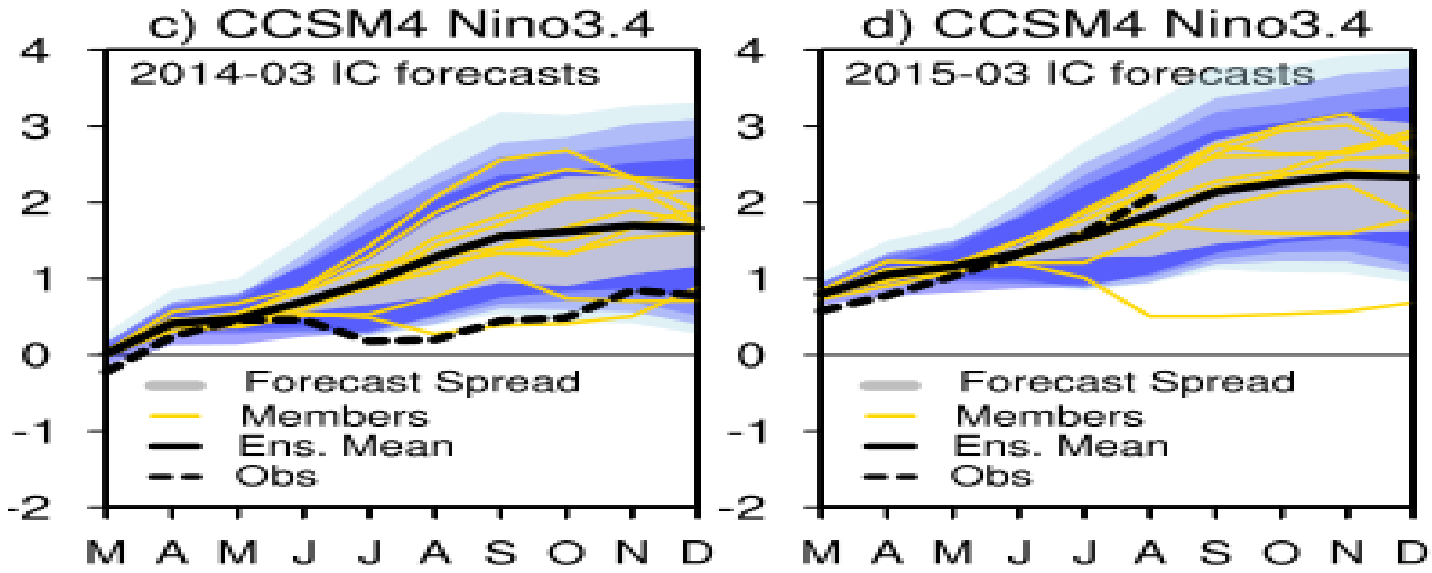
	A/N/B	Lead 0	Lead 1	Lead 2	Lead 3	Lead 4	Lead 5
CFS (24 Members)	Above	0.54	0.45	0.39	0.33	0.28	0.25
	Normal	0.10	0.05	0.03	0.03	0.03	0.02
	Below	0.49	0.43	0.40	0.38	0.36	0.35
Mini-NMME (24 Members)	Above	0.68	0.60	0.55	0.48	0.42	0.37
	Normal	0.34	0.24	0.18	0.15	0.13	0.09
	Below	0.66	0.59	0.56	0.53	0.49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


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

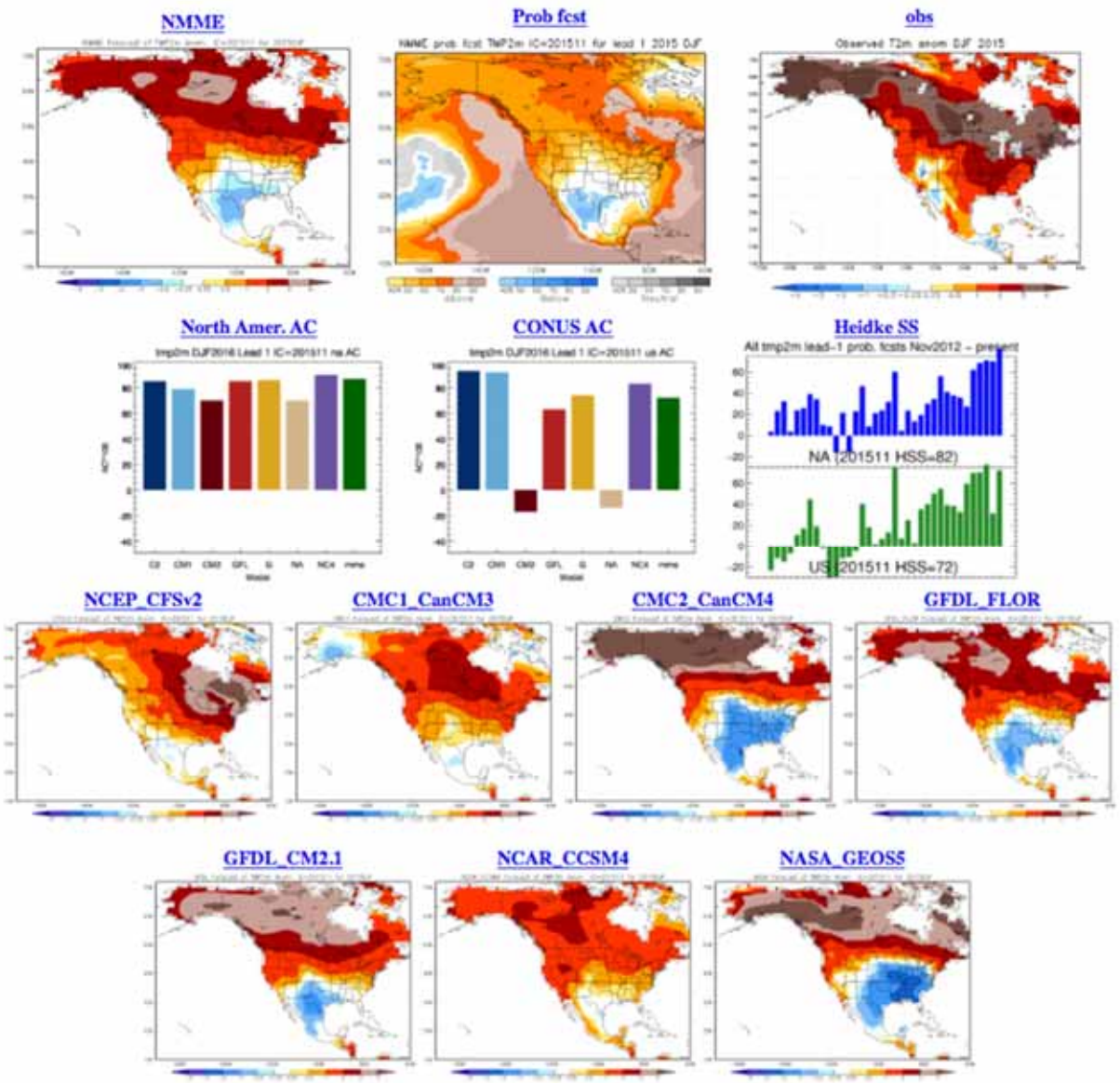

Sea Surface Temperature Anomaly (C)
DJF15-16
50N
40N
30N
20N
10N
EQ
10S
20S
30S
40S
50S
60E
120E
180
120W
60W
0
−3 −2 −1 −0.5 0.5 1 2 3



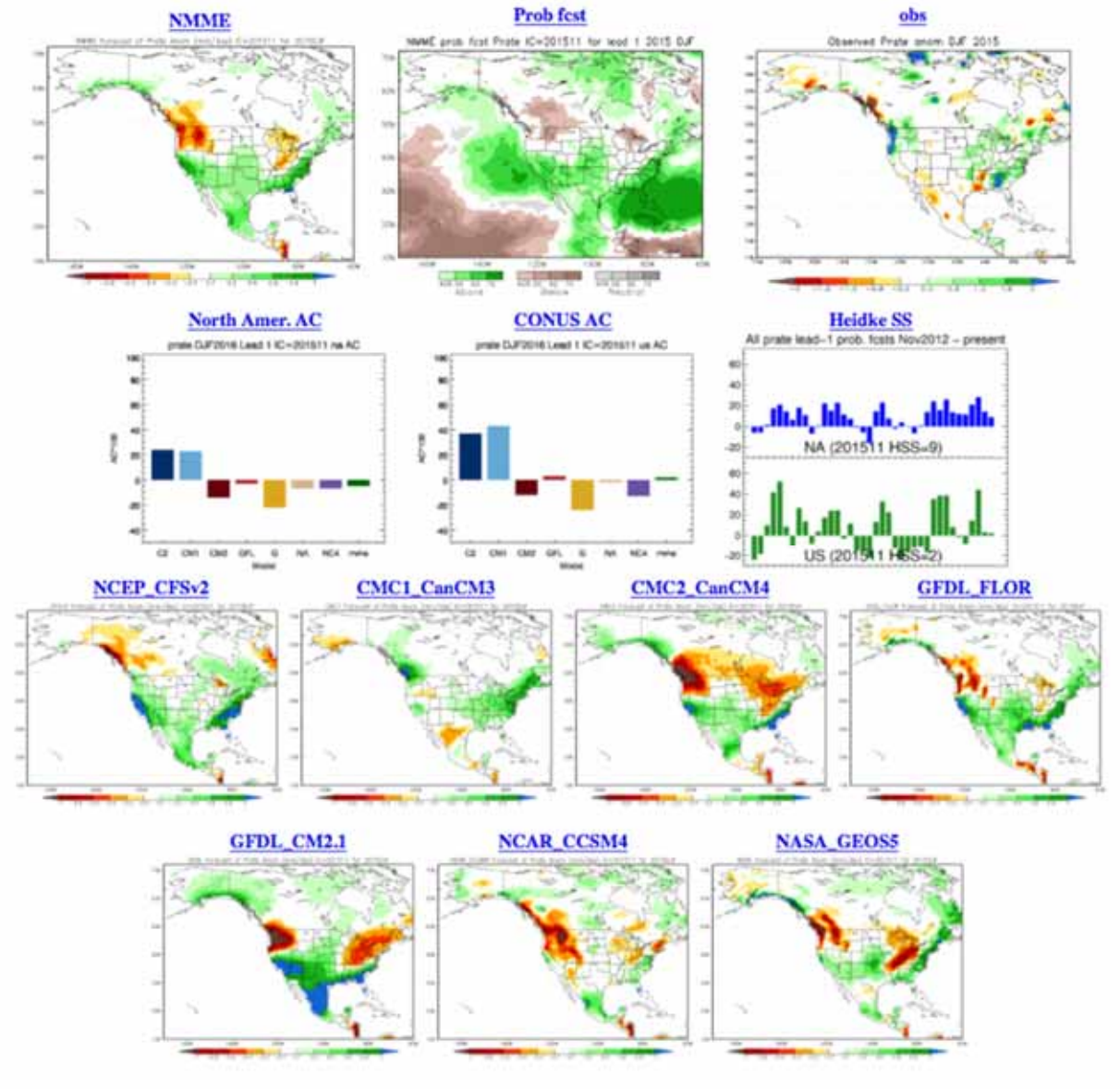
- Observed 2014 Nino-3.4 falls within the "expected" noise-driven spread
- "Expert assessment" of longer lead-time forecasts may benefit from a measure of the noise-driven "expected" spread

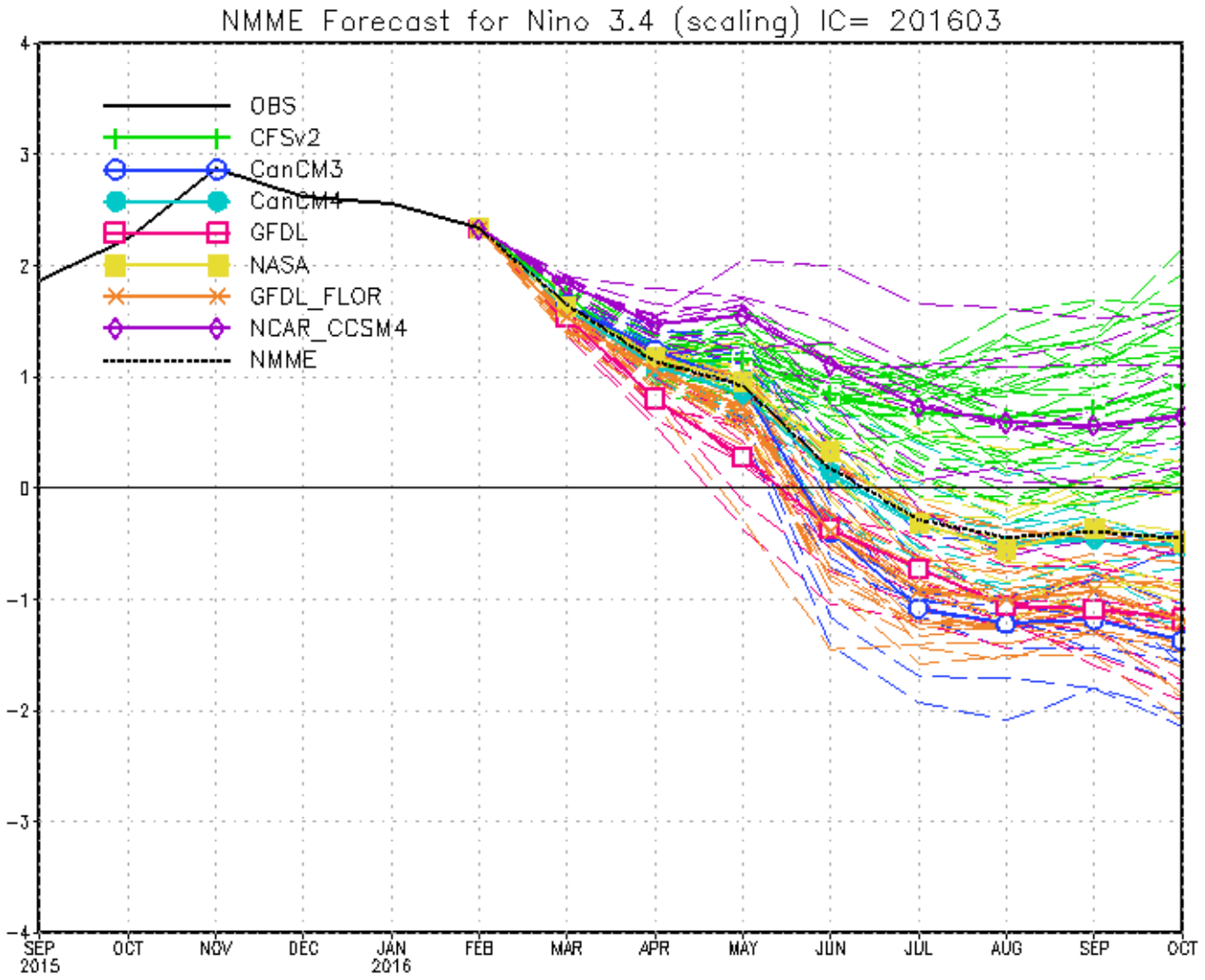
Larson and Kirtman (2015a)

DJF 2016 T2m Forecast Verification
November 2016 Initial Condition

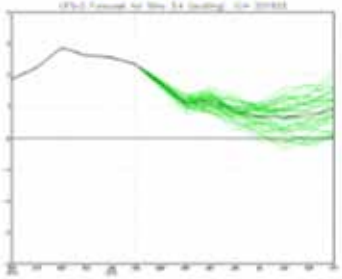


DJF 2016 Precipitation Forecast Verification
November 2016 Initial Condition

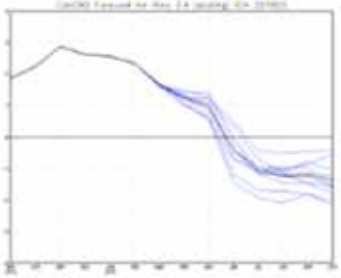



NMME Forecast for Nino 3.4 (scaling) IC= 201603
OBS
CFSv2
CanCM3
CanCM4
GFDL
NASA
GFDL_FLOR
NCAR_CCSM4
NMME
4
3
2
1
0
−1
−2
−3
−4
SEP
2015
OCT
NOV
DEC
JAN
2016
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT

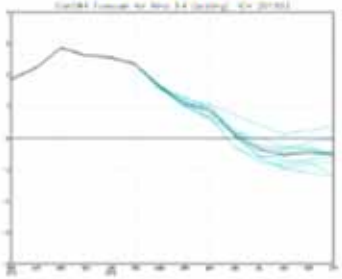
CFSv2_CFSv2



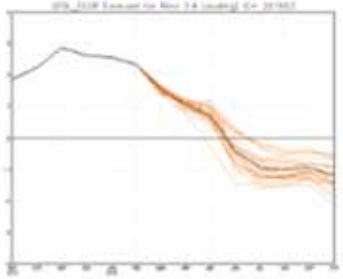
CMC1_CanCM3



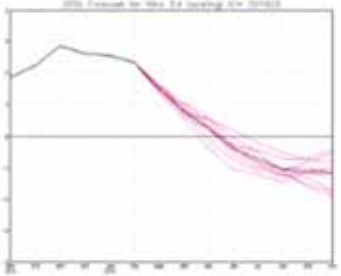
CMC2_CanCM4



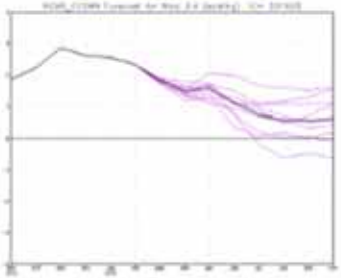
GFDL_FLOR



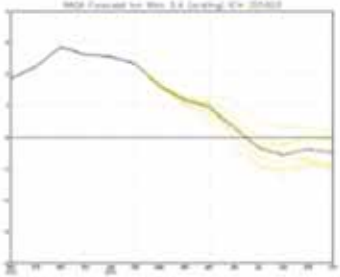
GFDL_CM2.1

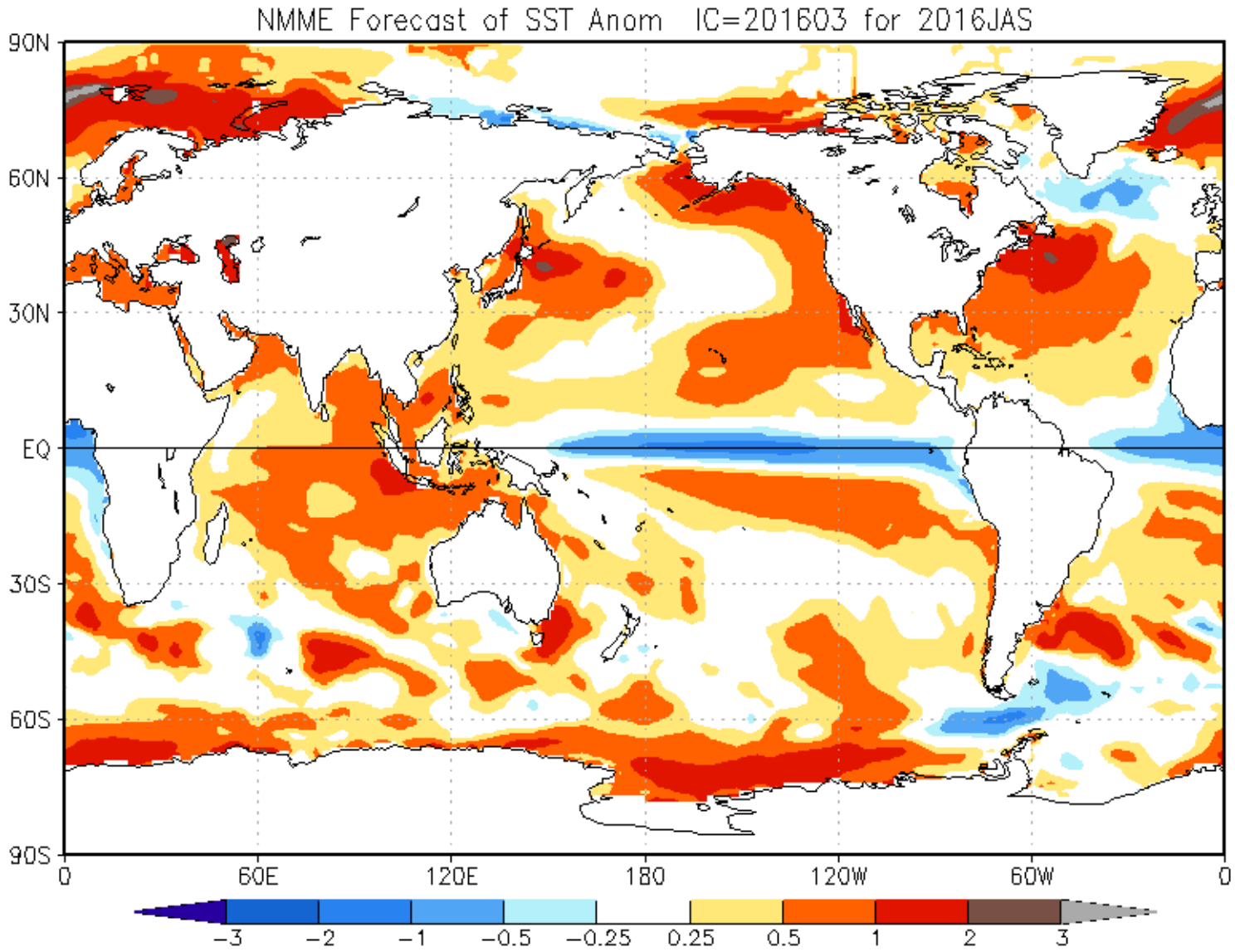


NCAR_CCSM4



NASA_GEOS5




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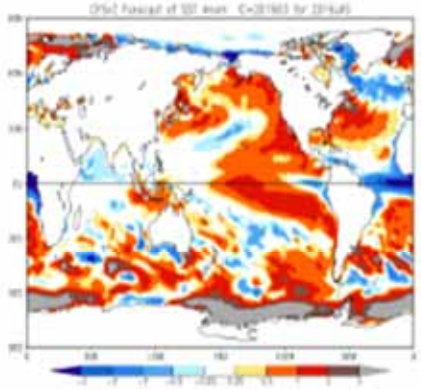
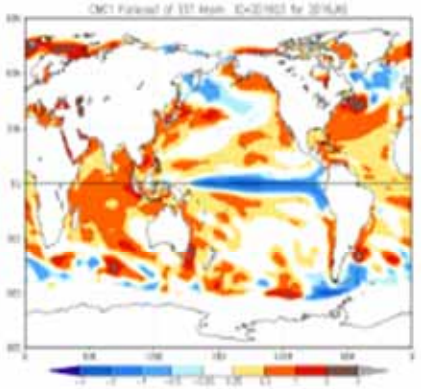
−2
−1
−0.5
−0.25
0.25
0.5
1
2
3

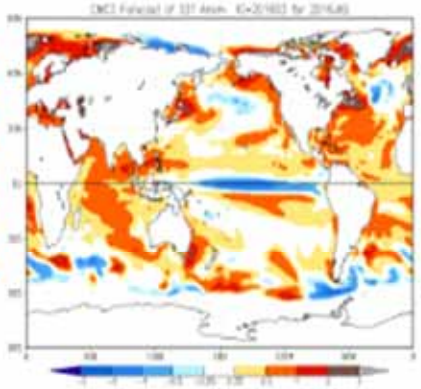
NCEP_CFSv2



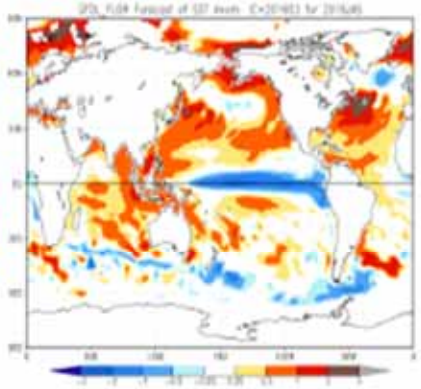
CMC1_CanCM3



CMC2_CanCM4



GFDL_FLOR



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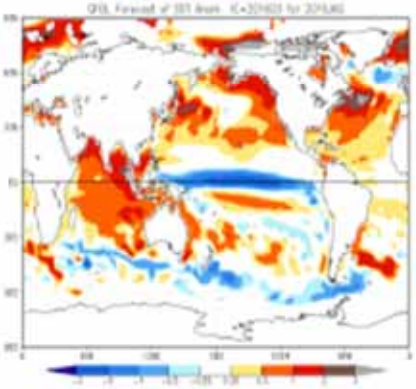
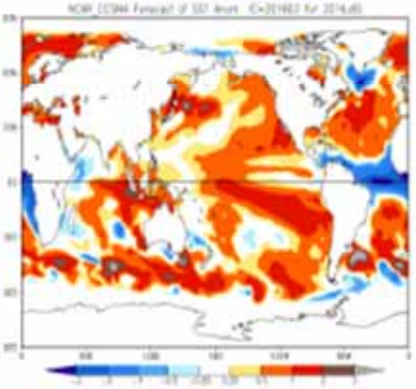
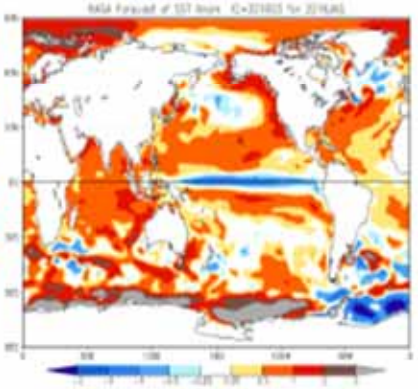


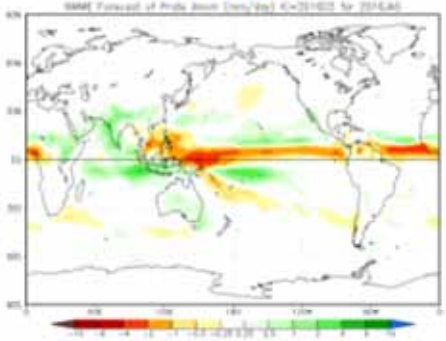
NCAR_CCSM4



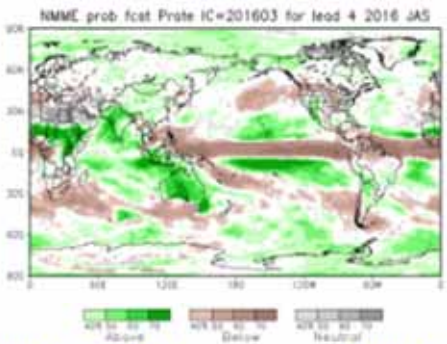
NASA_GEOS5



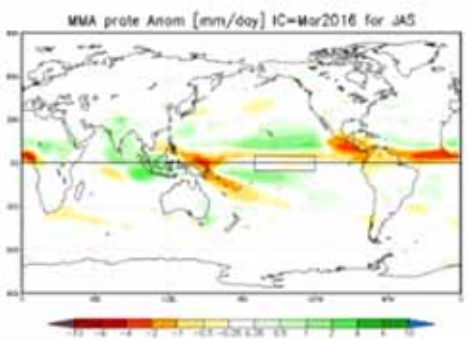
NMME



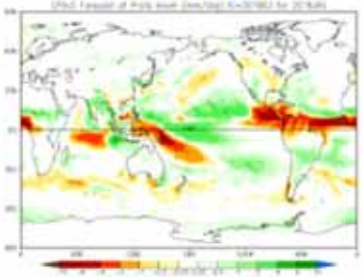
Prob fcst



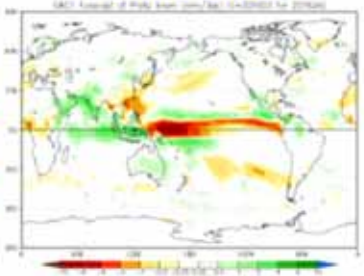
IMME



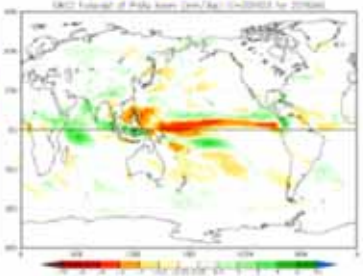
NCEP_CFSv2



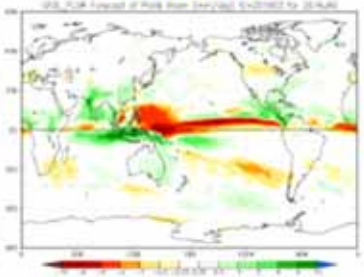
CMC1_CanCM3



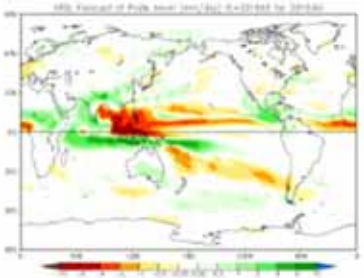
CMC2_CanCM4



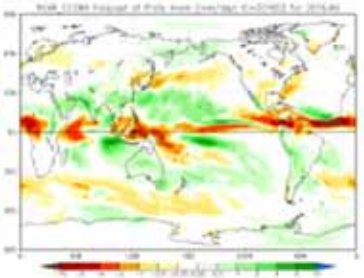
GFDL_FLOR



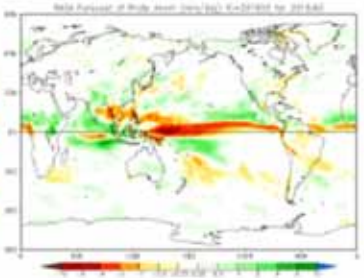
GFDL_CM2.1



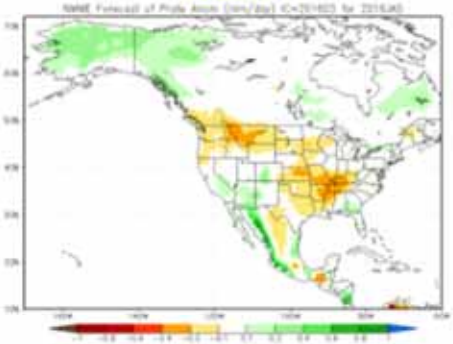
NCAR_CCSM4



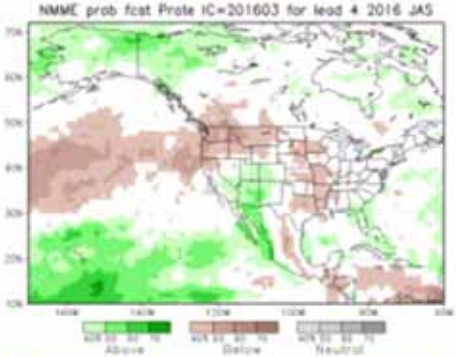
NASA_GEOS5



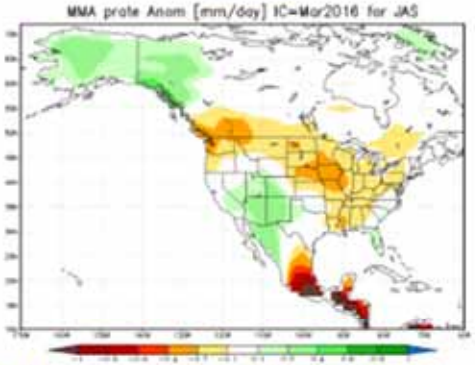
NMME



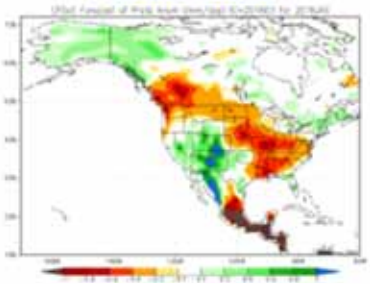
Prob fcst



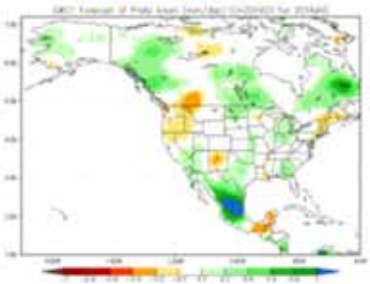
IMME



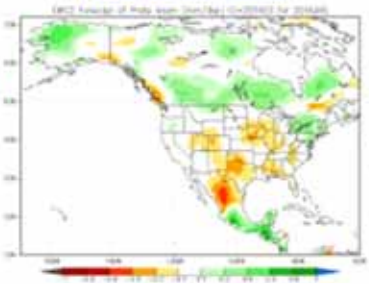
NCEP_CFSv2



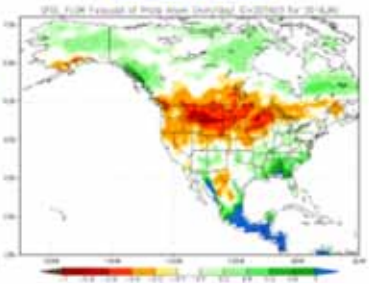
CMC1_CanCM3



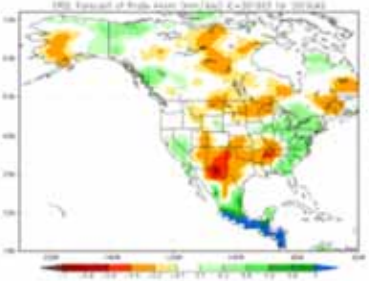
CMC2_CanCM4



GFDL_FLOR



GFDL_CM2.1



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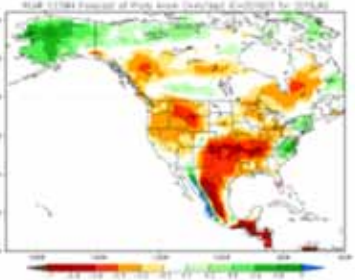

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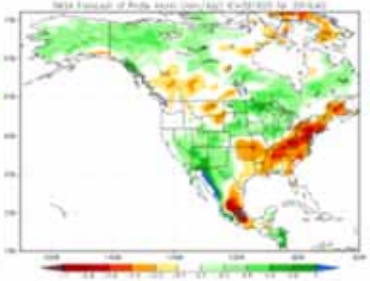
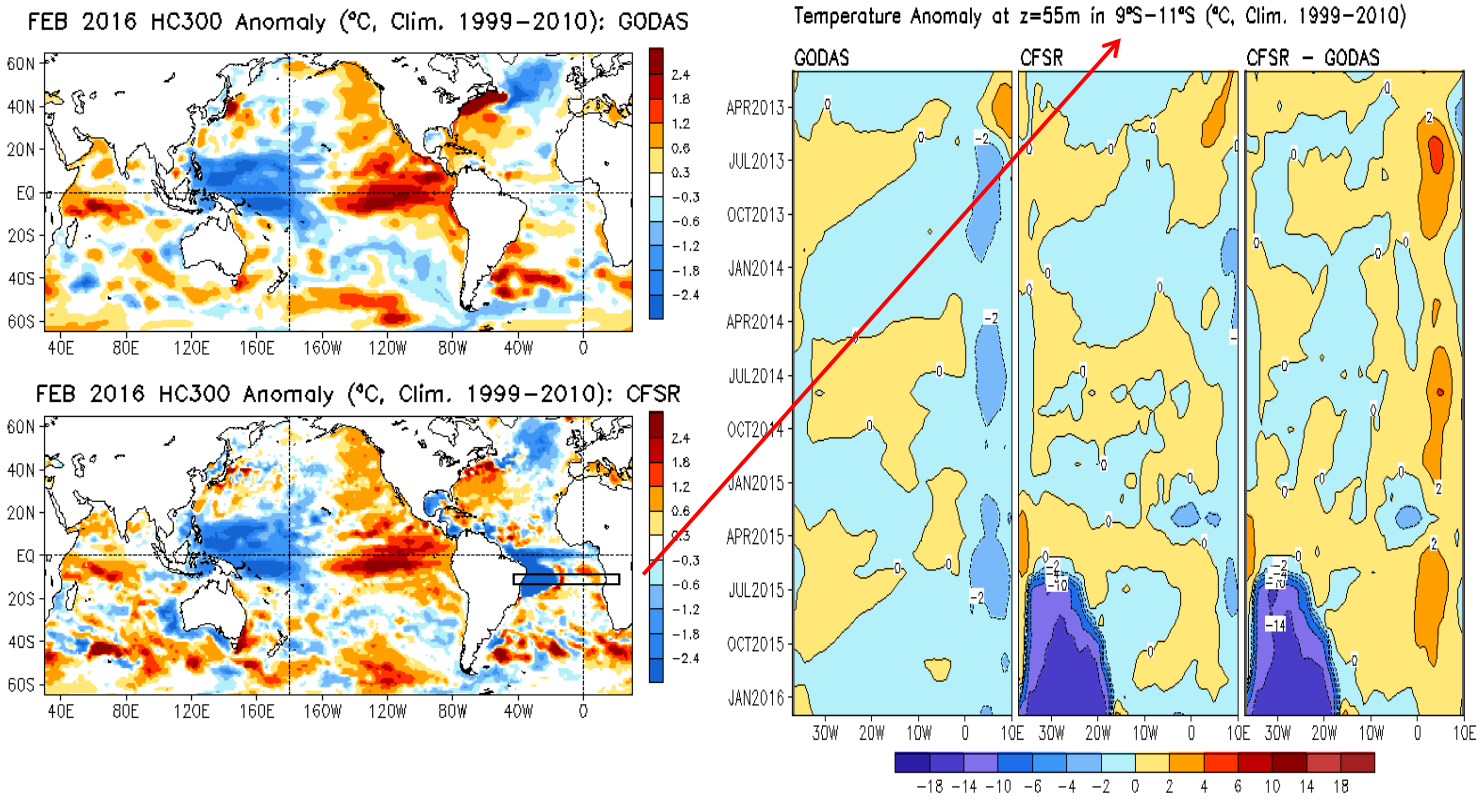
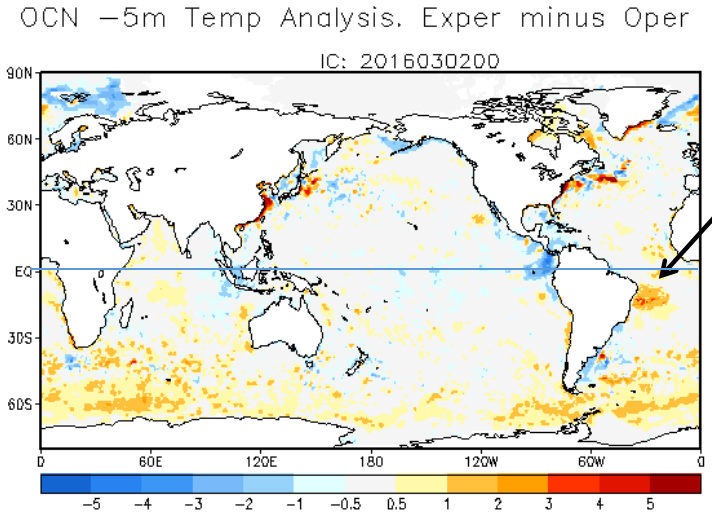


Recent CFSv2 Cold Biases in Tropical South Atlantic



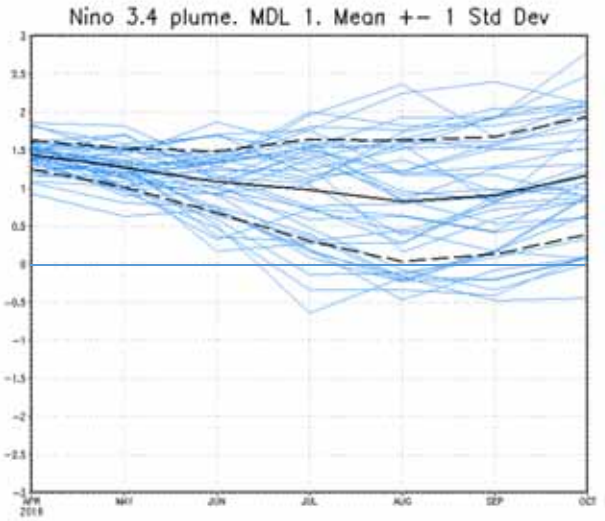
- **A cold bias emerged around 10S in the South Atlantic around Jul 2015 and enhanced quickly with time.**
- **It reached -18 degree at 55m depth since Oct 2015.**

CFSv2 : 1-8 March 2016 Initial conditions



Noticeably warmer, Elimination of the cold bias in all 4 initial months of testing.
Also, CFSv2 is not an outlier as shown on slide 5 for the ENSO evolution.

Operational



Experimental