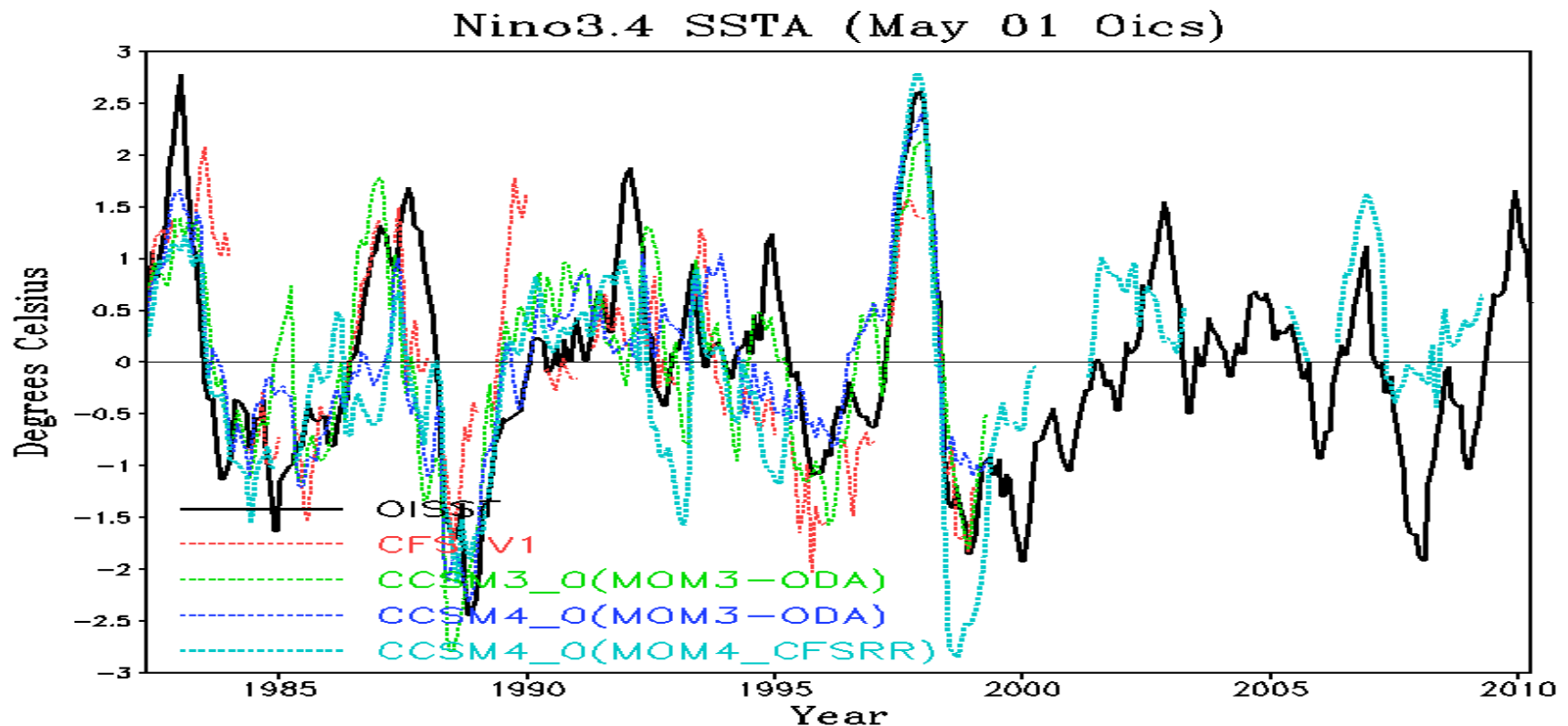




CCSM3 and CCSM4 Seasonal-to-Interannual Prediction





CCSM3 and CCSM4 Seasonal-to- Interannual Prediction

University of Miami: Kirtman, Min
COLA: Kinter, Paolino
CIRES: Pegion
NOAA/CPC: van den Dool, Peña

Experiments Completed

- **CCSM3.0:**

- Ocean-Only ICs, All months (1982-present), 6-member ensembles
- O-L-A ICs, 21-30 Dec., 22-31 May, 10-member ensembles
- Initial Condition Sources (GFDL-OI, GOLD, ECMWF, NCEP Reanalysis)
- Experimental Real-Time Prediction in Support of NMME

- **CCSM3.5:**

- Ocean-Only ICs, Jan, Apr, Jul, Oct, 6-member ensembles
- O-L-A ICs, 21-30 Apr., 22-31 Oct, 10-member ensembles
- Initial Condition Sources (GFDL-OI, GOLD, ECMWF, NCEP Reanalysis)

- **CCSM4.0:**

- Ocean-Only ICs
 - GFDL-OI: May 1982-1999, CFS-R: May 1982-Present
- O-L-A ICs In Preparation

Results

- **Initial Prediction Experiments**
 - CCSM3.0, CCSM3.5, CCSM4.0
 - Ocean-Only Initialization, 6-member ensembles
 - Comparing GFDL-IO vs. CFS-R Ocean Initial States
- **Ocean-Land-Atmosphere Initialization**
 - CCSM3.0 Only
- **Sub-Seasonal Predictions**
 - CCSM3.5 Only

CCSM3.0 Jan 1982 IC

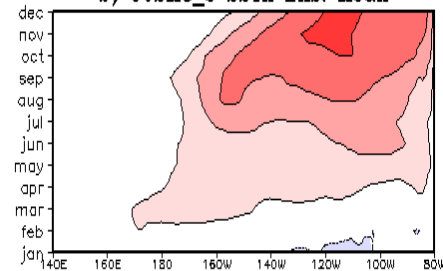
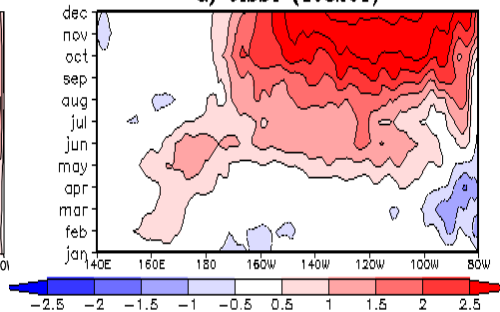
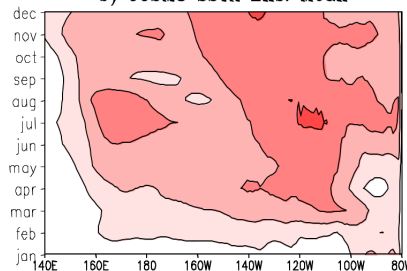
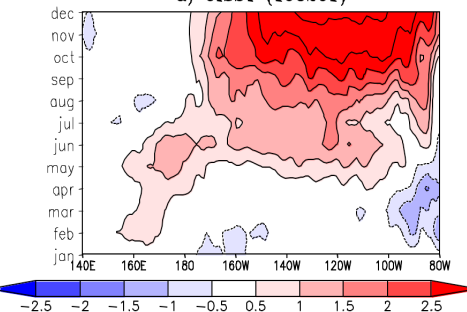
CCSM3.5 Jan 1982 IC

a) OISST (198201)

b) CCSM3 SSTA Ens. Mean

a) OISST (198201)

b) CCSM3_5 SSTA Ens. Mean

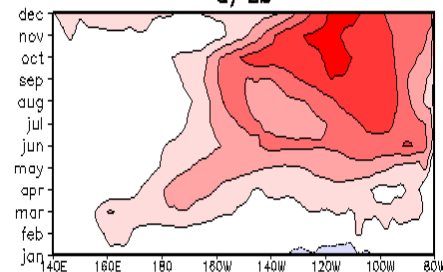
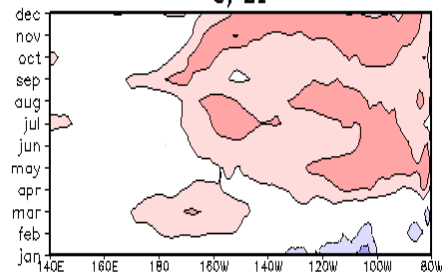
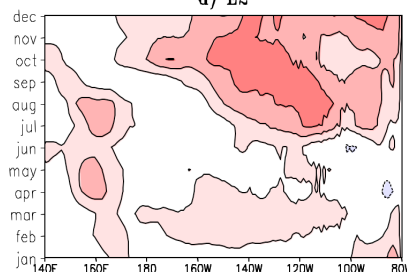
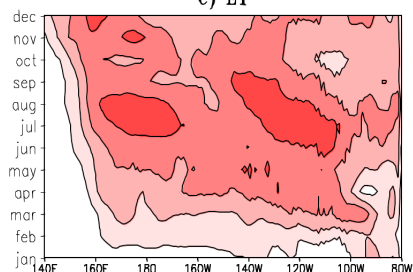


c) E1

d) E2

c) E1

d) E2

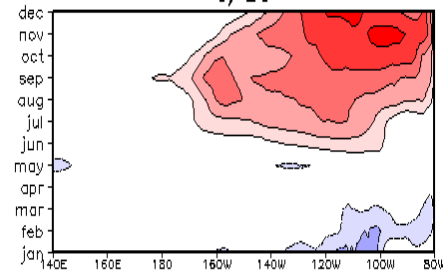
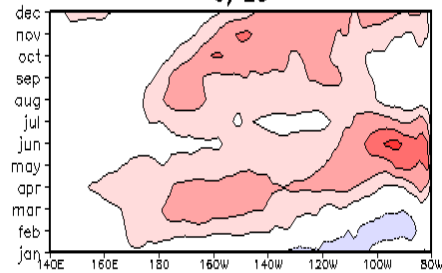
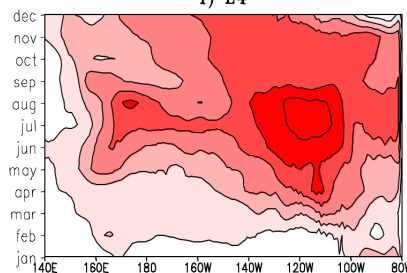
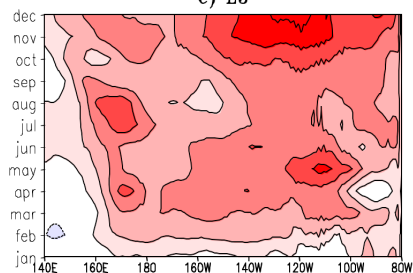


e) E3

f) E4

e) E3

f) E4

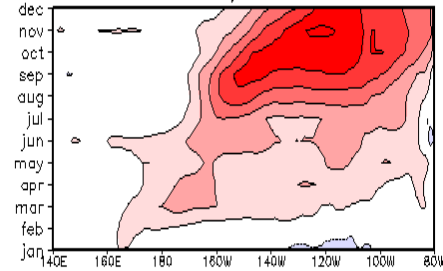
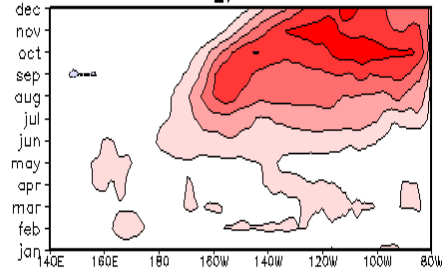
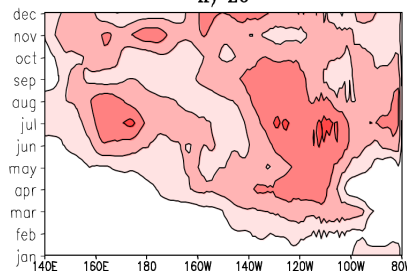
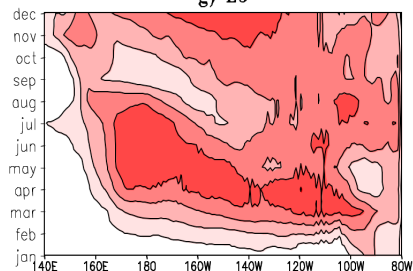


g) E5

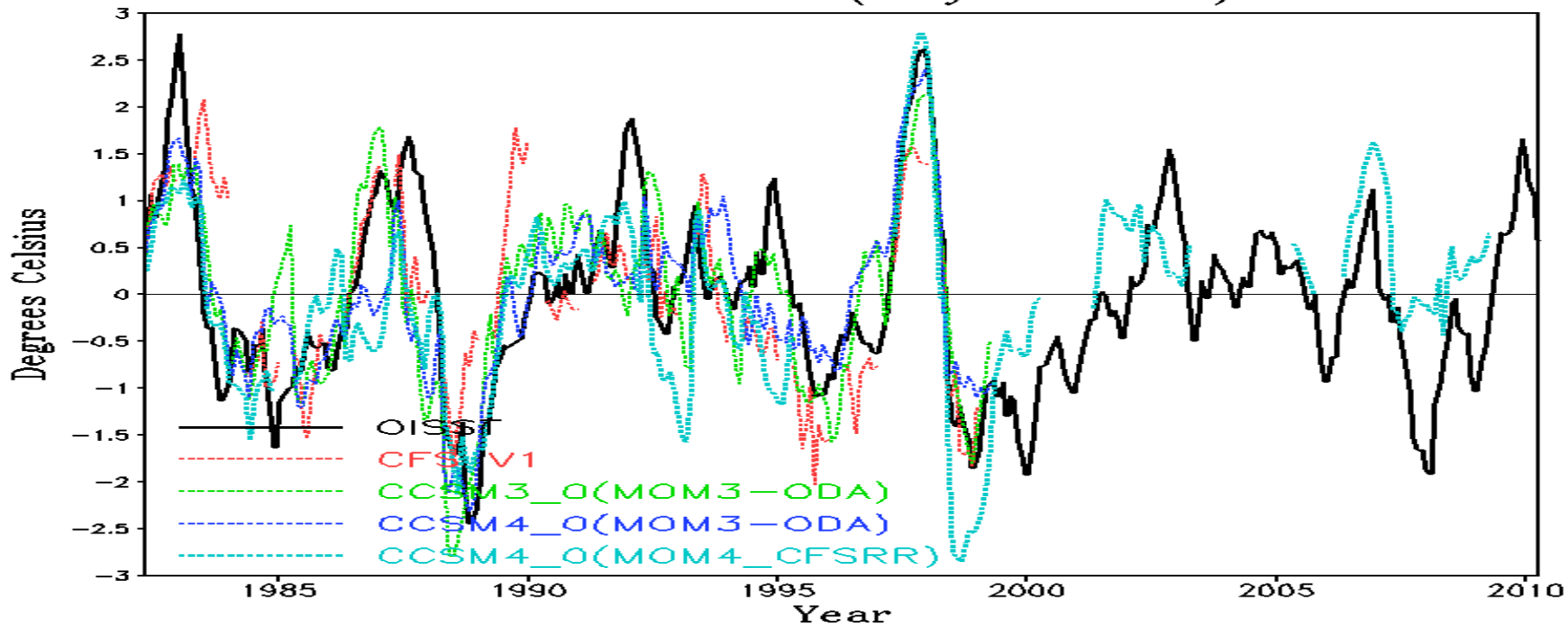
h) E6

g) E5

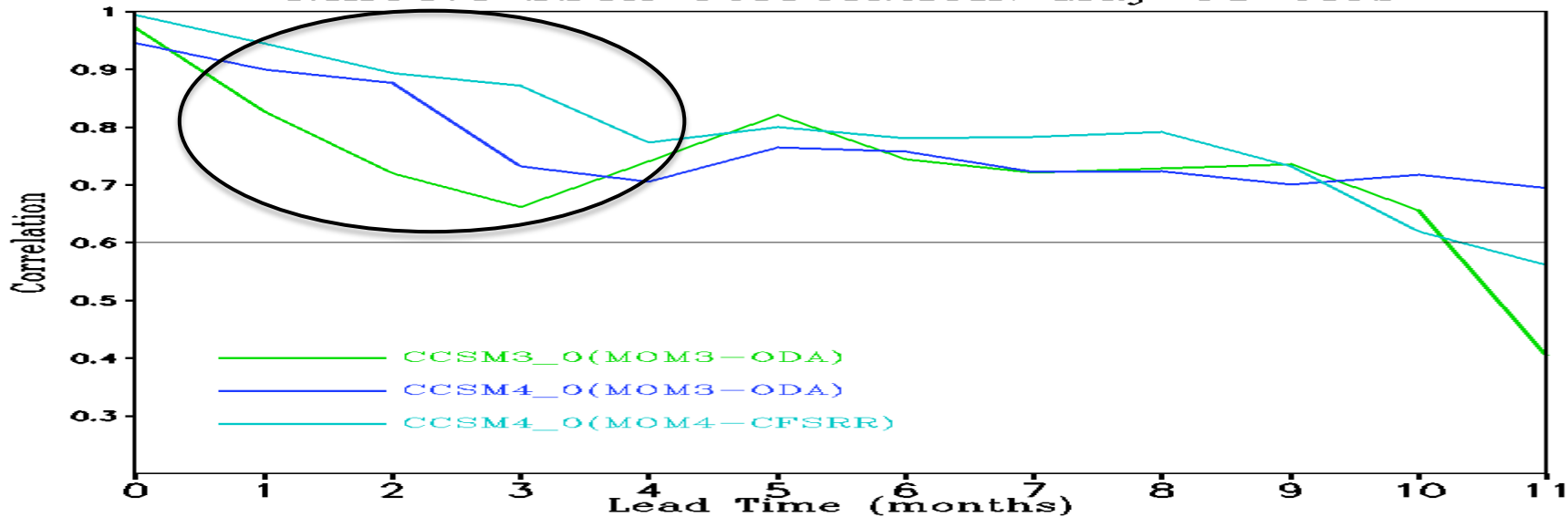
h) E6



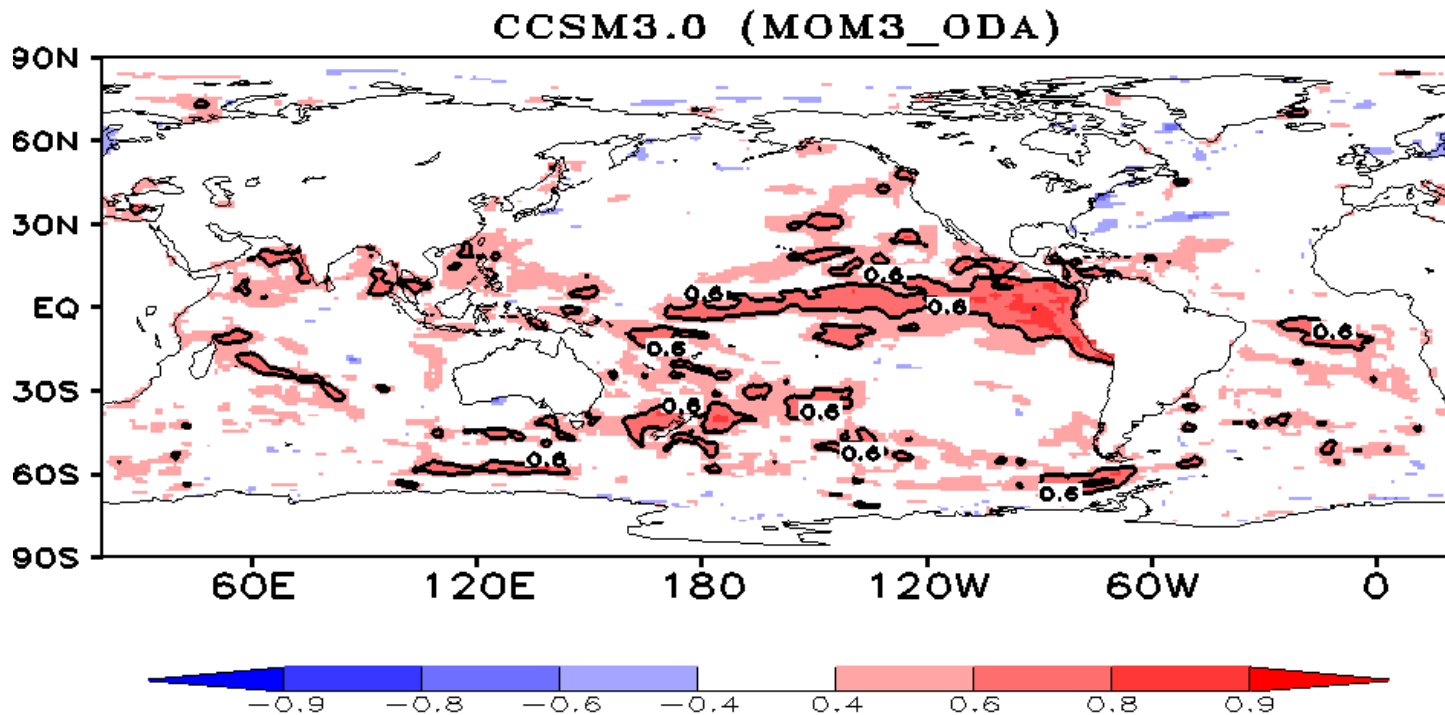
Nino3.4 SSTA (May 01 Oics)



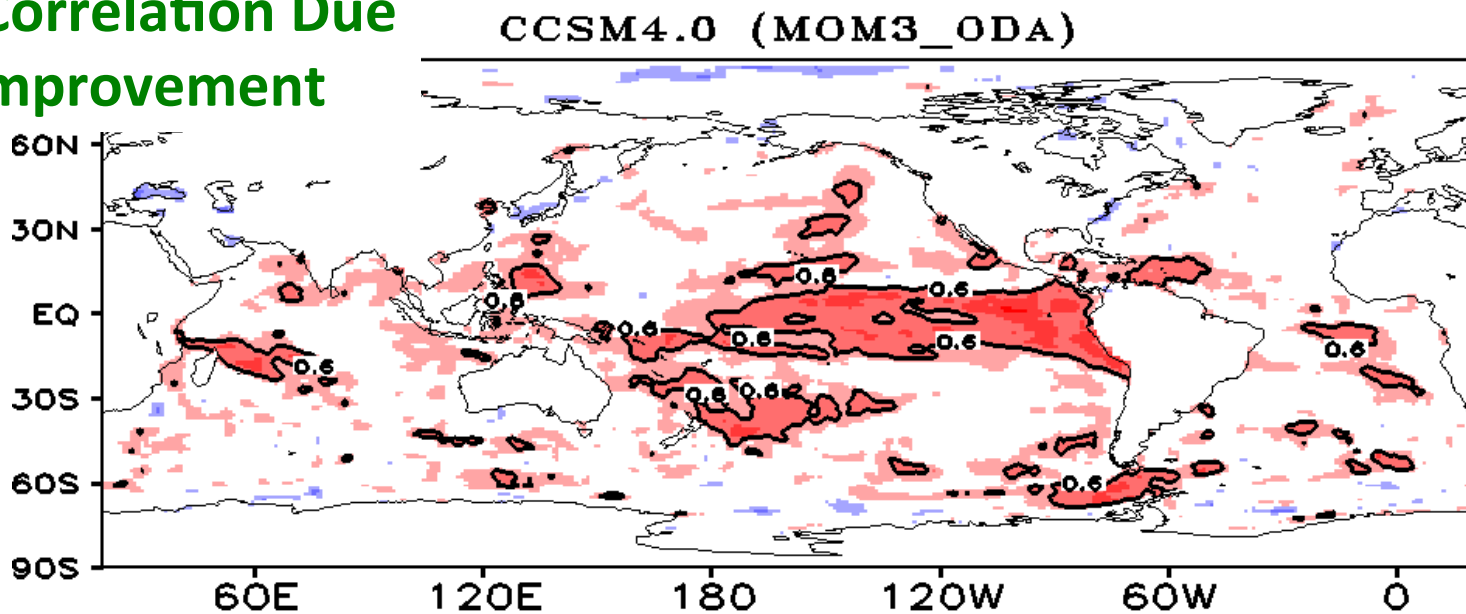
Nino3.4 SSTA Correlation: May 01 Oics



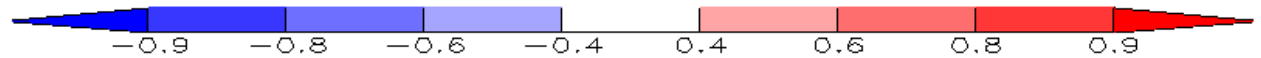
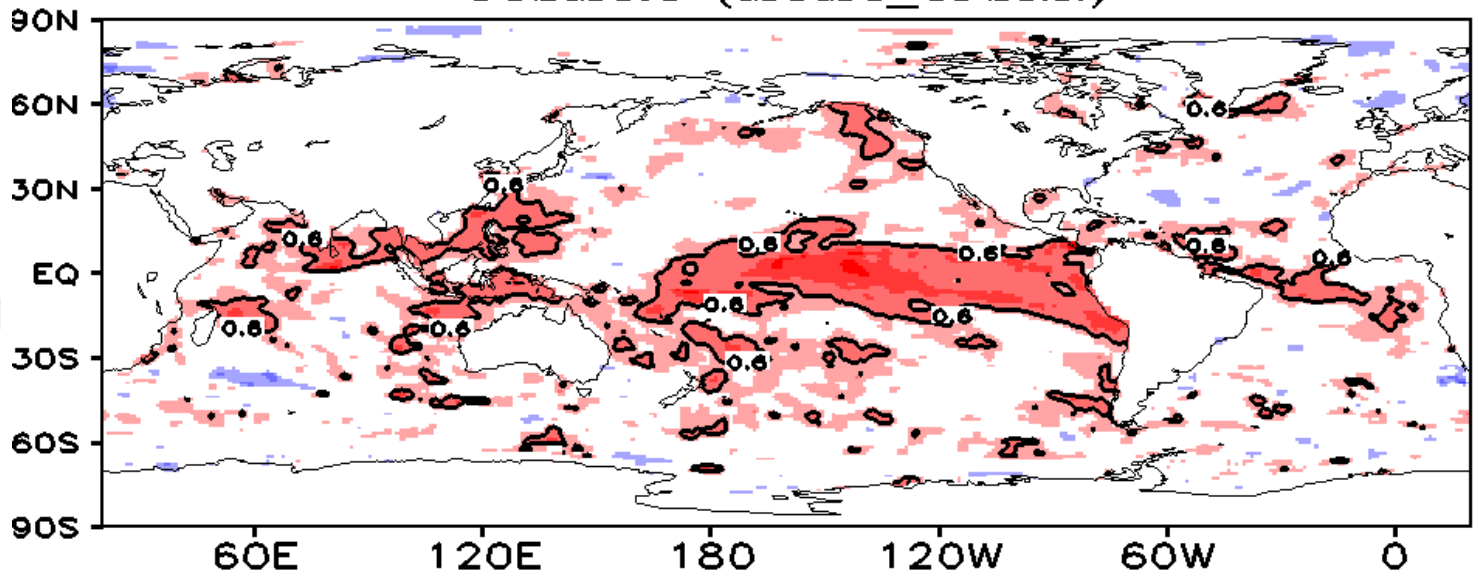
May Initial
Conditions
3-Months Lead



Improved Correlation Due
to Model Improvement

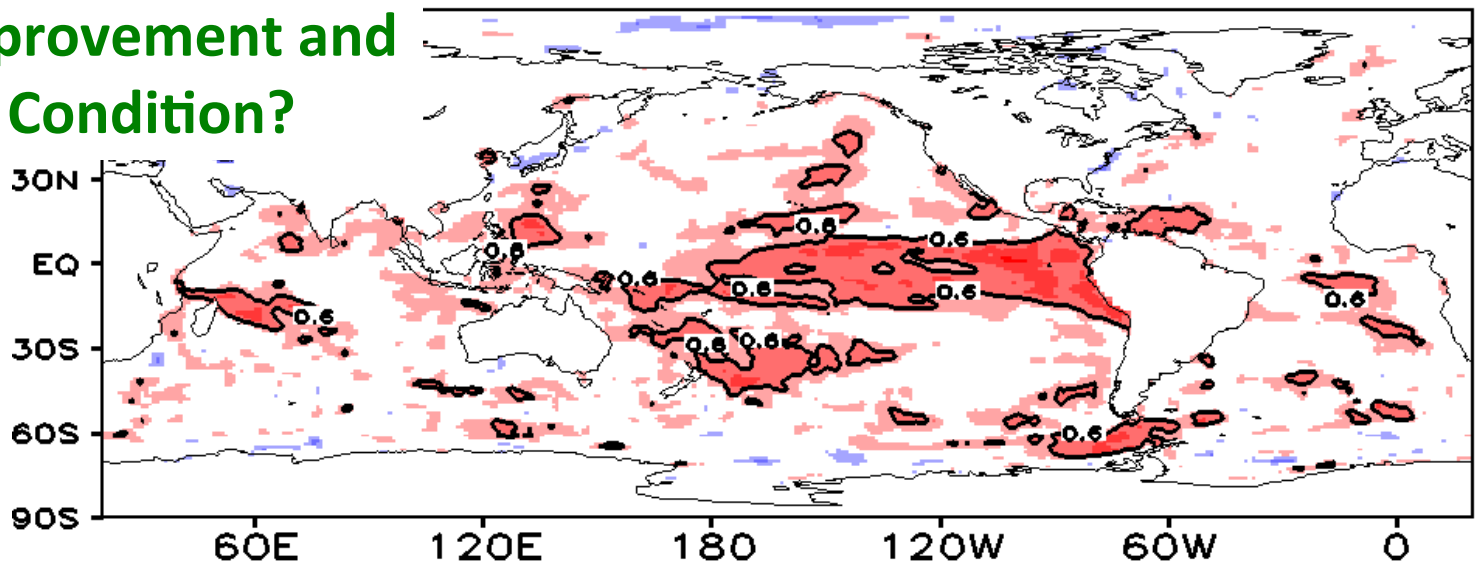


CCSM4.0 (MOM4_CFSRR)



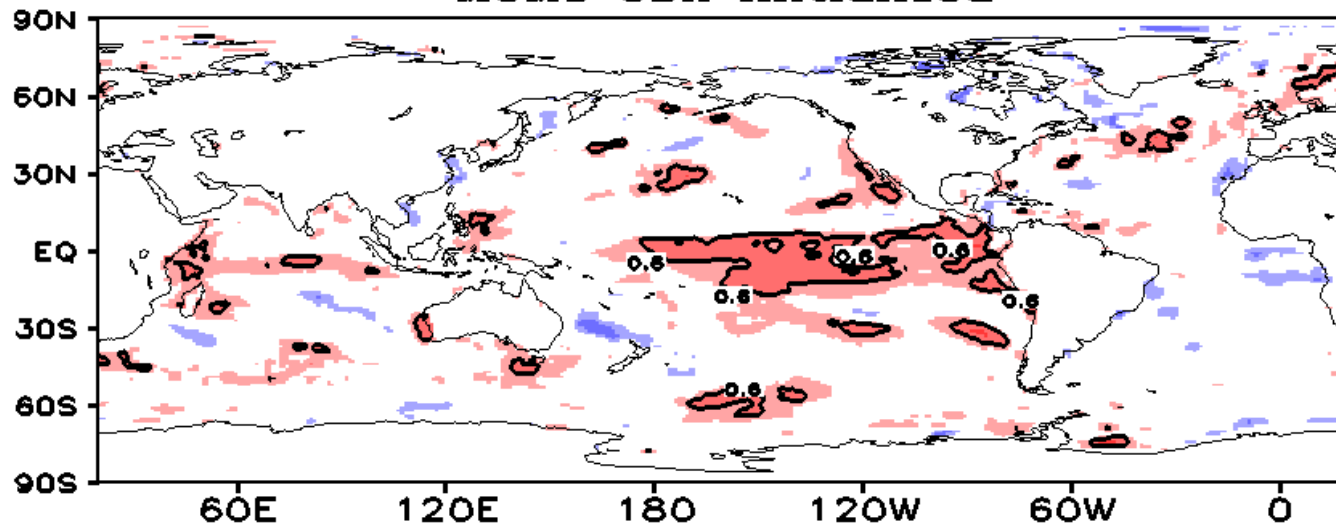
May Initial
Conditions
3-Months Lead

CCSM4.0 (MOM3_ODA)

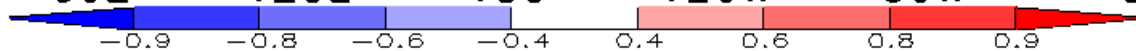
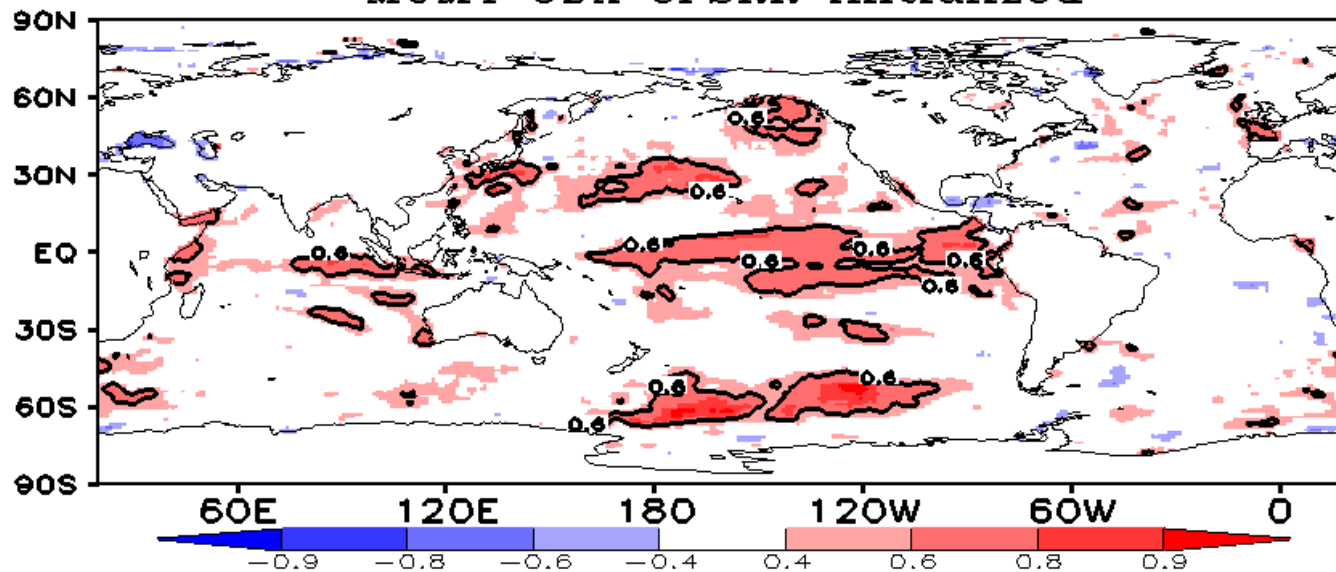


Improved Correlation Due
to Model Improvement and
Better Initial Condition?

Corr. of CCSM4.0 SSTA with OISST
Lead Month = 9 (May IC)
MOM3 ODA Initialized



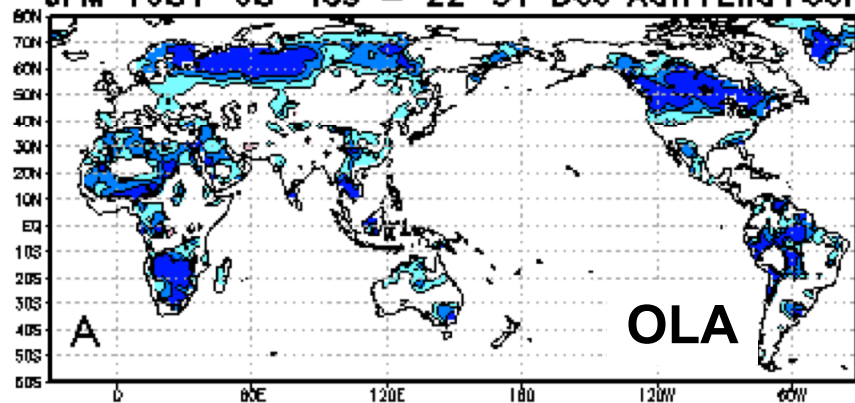
MOM4 ODA CFSRR Initialized



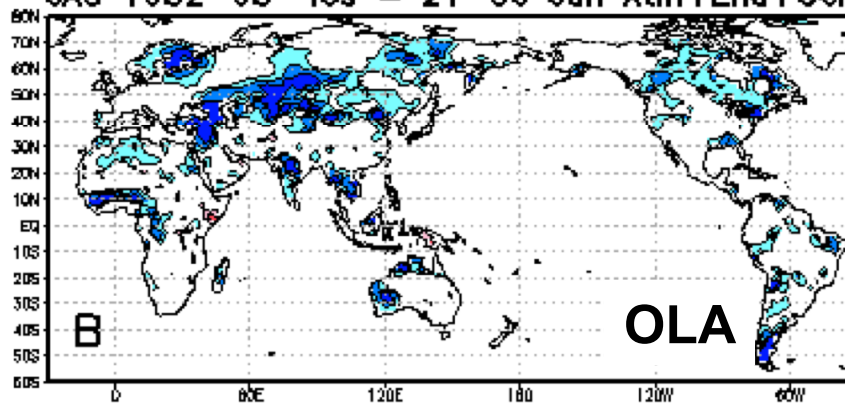
Results

- **Initial Prediction Experiments**
 - CCSM3.0, CCSM3.5, CCSM4.0
 - Ocean-Only Initialization, 6-member ensembles
 - Comparing GFDL-IO vs. CFS-R Ocean Initial States
- **Ocean-Land-Atmosphere Initialization**
 - CCSM3.0 Only
- **Sub-Seasonal Predictions**
 - CCSM3.5 Only

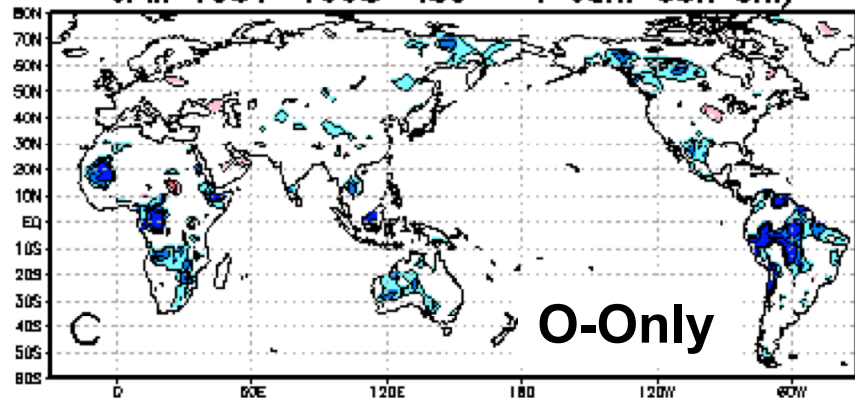
C.C. JFM CCSM3.0 T2m vs CAMS T_{sf}c
 JFM 1981-98 ICs = 22-31 Dec Atm+Lnd+Ocn



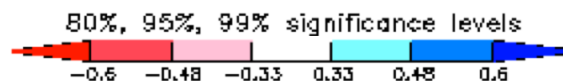
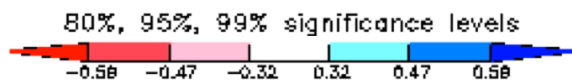
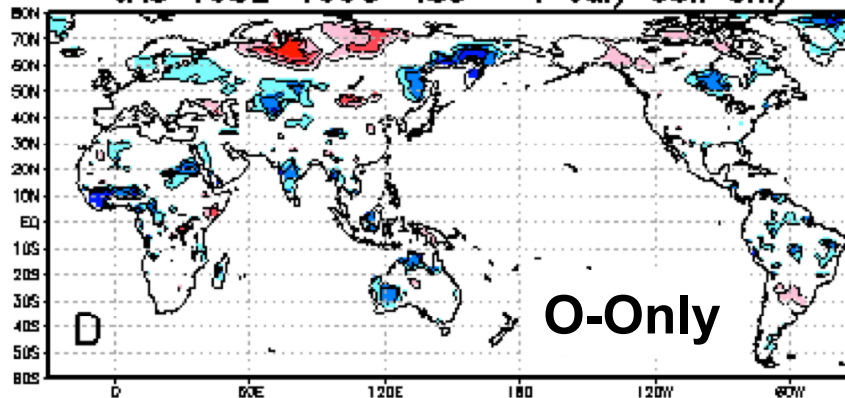
C.C. JAS CCSM3.0 T2m vs CAMS T_{sf}c
 JAS 1982-98 ICs = 21-30 Jun Atm+Lnd+Ocn



JFM 1981-1998 ICs = 1 Jan. Ocn only

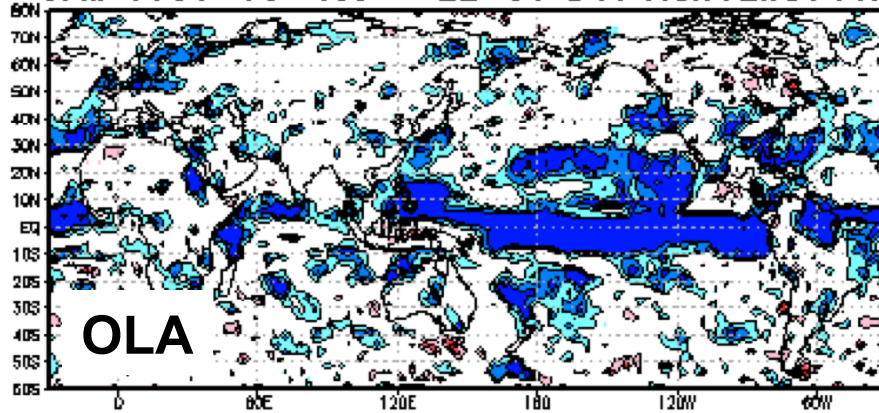


JAS 1982-1998 ICs = 1 July Ocn only



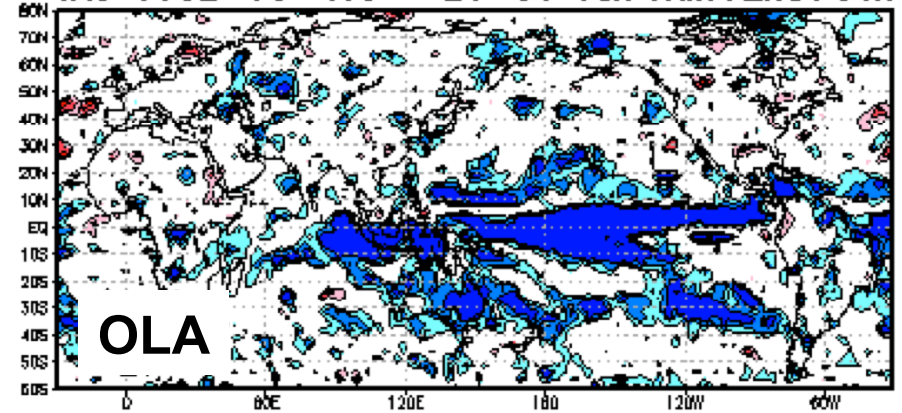
C.C. JFM CCSM3.0 Tppt vs CMAP

JFM 1981-98 ICs = 22-31 Dec Atm+Lnd+Ocn

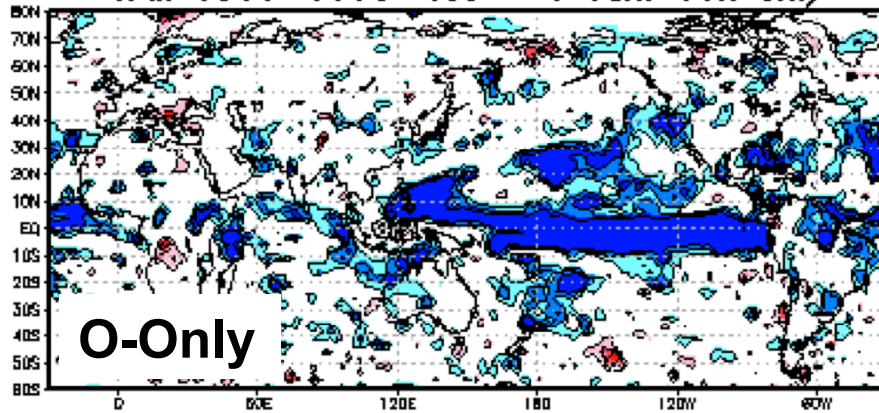


C.C. JAS CCSM3.0 Tppt vs CMAP

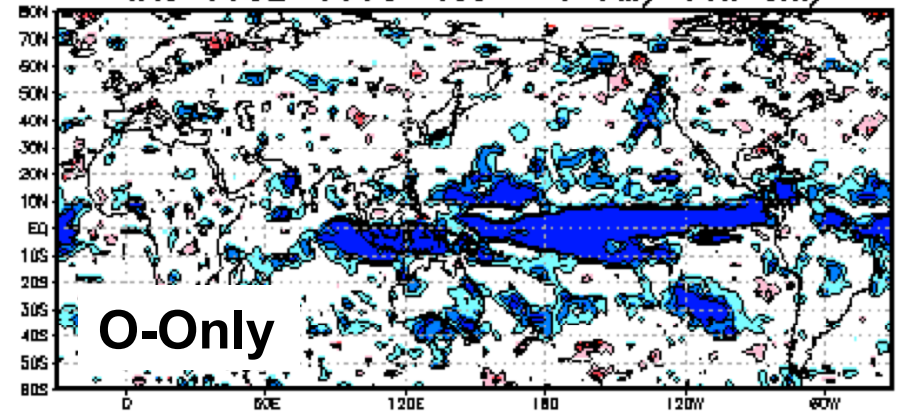
JAS 1982-98 ICs = 21-30 Jun Atm+Lnd+Ocn



JFM 1981-1998 ICs = 1 Jan. Ocn only



JAS 1982-1998 ICs = 1 July Ocn only



80%, 95%, 99% significance levels

-0.58 -0.47 -0.32 0.32 0.47 0.58

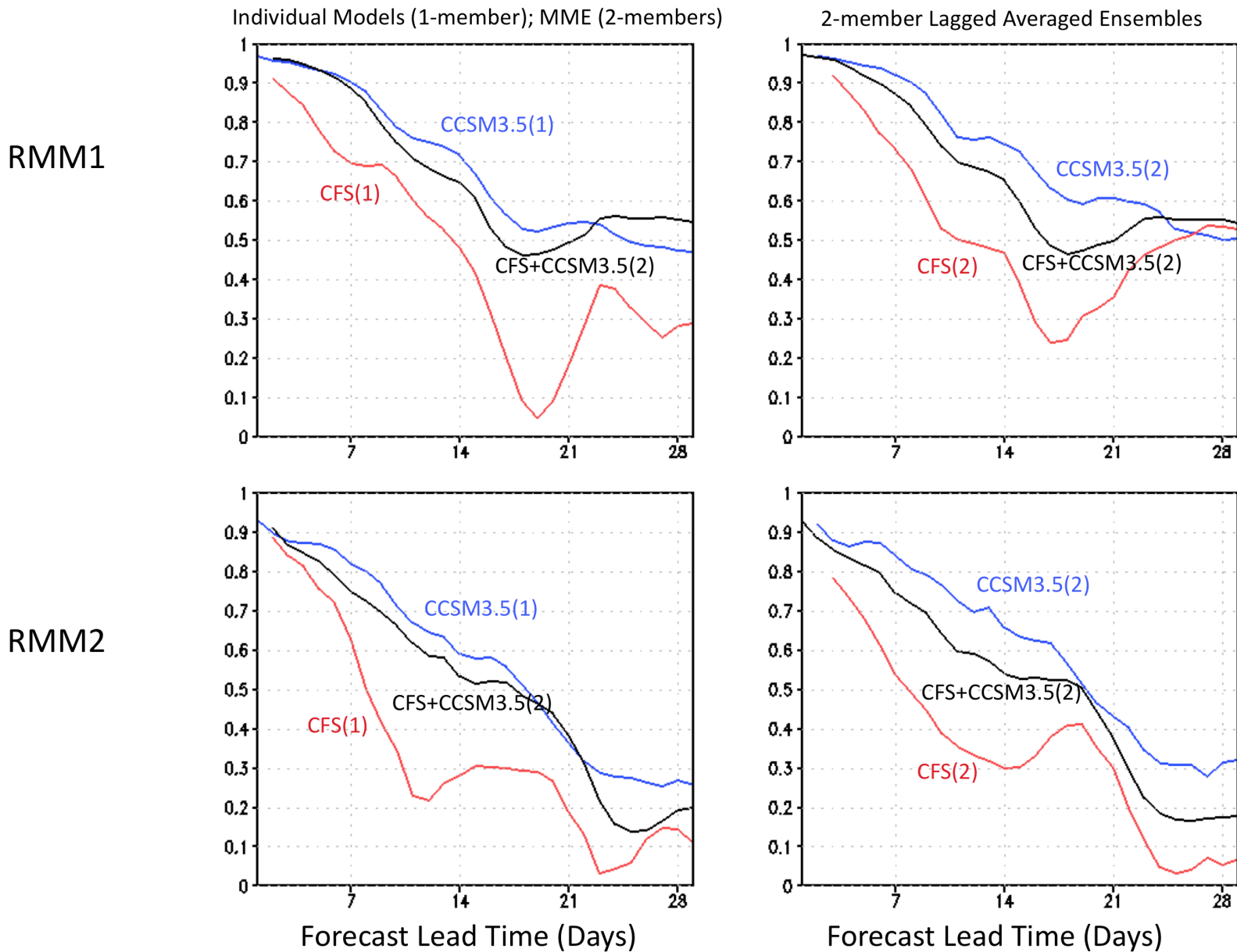
80%, 95%, 99% significance levels

-0.6 -0.48 -0.33 0.33 0.48 0.6

Results

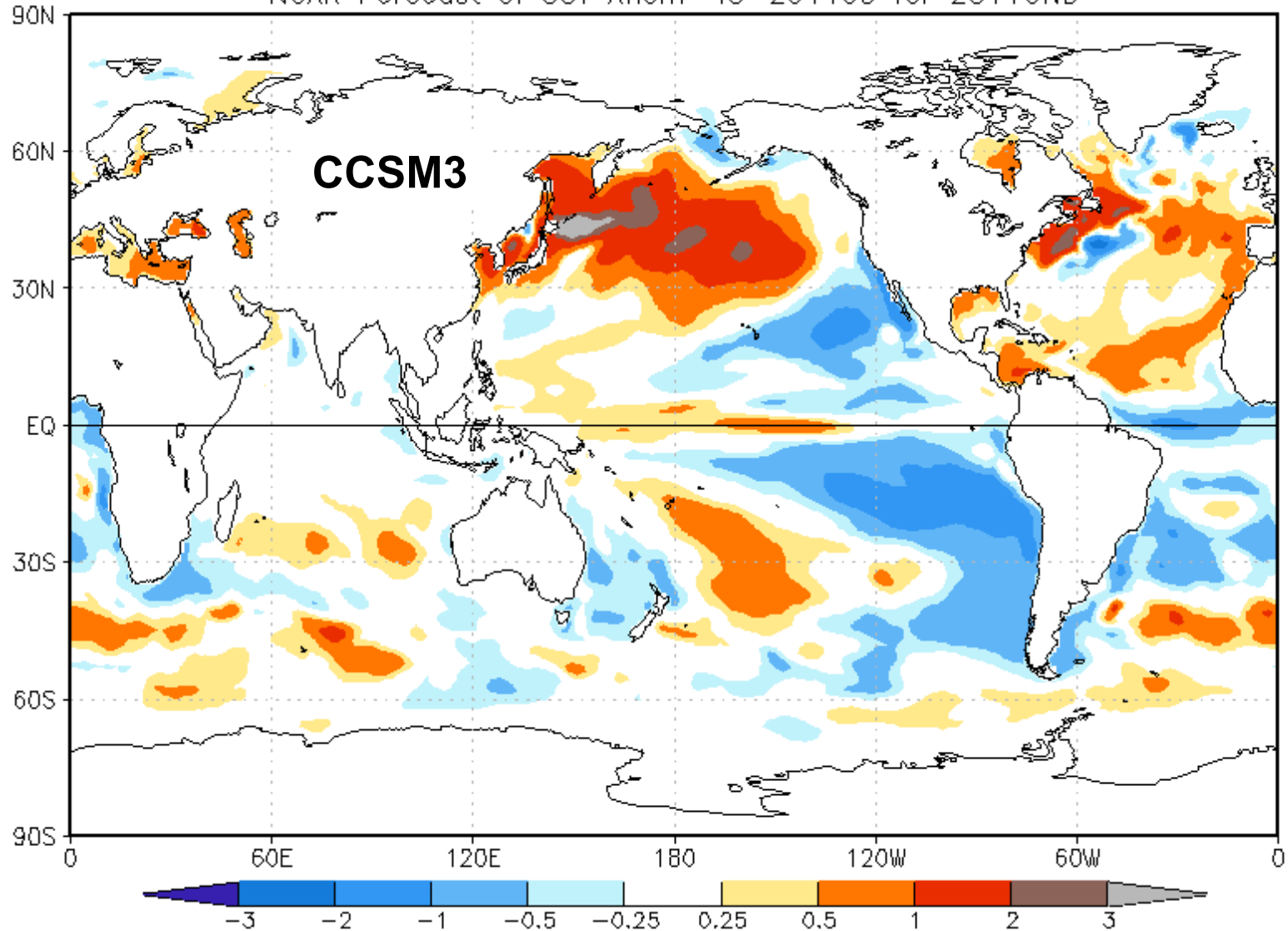
- **Initial Prediction Experiments**
 - CCSM3.0, CCSM3.5, CCSM4.0
 - Ocean-Only Initialization, 6-member ensembles
 - Comparing GFDL-IO vs. CFS-R Ocean Initial States
- **Ocean-Land-Atmosphere Initialization**
 - CCSM3.0 Only
- **Sub-Seasonal Predictions**
 - CCSM3.5 Only

Average Anomaly Correlation Skill of MJO Index (RMM12) Apr and Oct Initial Conditions (1981-1999) with CCSM3.5



Experimental Real-Time

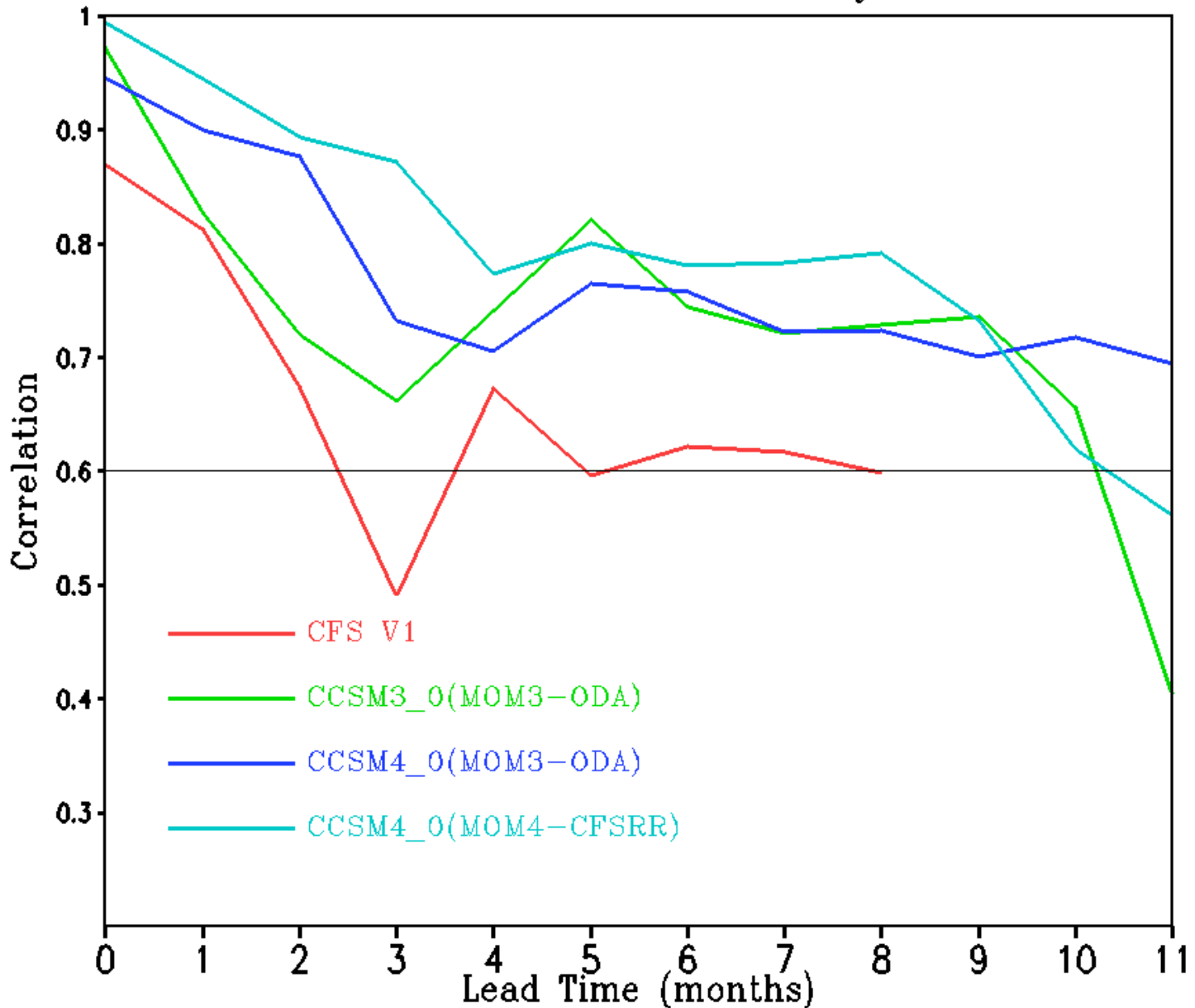
NCAR Forecast of SST Anom IC=201109 for 2011OND



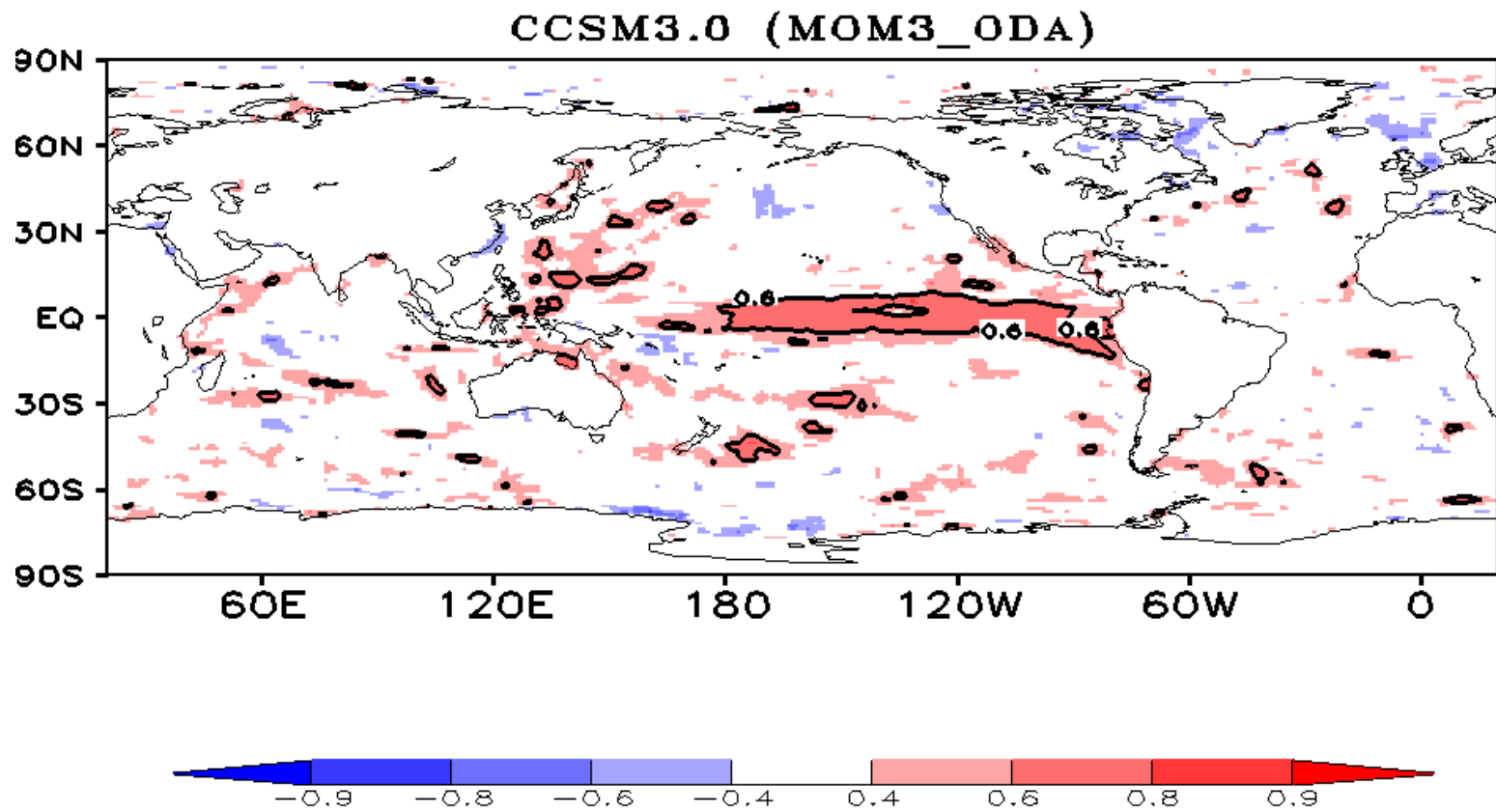
Results

- **Initial Prediction Experiments**
 - Isolate Model Improvements Leading to Improved Forecast SSTA Correlation
 - CFS-R Ocean ICs Improve Correlations?
- **Ocean-Land-Atmosphere Initialization**
 - CCSM3.0: First Season Land T2m and Precip Improve Correlations
- **Sub-Seasonal Predictions**
 - CCSM3.5+CFSv1: Multi-Model RMM1 and RMM2 Improved Correlation
- **No Substitute for Real Prediction**

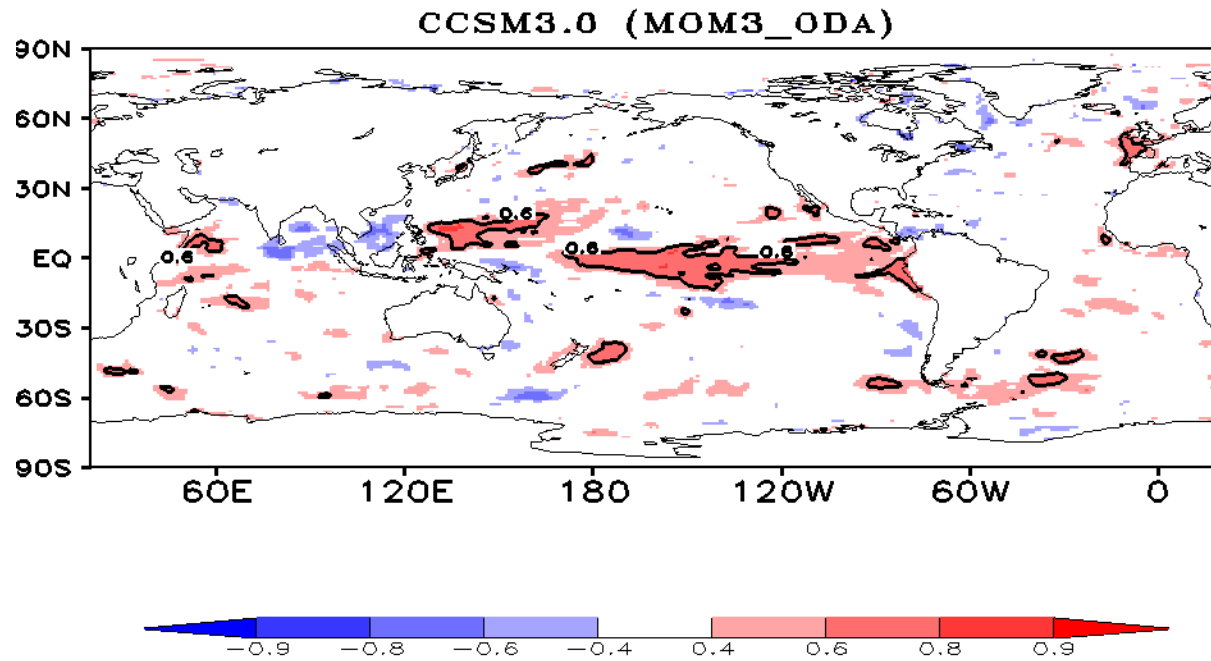
Nino3.4 SSTA Correlation: May 01 Oics



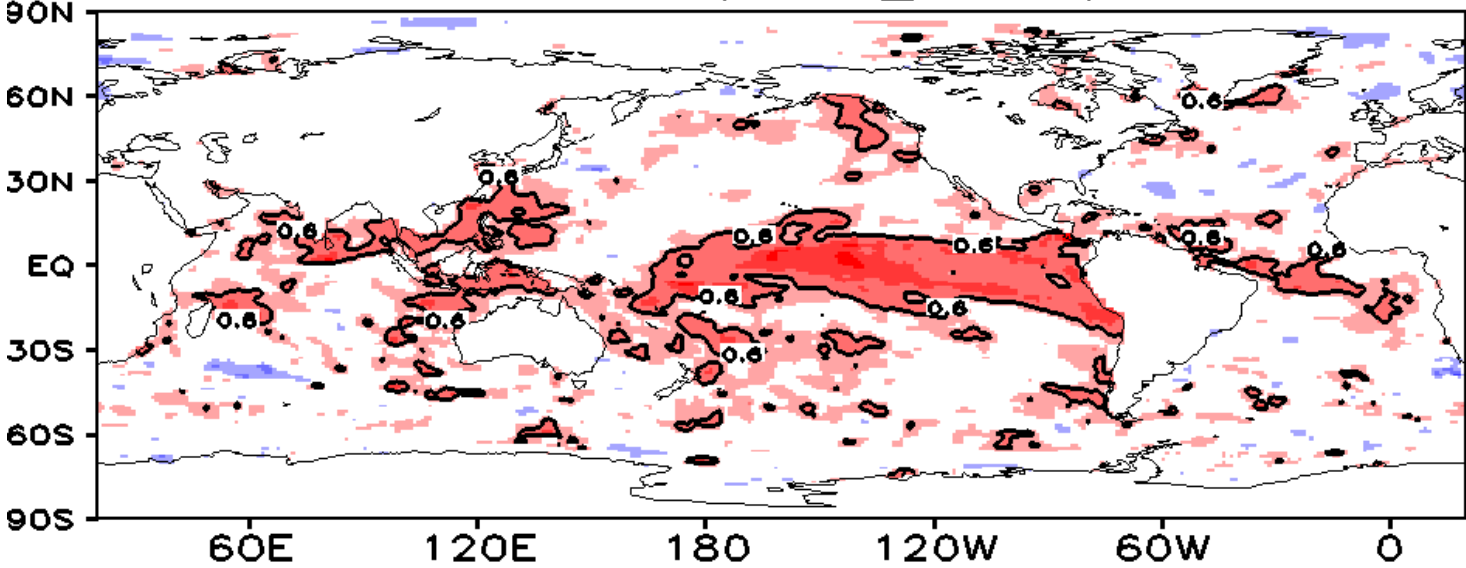
Corr. of Global SSTA with OISST
Lead Month = 6 (May IC)



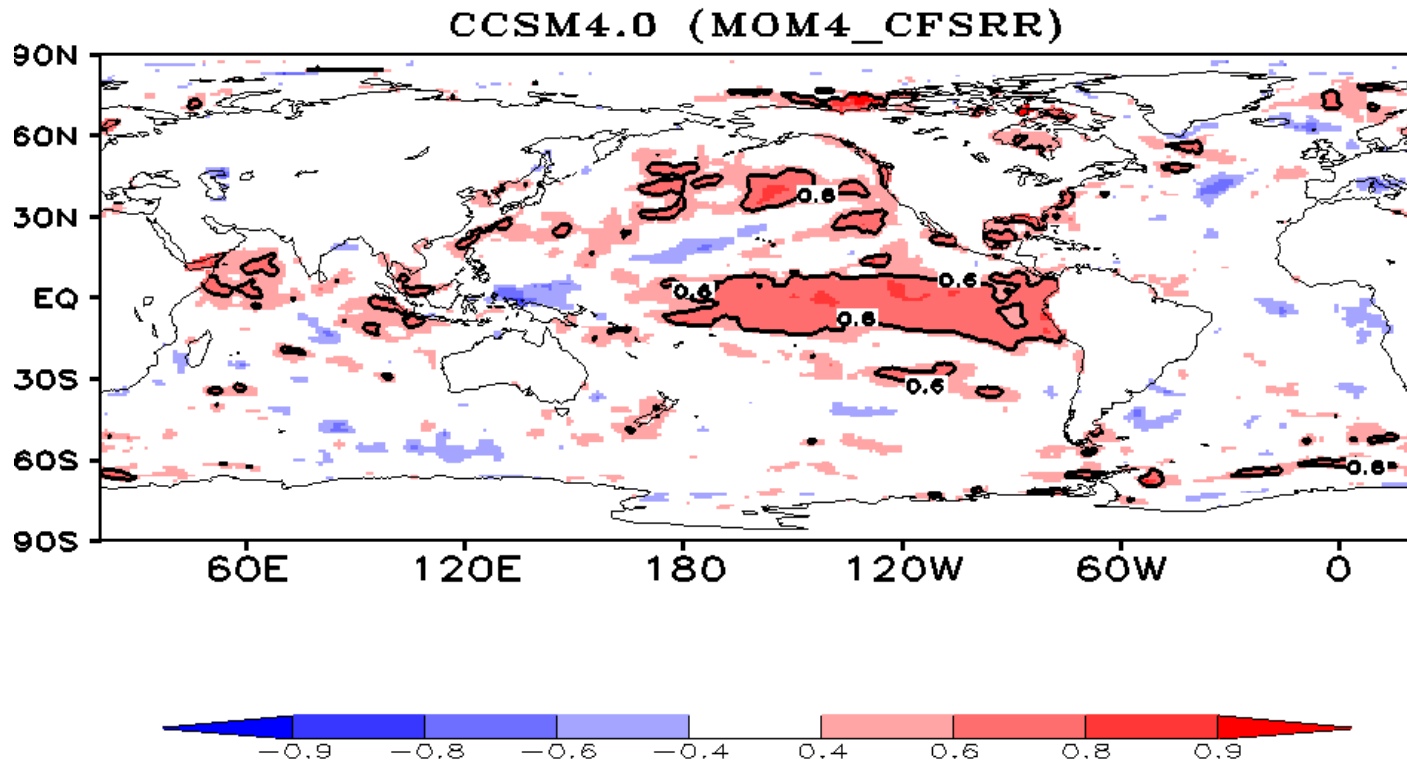
Corr. of Global SSTA with OISST
Lead Month = 9 (May IC)



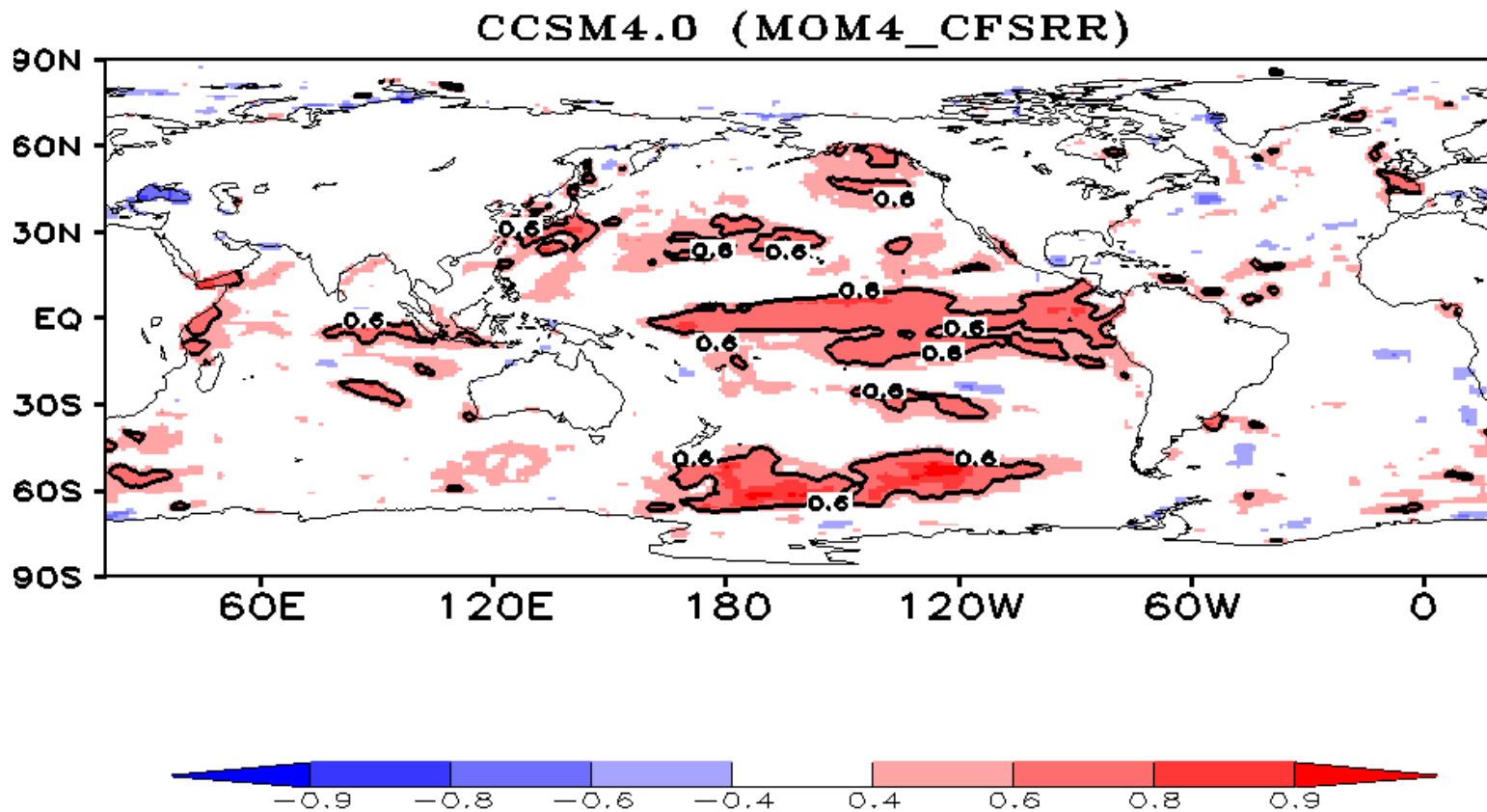
CCSM4.0 (MOM4_CFSRR)



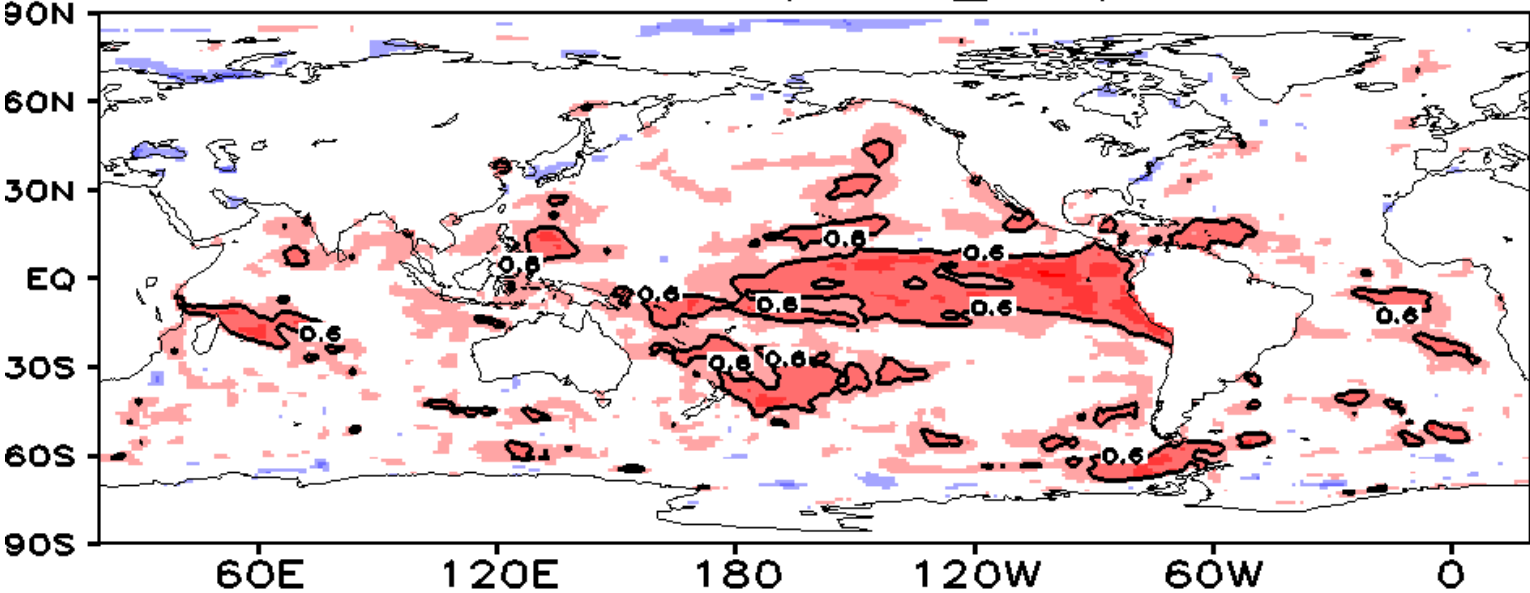
Corr. of Global SSTA with OISST
Lead Month = 6 (May IC)



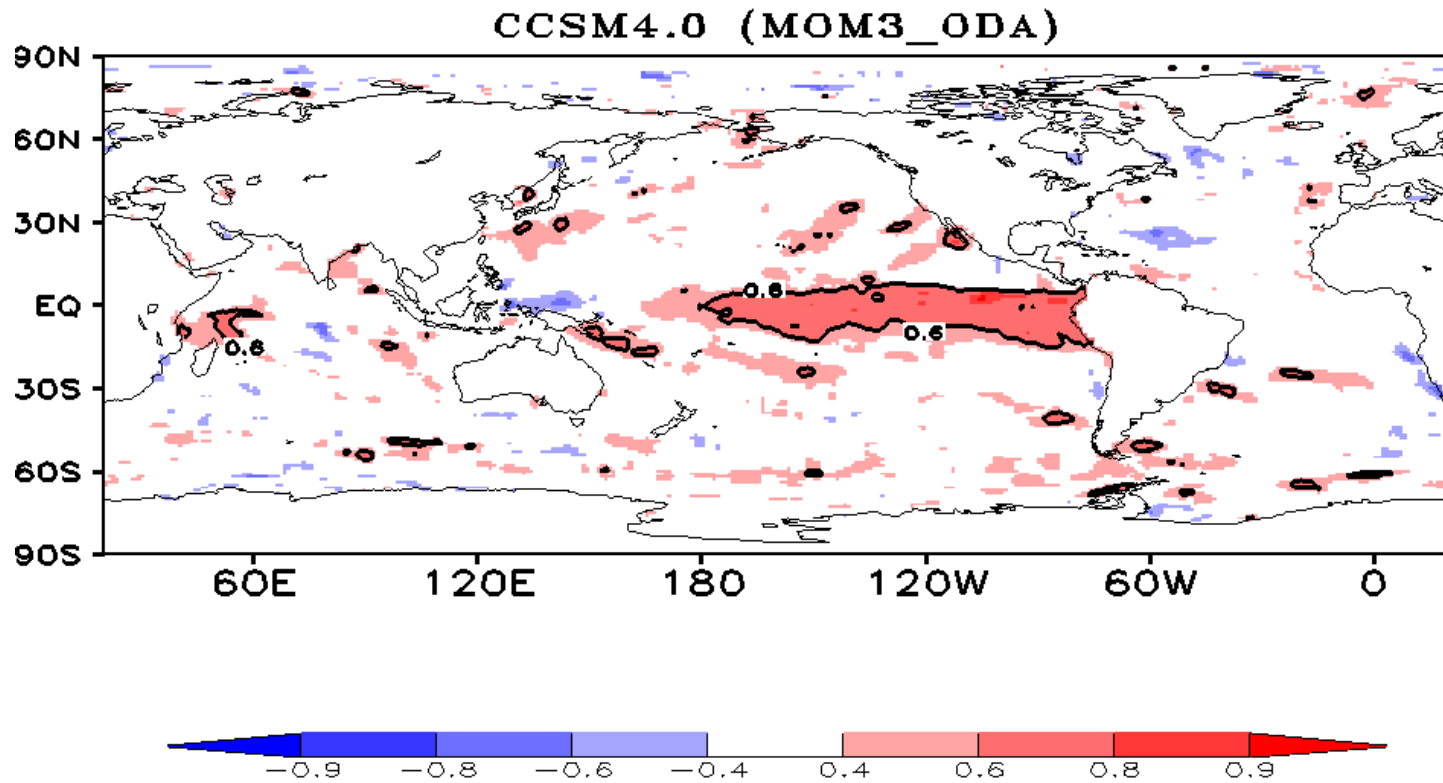
Corr. of Global SSTA with OISST
Lead Month = 9 (May IC)



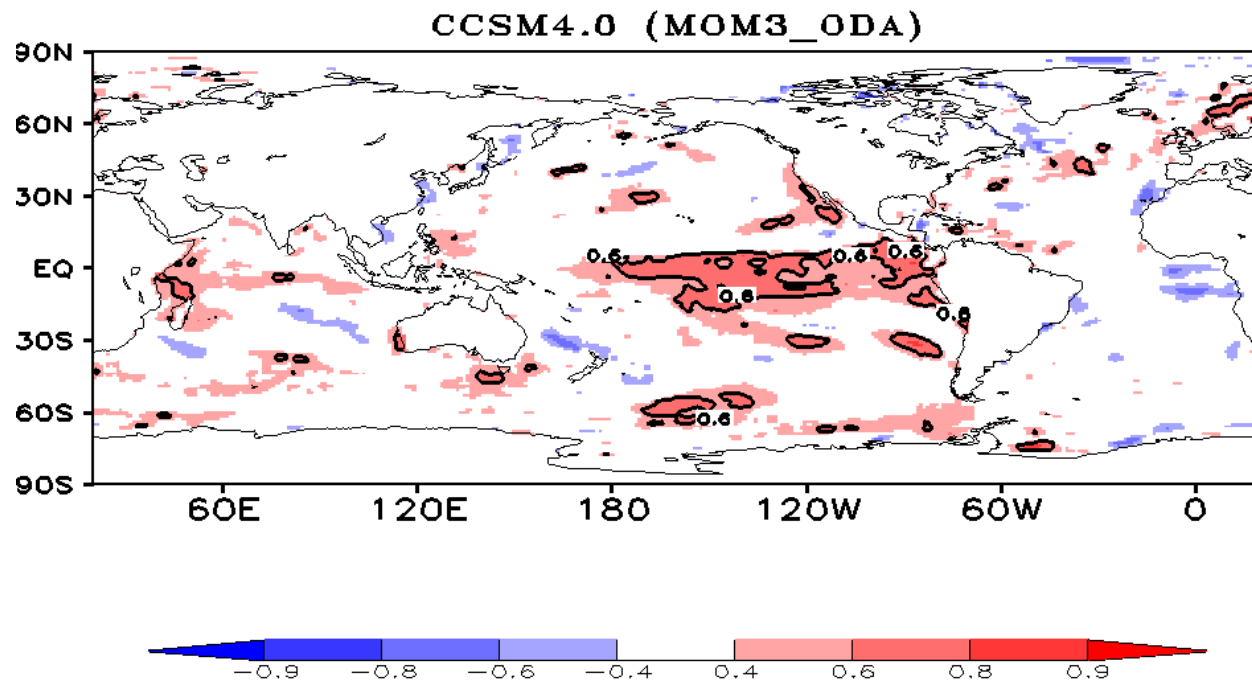
CCSM4.0 (MOM3_ODA)



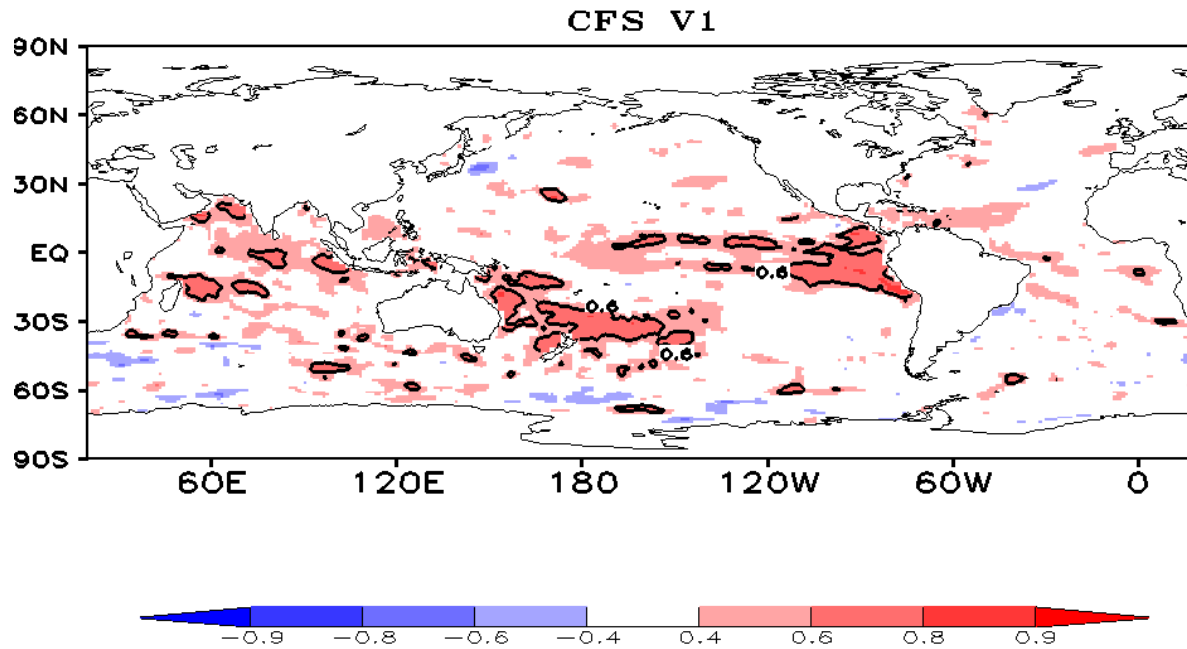
Corr. of Global SSTA with OISST
Lead Month = 6 (May IC)



Corr. of Global SSTA with OISST
Lead Month = 9 (May IC)



Corr. of Global SSTA with OISST
Lead Month = 3 (May IC)



Corr. of Global SSTA with OISST
Lead Month = 6 (May IC)

