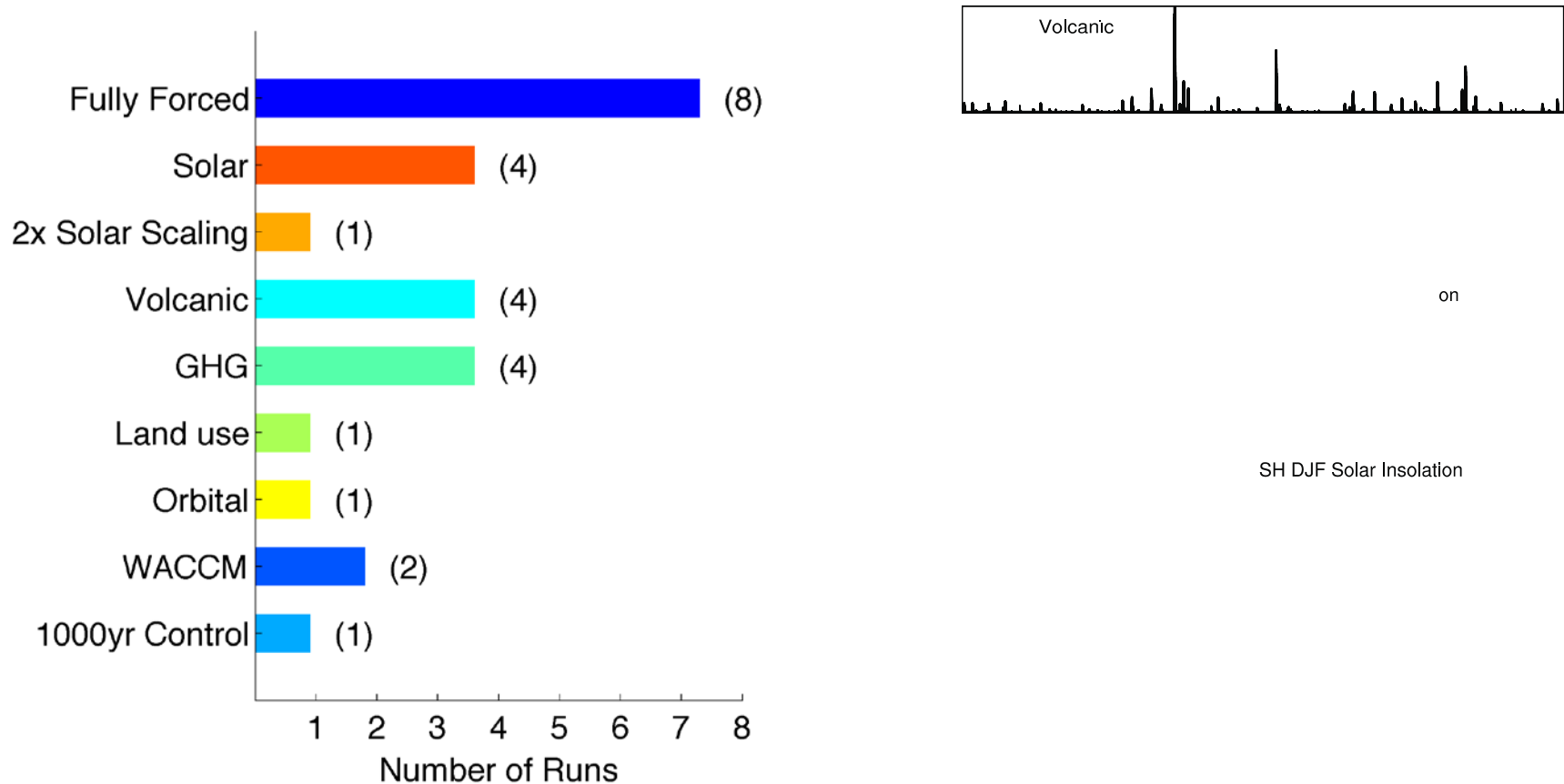


Last Millennium Community Experiments with CESM1.1.1

*Toby Ault and Bette Otto-Bliesner
National Center for Atmospheric Research*

Last Millennium Community Experiments with CESM

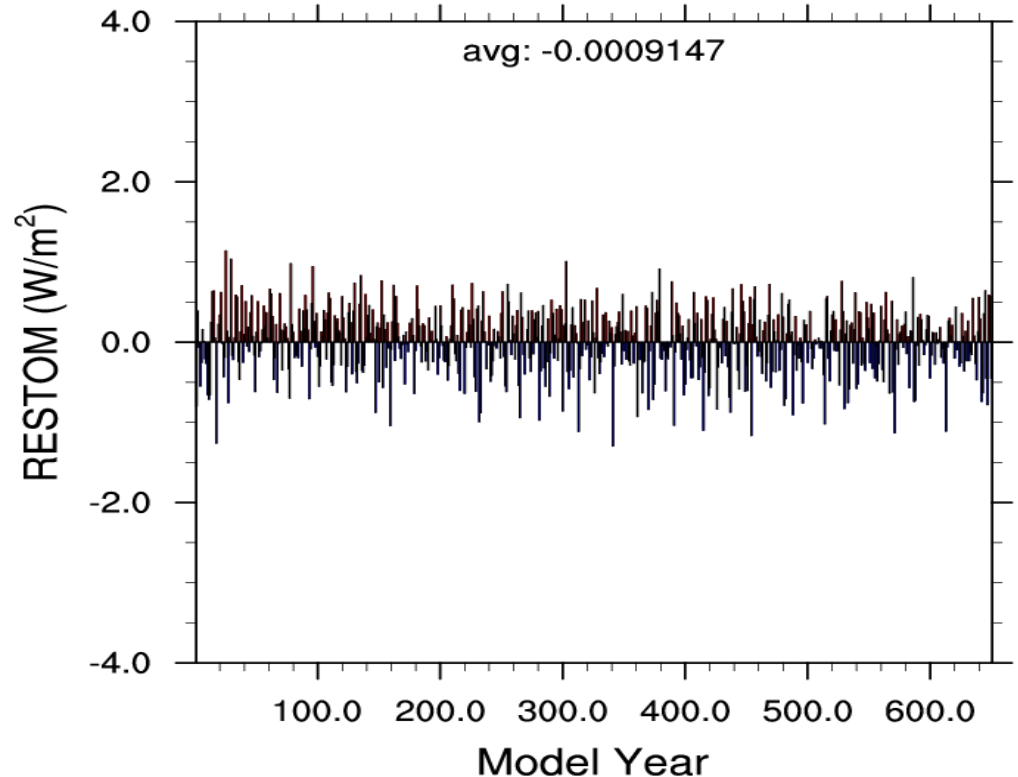


- Motivation: only one full forcing simulation with CCSM4 completed for CMIP5
- New runs: ensembles of fully-forced + single forcing CESM-CAM5 FV2x1 experiments (23) and fully-forced WACCM runs (2)
- Serving user-community (model and data) for assessing and attributing regional climate changes

2-Degree Control Run Specs:

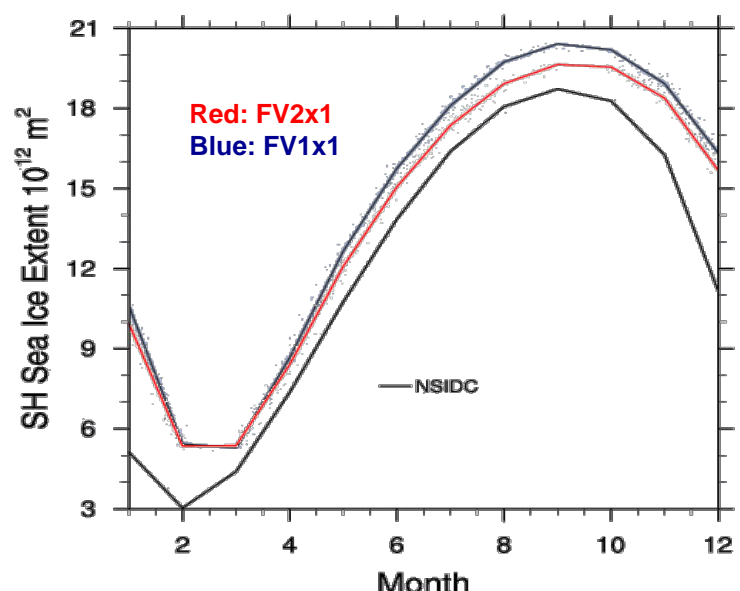
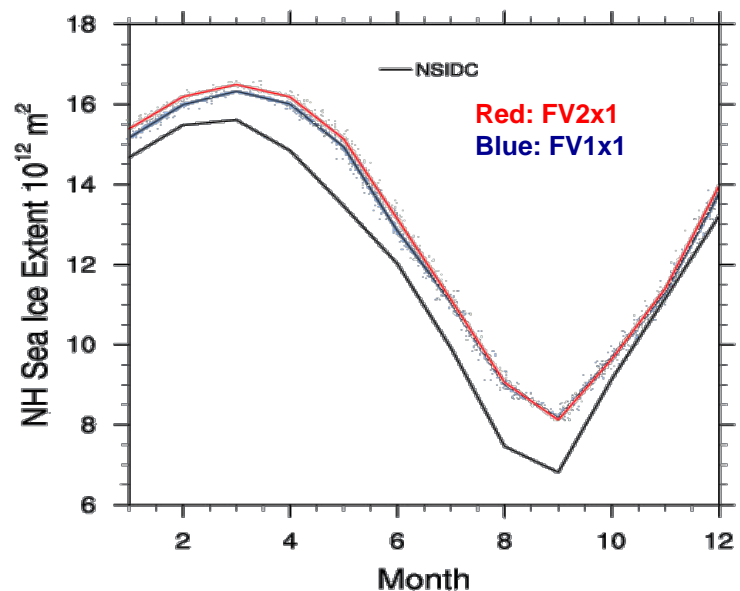
CESM1.1.1
B_1850_CAM5_CN
1.9x2.5_gx1v6

WACCM ozone
“Consistent” orography
Cart3D
Patch mapping

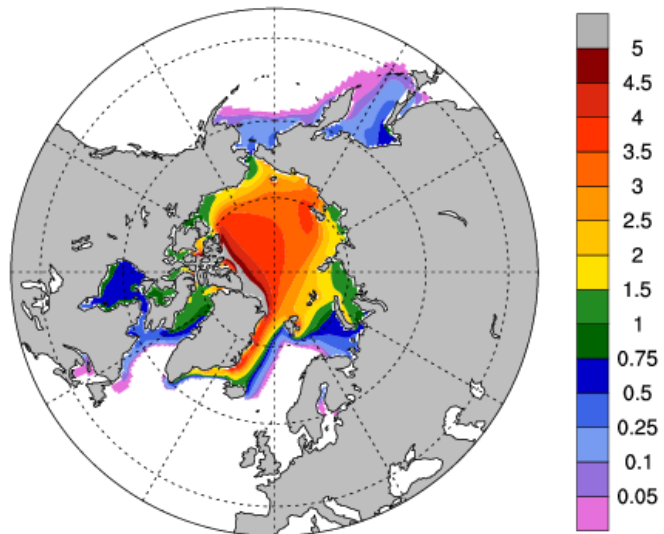


Many thanks ... Andy Mai, Jim Edwards, Cecile Hannay, Michael Levy, Peter Lauritzen and Rich N., Gokhan, Dave B. Esther, Alexandra J.

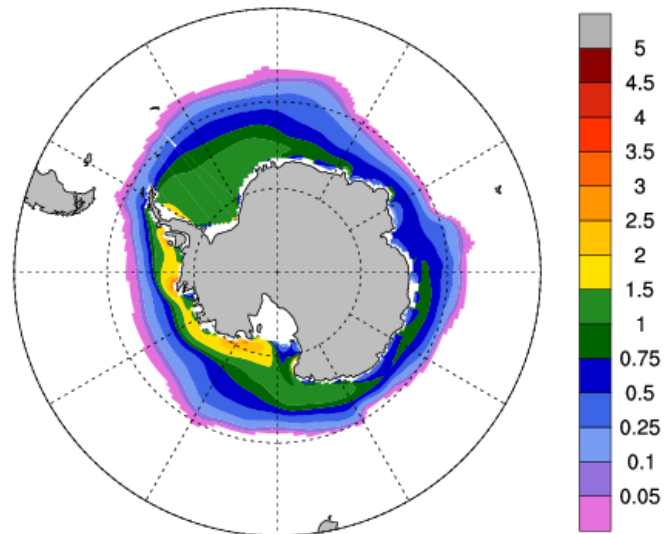
1850 Control FV2x1: Sea ice



grid cell mean ice thickness m

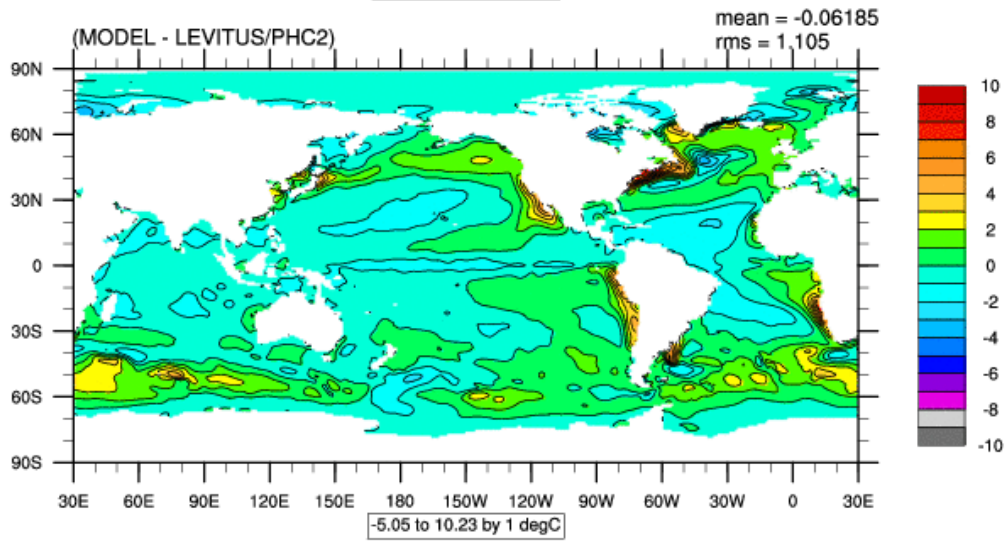
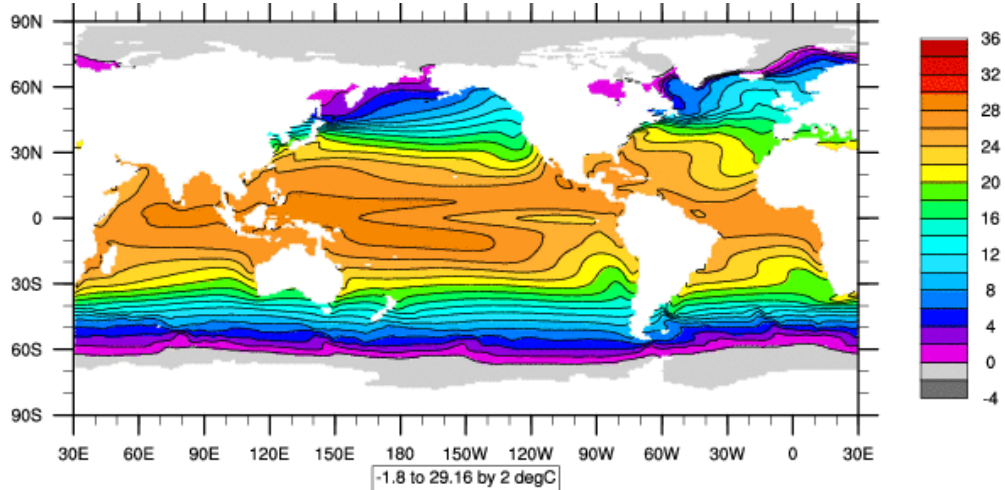


grid cell mean ice thickness m

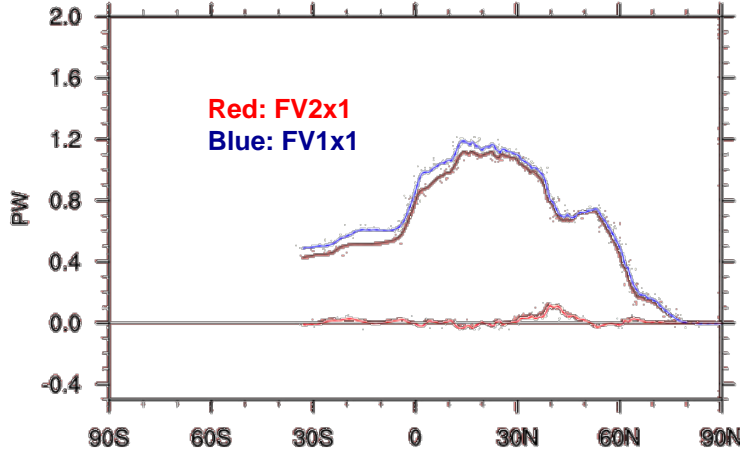


1850 Control FV2x1: Ocean

Sea surface temperature

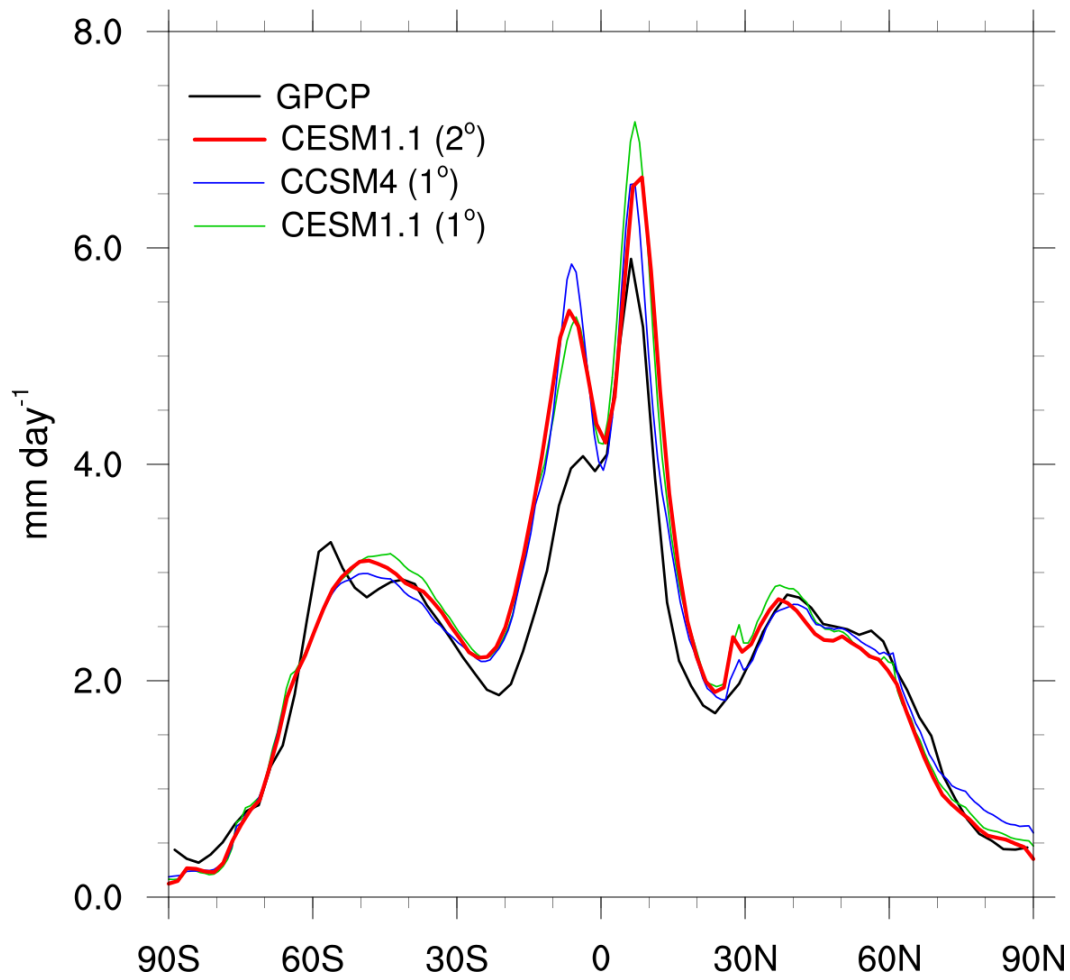


Atlantic OHT

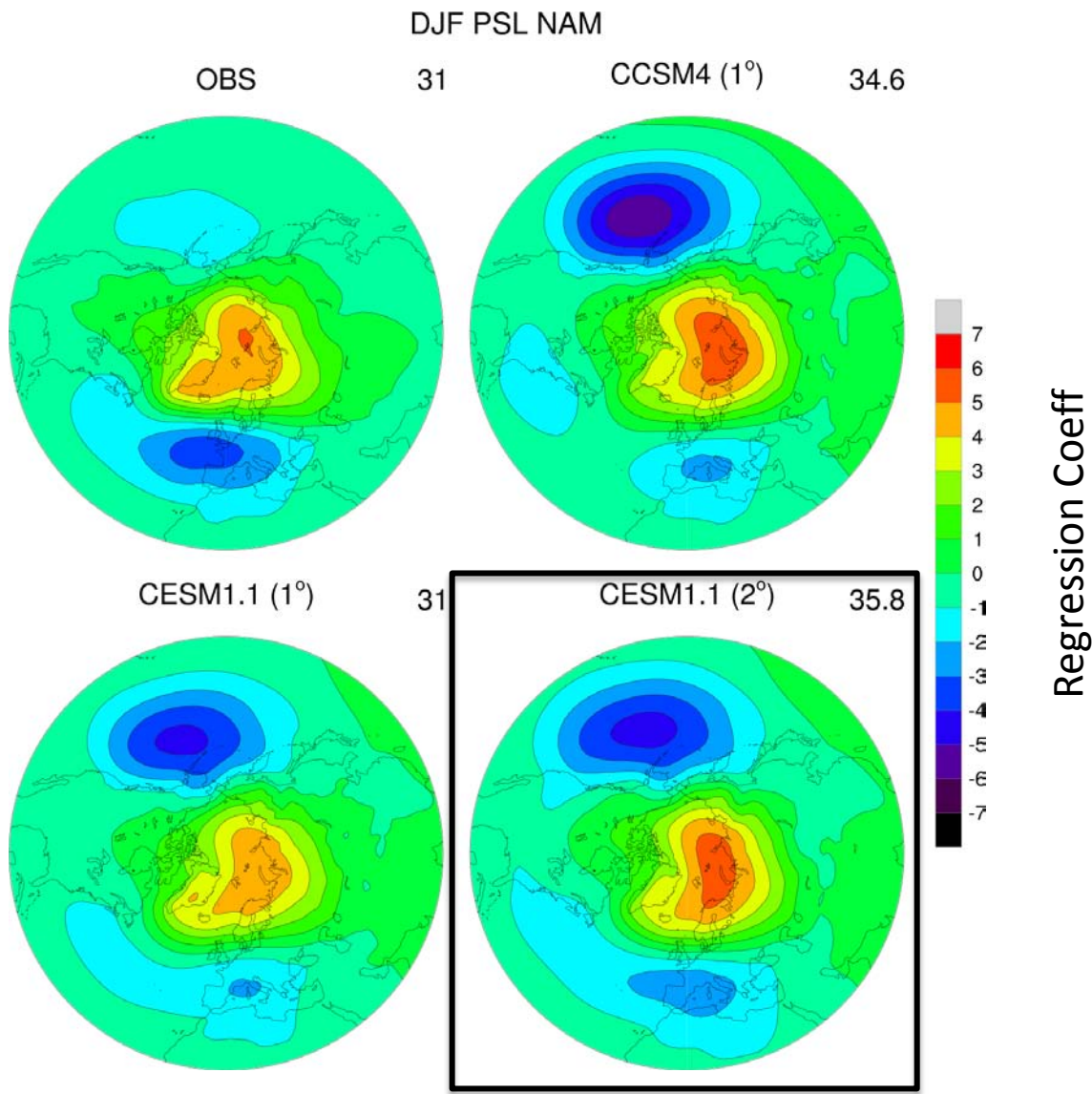


1850 Control FV2x1: Atmosphere

Zonally-averaged precipitation

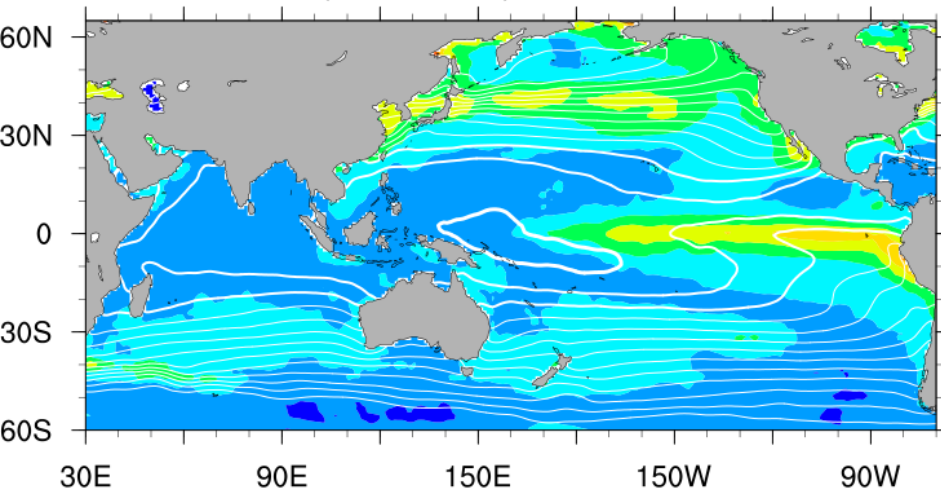


Northern Annular Mode (NAM)

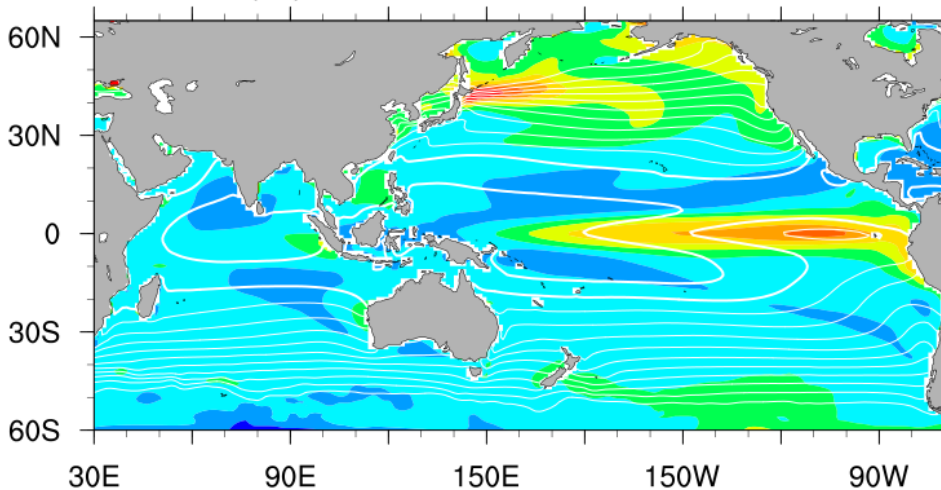


SST means & standard deviations

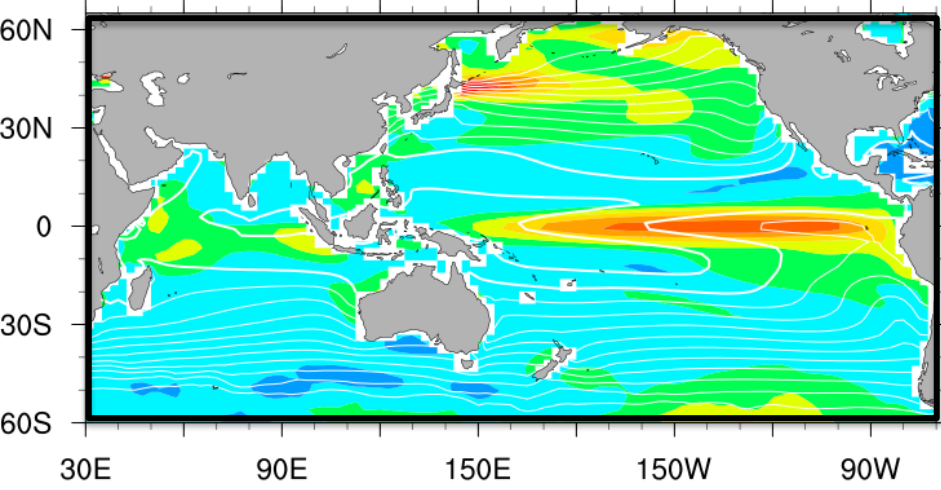
Observations (detrended)



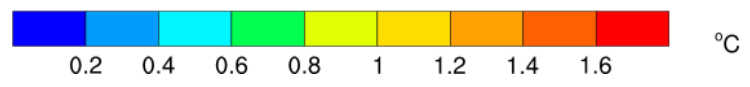
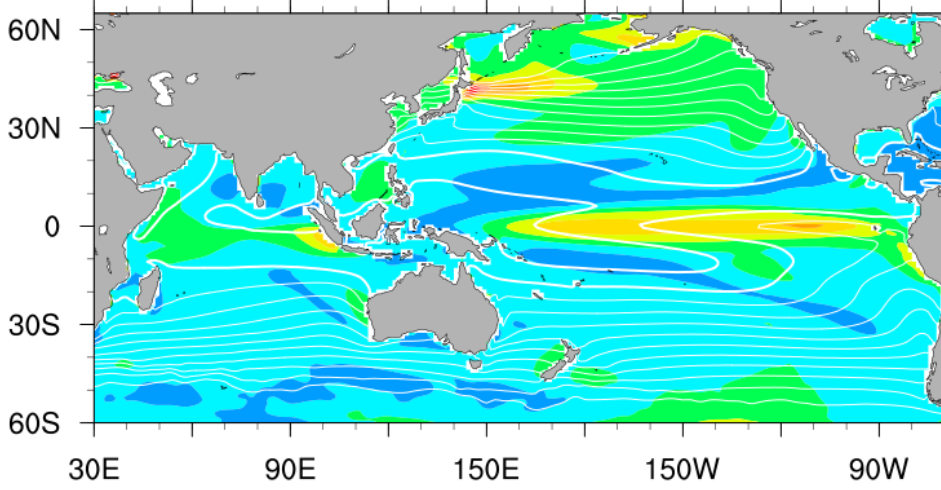
CCSM4 (1°)



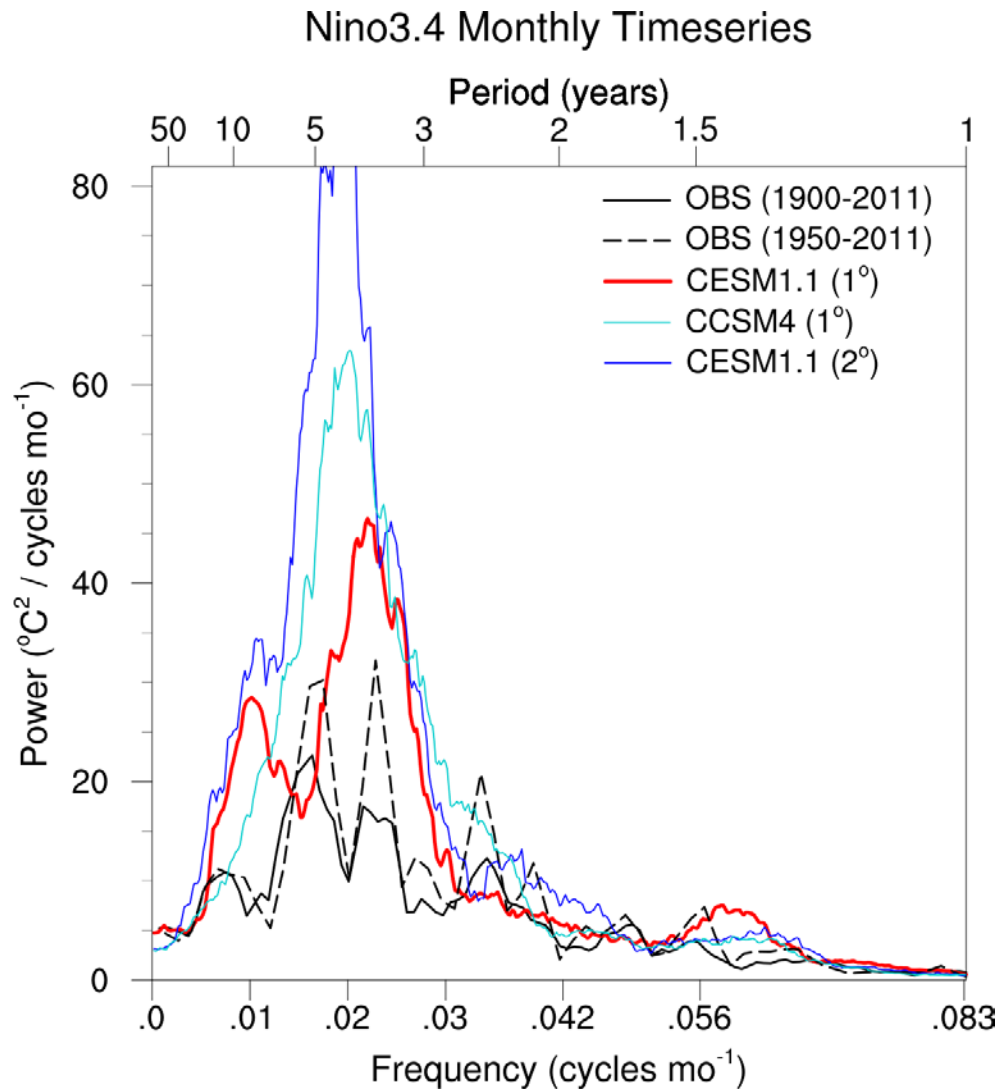
CESM1.1 (2°)



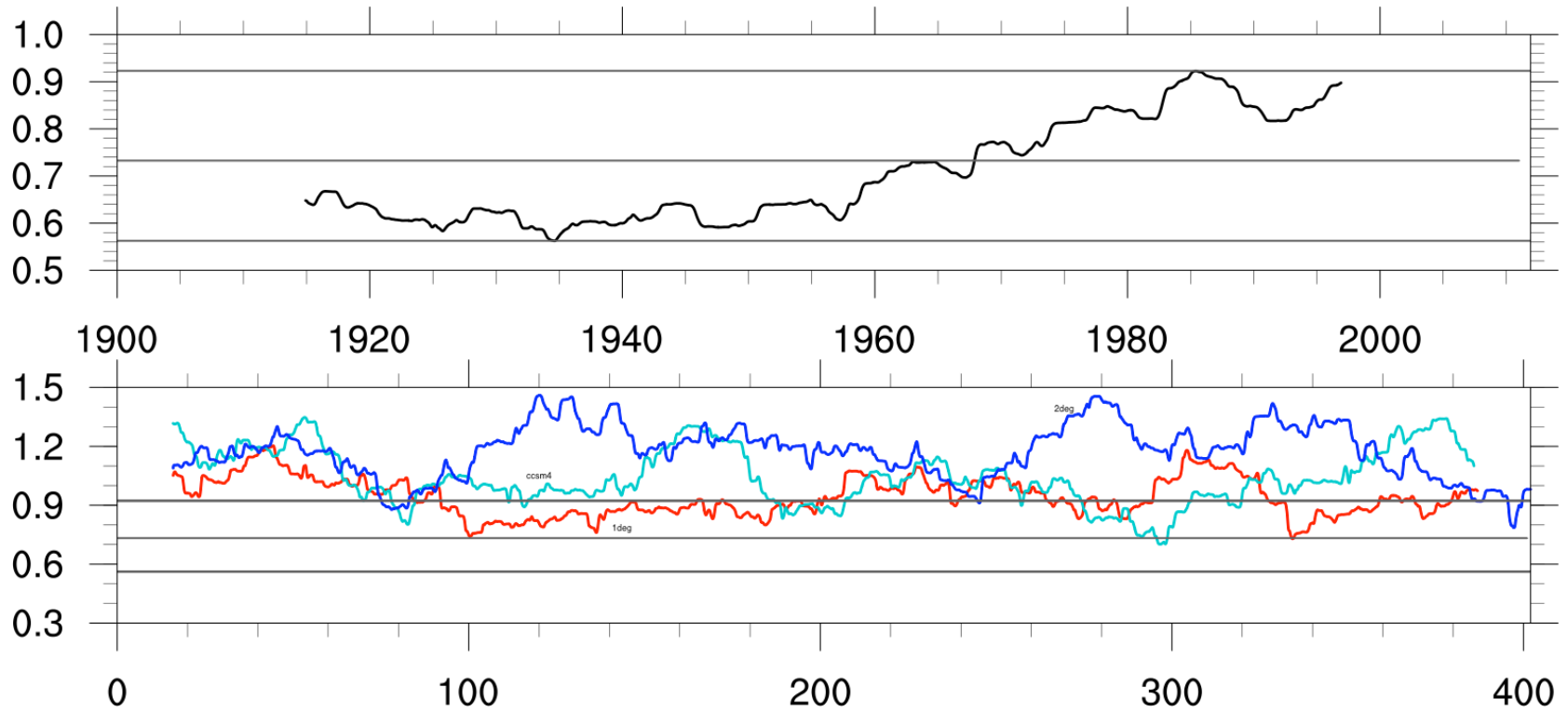
CESM1.1 (1°)



NINO3.4 power spectra



NINO3.4 variance through time



HadISST

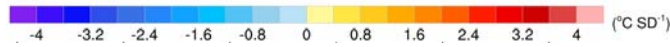
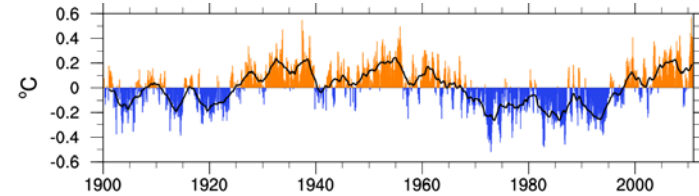
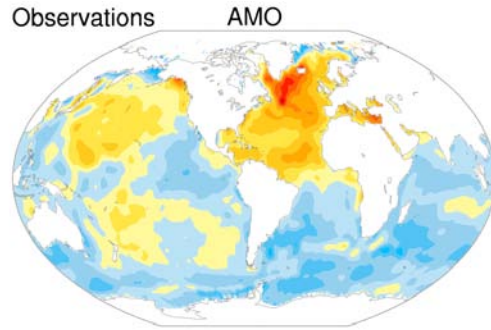
CCSM4 (1°)

CESM1.1 (1°)

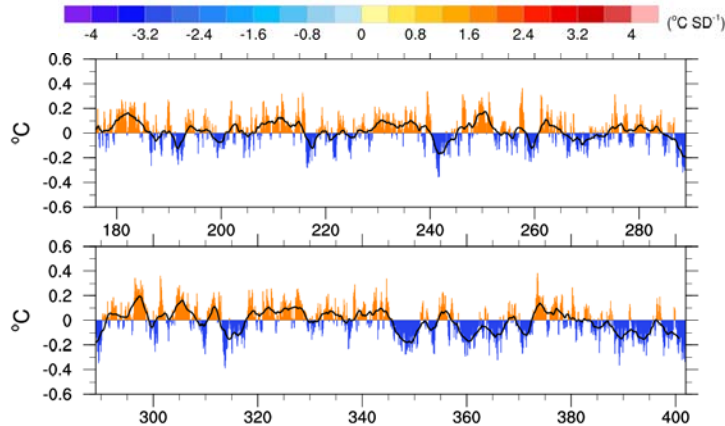
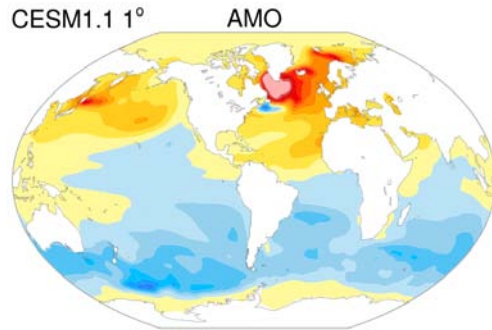
CESM1.1 (2°)

Atlantic Multidecadal Oscillation (AMO) in CESM-CAM5

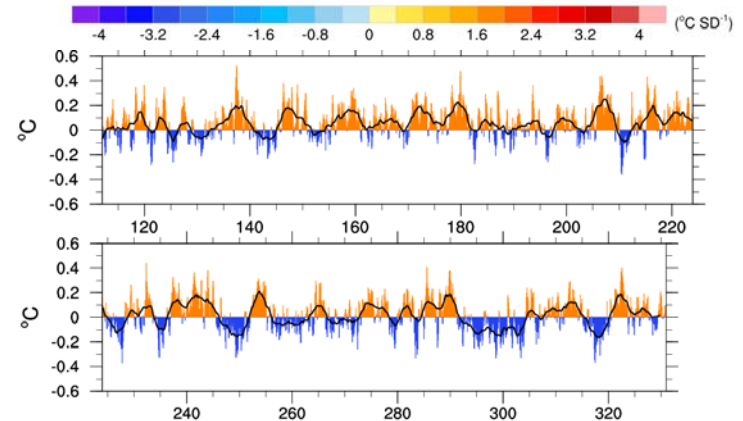
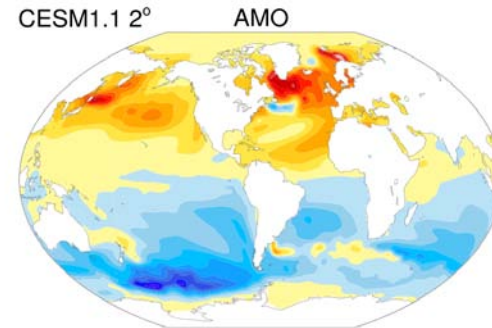
Observations



FV1 x 1

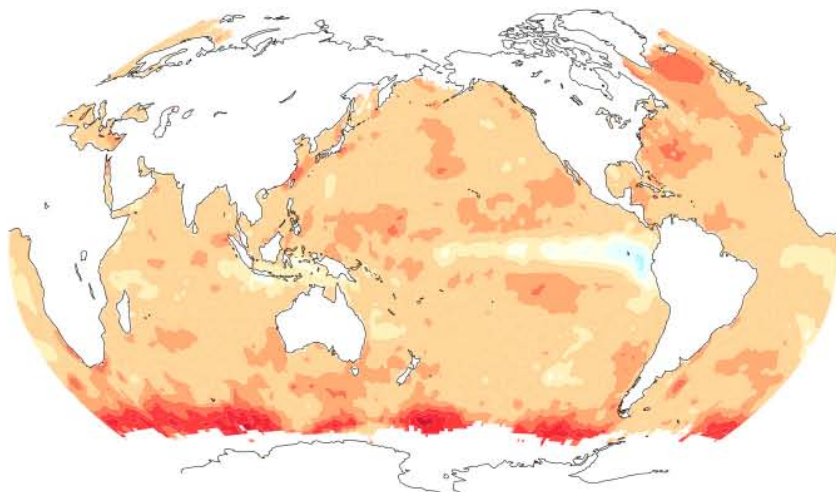


FV2 x 1

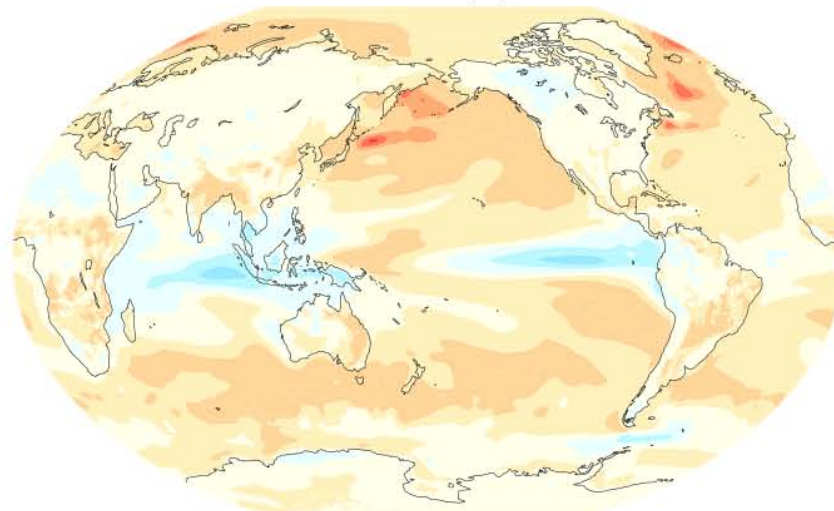


Spectral slopes (power laws)

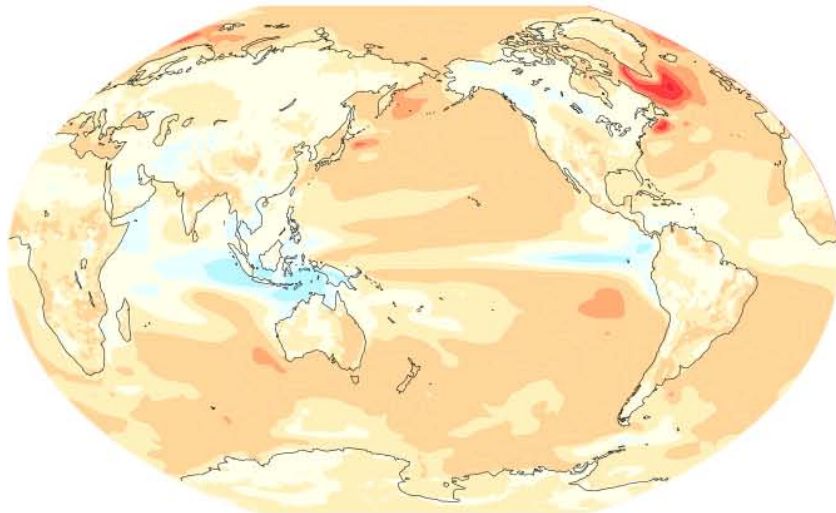
Obs



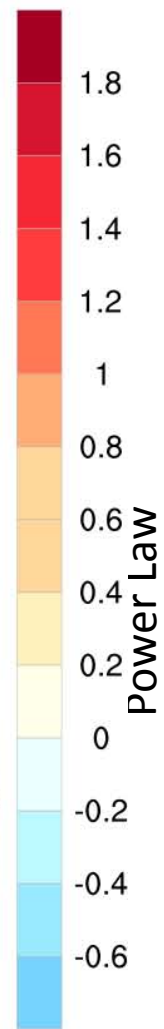
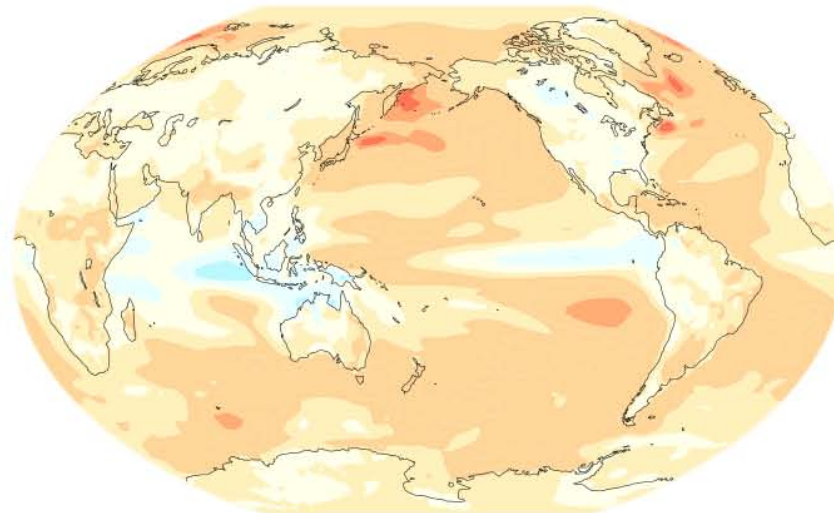
CCSM4 (1°)



CESM1.1 (1°)



CESM1.1 (2°)



Next steps

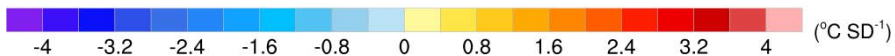
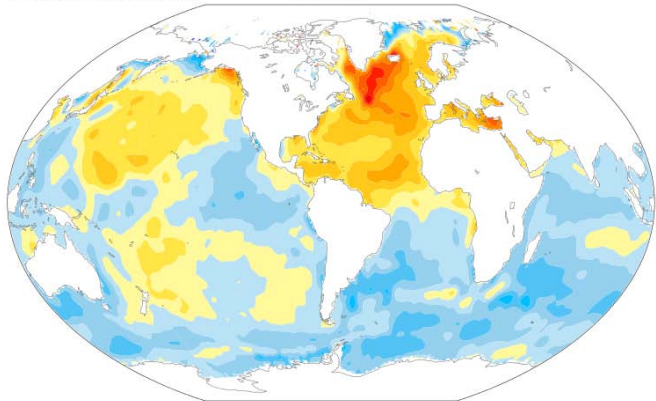
- Create a compset for FV2x1 1850 Control
- Finalize output strategy for simulations: multi-decadal periods of high-frequency output suitable for regional modeling
- Start single forcing simulations
- Work with community to increase ensemble size
- Additional simulations for:
 - Isotope-enabled CESM
 - New volcanic implementations
 - 60-level CAM
 - Last 2000 years

Thanks

Atlantic Multidecadal Oscillation

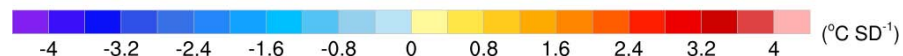
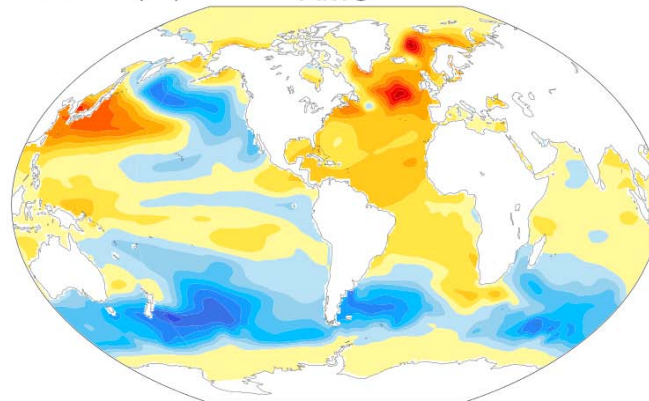
Observations

AMO



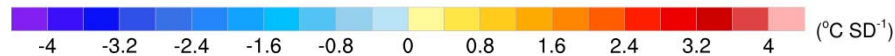
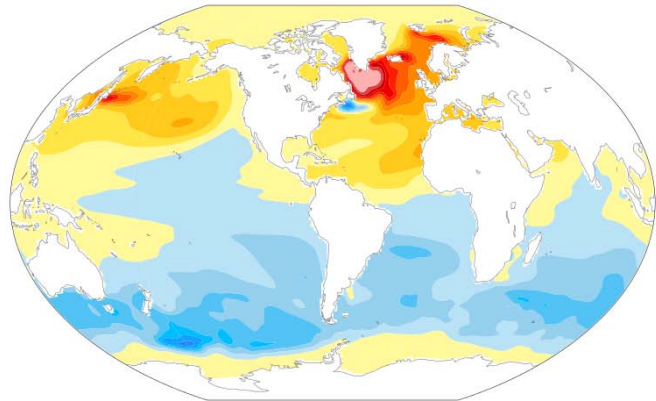
CCSM4 (1°)

AMO



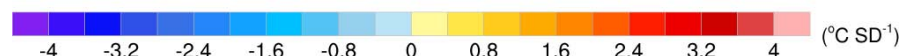
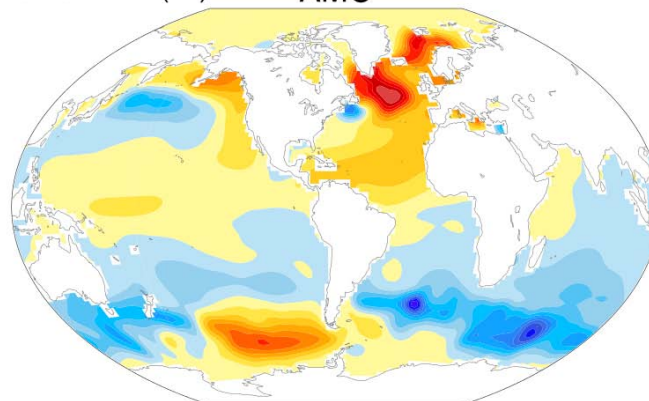
CESM1.1 (1°)

AMO

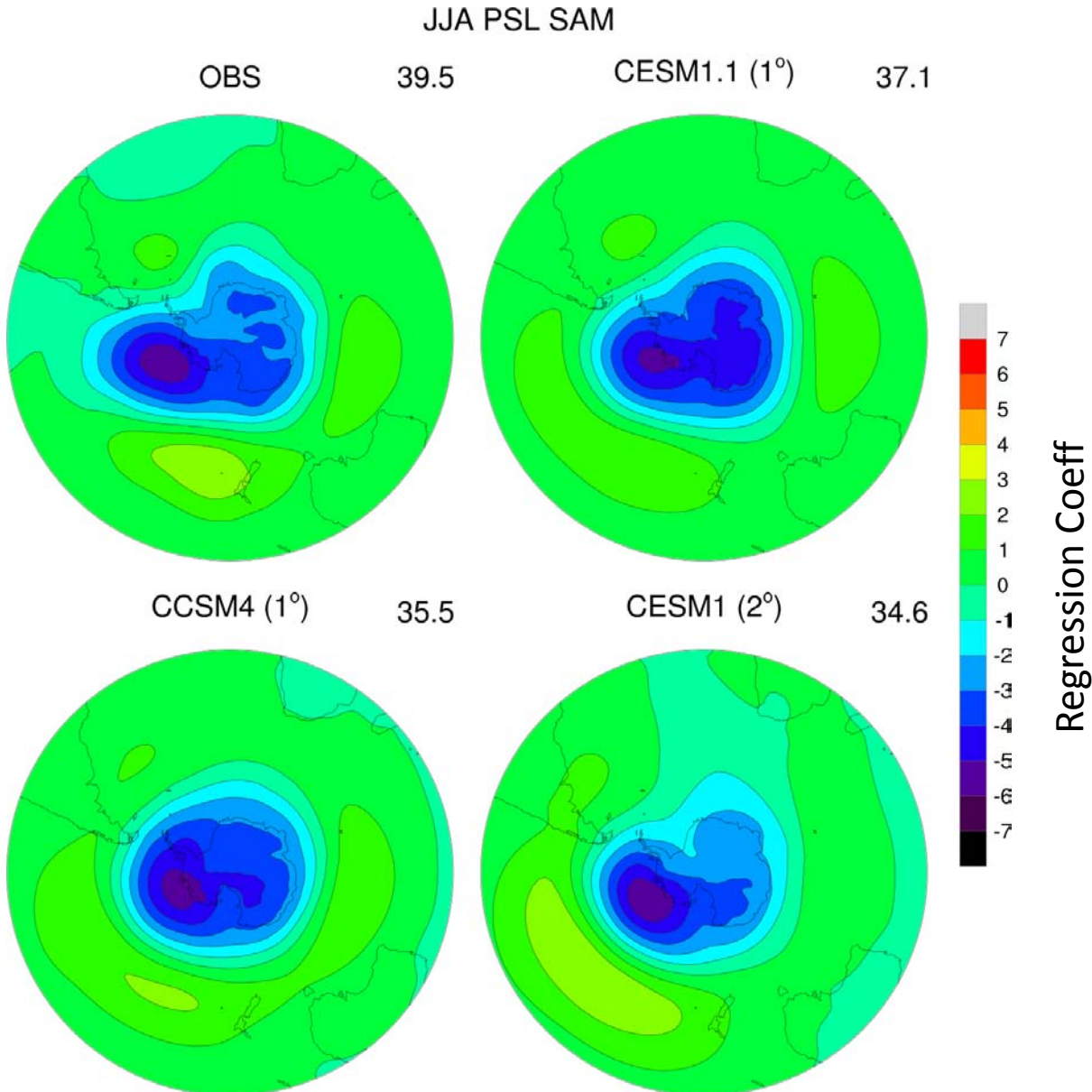


CESM1.1 (2°)

AMO



Southern Annular Mode (SAM)

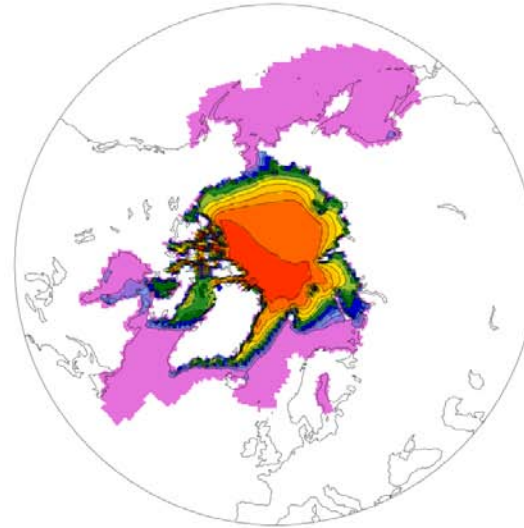
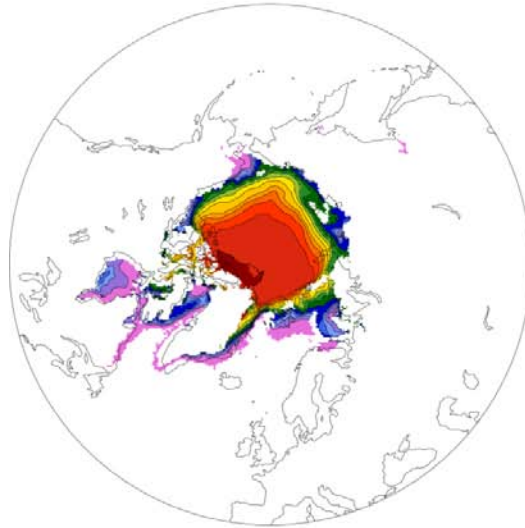


Northern hemisphere sea ice coverage (summer)

JAS ICEFRAC mean

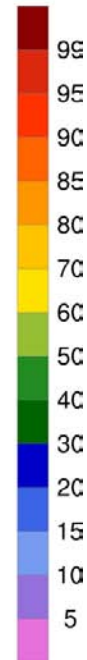
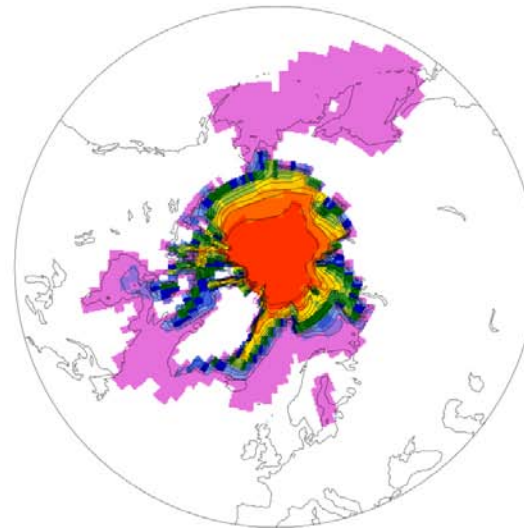
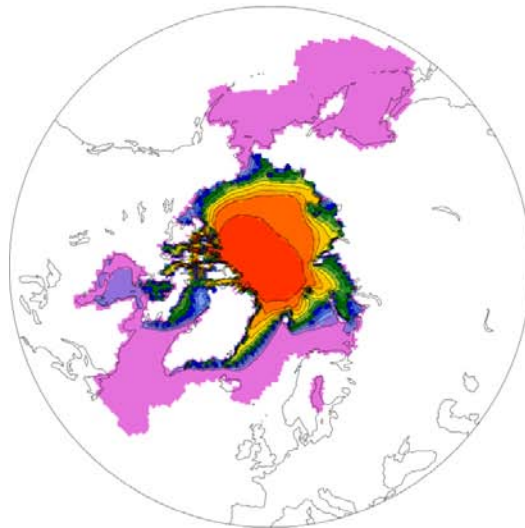
NSIDC

CCSM4 (1°)



CESM1.1 (1°)

CESM1.1 (2°)

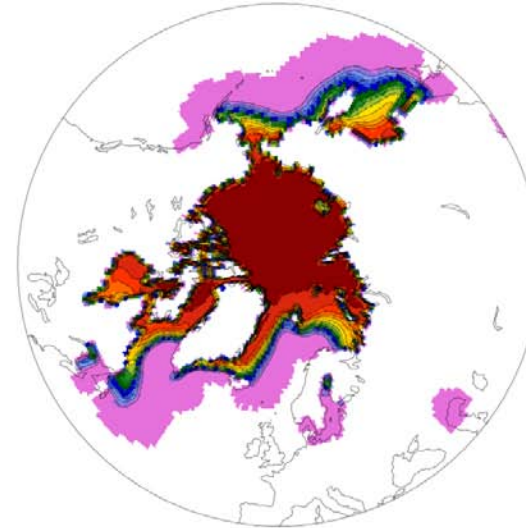
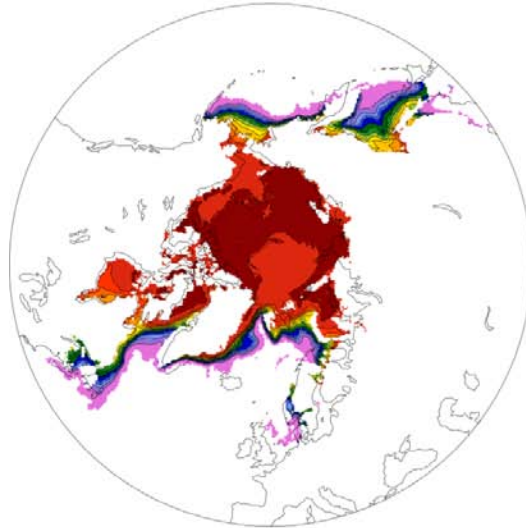


Northern hemisphere sea ice coverage (winter)

DJF ICEFRAC mean

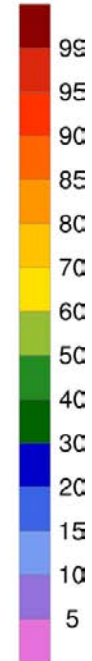
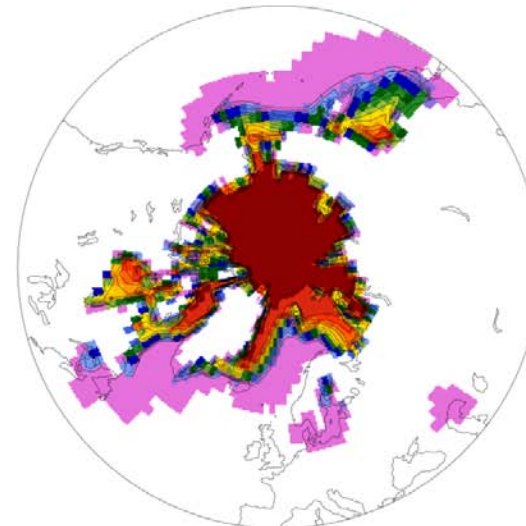
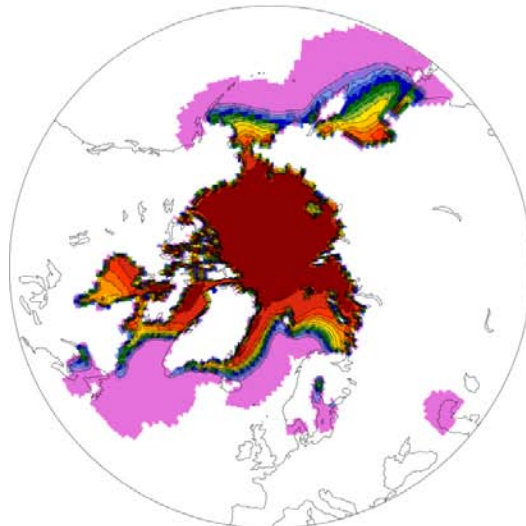
NSIDC

CCSM4 (1°)



CESM1.1 (1°)

CESM1.1 (2°)

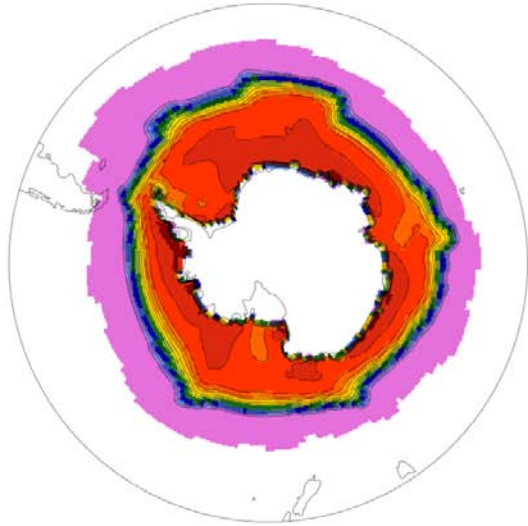
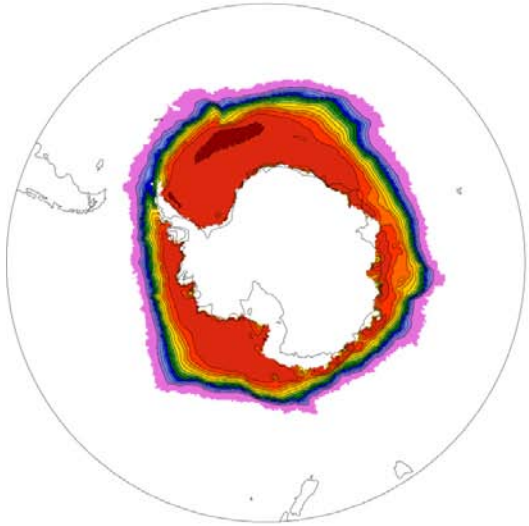


Southern hemisphere sea ice coverage (winter)

JAS ICEFRAC mean

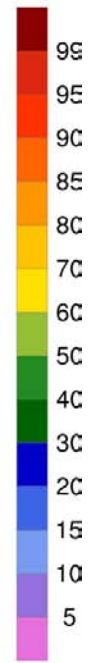
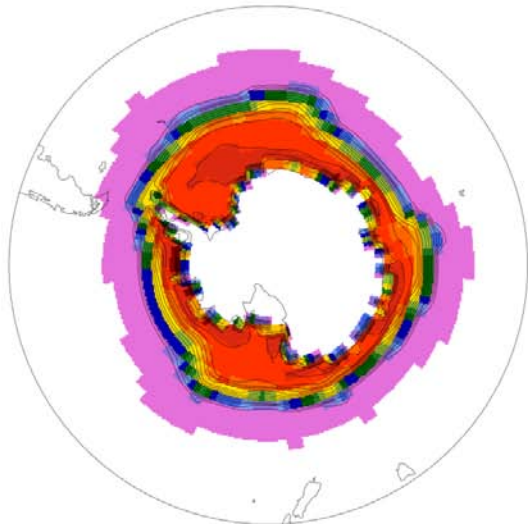
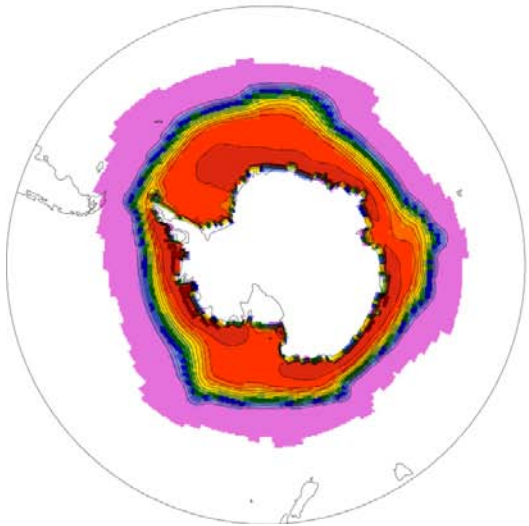
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CCSM4 (1°)



CESM1.1 (1°)

CESM1.1 (2°)

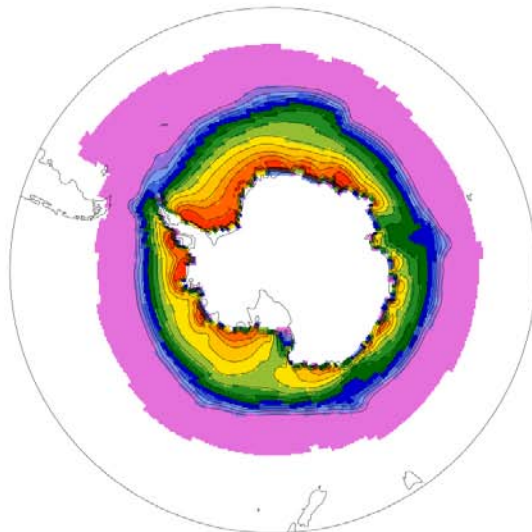
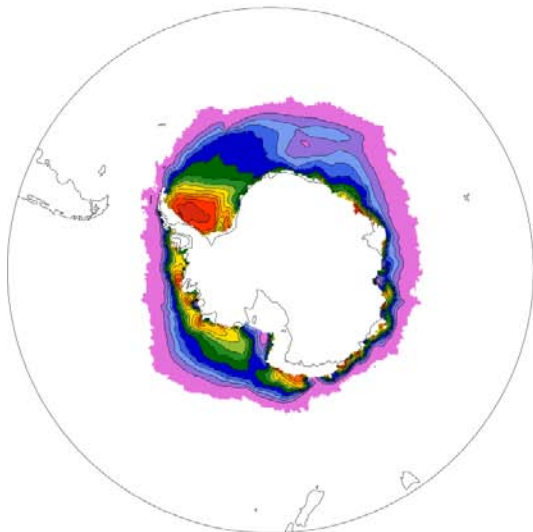


Southern hemisphere sea ice coverage (summer)

DJF ICEFRAC mean

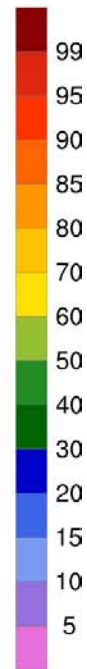
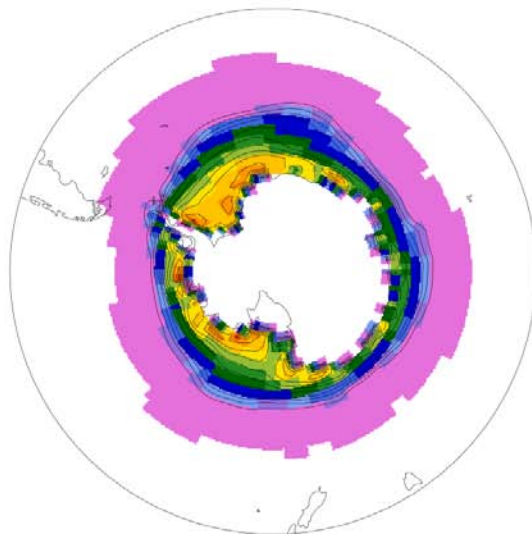
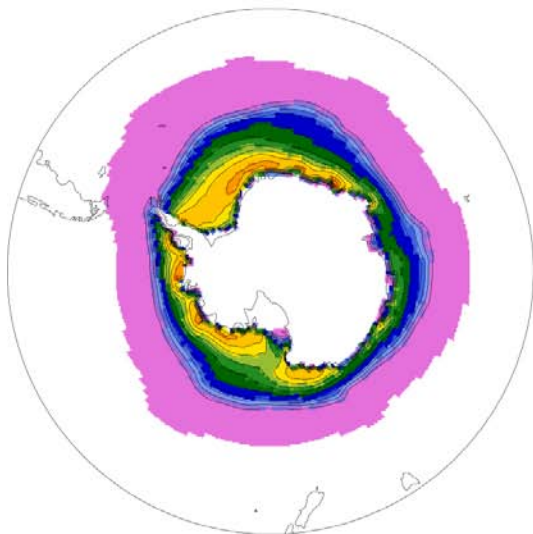
NSIDC

CCSM4 (1°)



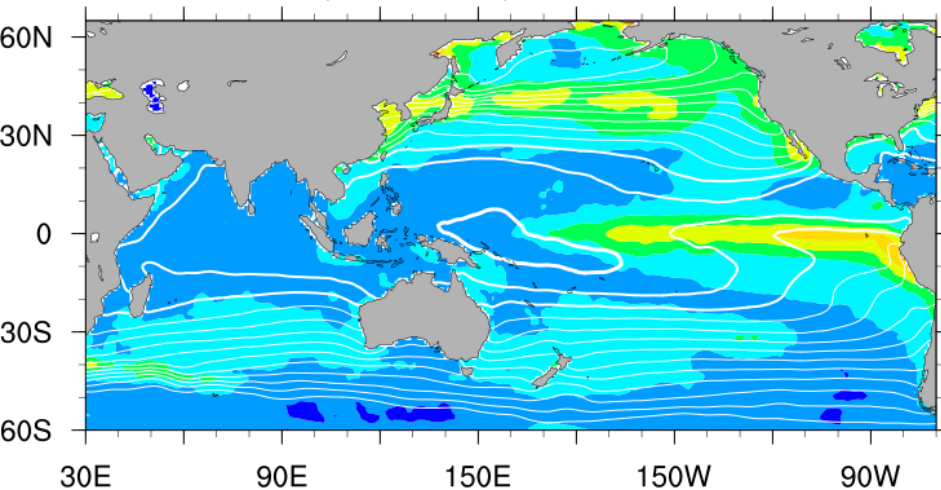
CESM1.1 (1°)

CESM1.1 (2°)

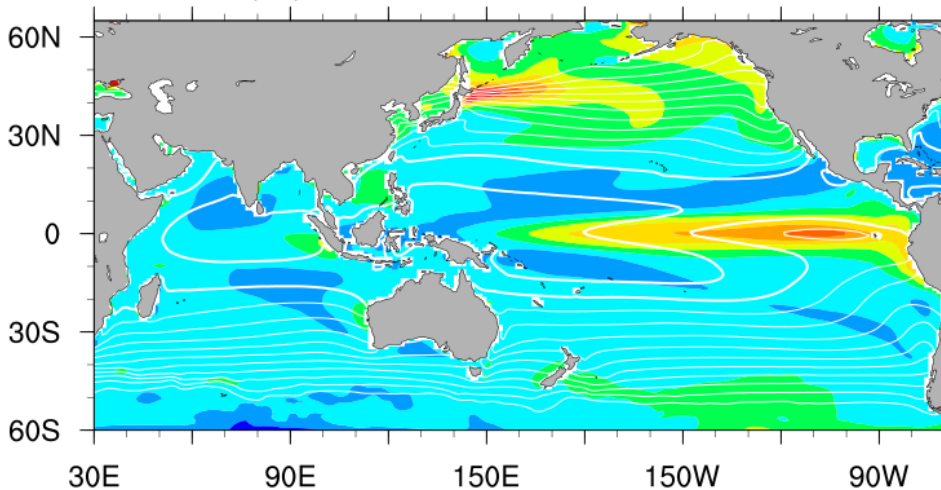


SST means & standard deviations

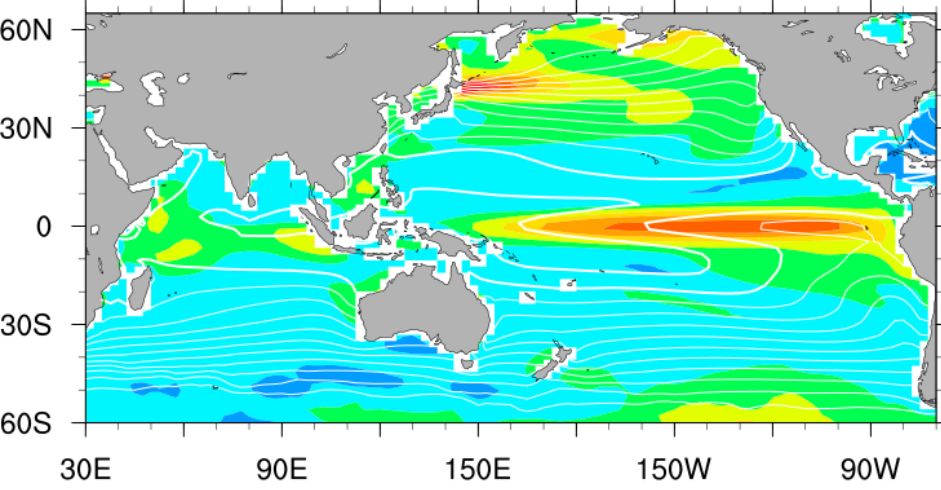
Observations (detrended)



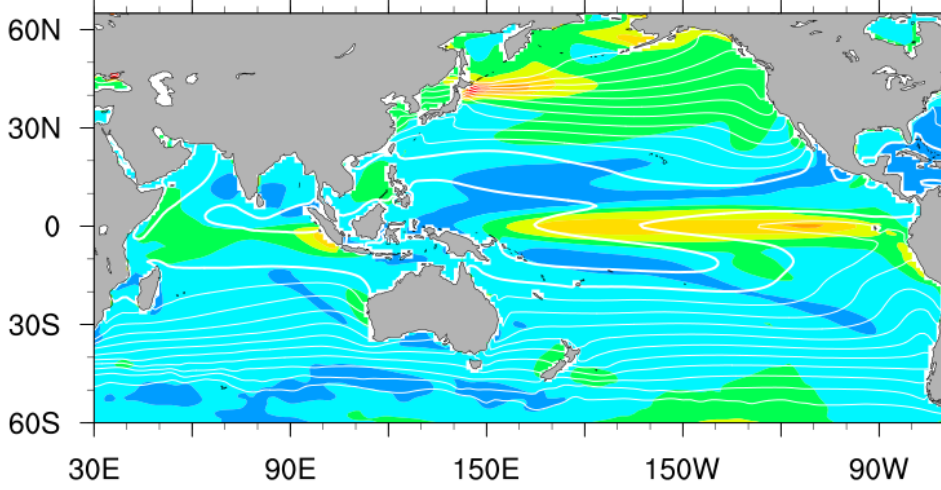
CCSM4 (1°)



CESM1.1 (2°)

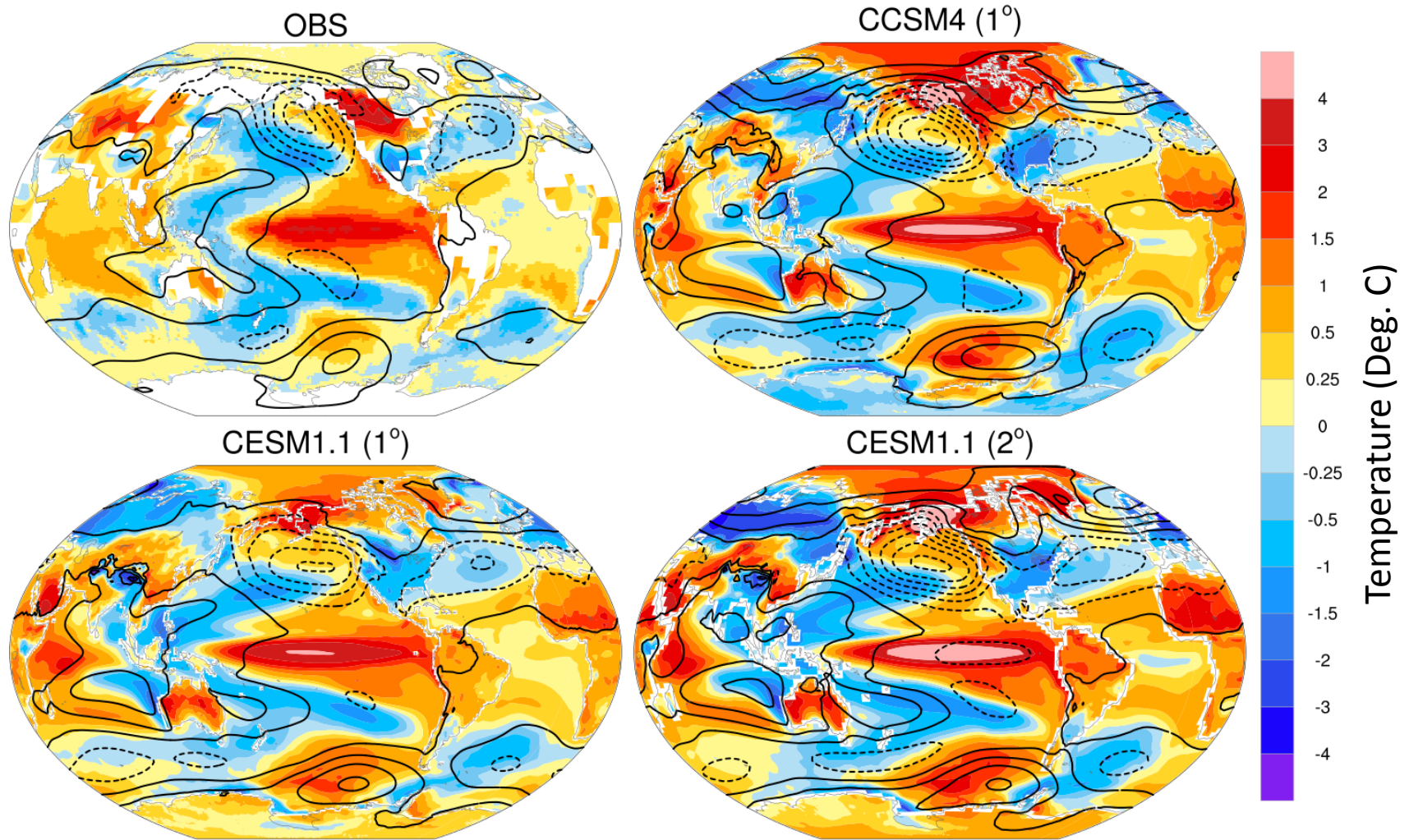


CESM1.1 (1°)



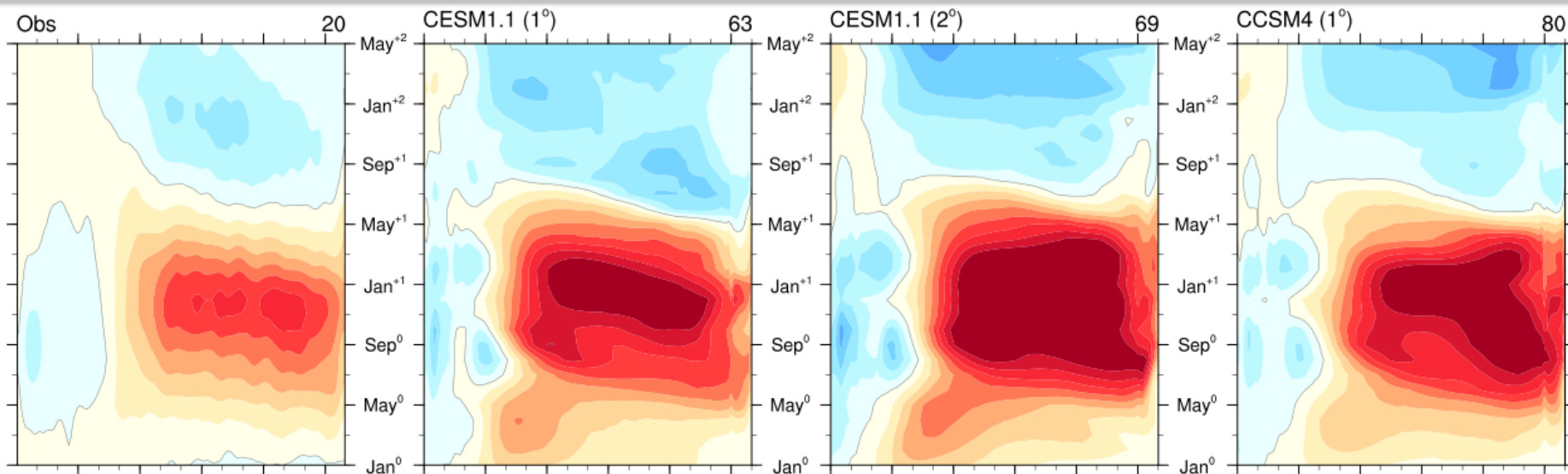
NINO3.4 teleconnections (temp.)

ENSO SLP / TS / TREFHT composite (DJF⁺¹)

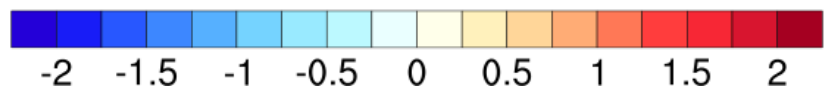
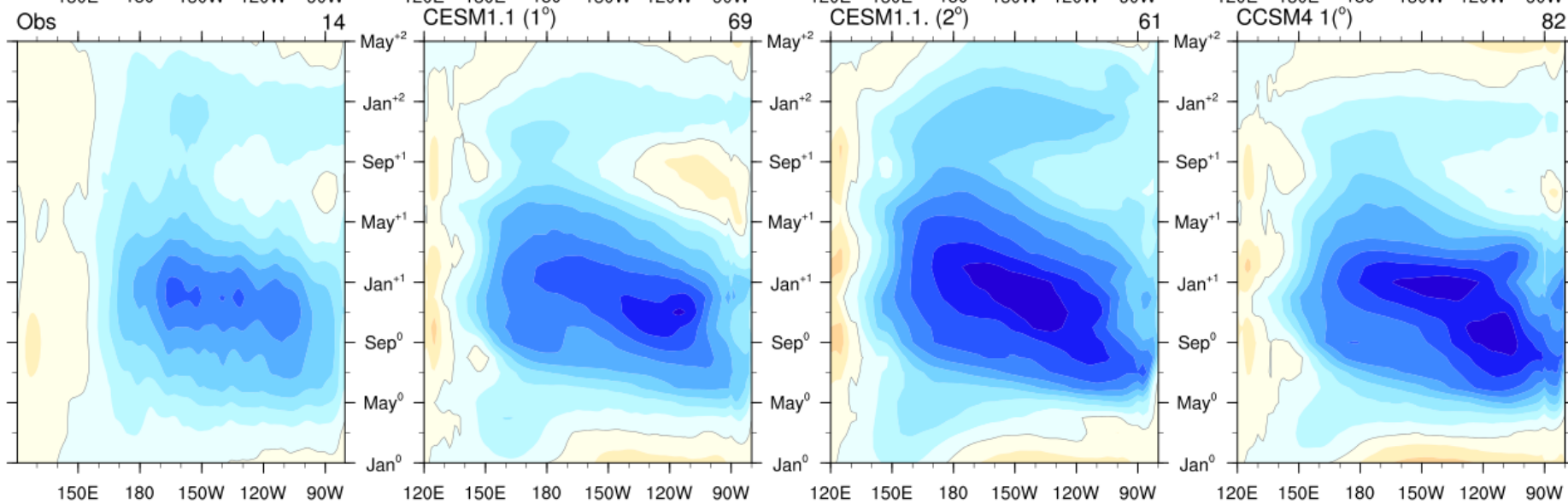


ENSO evolution

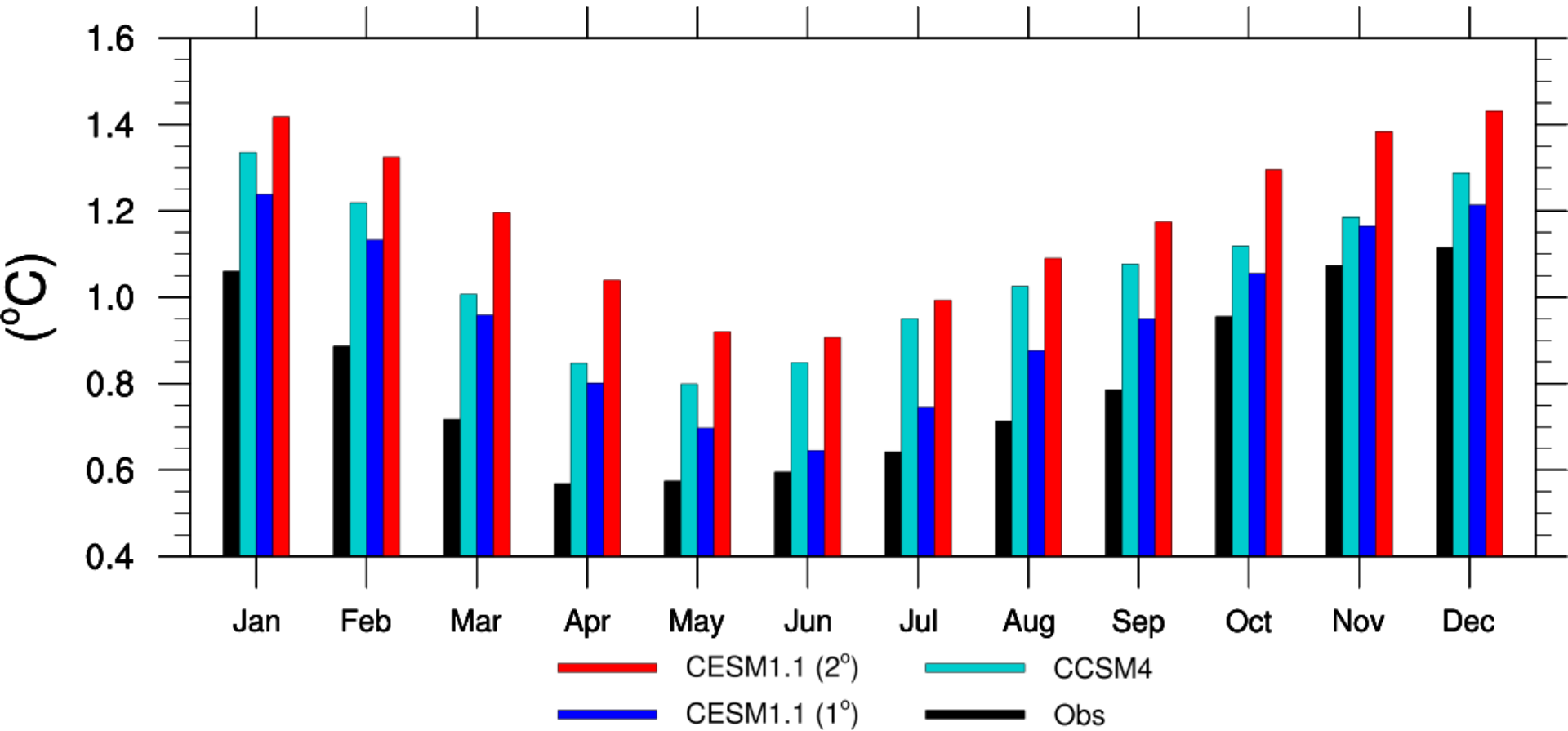
El Niño



La Niña

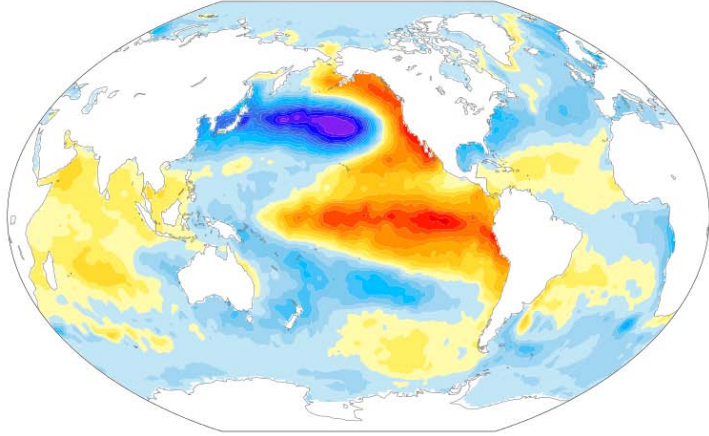


NINO3.4 seasonality

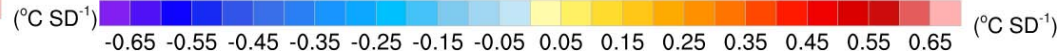
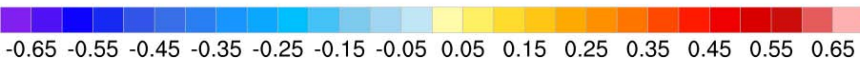
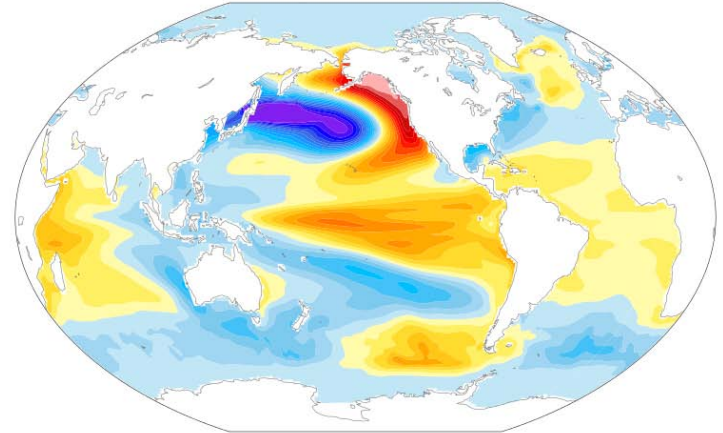


PDO

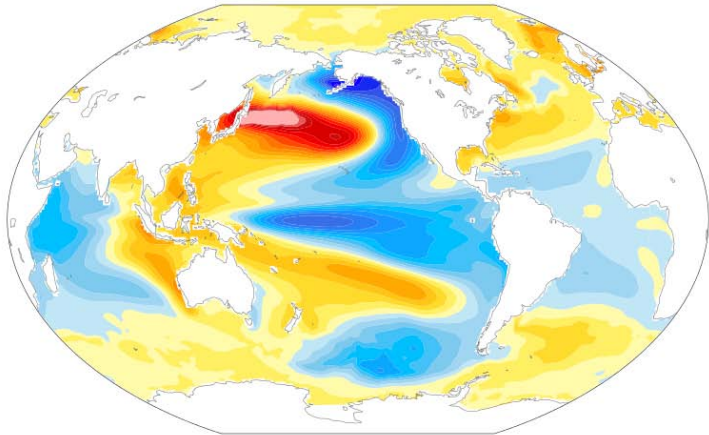
OBSERVATIONS



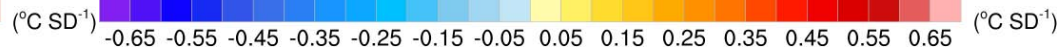
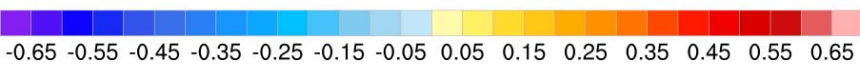
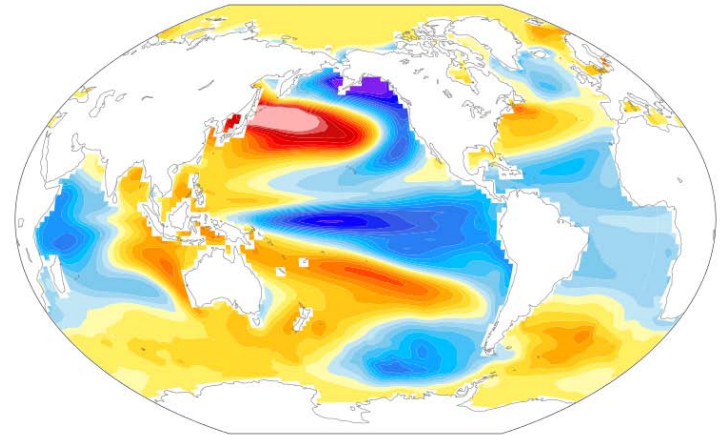
CCSM4 (1°)



CESM1.1 (1°)



CESM1.1 (2°)



NINO3.4 teleconnections (precip.)

ENSO SLP / PRECIP composite (DJF⁺¹)

