

2356-15

Targeted Training Activity: ENSO-Monsoon in the Current and Future Climate

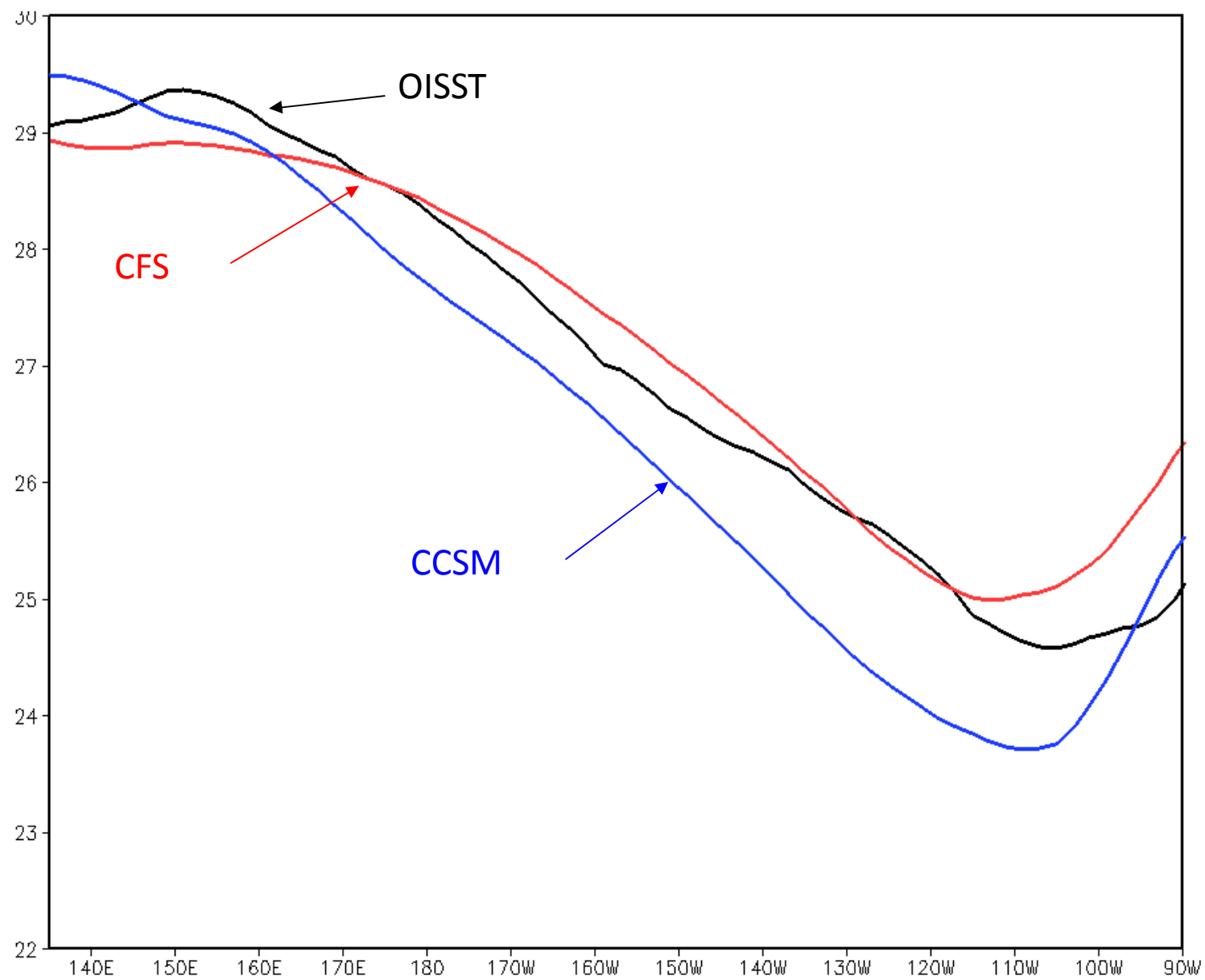
30 July - 10 August, 2012

ENSO in Models

KIRTMAN Benjamin Paul

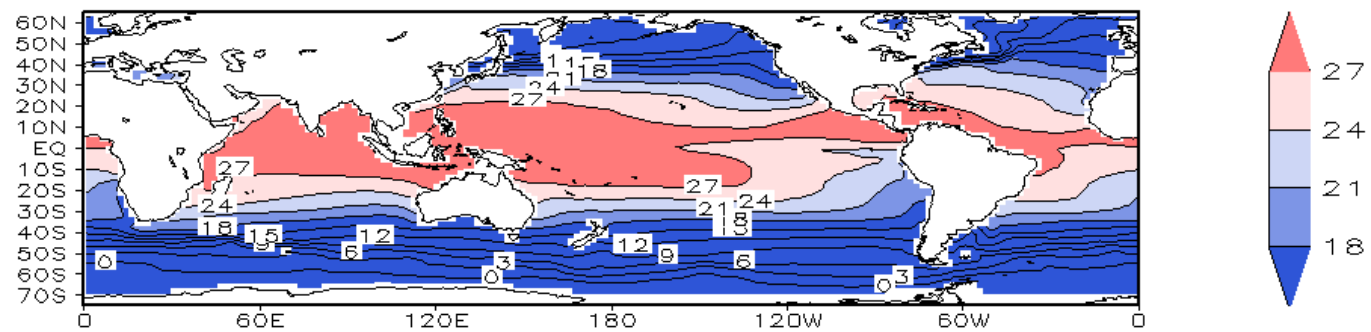
*Rosenstiel School of Marine and Atmospheric Science, University of Miami
4600 Rickenbacker Causeway Miami 33149
Florida
U.S.A.*

Equatorial Pacific SST

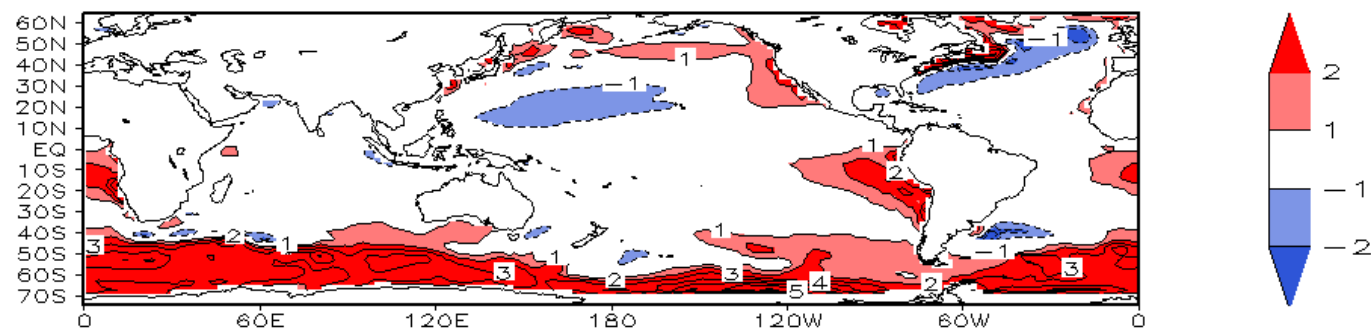


Annual Mean Sea Surface Temperature

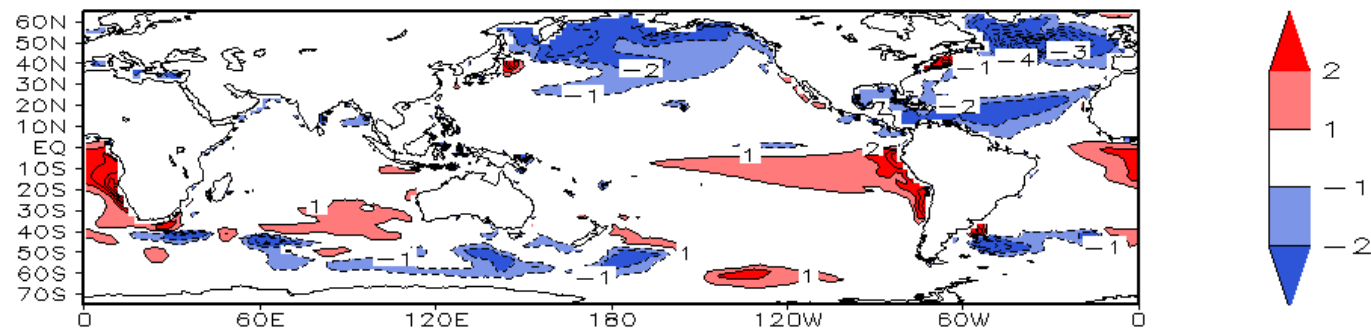
OISST



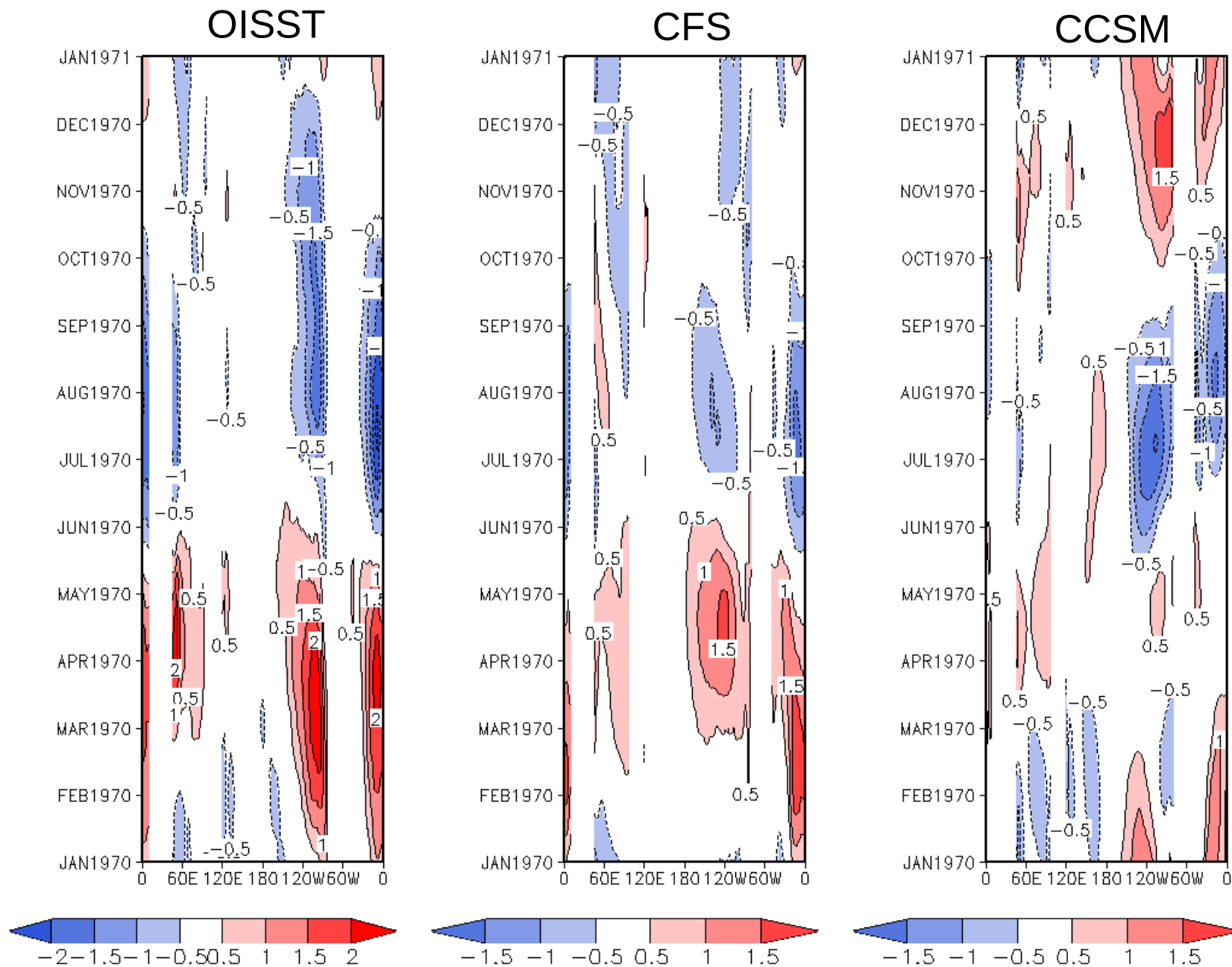
CFS Error



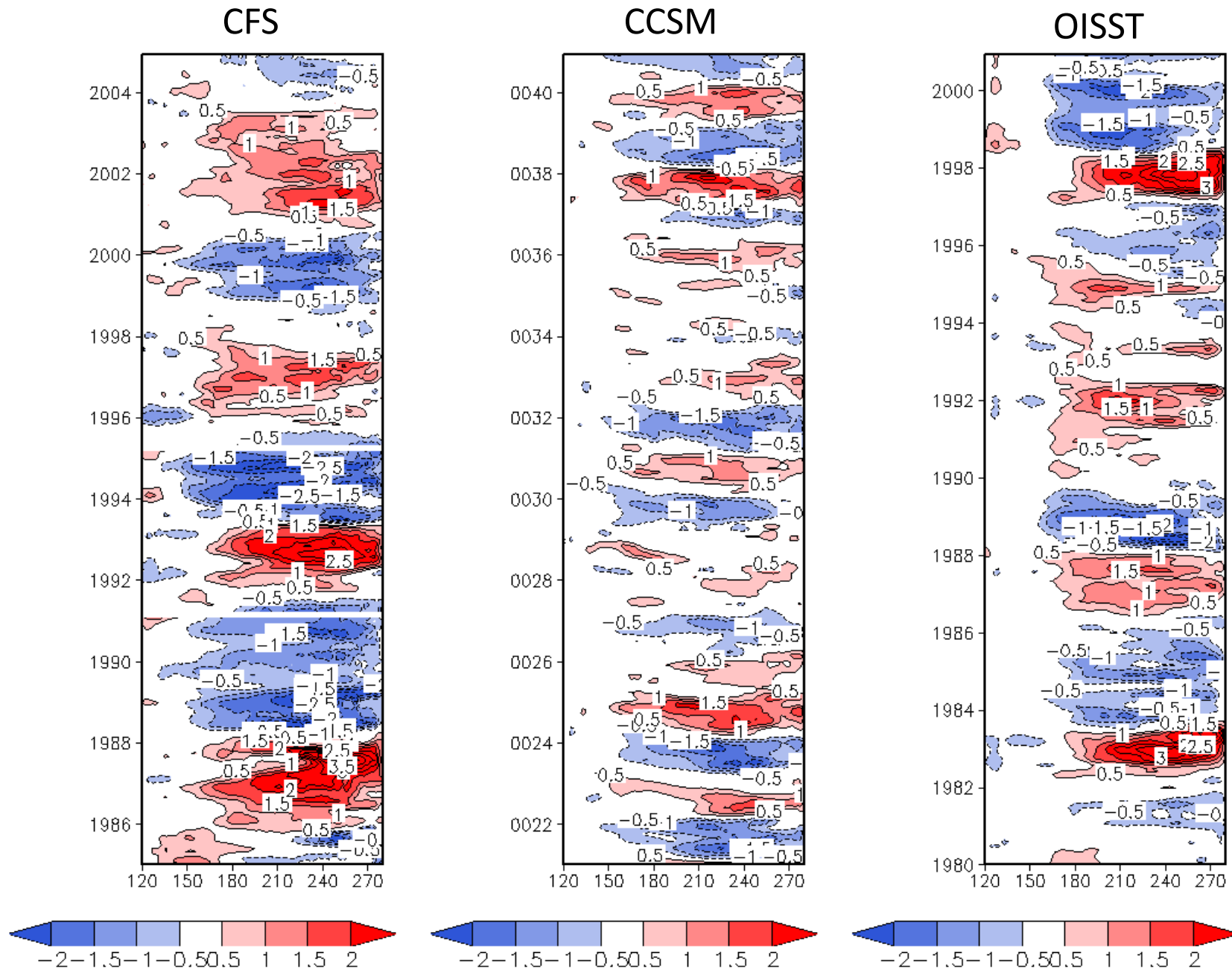
CCSM Error



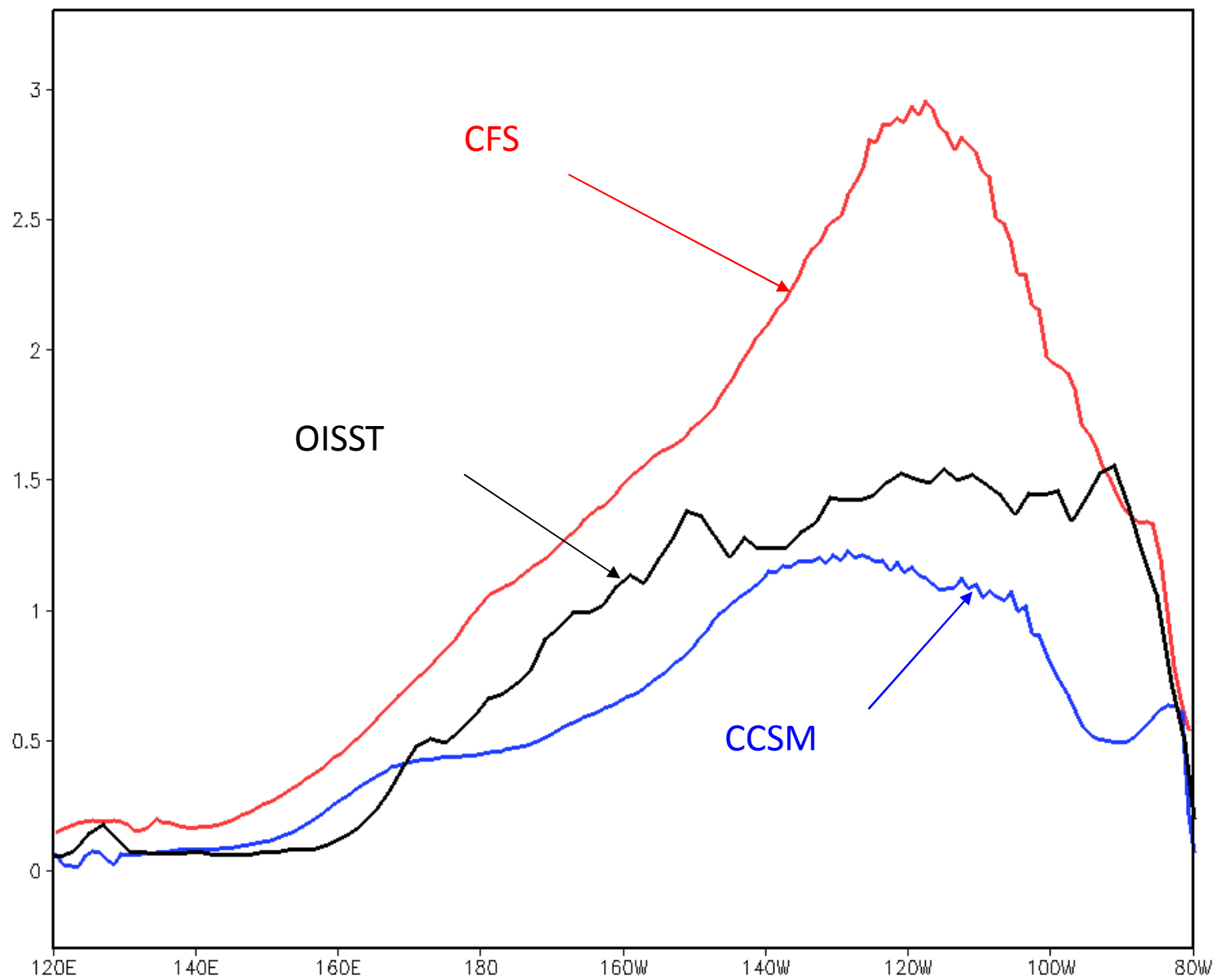
Equatorial SST Annual Cycle



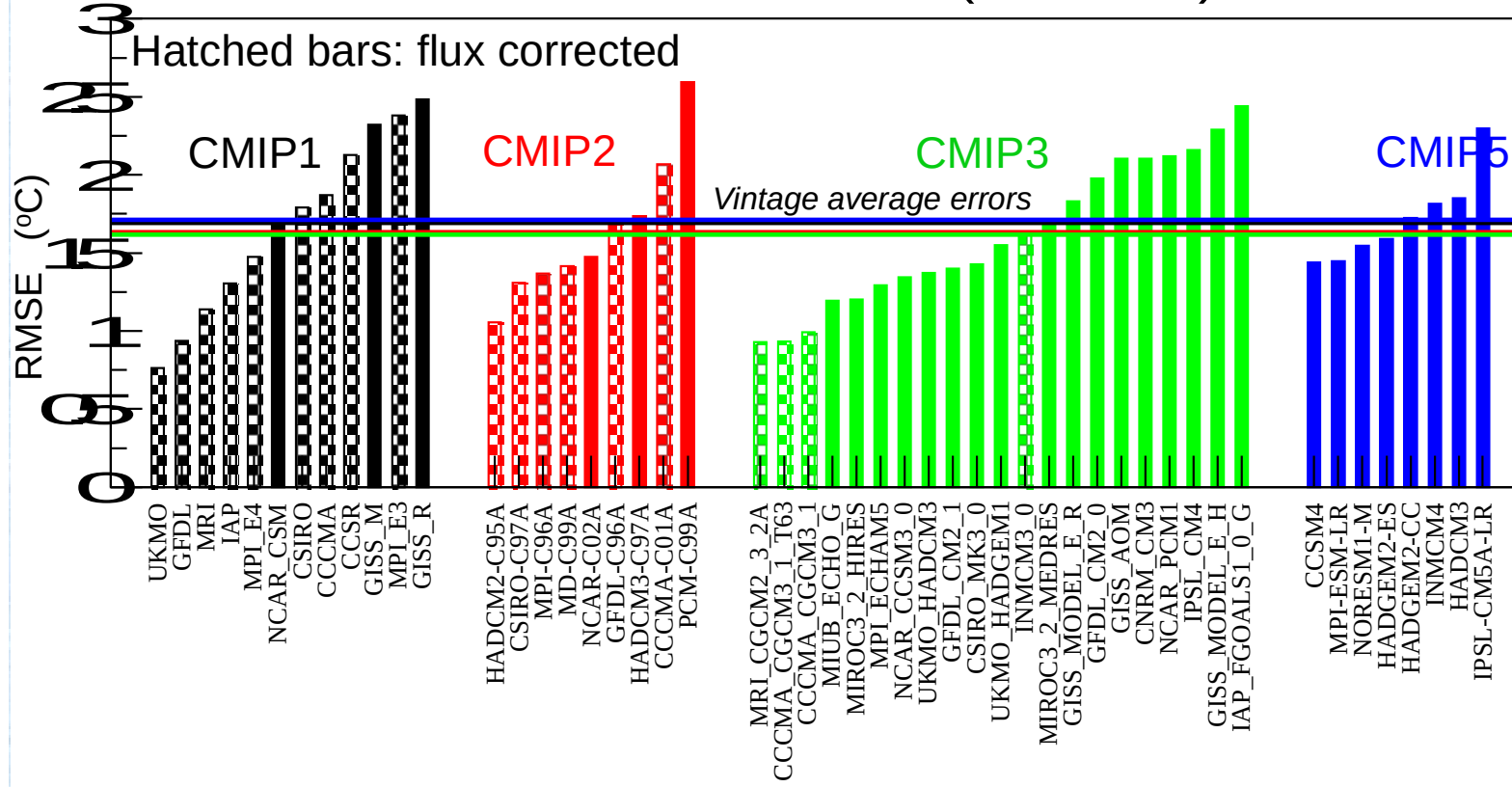
Equatorial Pacific SSTA

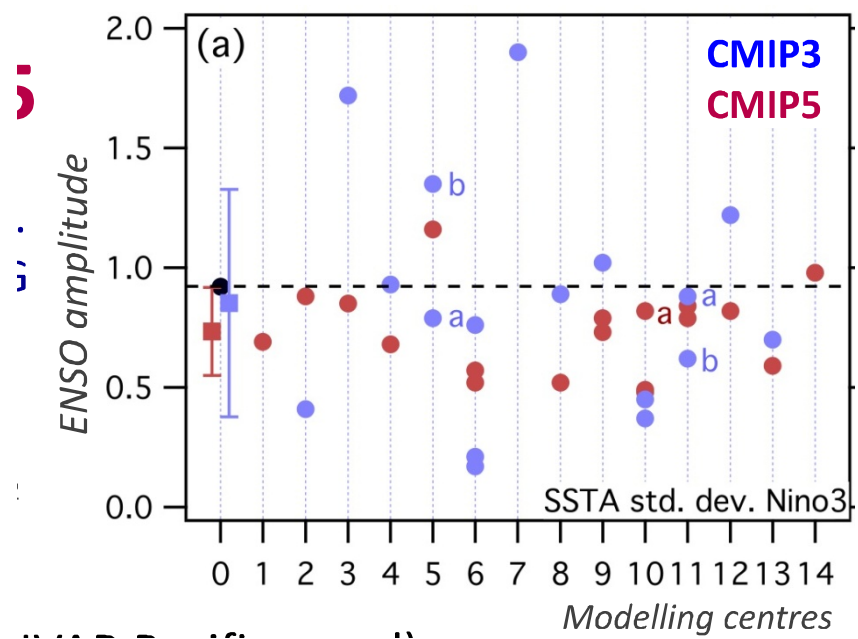


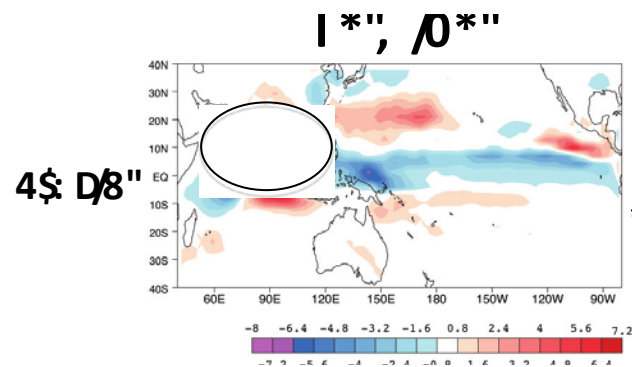
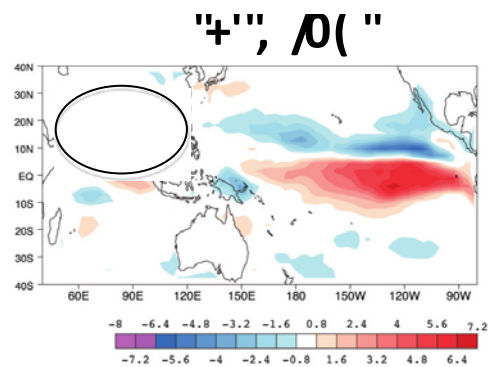
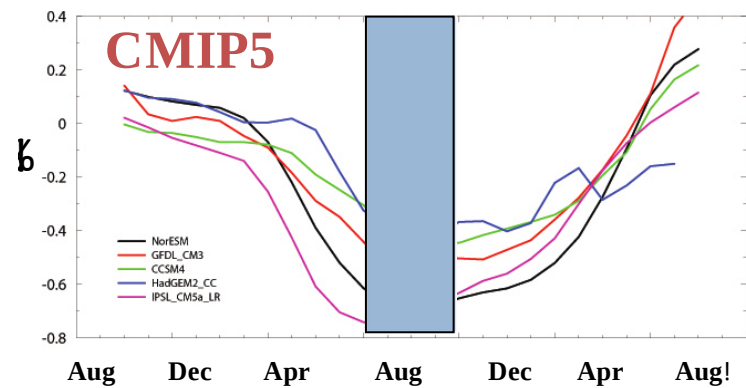
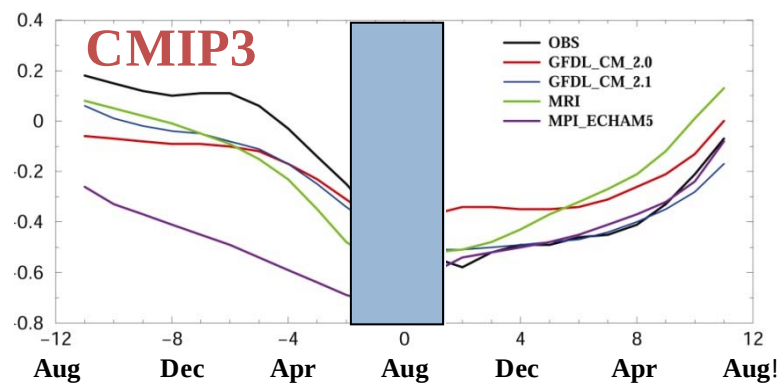
Equatorial Pacific SST Variance



DJF SST Error (50N-50S)

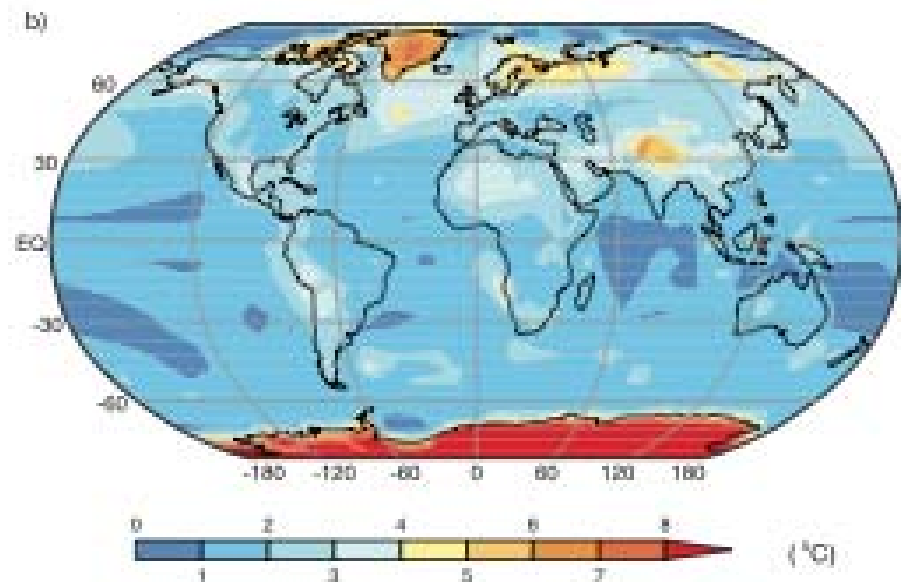
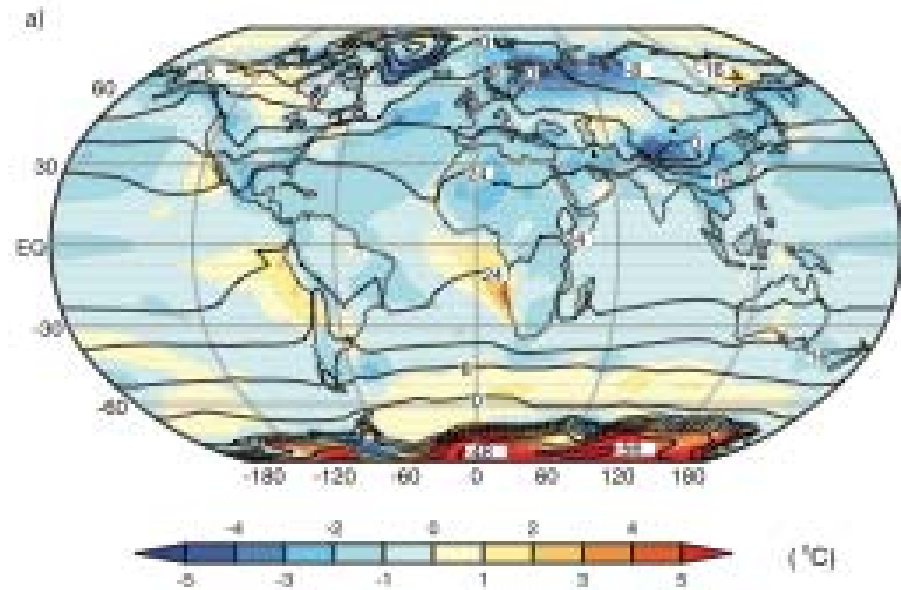
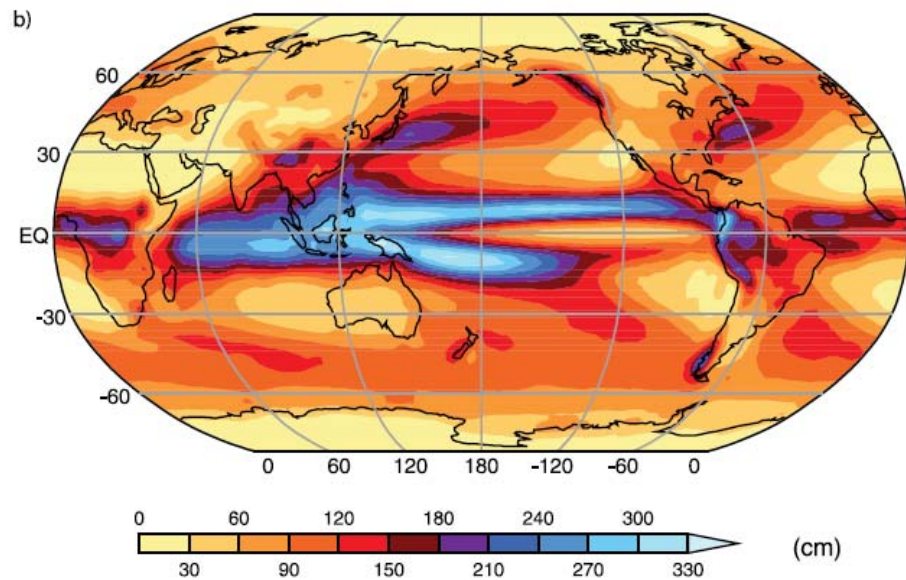
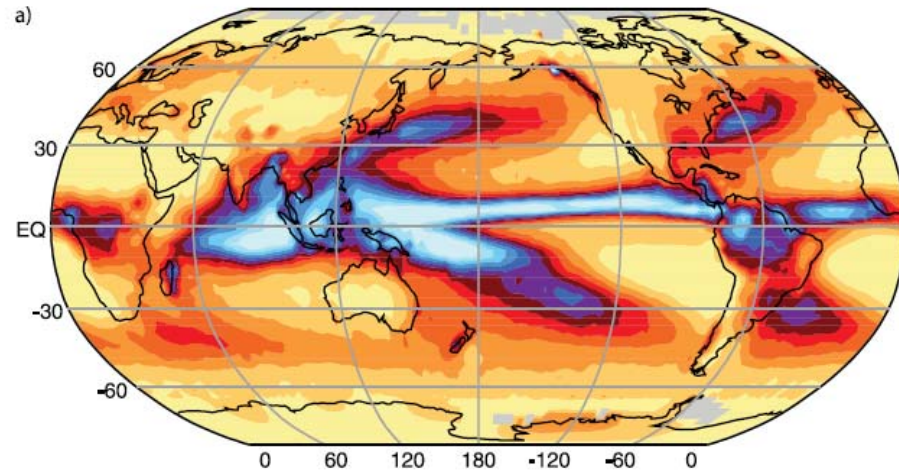




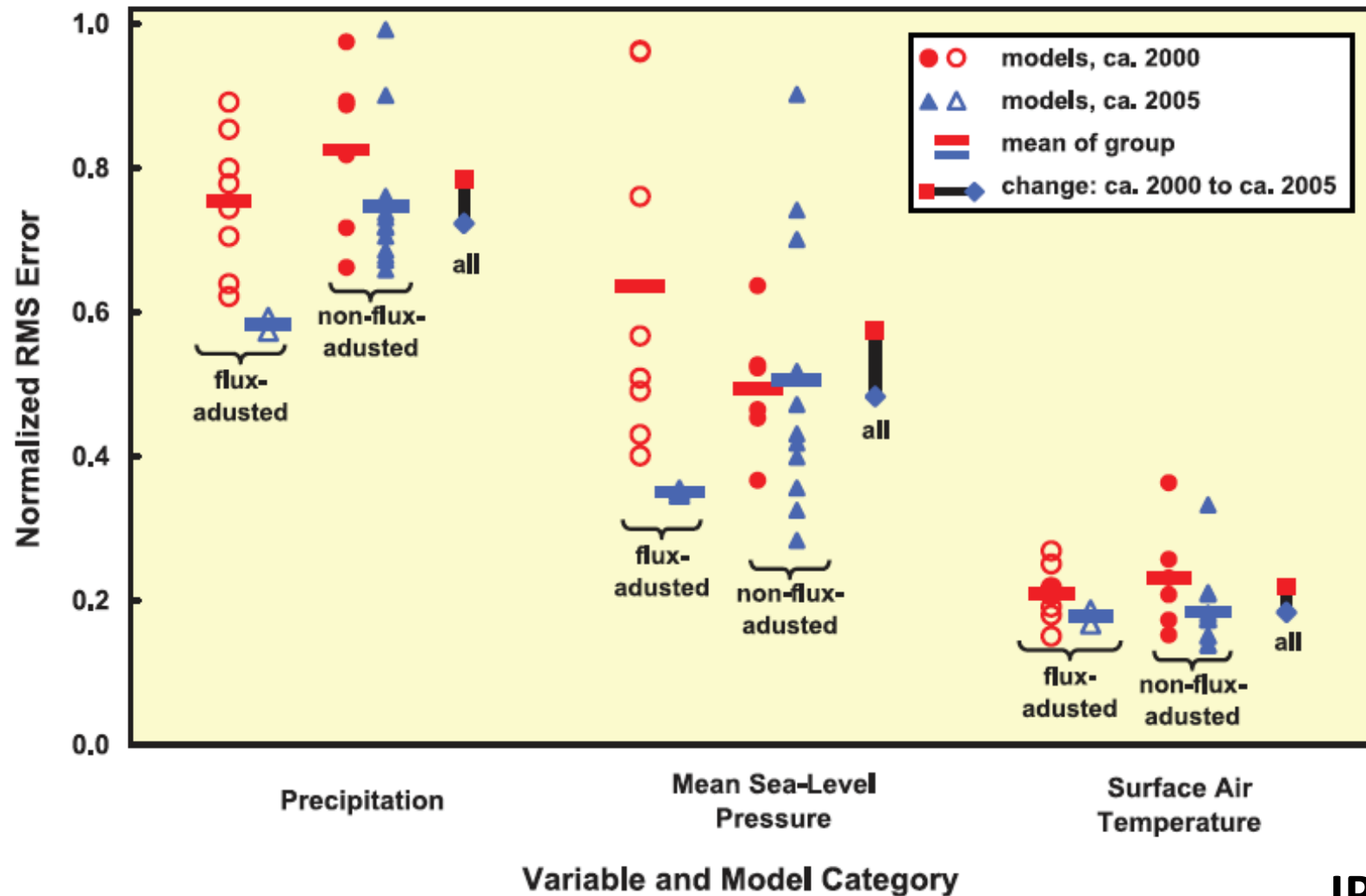


4\$ D/8"

CMIP3 Errors: Rainfall and SST

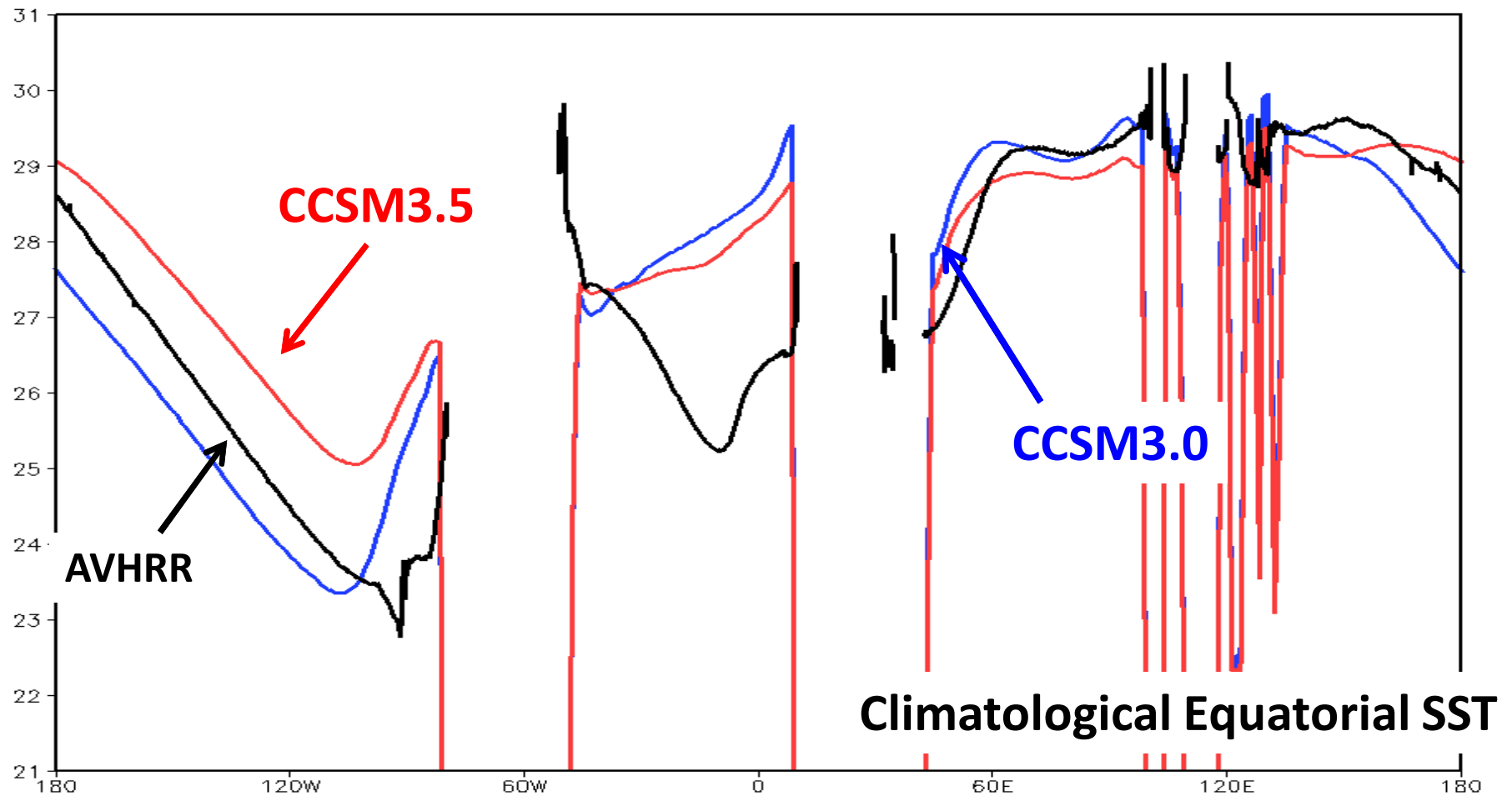


Have Models Improved? Maybe, Not in the Atlantic

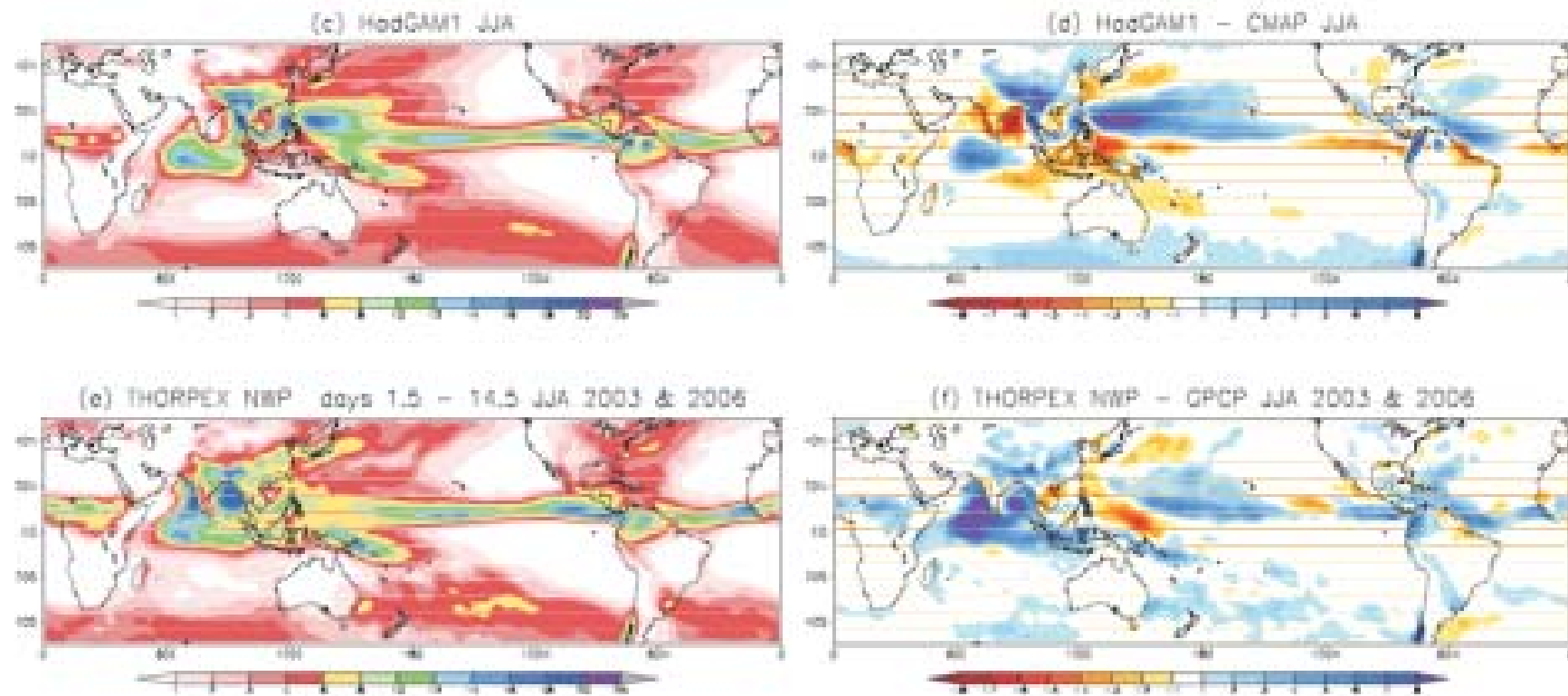


Affect of Improved Parameterized Physics

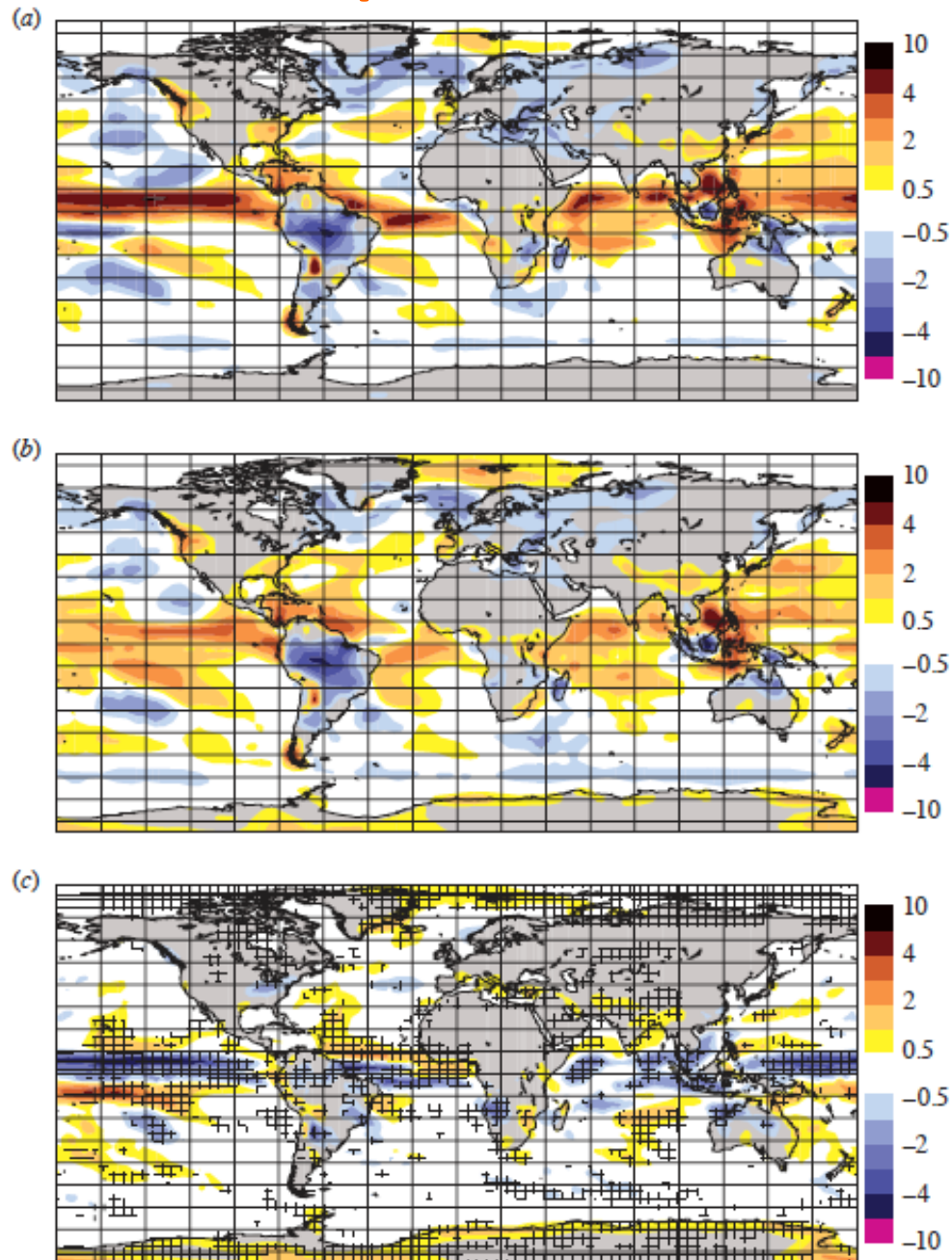
- **CCSM3.0 vs CCSM3.5**
 - Atmosphere: T85; Ocean 1x1



Martin et al. (2010): Reduction of Systematic Errors through a Seamless Approach to Modeling Weather and Climate



Precipitation Bias

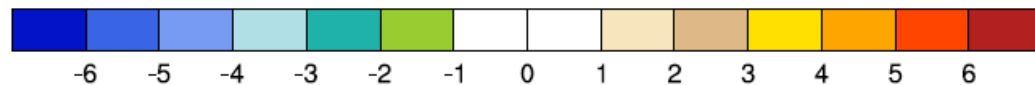
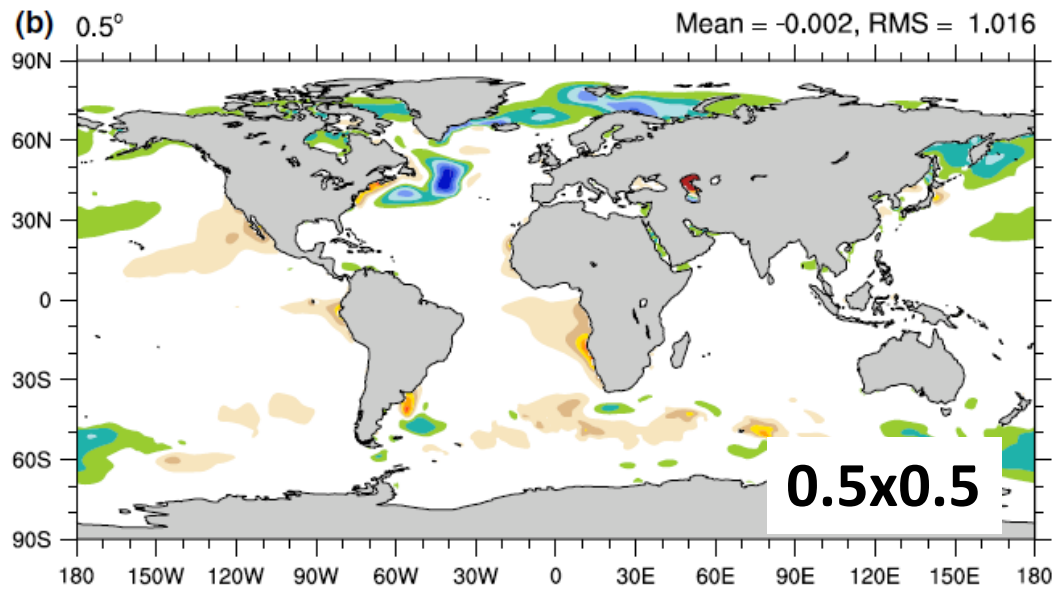
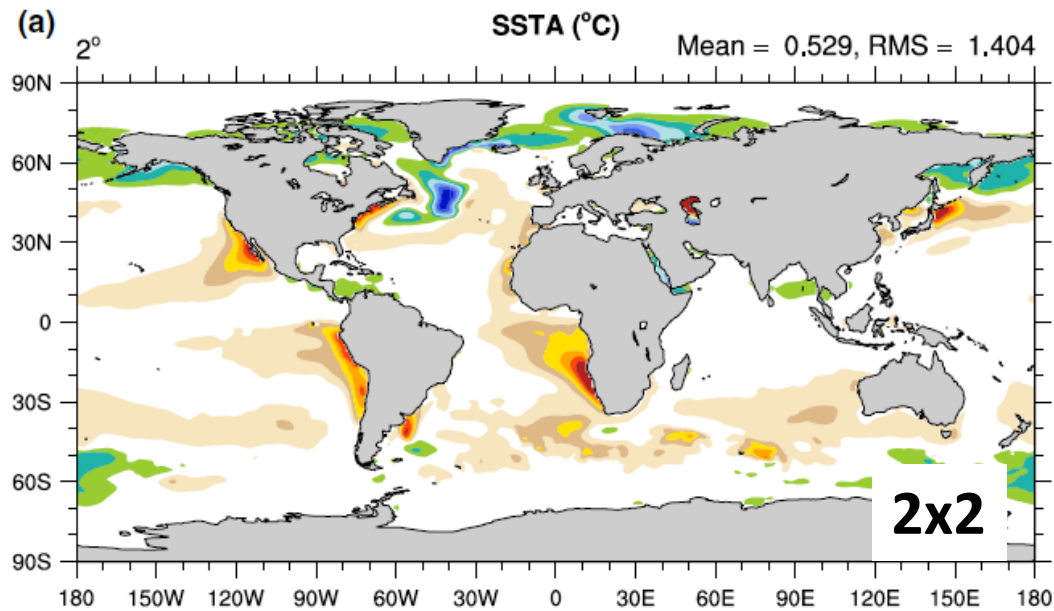


Parameterization of Model Uncertainty:

Stochastic-Dynamic Approaches (Palmer 2001)

Stochastic Physics (Buizza et al. 1999)

Stochastic Backscatter (Berner et al. 2008)

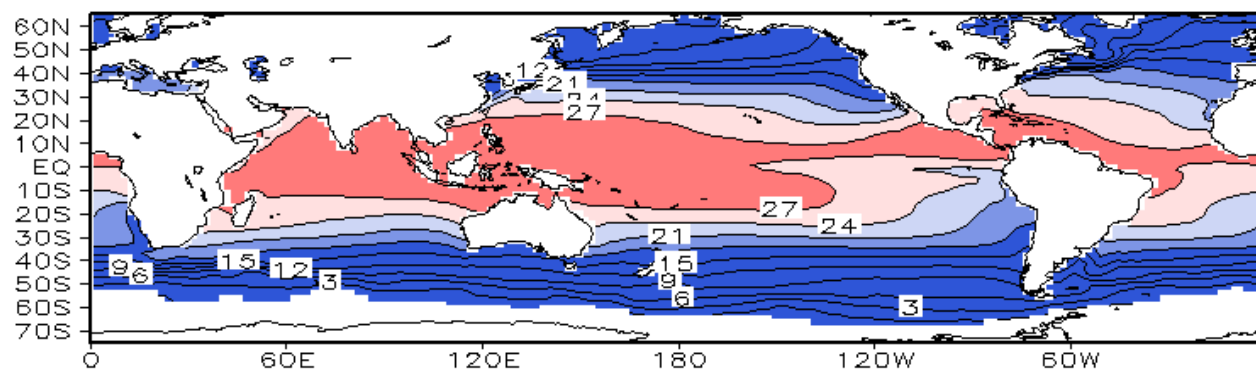


Increasing AGCM Resolution:
2x2 vs 0.5x0.5

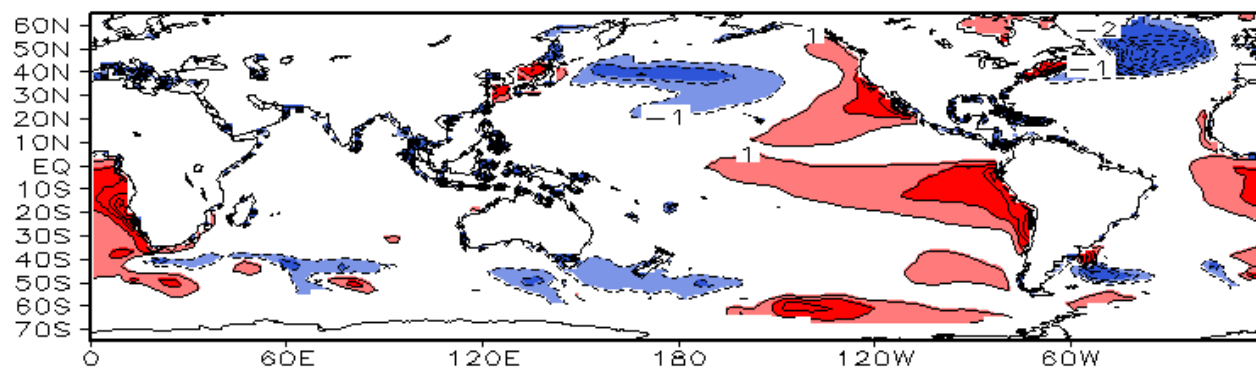
Gent et al. 2010

Annual Mean Sea Surface Temperature

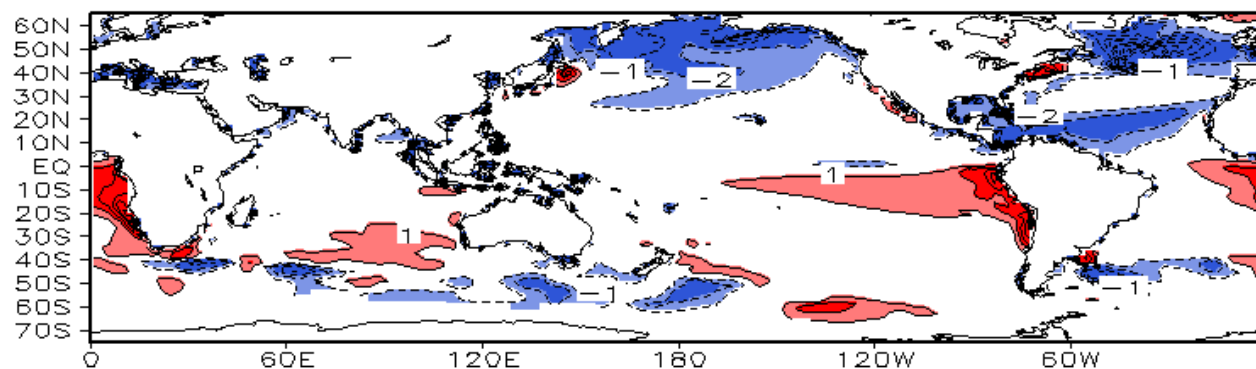
OISST



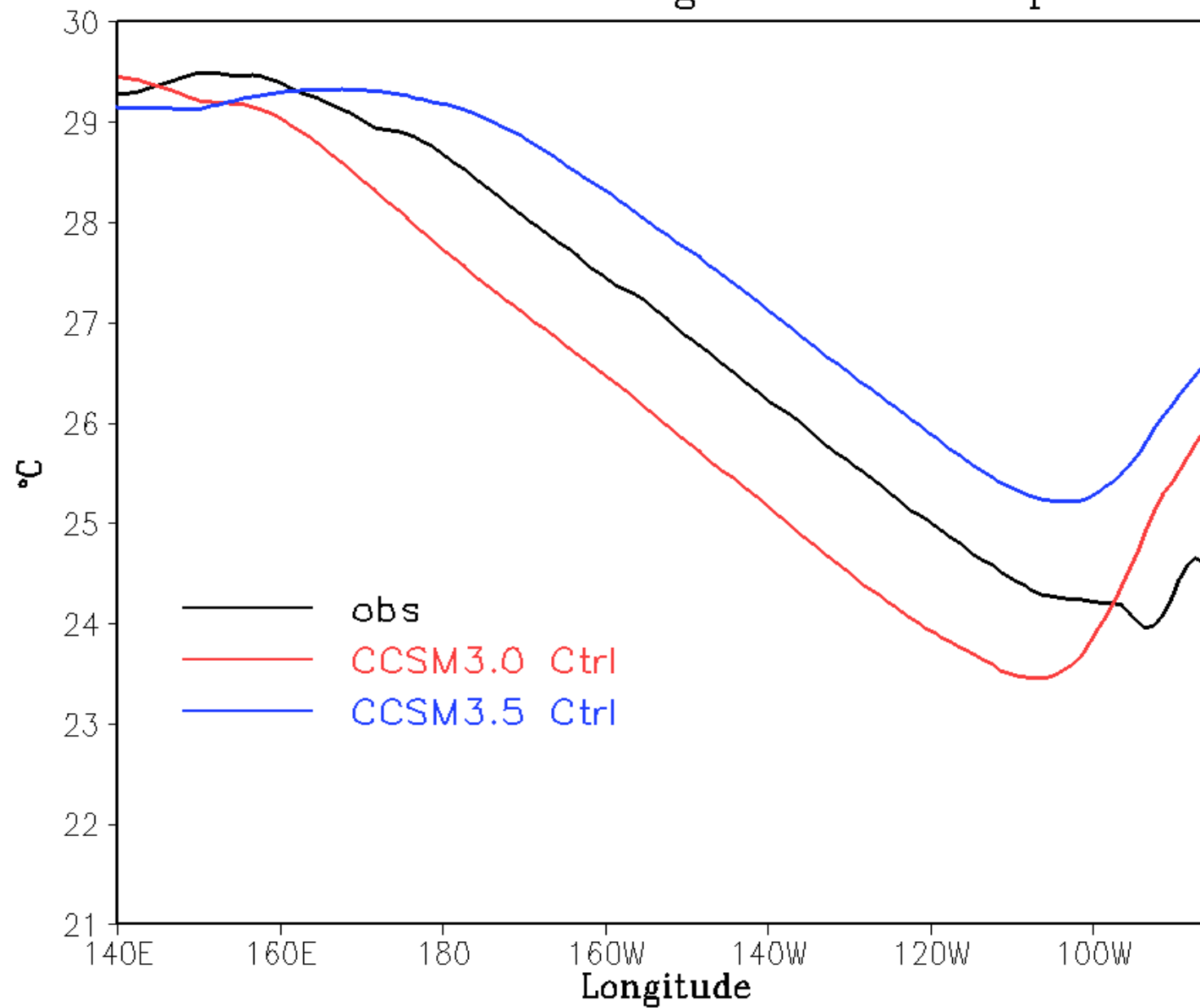
CCSM3.5 Error



CCSM3.0 Error



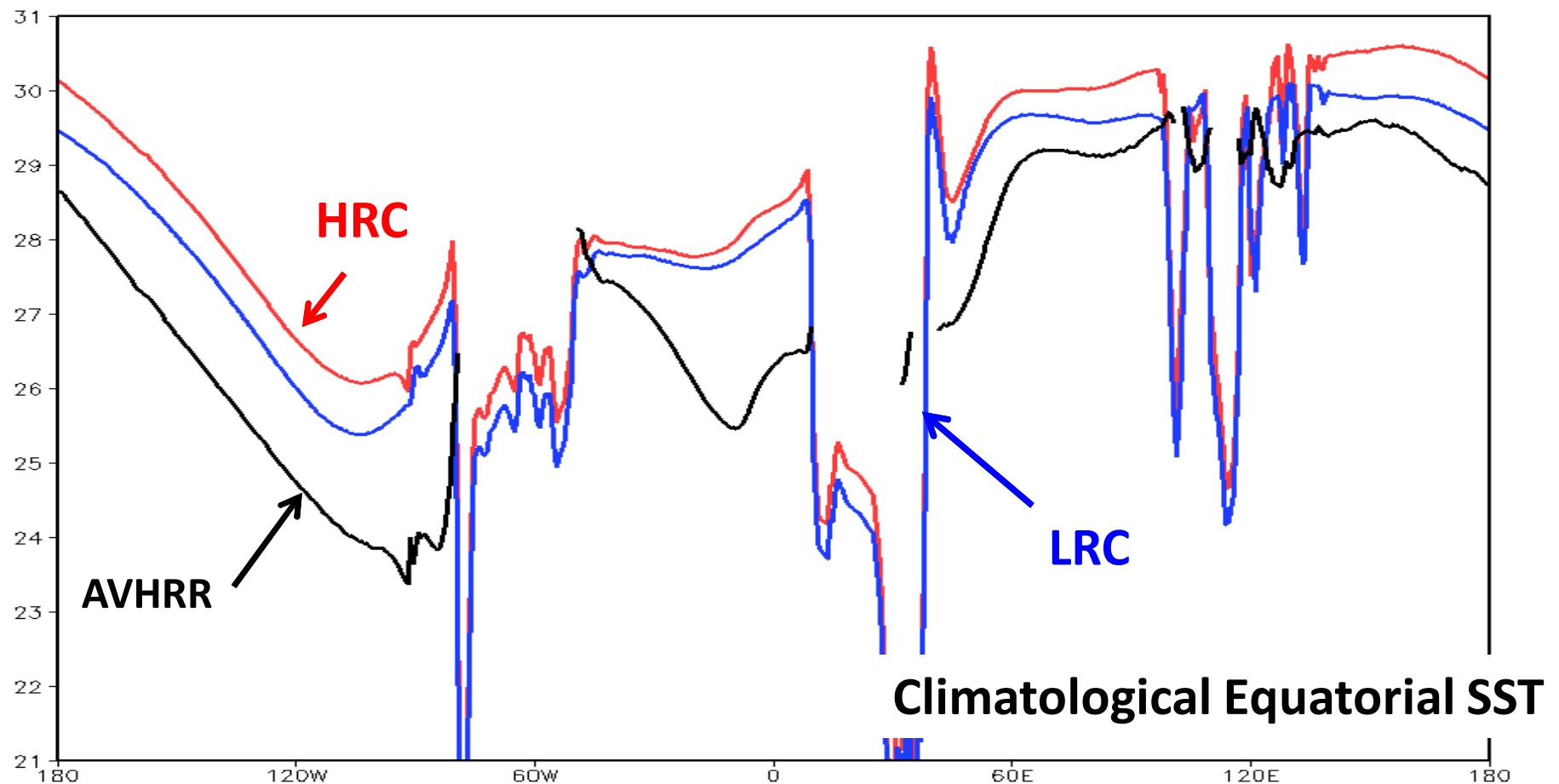
Annual Mean SST Along the Pacific Equator



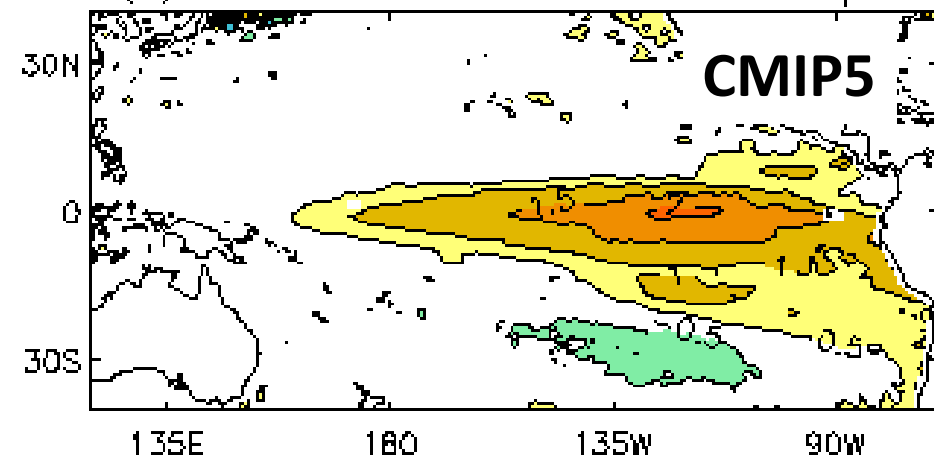
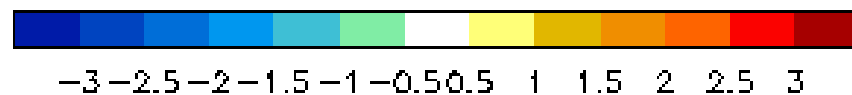
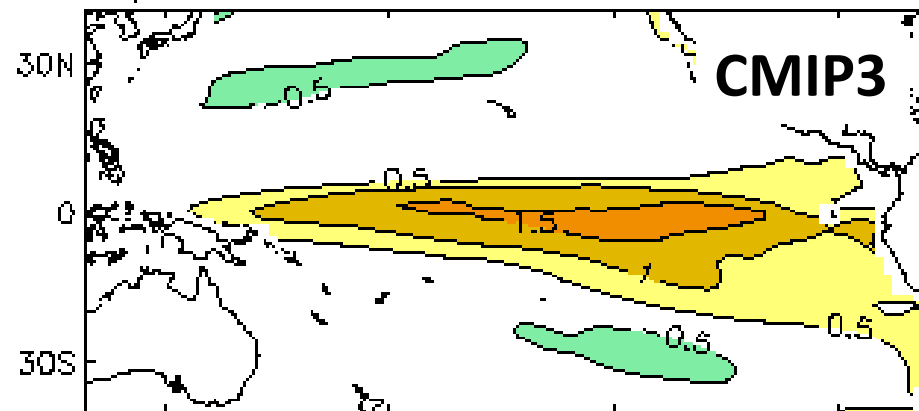
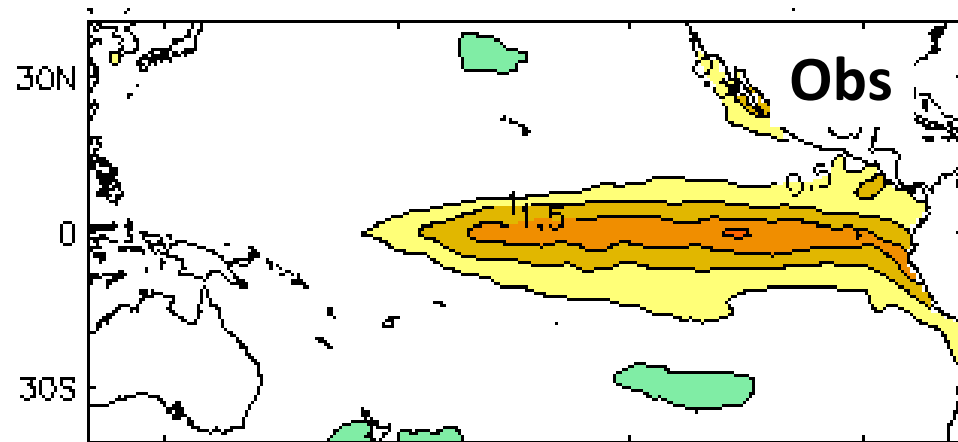
Affect of Resolved Ocean Eddies

- **CCSM4**

- Atmosphere: 0.5x0.5
- Two Versions: 1x1 [**LRC**] and 0.1x0.1 [**HRC**]



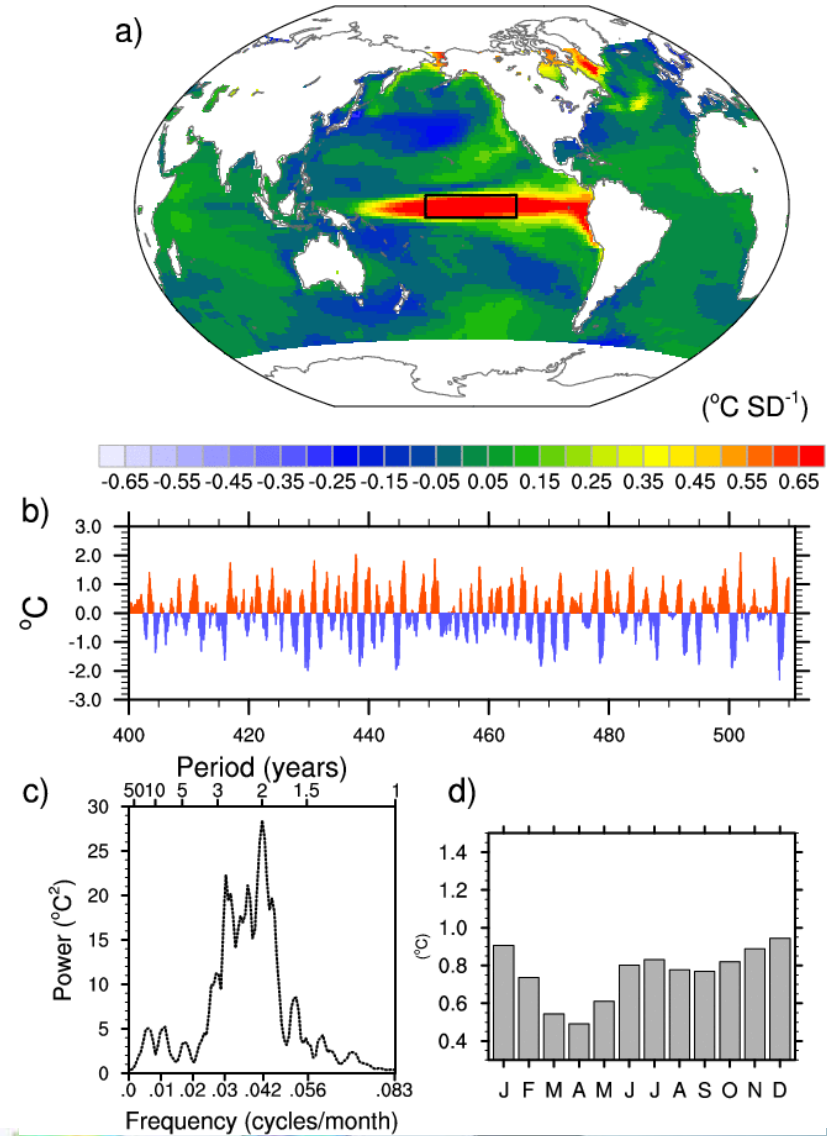
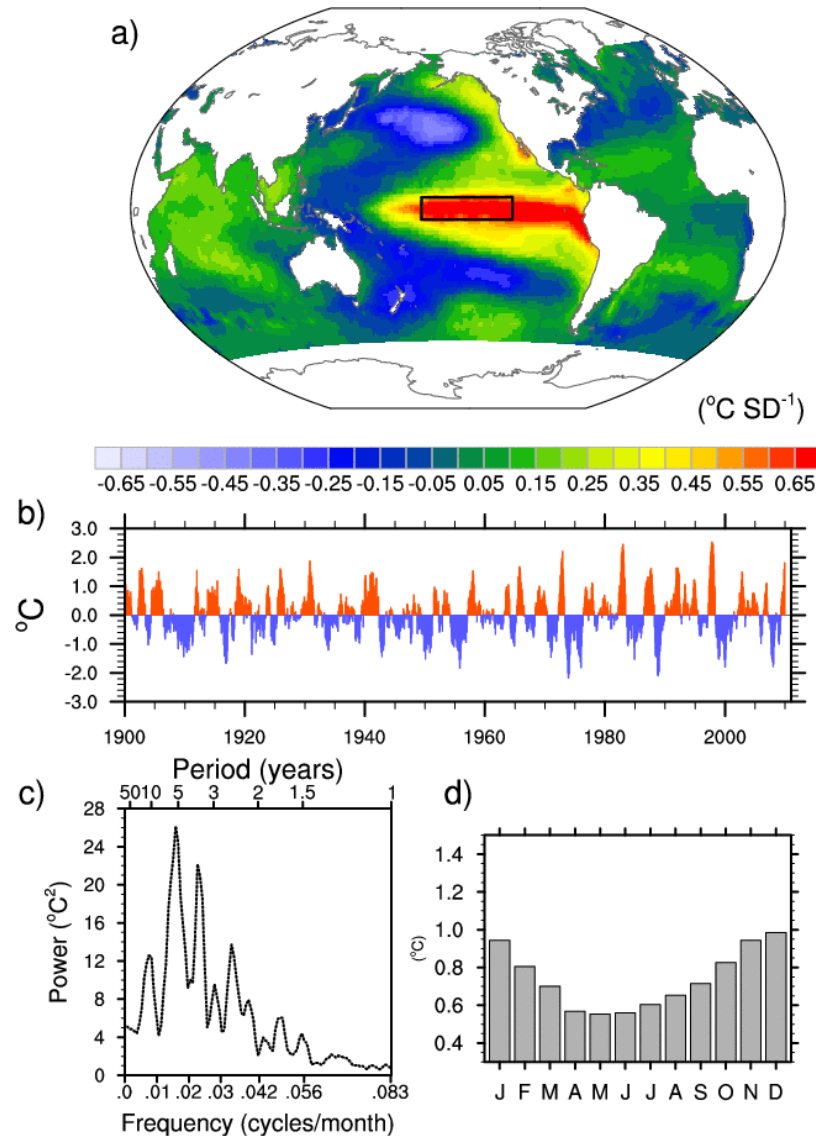
ENSO in Models



Leading Mode of Global SST Variability

Observations Seasonal Capability

CCSM3



Leading Mode of Global SST Variability

Observations Seasonal Capability

CCSM4

