

Recent Development in the NCEP Climate Forecast System / Evaluation of CFS-Tier2 Forecasts with Bias-Corrected SST

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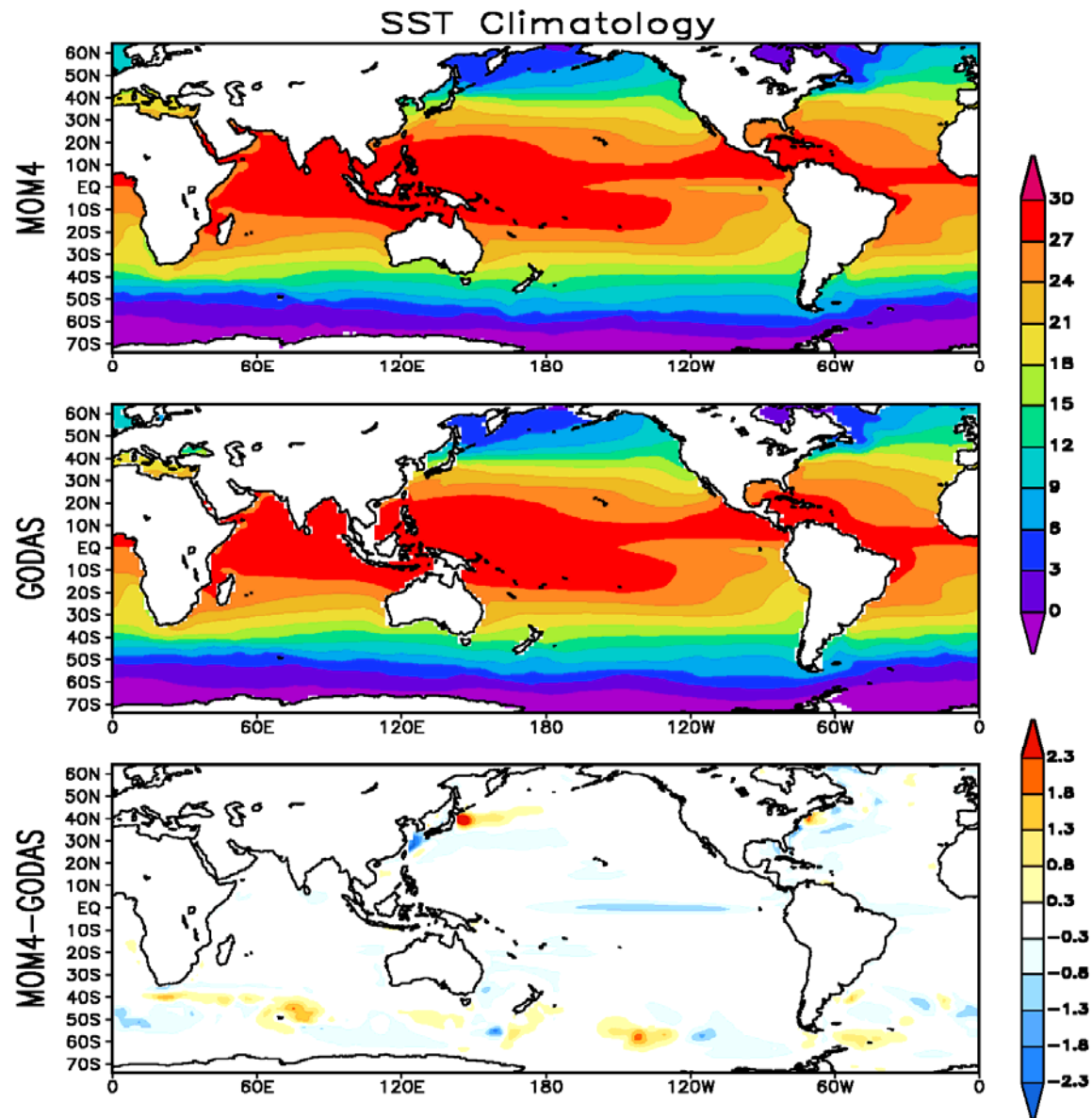
**Acknowledgements: EMC Climate Modeling Group,
CPC Model Assessment Group,
NOAA Climate Test Bed**

Outline

1. CFS upgrade activities at NCEP
2. NOAA Climate Testbed Project
3. CFS Tier2 experiment with bias corrected SST forecasts

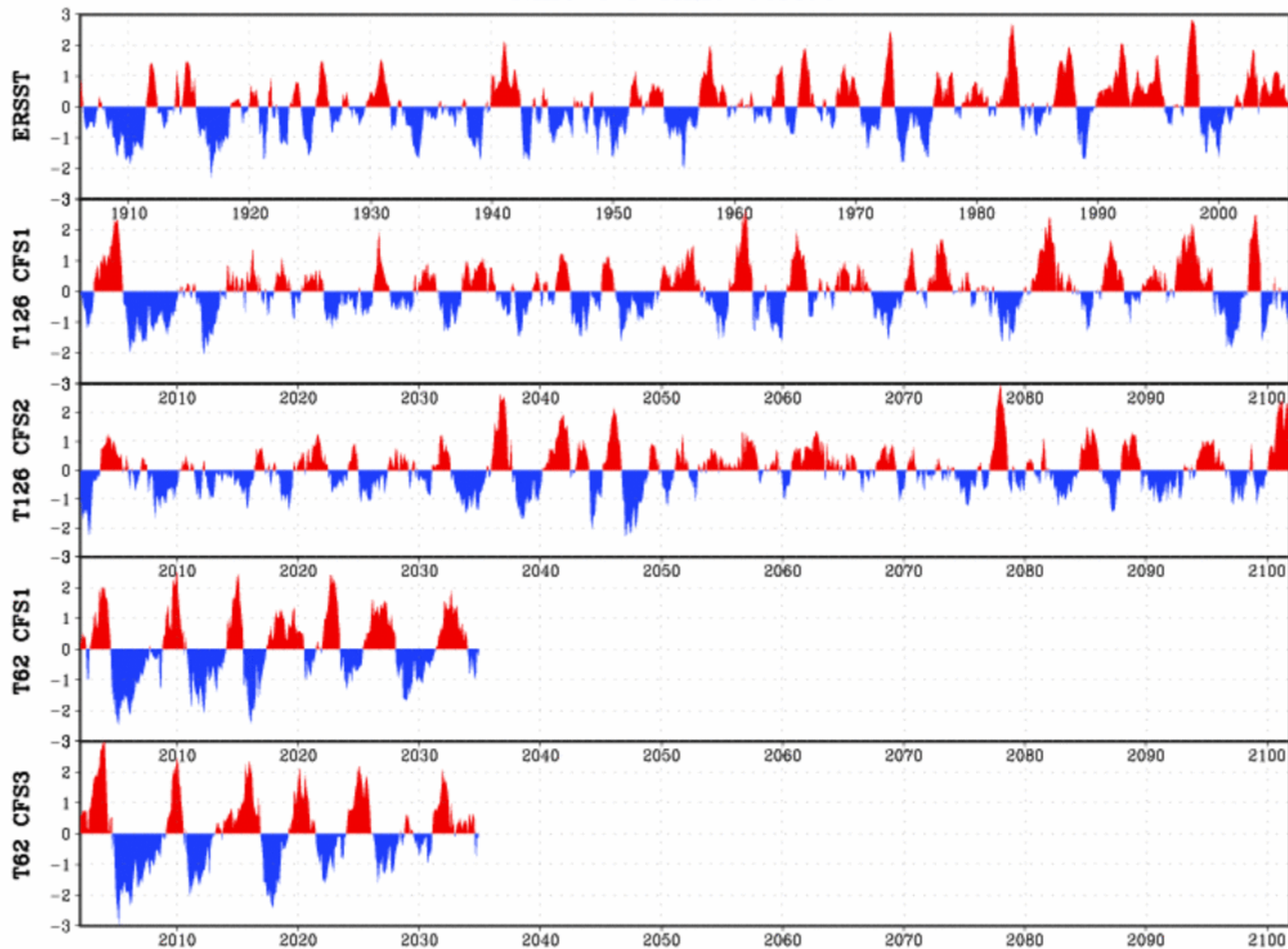
CFS components for the next upgrade

1. Current NCEP operational GFS in T126 resolution; Noah land model, new sea-ice model, RRTM LW
2. New ocean model with GFDL MOM4; 1/4 degree in Tropics (30S-30N), 1/2 degree elsewhere, 50 vertical levels, more efficient coupler
3. New ice model; 3-layer thermodynamics of Winton, 2000 and EVP model dynamics of Hunke and Dukowicz, 1997
4. Modifications in global ocean data assimilation system; explicit bias correction, geostrophic balance, altimetry and Argo salinity



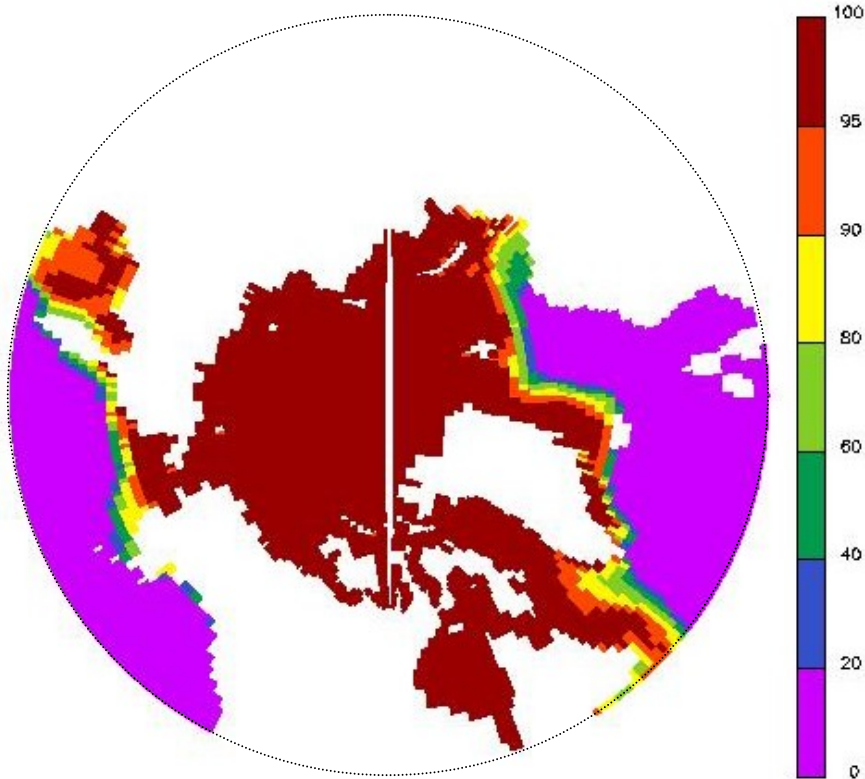
The bias everywhere is considerably less than with MOM3

Nino 3.4 Time Series

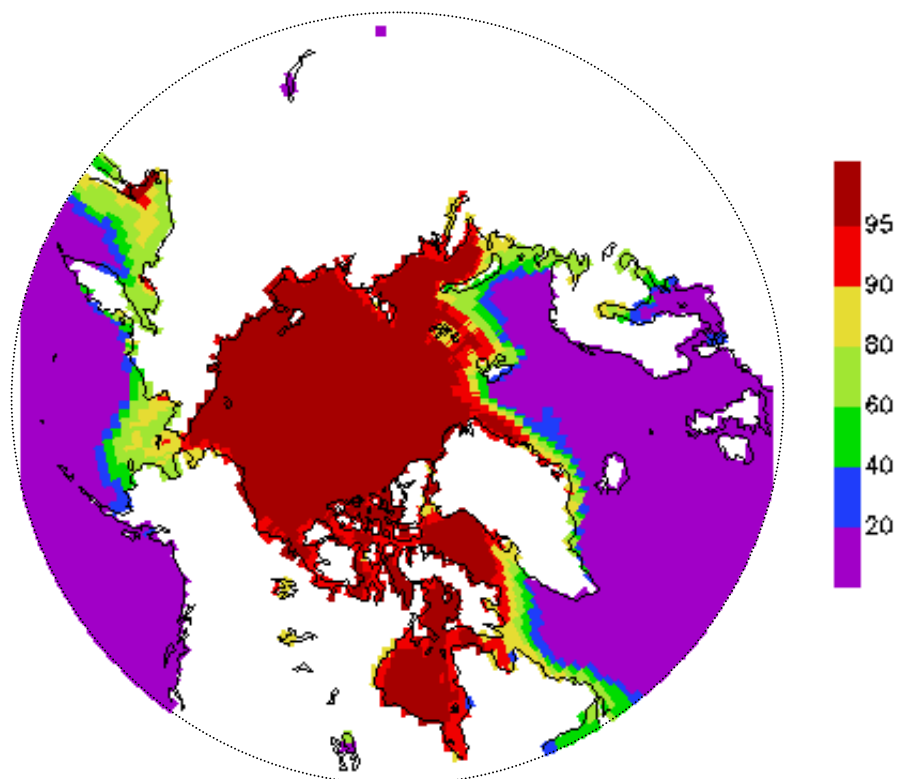


Sea ice concentration (Year-20, March)

Model Simulation

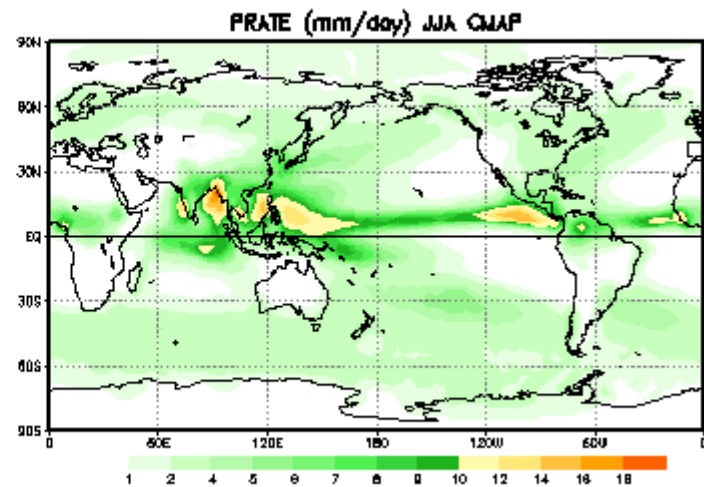
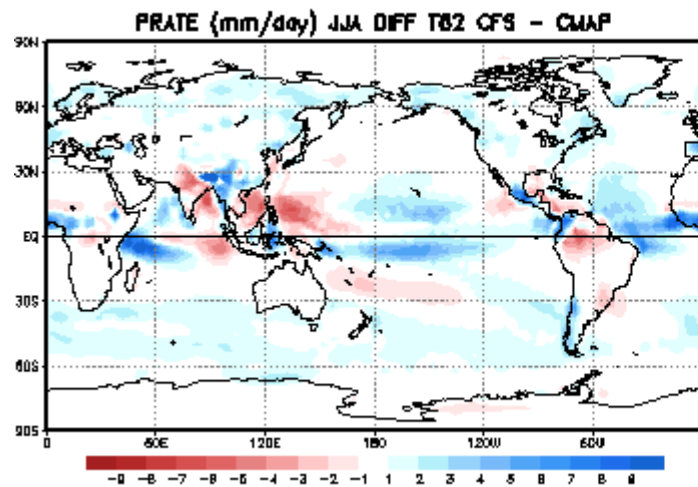
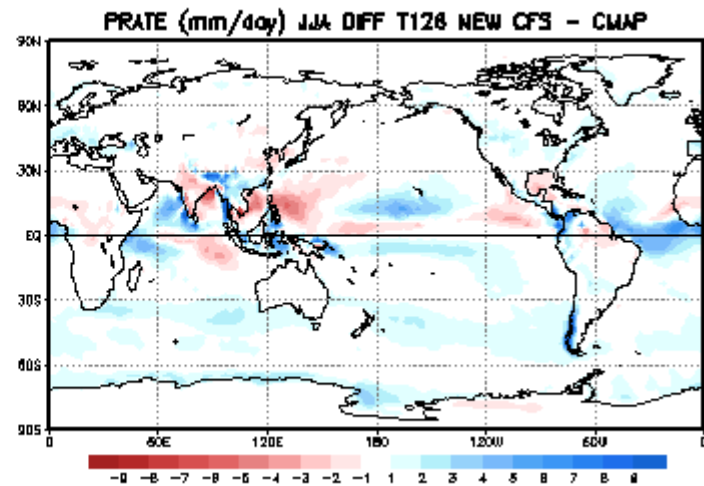
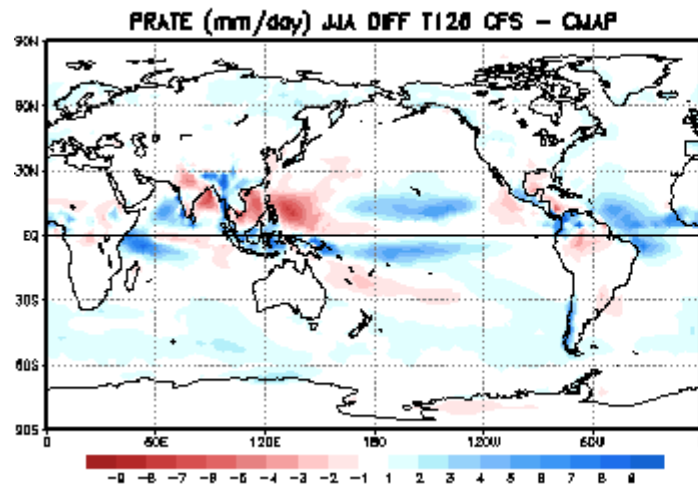


Observations

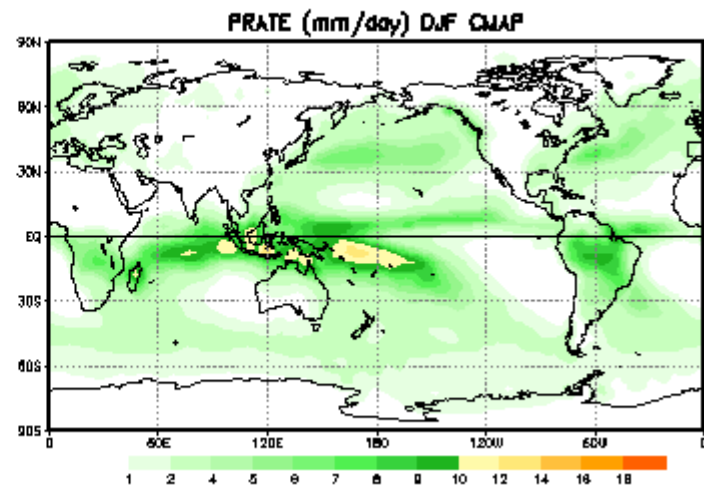
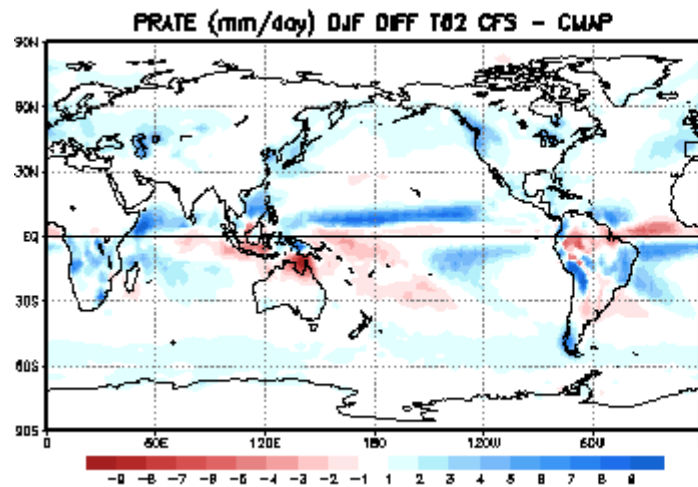
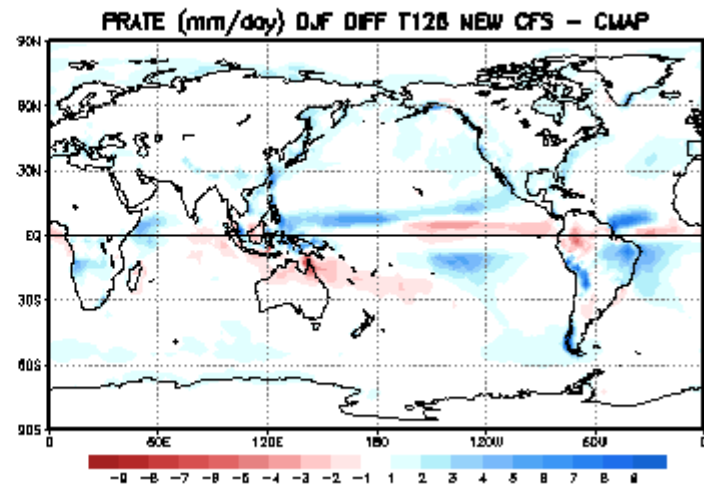
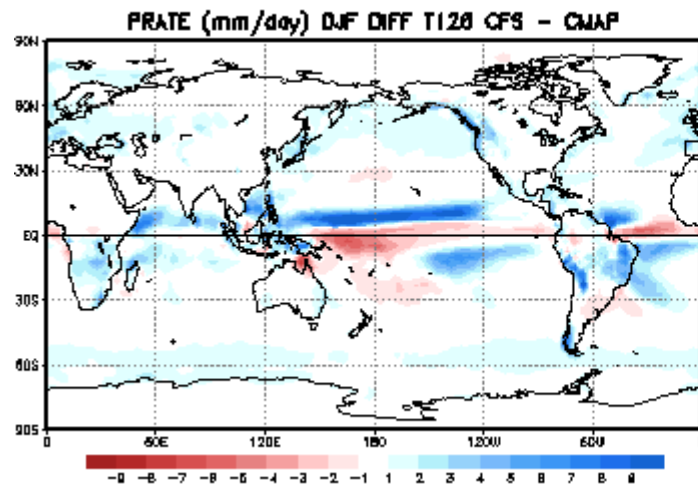


**Sea ice concentration is just a little bit too high
relative to the satellite observations**

PRATE [mm/day] BIAS JJA



PRATE [mm/day] BIAS DJF



NOAA Climate Test Bed (CTB)

- Established at NCEP in Sept. 2004 as a joint project of CPC and EMC.
- Mission: To accelerate the transition of research and development into improved NOAA operational climate forecasts, products and applications.
- Motivation: To achieve the effective blend of internal and external efforts to improve NOAA climate forecast operations.
- Objective: Faster development of NOAA climate forecast system by fostering partnership between NOAA and the external research community.

CTB Plans for Multi-Model Ensemble Prediction System

1. Coordination for a national MME system with global atmosphere-land-ocean coupled models among NCEP/CFS, GFDL/CM2, NASA/GEOS-2, NCAR/CCSM.
2. Willing to coordinate with any international MME projects - APCC and Euro-SIP.

Evaluation of CFS-Tier2 Forecasts with Bias-Corrected SST

**J. Schemm, K. Seo, Q. Zhang and M. L'Heureux
CPC/NCEP/NWS/NOAA**

Objective:

To assess the impact of improved SST forecasts on seasonal climate prediction. One of the CTB projects for FY2005/6.

Description:

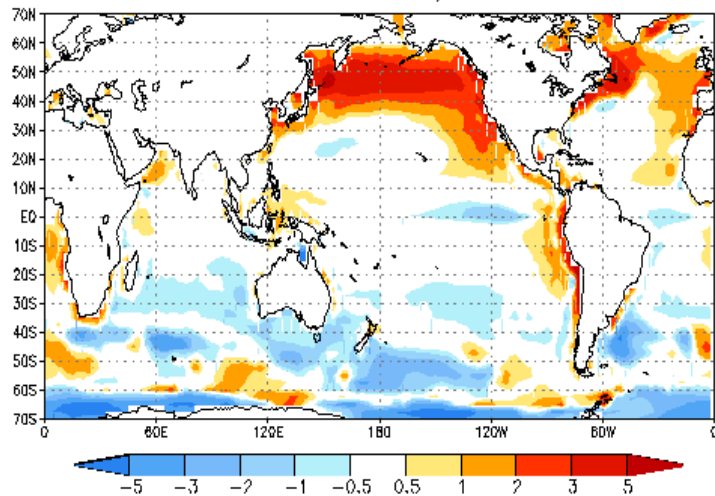
15-member hindcast suite (1981-2004) of 6-month forecast length with the atmospheric component of CFS. The bias-corrected CFS monthly mean SST forecasts imposed as ocean boundary condition.

Status:

Forecast runs with January, April, July and October IC's finished. Analyses focused on precipitation and surface temperature will be discussed.

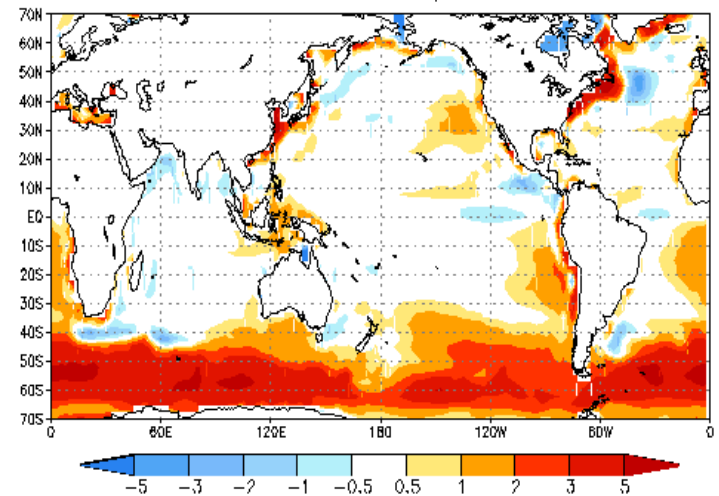
SST Climatology (1981–2003)

CFS – RNL2; JJA

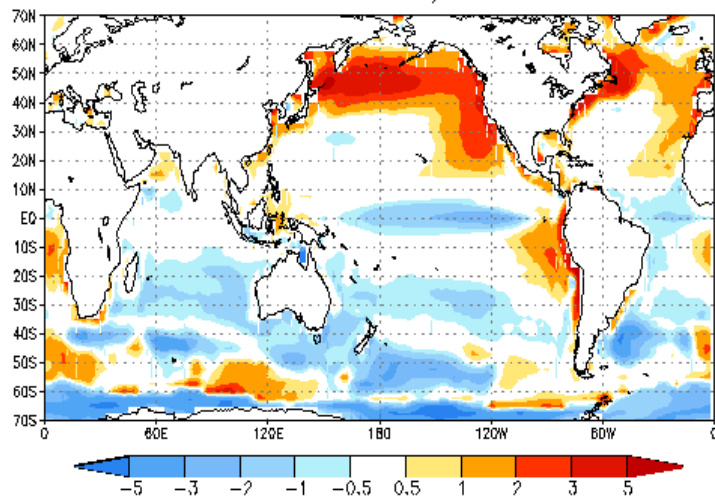


SST Climatology (1981–2003)

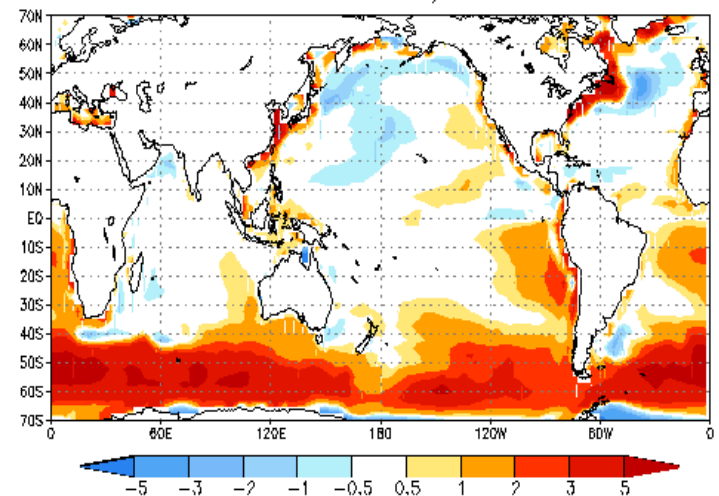
CFS – RNL2; DJF



CFS – RNL2; ASO

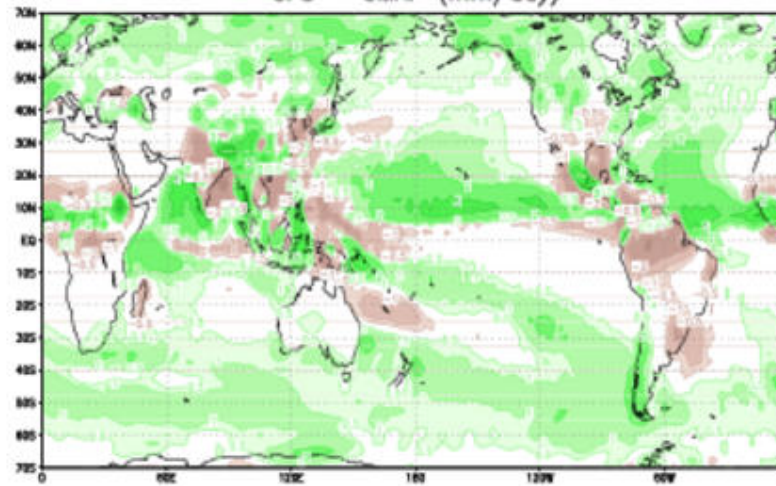


CFS – RNL2; FMA

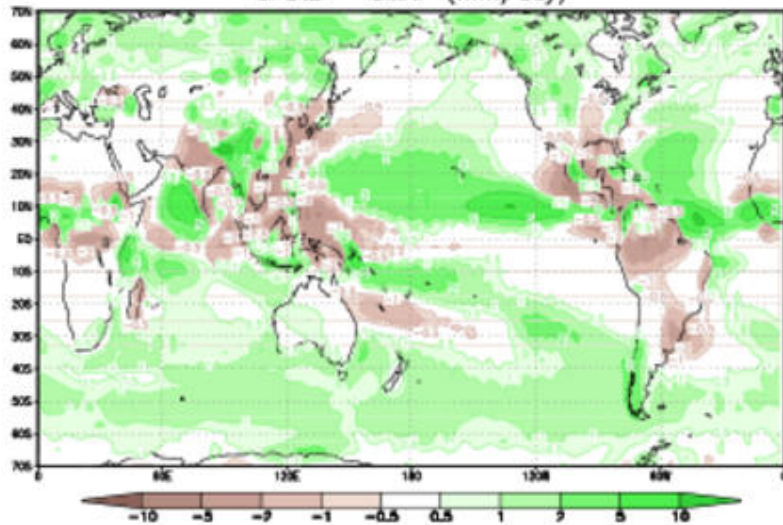


JJA Precipitation Climatology

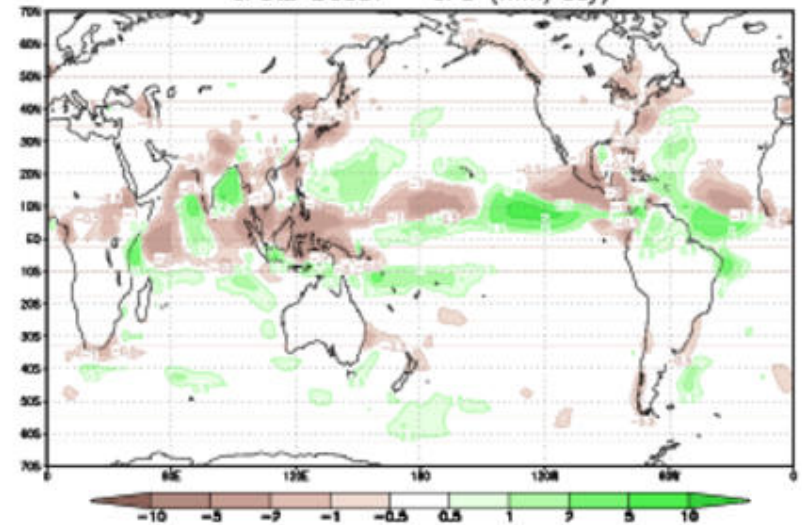
CFS - CMAP (mm/day)



CFS12 - CMAP (mm/day)

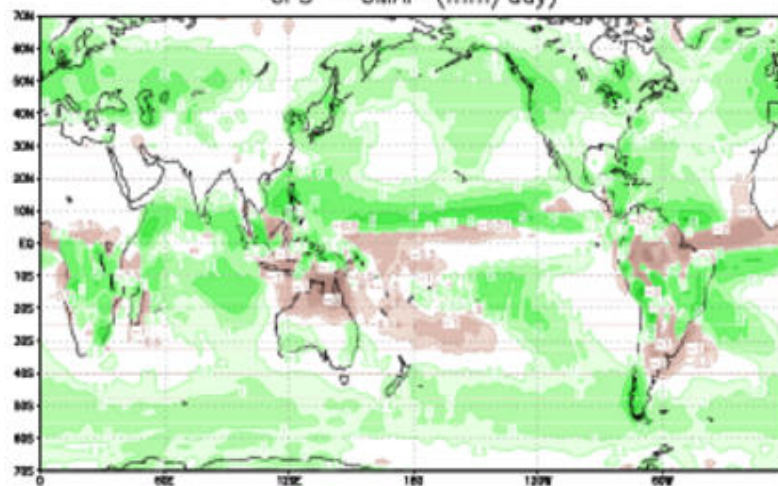


CFS12 BCSST - CFS (mm/day)

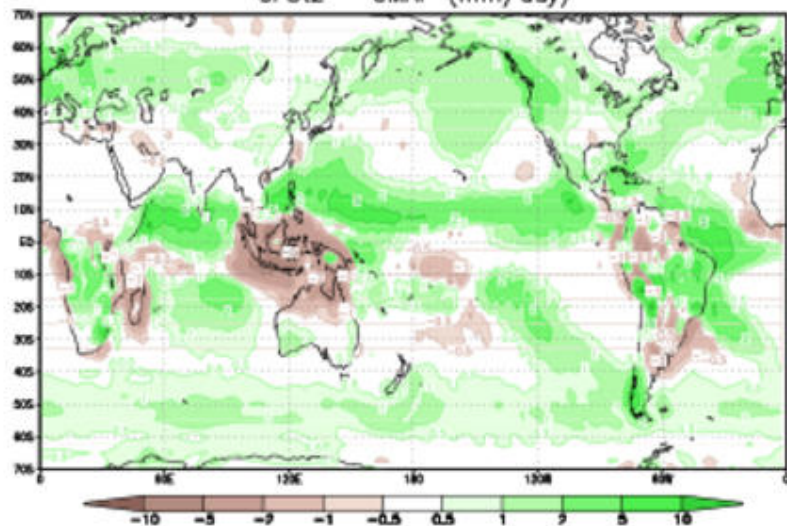


DJF Precipitation Climatology

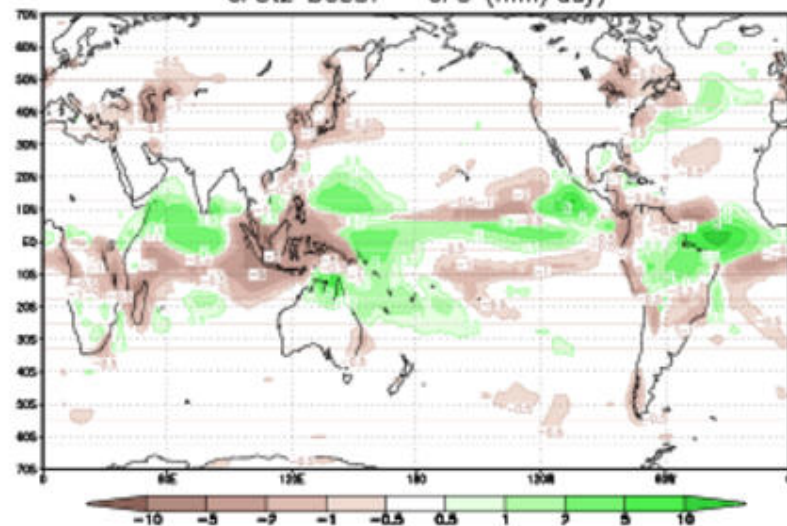
CFS - CMAP (mm/day)



CFS12 - CMAP (mm/day)

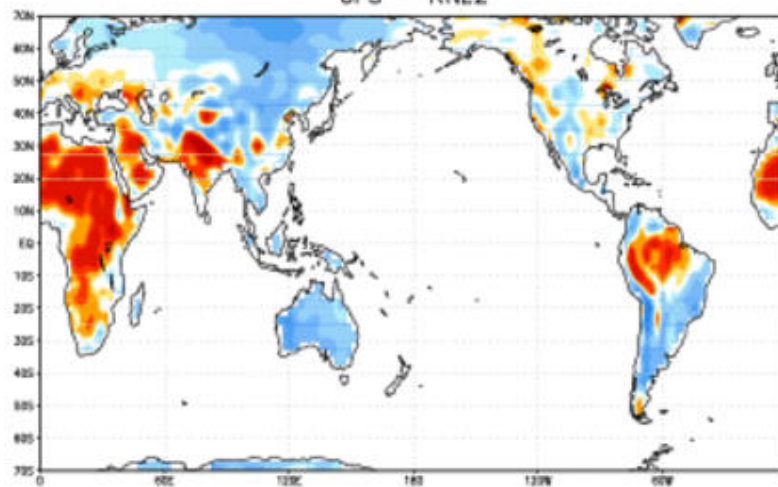


CFS12 BCSST - CFS (mm/day)

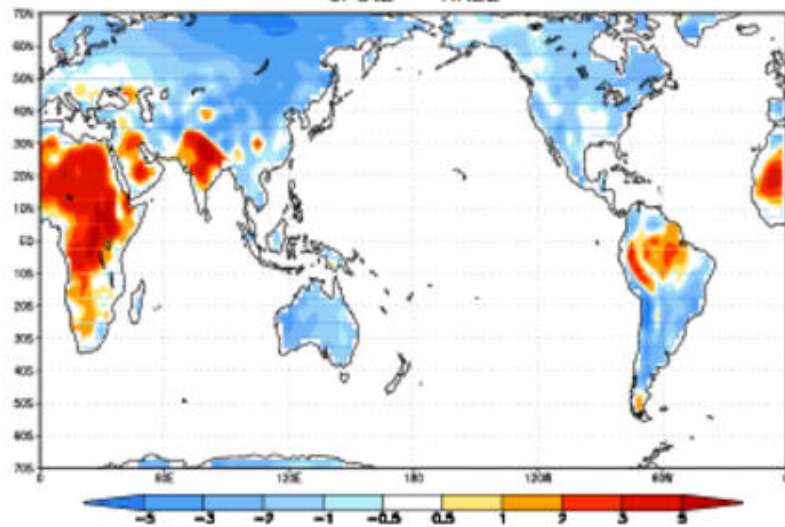


ASO T2m Climatology

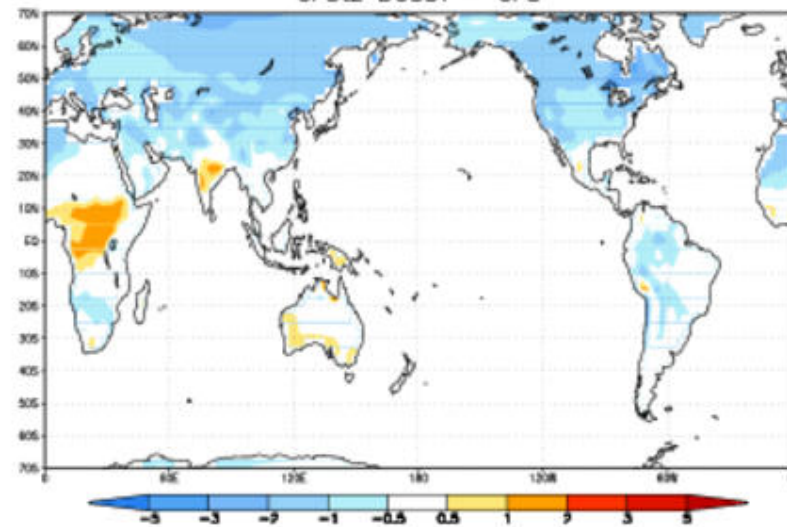
CFS - RNL2



CFS12 - RNL2



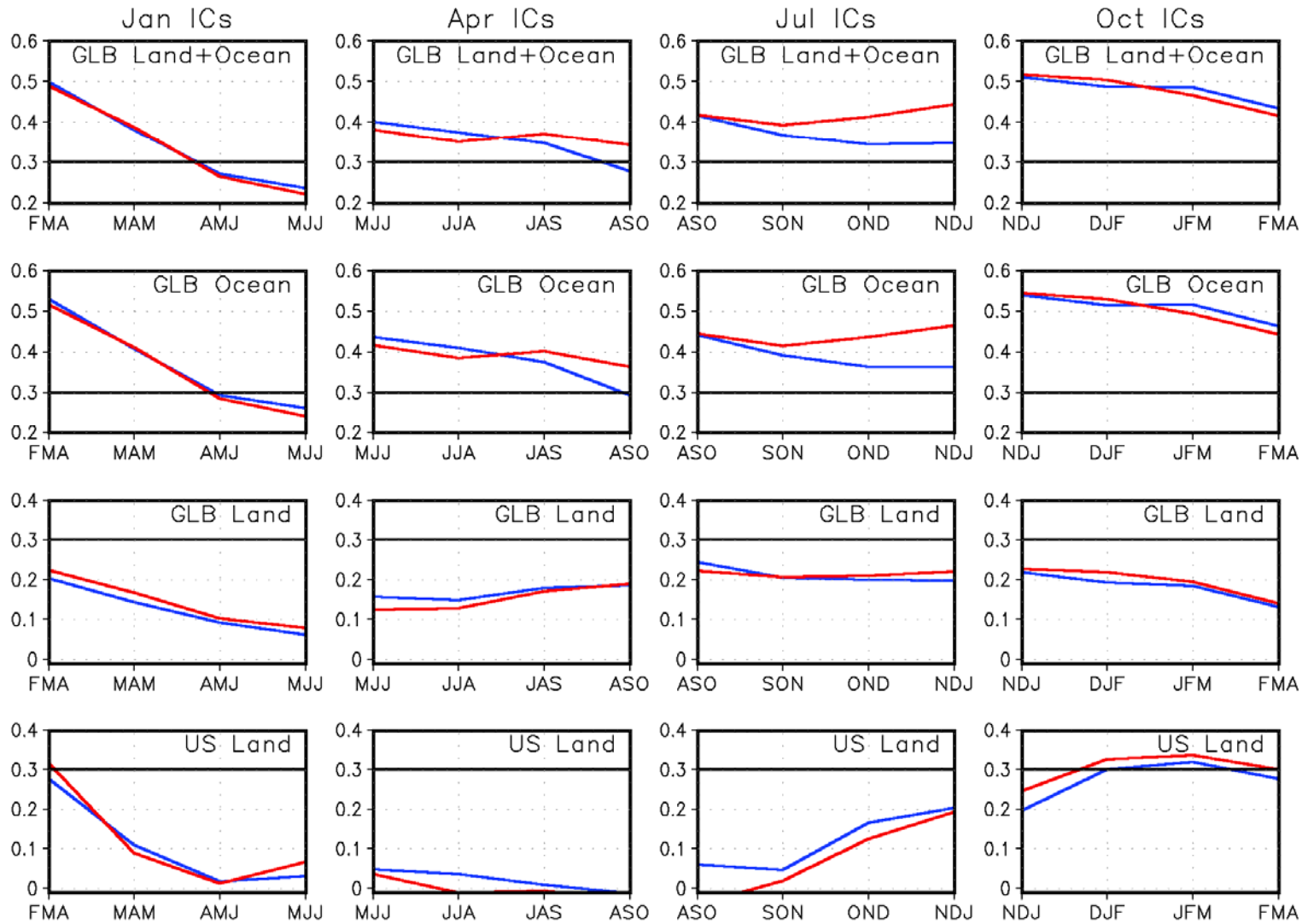
CFS12 BCSST - CFS



Precipitation Skill of CFS forecasts

— Tier 1

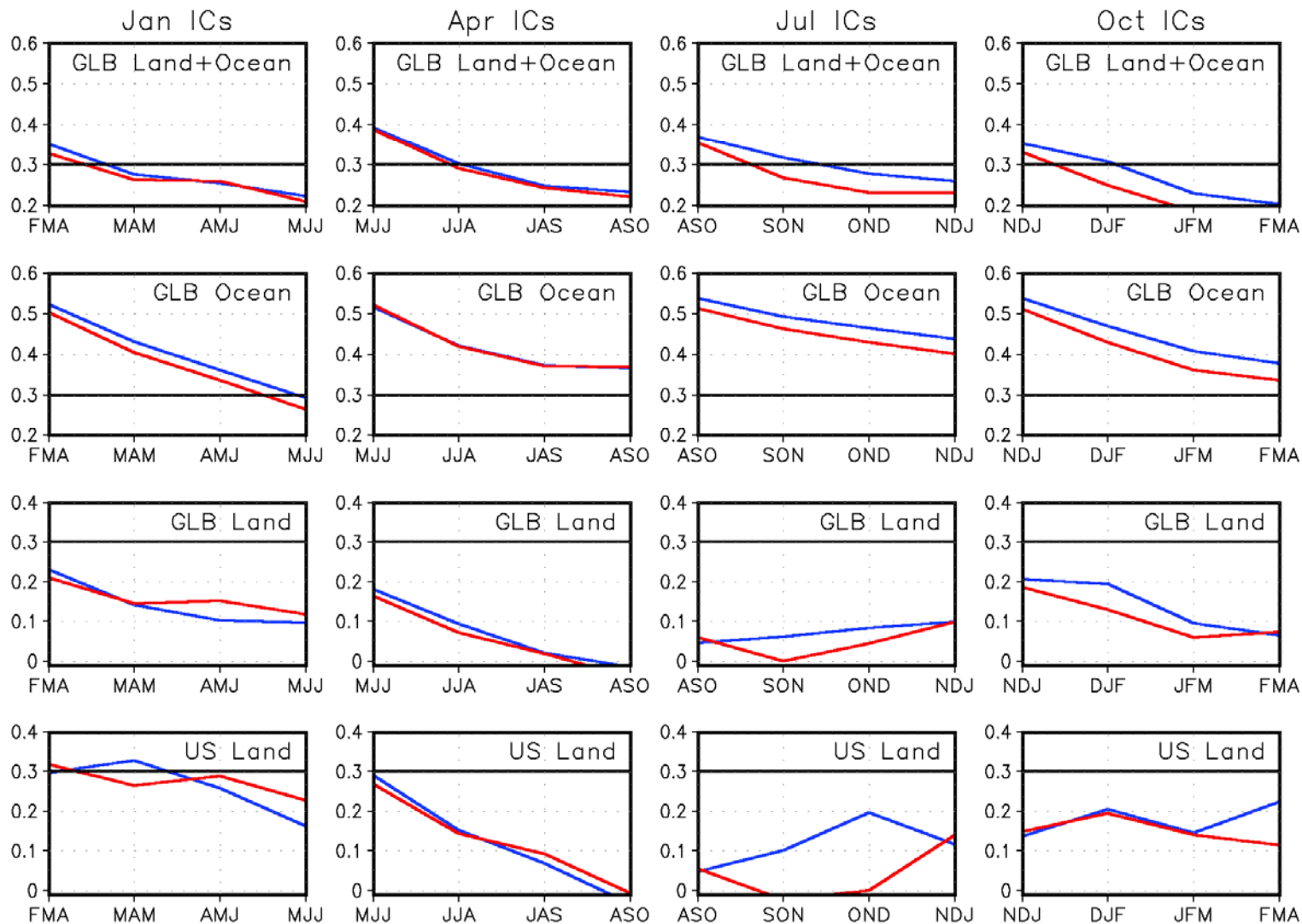
— Tier 2



T2m Skill of CFS forecasts

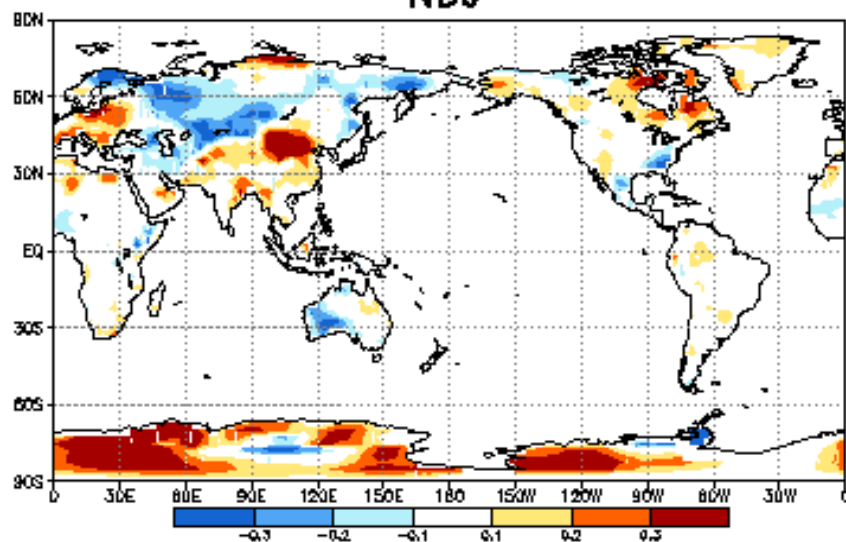
— Tier 1

— Tier 2

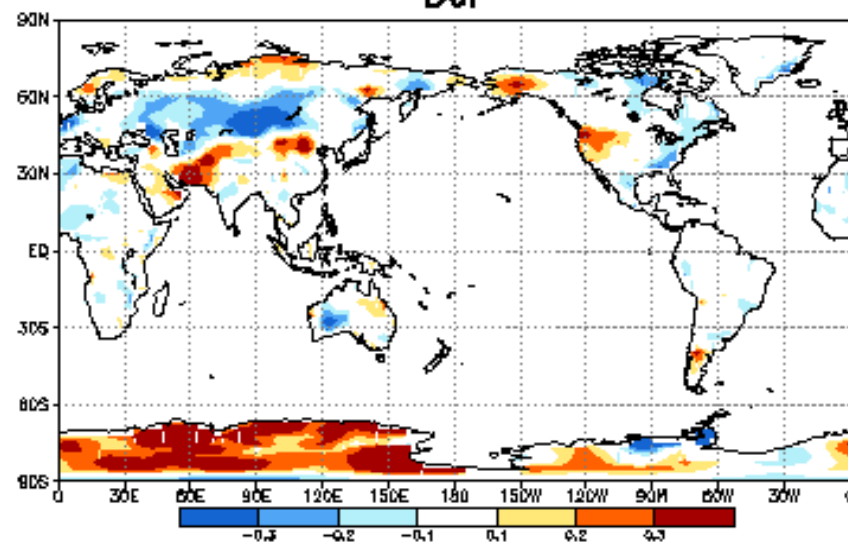


Skill Difference: Tier 2-CFS
Surface Temperatur (2m) (IC:OCT)

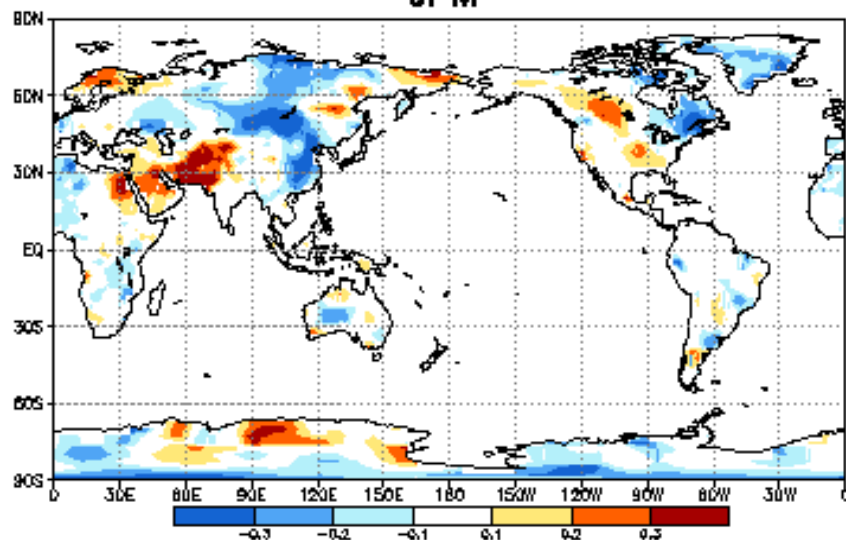
NDJ



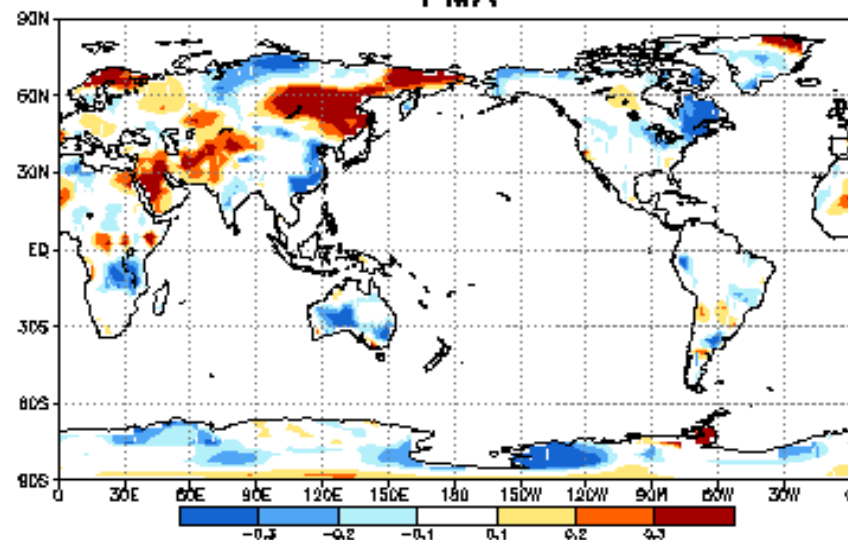
DJF



JFM



FMA



Summary

1. Analyses concentrated on precipitation and surface temperature so far.
2. Some reduction in Tropical precipitation error realized in longer lead times. Positive impact on coastal areas of Asia and NA.
3. Impact of SST corrections in mid-latitude areas shows very localized response, e. g., some improvement in both variables over west coast and eastern sector of NA.
4. Further analyses needed to explain the changes in CFS response to SST corrections.