CESM Whole Atmosphere Working Group Session
Thursday, 23 June 2011
The Village – Tarn Room – Breckenridge, Colorado

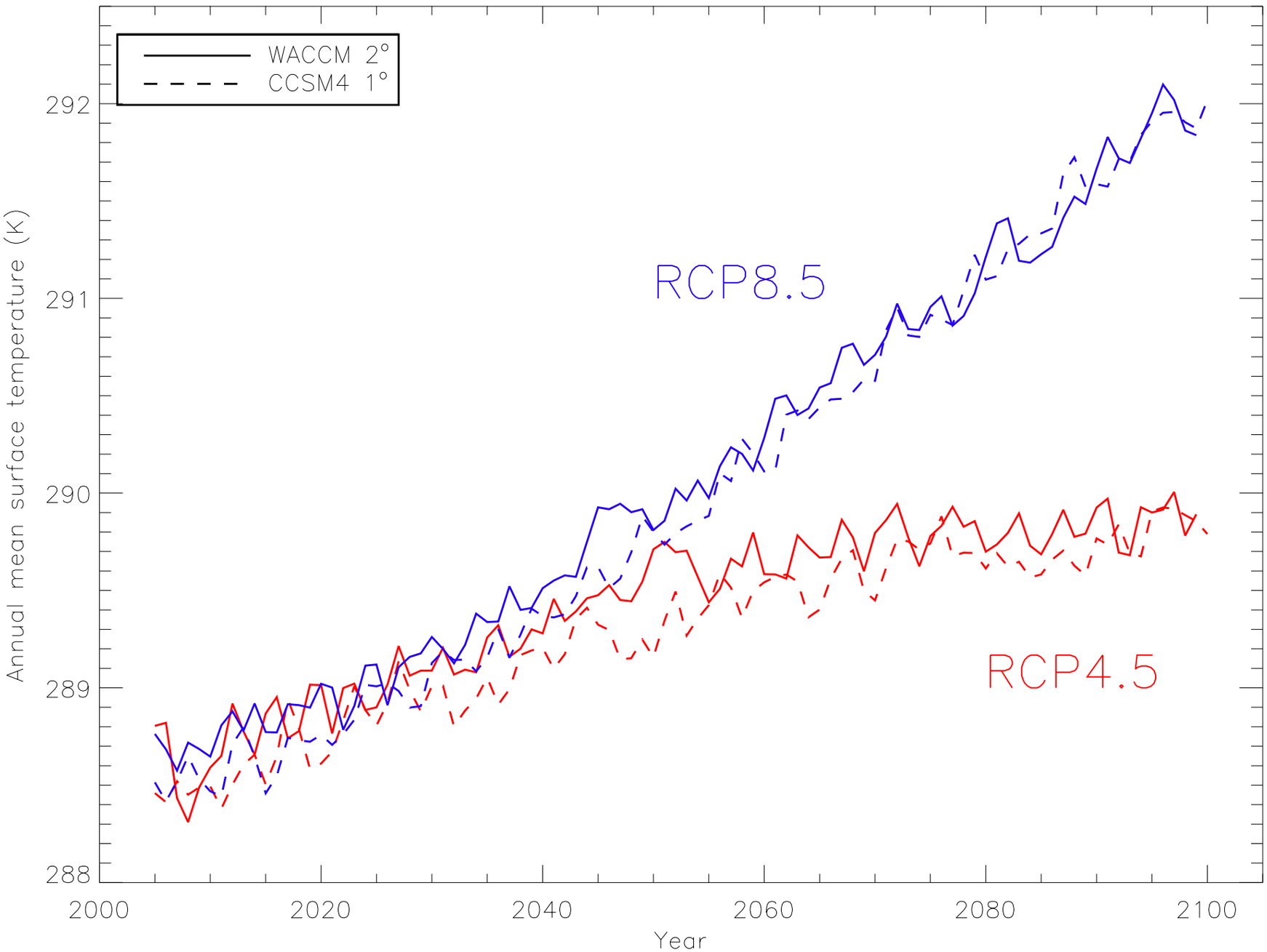
Webcast Instructions and Information: http://www.cesm.ucar.edu/events/webcasts/

8:30 a.m.	Dan Marsh – Introduction and status of the IPCC simulations
8:45 a.m.	Mike Mills – The CESM1.0.3 public release: What's new in WACCM
9:00 a.m.	Doug Kinnison – Polar heterogeneous processes in WACCM: A new approach
9:15 a.m.	Andrew Conley – Solar effects in WACCM
9:30 a.m.	Joe McInerney – Using WACCM-X and WAM to assess contributions to thermospheric temperature and winds by higher order migrating tides
9:45 a.m.	Jason English – Tropospheric sulfate burdens as a consequence of stratospheric sulfate geoengineering
10:00 a.m.	Ryan Neely – The need for meteoritic dust in the stratospheric aerosol layer
10:15 a.m.	Break
10:35 a.m.	Chuck Bardeen – The CARMA3.0 microphysics package in CESM
10:50 a.m.	Cora Randall – WACCM applications for the polar stratosphere and mesosphere
11:05 a.m.	Rolando Garcia – On the estimation of age of air trends from atmospheric tracers
11:20 a.m.	Hanli Liu – The quasi-biennial oscillation in the WACCM: Generation and structures
11:35 a.m.	Discussion (led by Lorenzo Polvani)

CMIP5 simulation status

- The bulk of the simulations are completed:
  - 1850 Control (200 years)
  - 1955-2005 (3 ensemble members)
  - RCP2.6 (a.k.a. RCP3-PD)
    - 1 x 2005-2100
  - RCP4.5
    - 1 x 2005-2100
    - 2 x 2005-2050
  - RCP8.5
    - 1x 2005-2100
- Simulation data will be made available to working groups and the public in accordance to the CESM data management and data distribution plan.

Annual mean surface temperature RCP4.5 & 8.5



RCP4.5 2080-2098

Global TS:

WACCM: 289.83 K
CCSM4: 289.76 K

Courtesy Mike Mills

Global mean temperature anomalies relative to 1961-1990

116 km

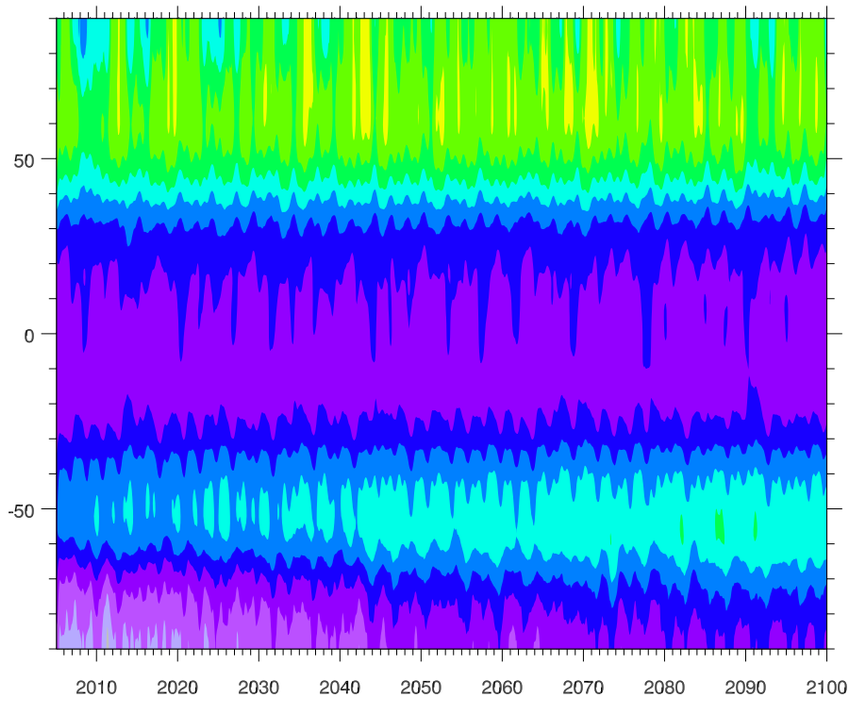
48 km

surface

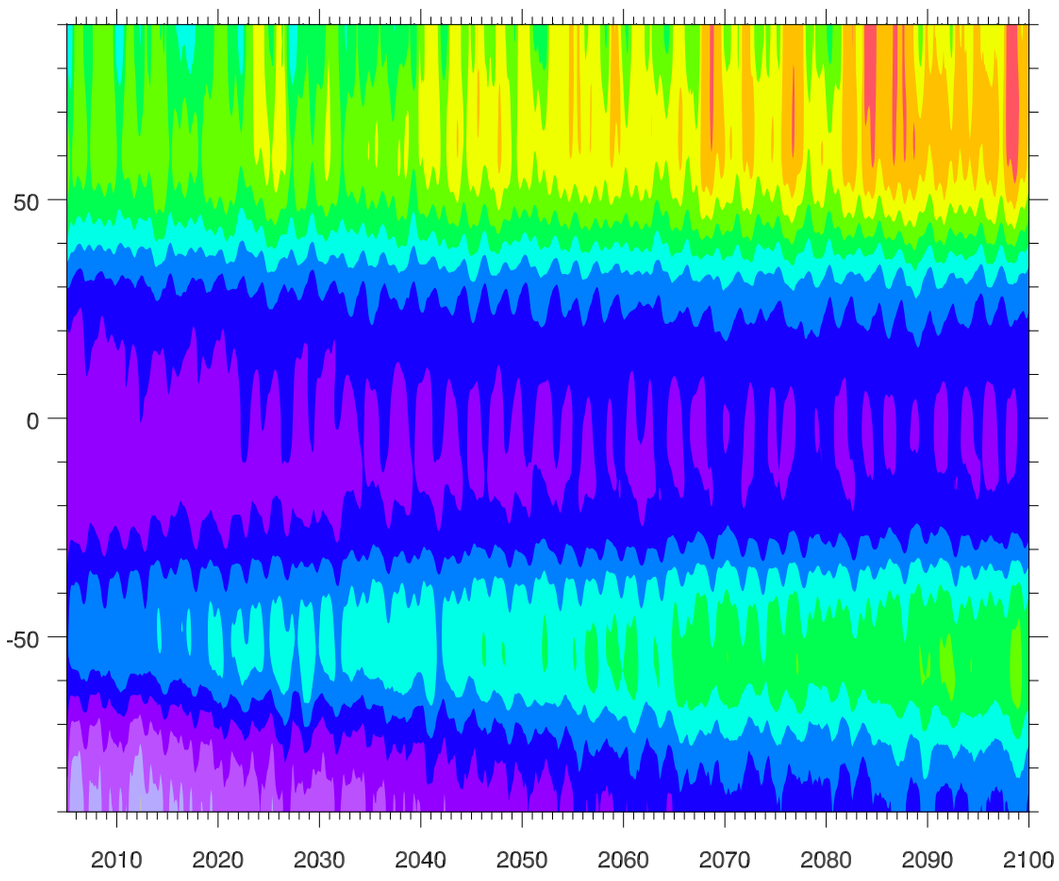
Courtesy Mike Mills

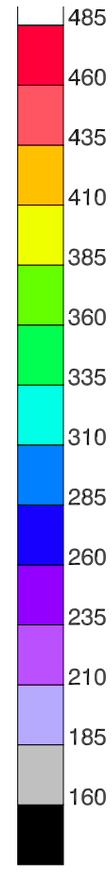
Ozone total column 2005-2100

RCP2.6

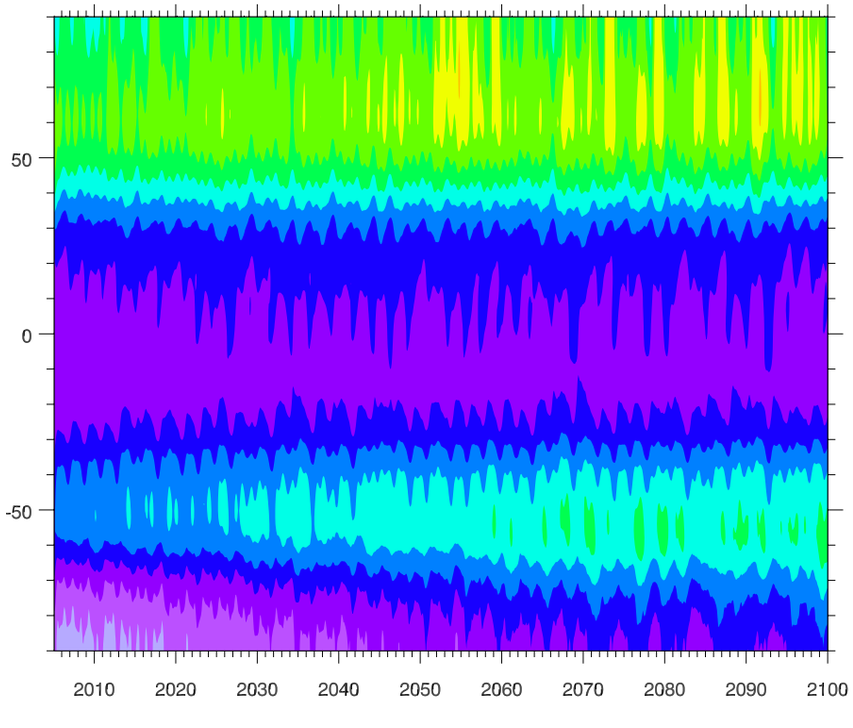


RCP8.5





RCP4.5



Sudden Stratospheric Warming Climatology

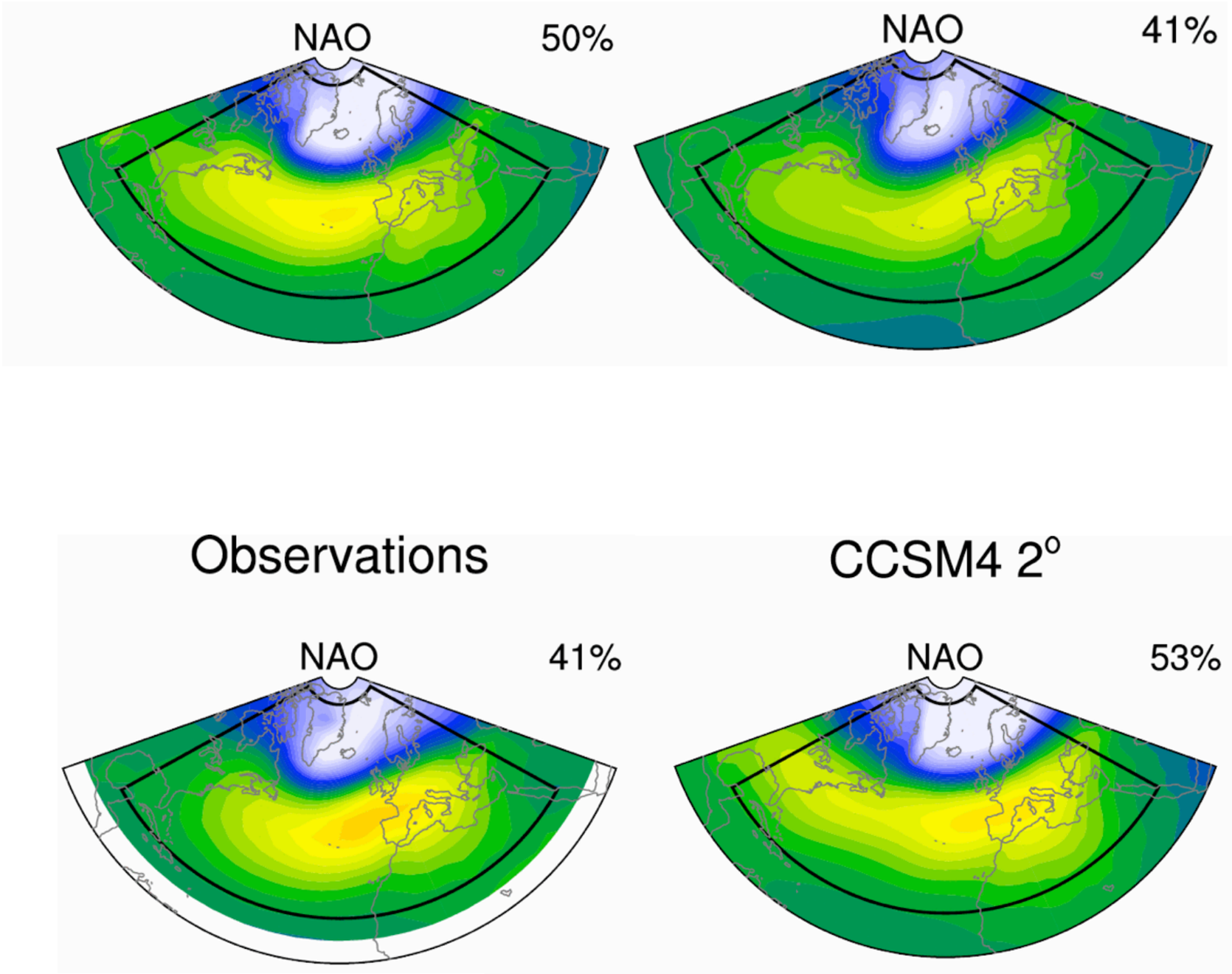
	1960-1970		1971-1981		1982-1992		1993-2003	
	minor	major	minor	major	minor	major	minor	major
ens1	17	5	14	7	19	6	19	4
ens2	17	4	17	3	19	9	16	2
ens3	14	9	15	9	18	4	23	3
mean/decade	14.5	5.5	13.9	5.8	17.0	5.8	17.6	2.7

ERA40 5-6 major warmings / decade

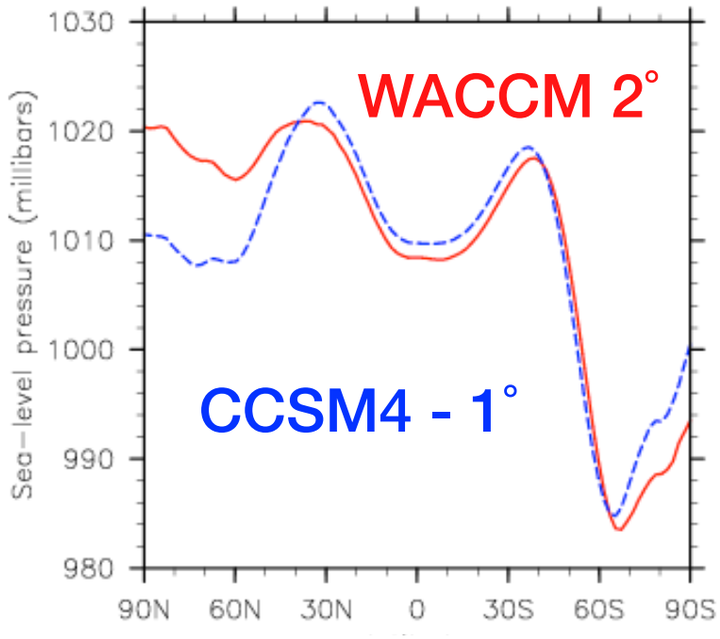
Increase due to addition of turbulent mountain stress (TMS)

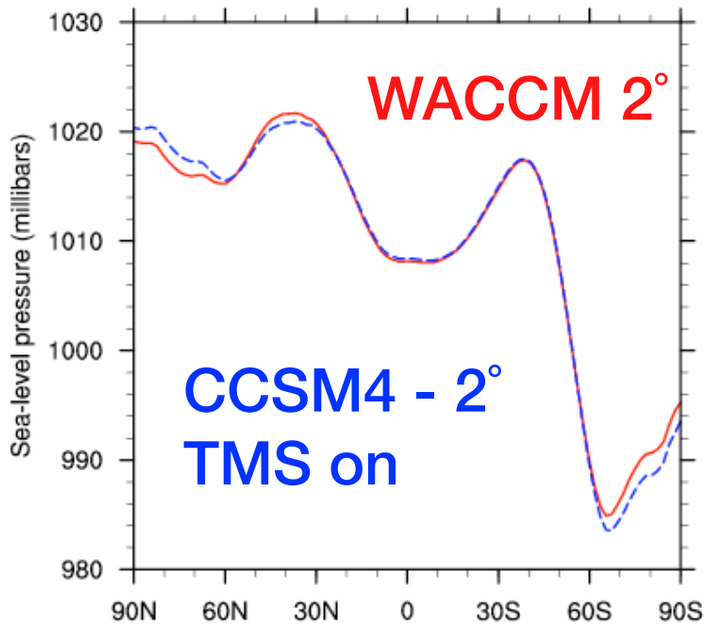
NAO index

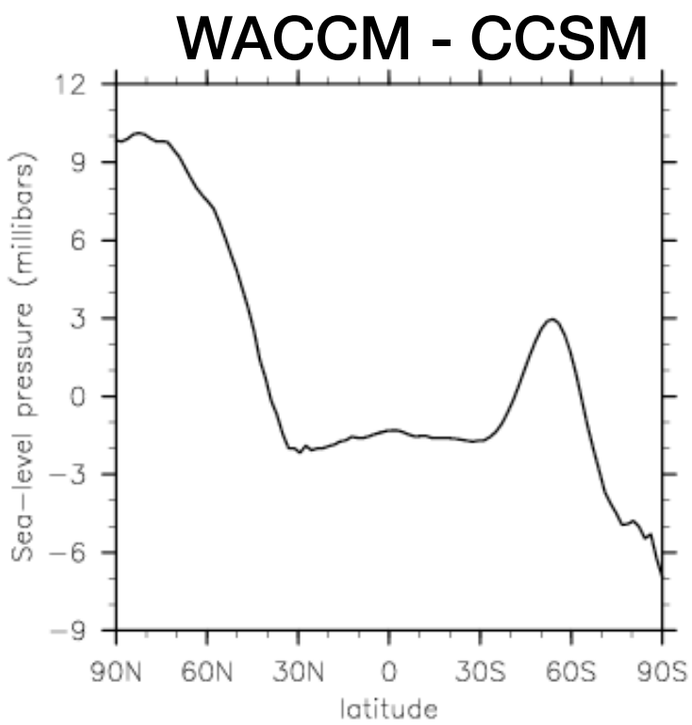
Courtesy Adam Phillips

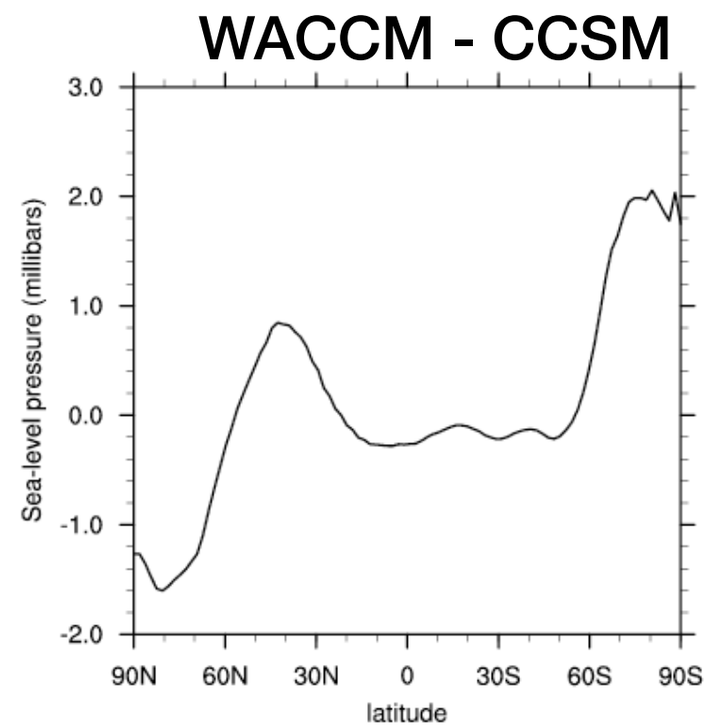


1850 Control DJF SLP - the downside of TMS





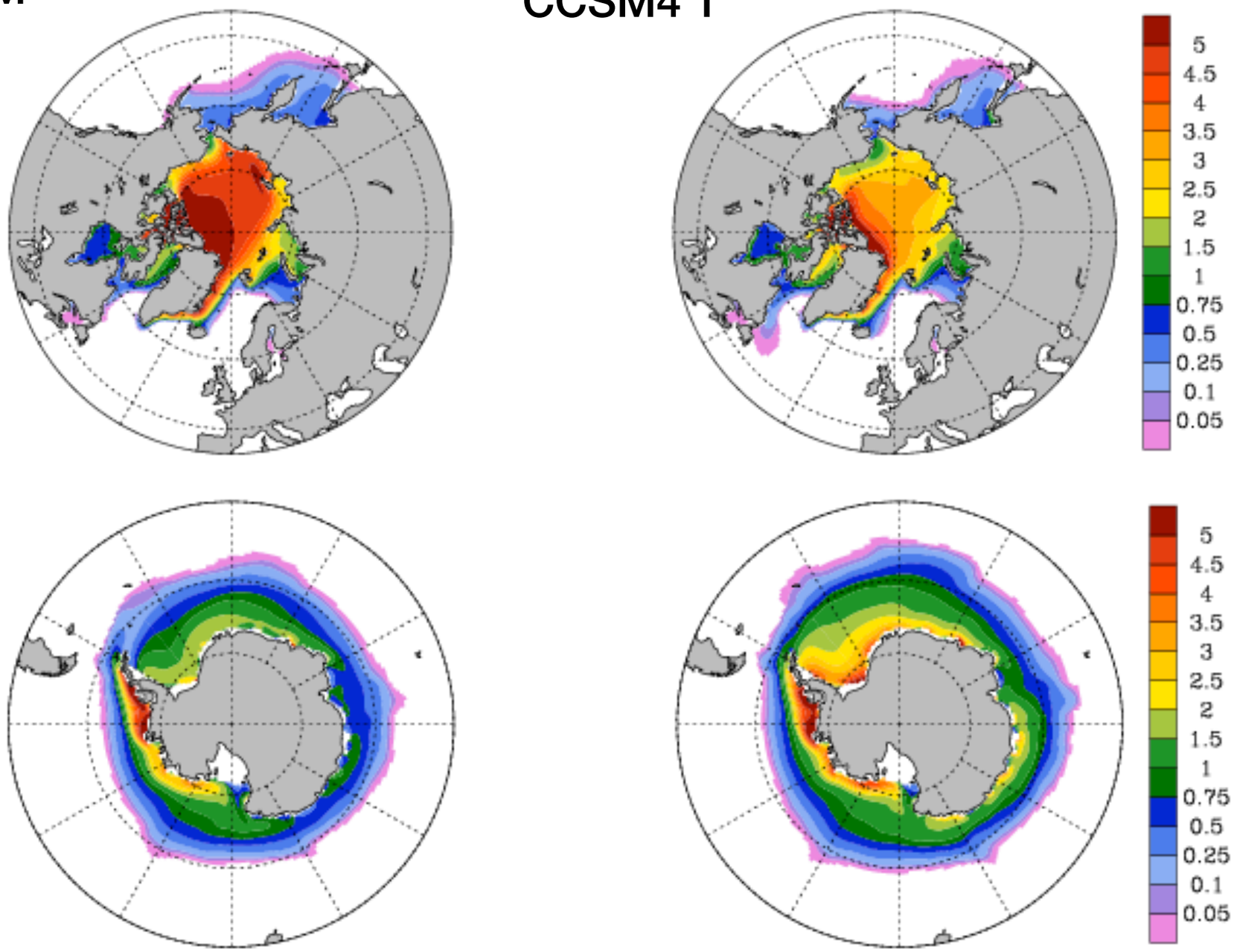




1850 control: Annual mean sea ice thickness

WACCM

CCSM4 1˚

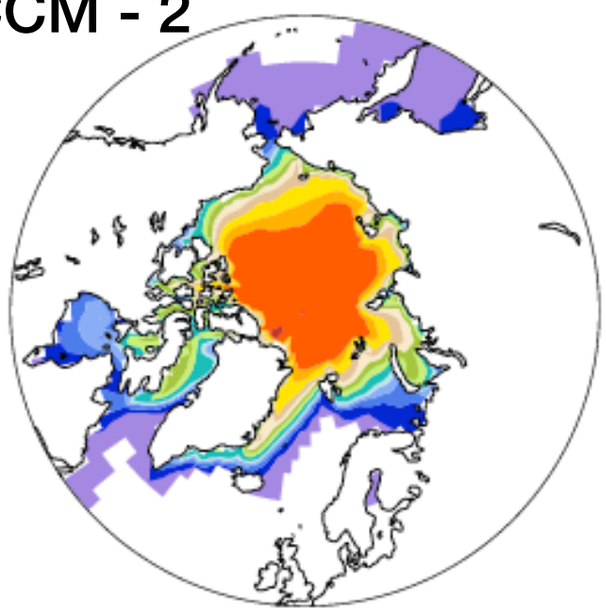


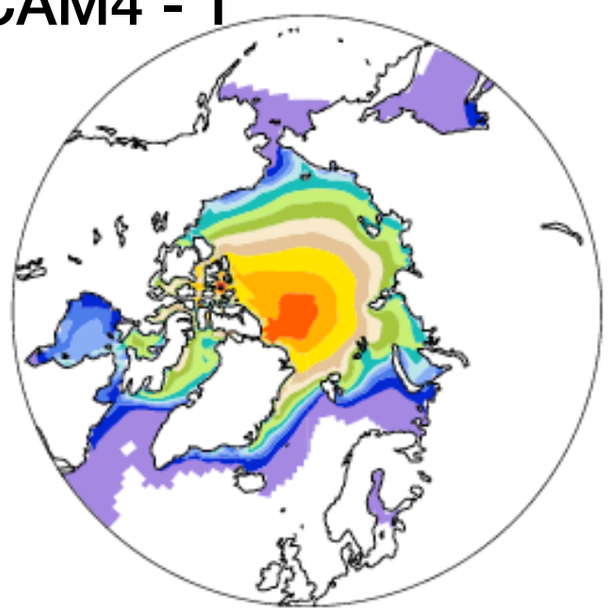
RCP4.5 yrs 2080-2098 Sea Ice Concentration (%)

WACCM - 2°

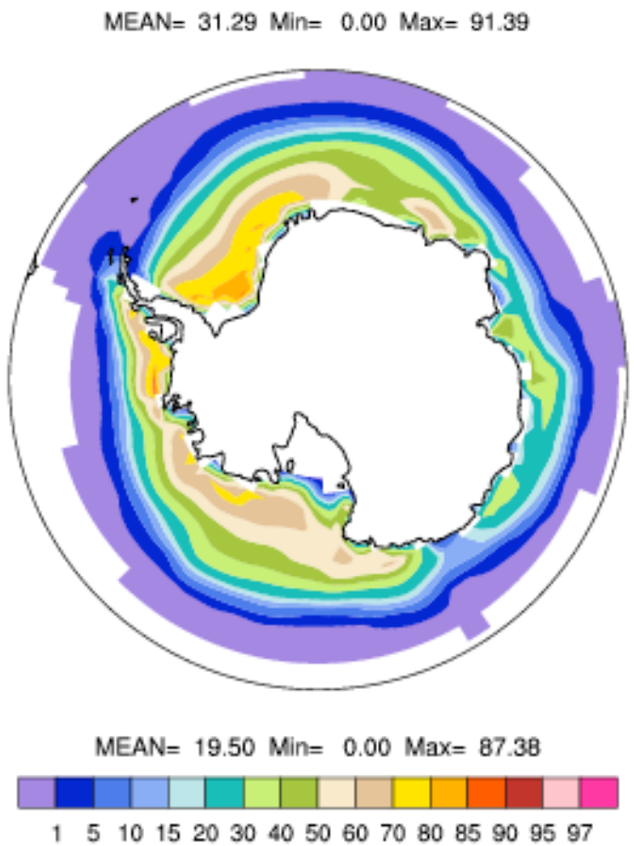
CAM4 - 1°

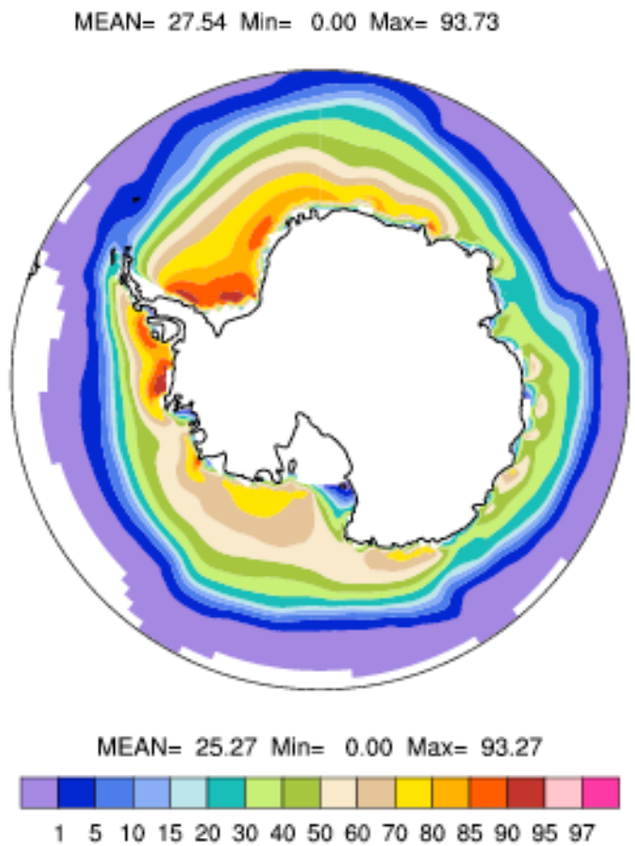
JJA NH



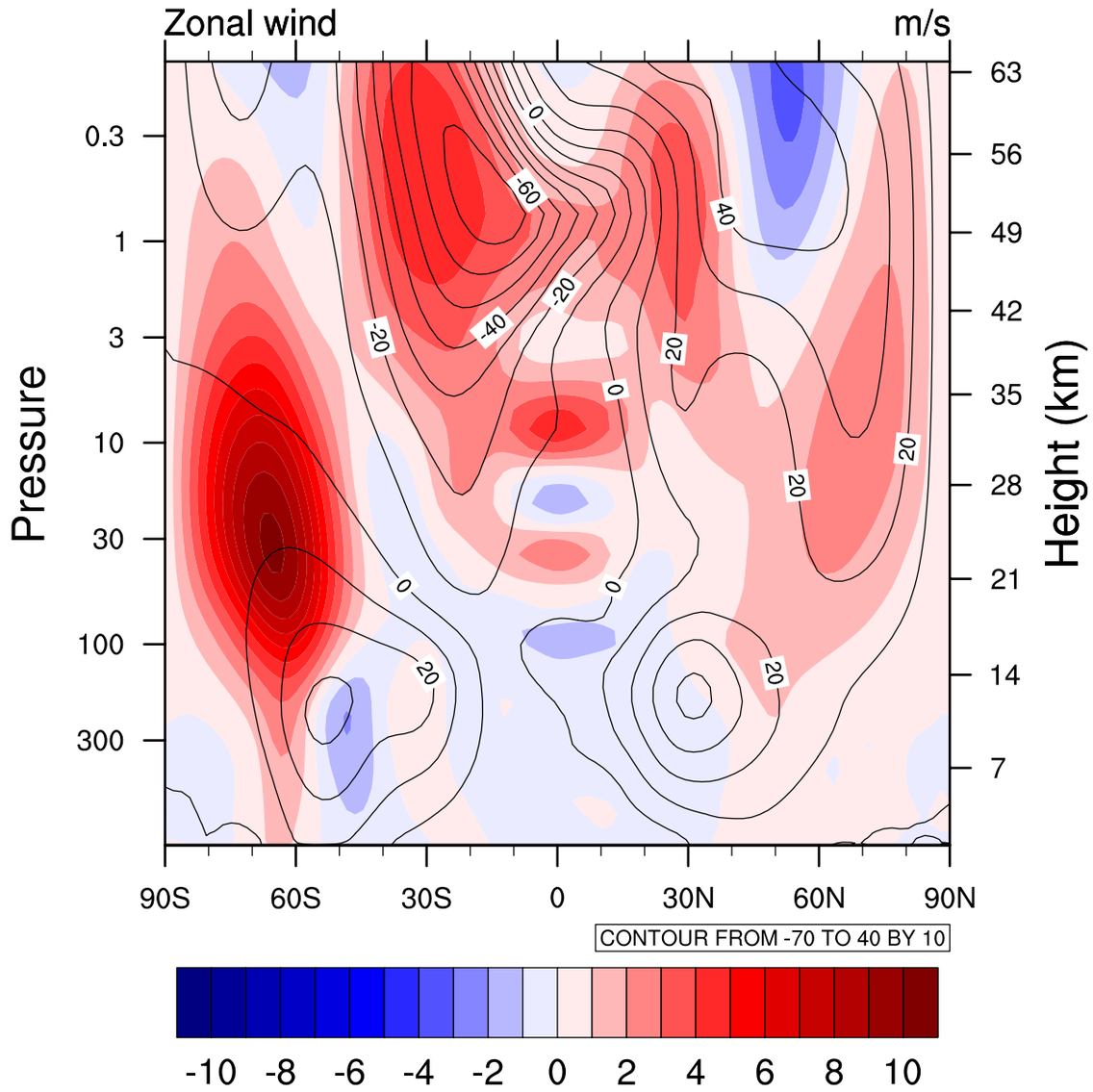


DJF SH

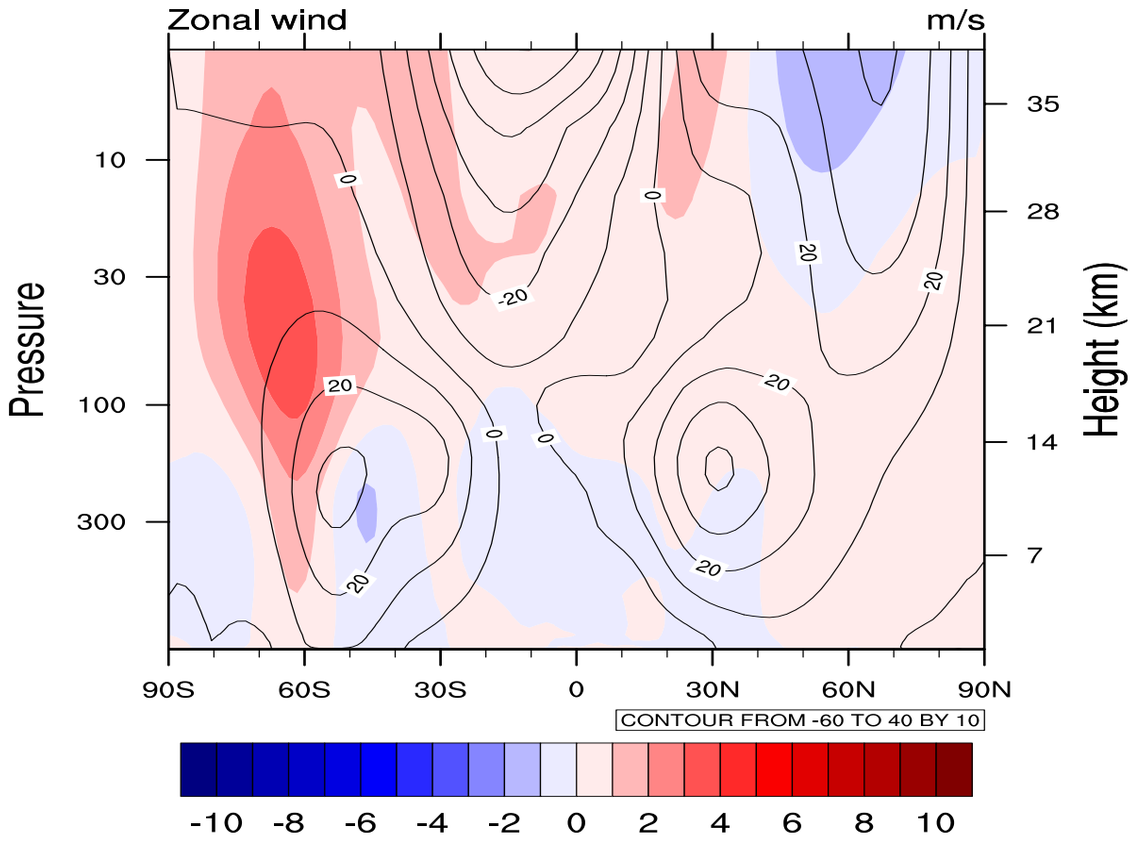




DJF zonal winds and change



1986 to 2005 minus
1960 to 1979



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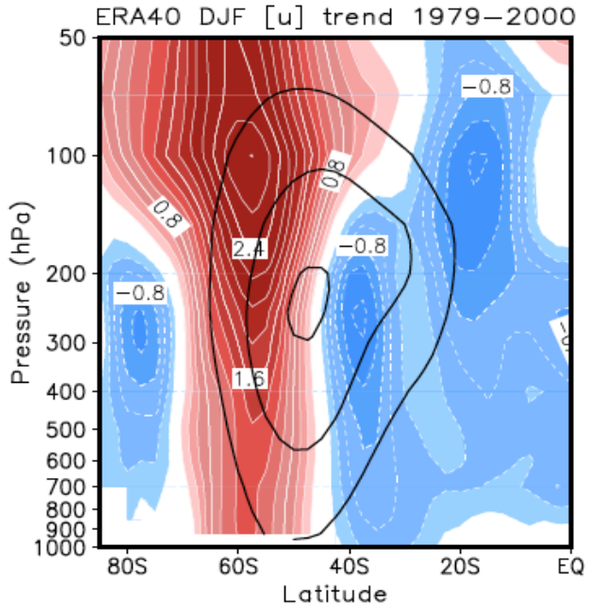
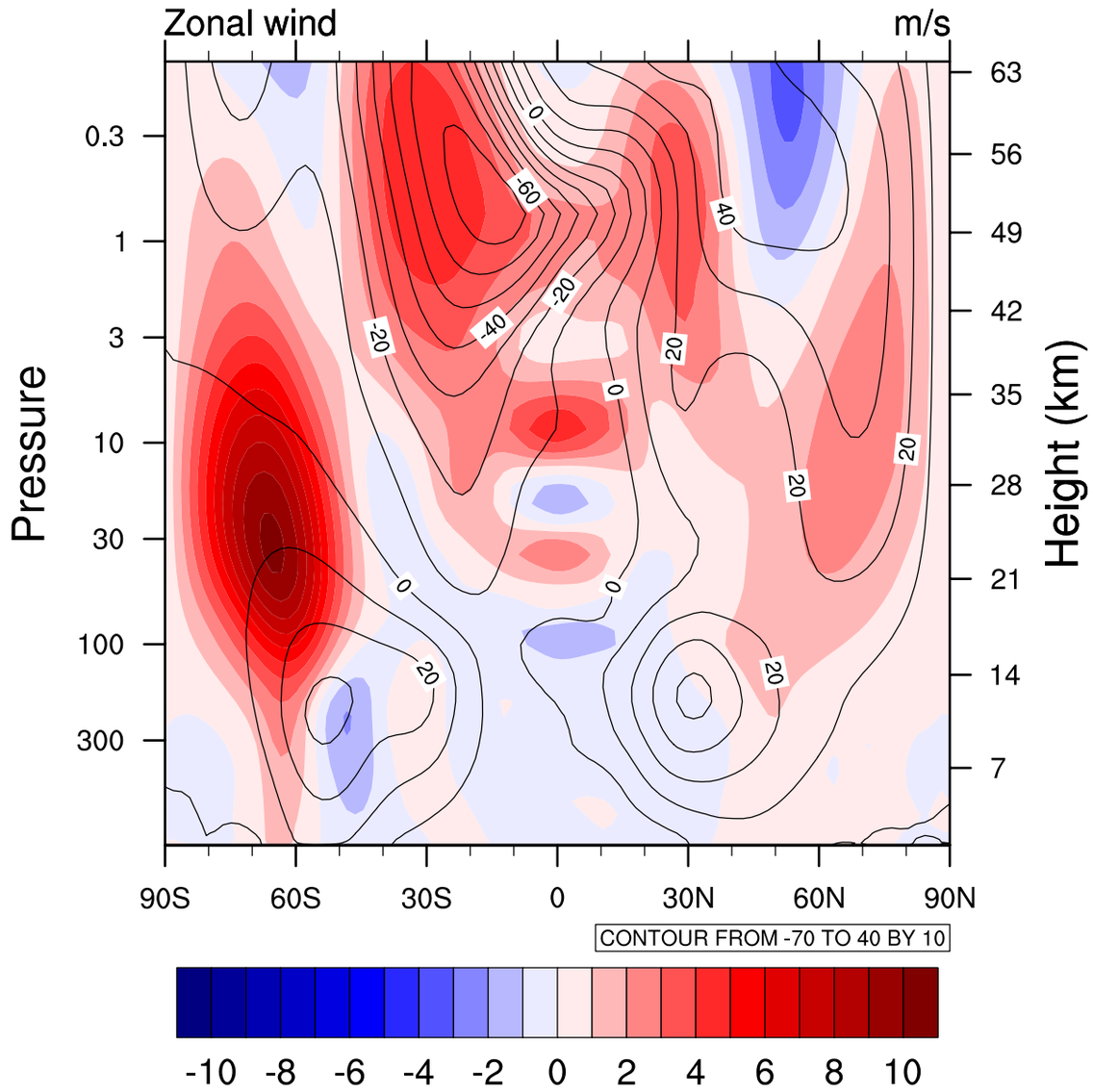
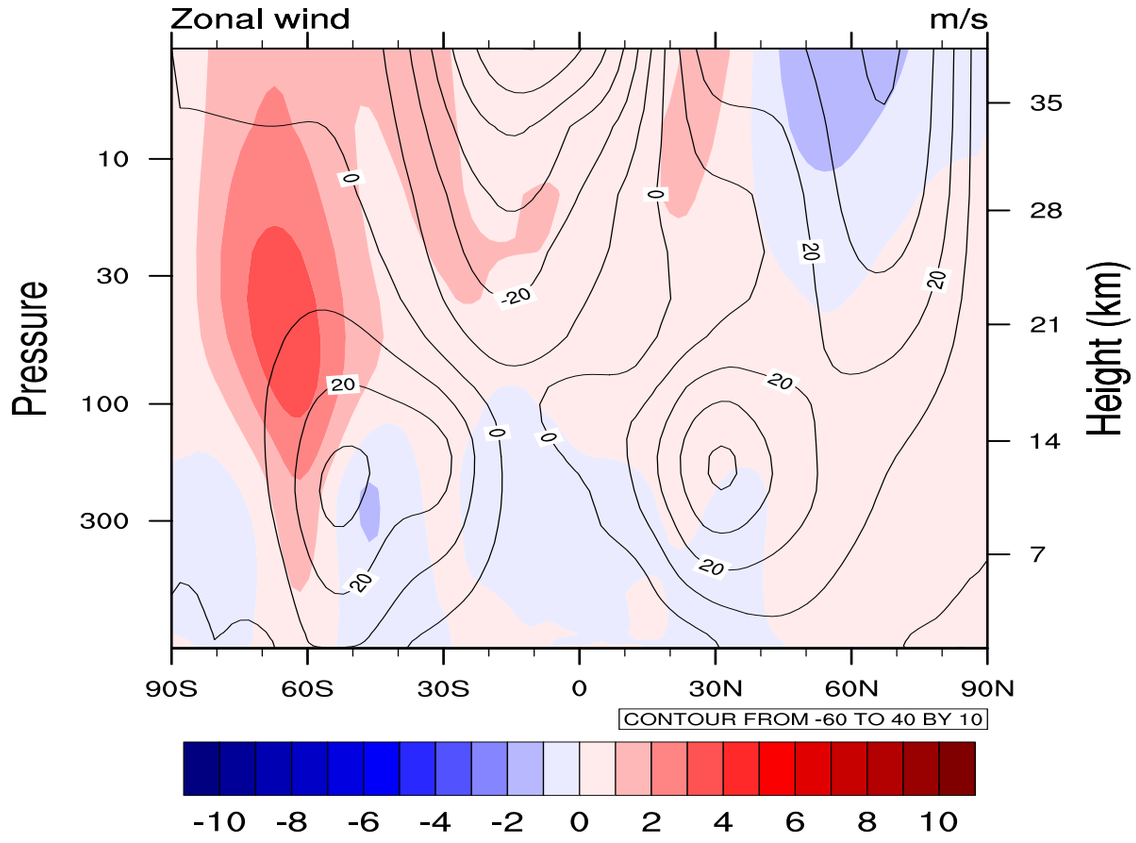
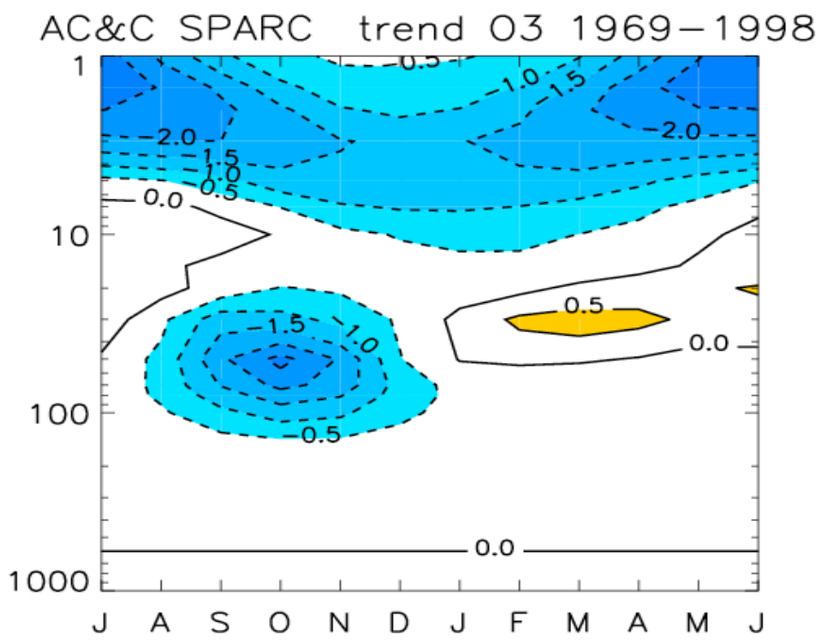


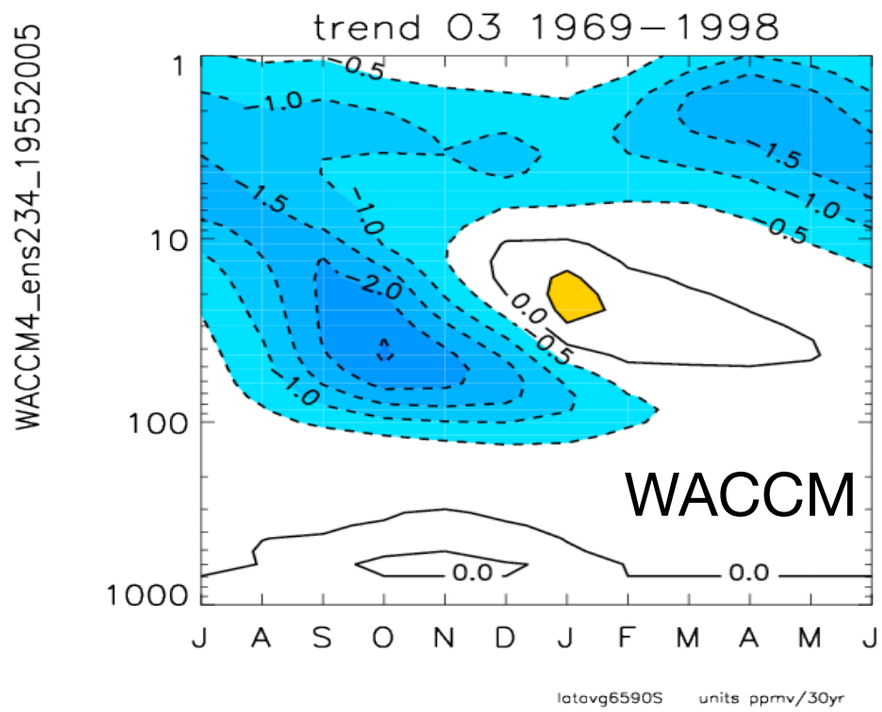
ERA40 Zonal wind trend 1979-2000 Son et al. (2002)





Ozone trends vs. month 1969-1998

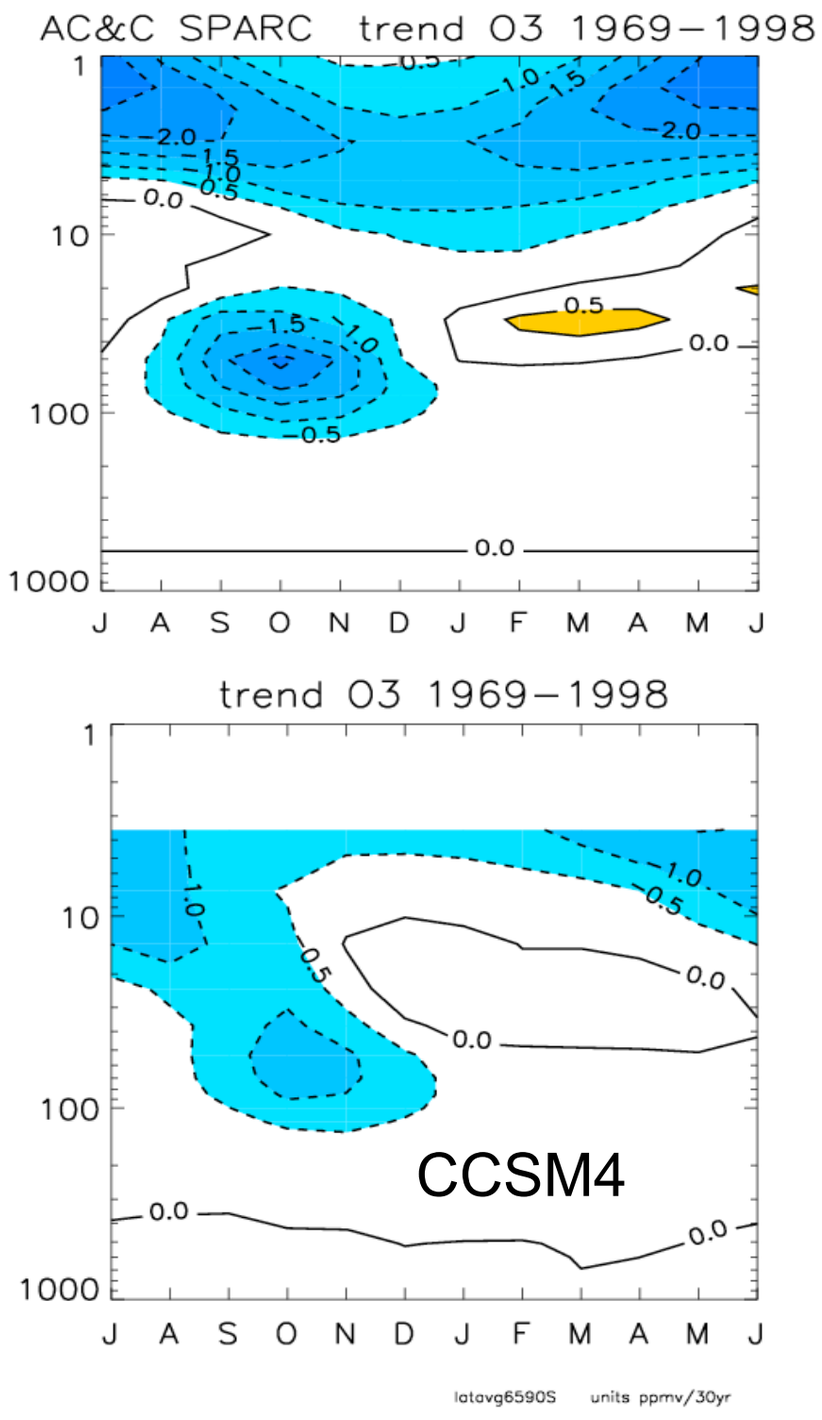


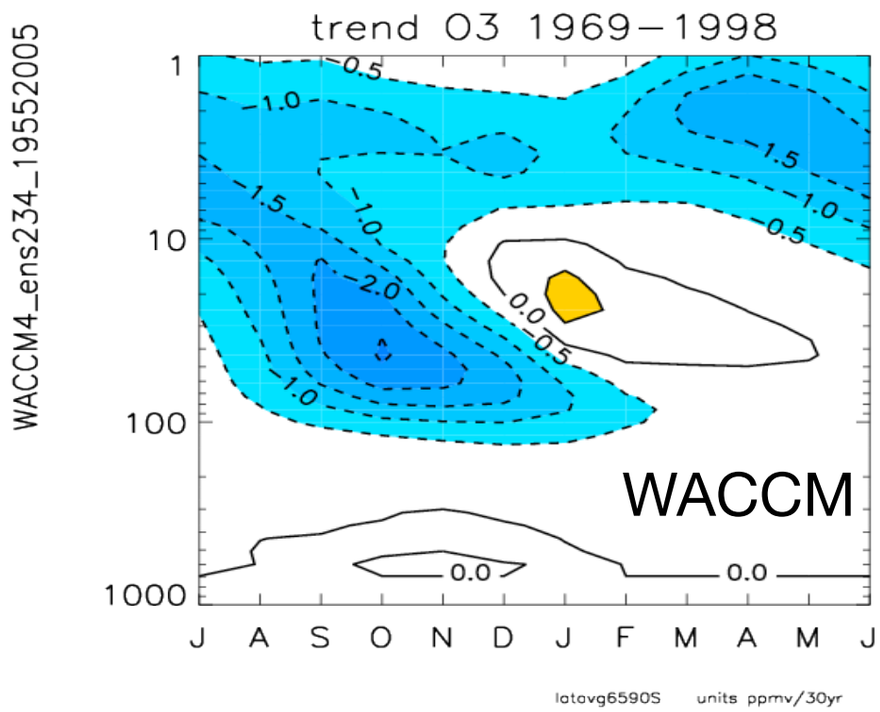


In collaboration with Natalia Calvo

- WACCM ozone trends similar to observed
- Ozone dataset used to drive CCSM4 weaker by factor of 3

Ozone trends vs. month 1969-1998





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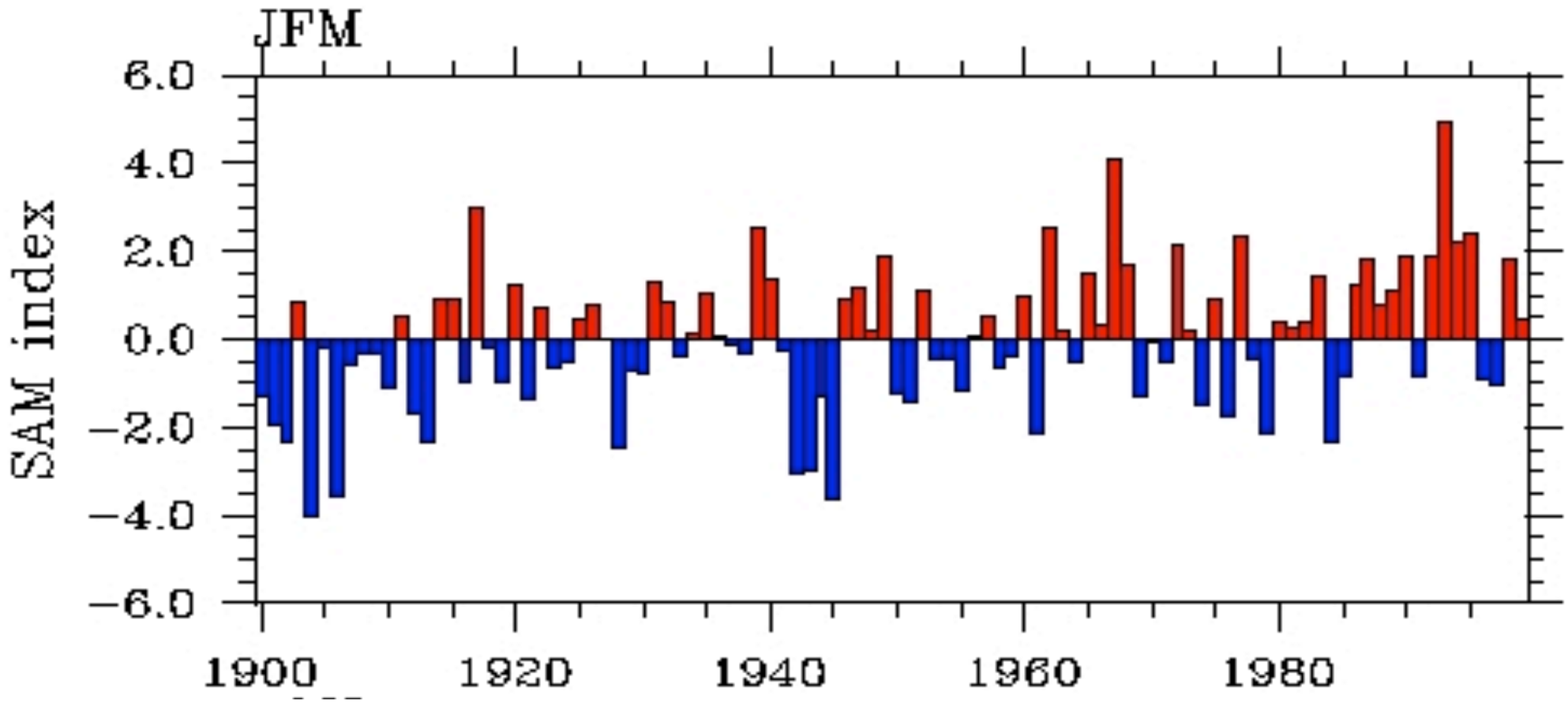
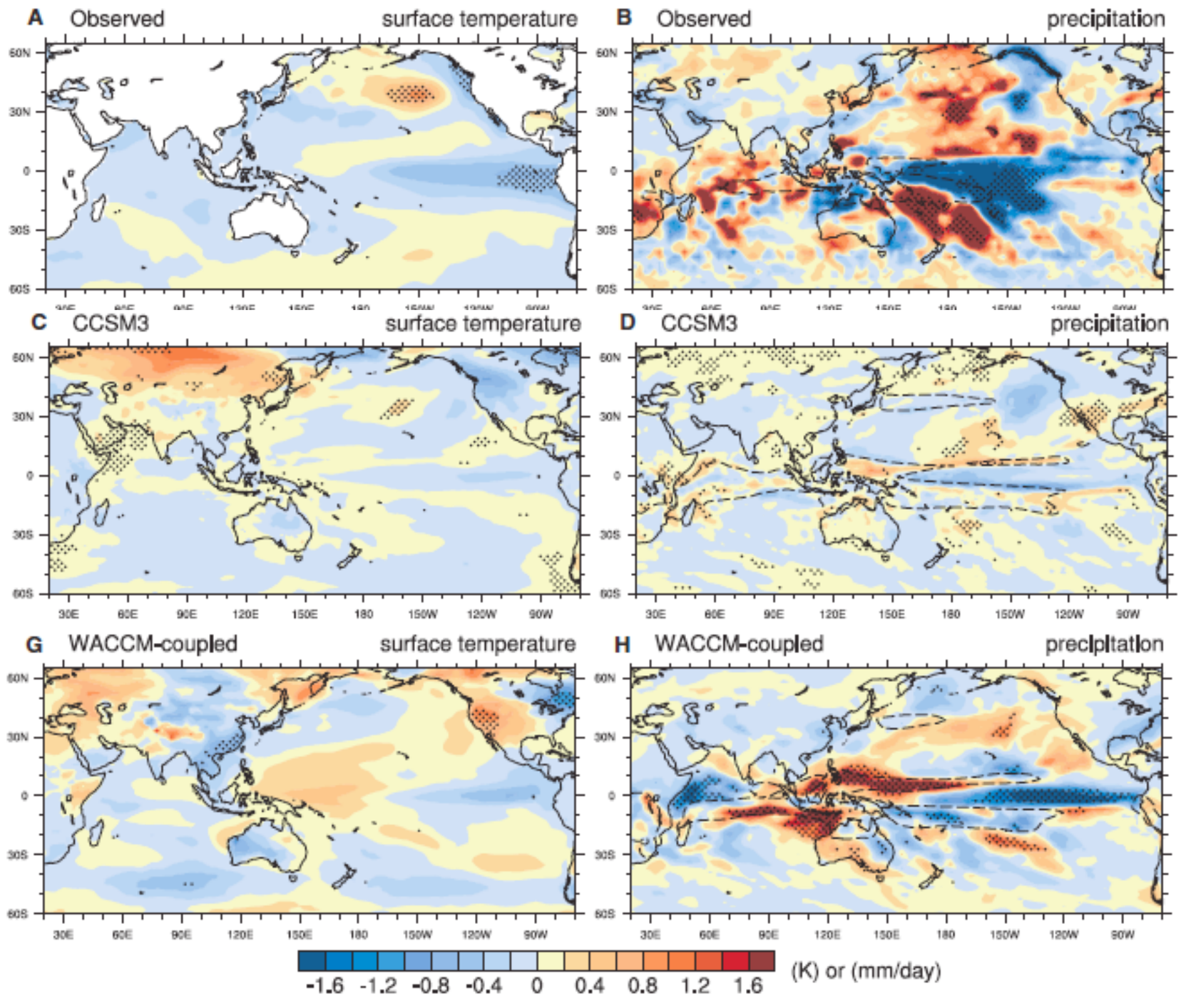
JFM Southern Annular Mode Index



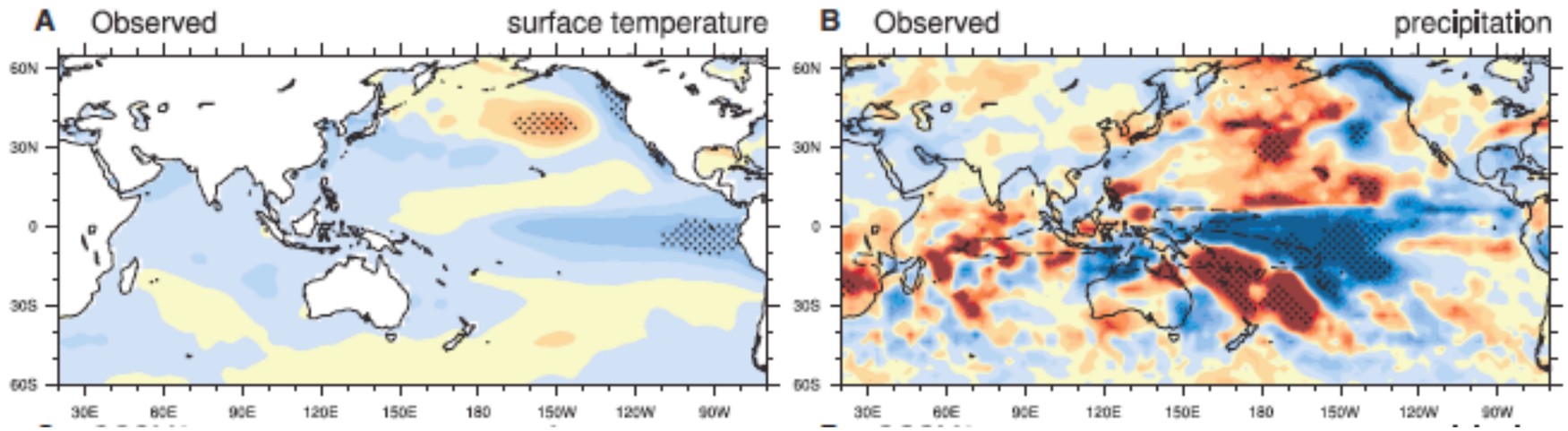
Courtesy Marilyn Raphael

SST response to the solar cycle

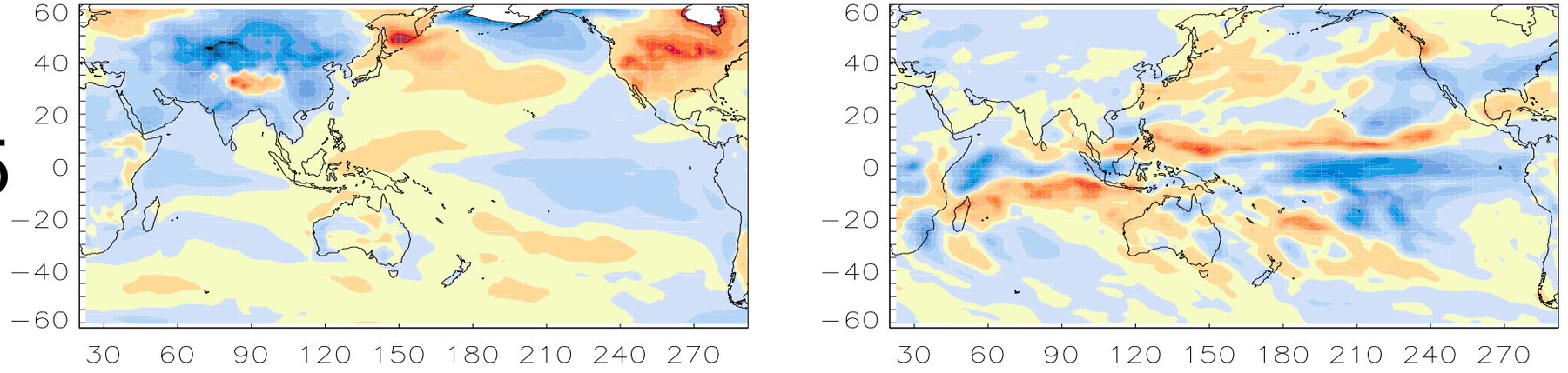
Meehl et al., Science, 2009



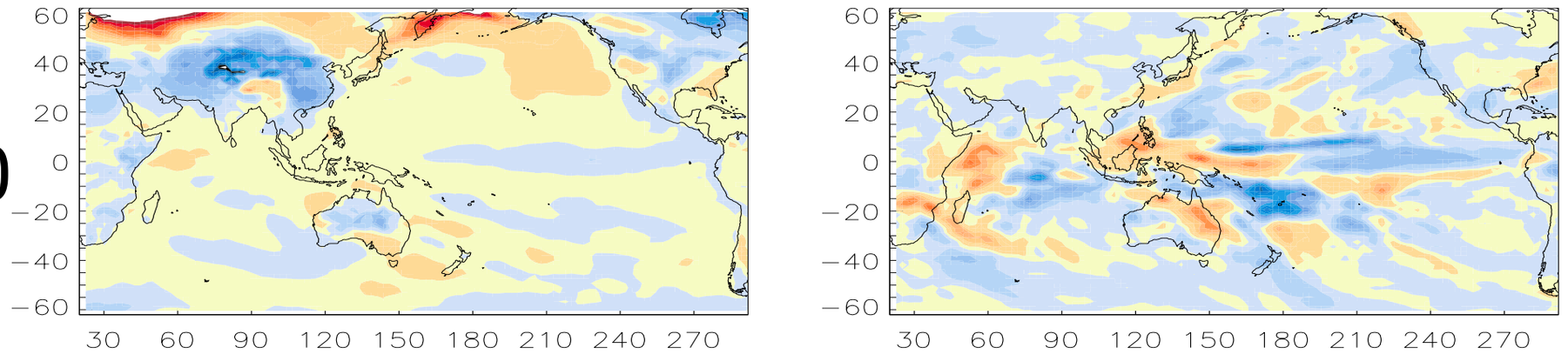
WACCM ensemble mean DJF solar max. yrs. - climatology



1955-2005



rcp4.5
2005-2050



Summary

- Bulk of CMIP5 simulations completed
- Surface temperature trends very similar to CCSM4 (and SSTs & ENSO)
- TMS changes lead to improved SSWs by significant differences in SLP, sea ice thickness/trends.
- Biases seen in AMIP runs persist in the coupled model (SH “cold pole” problem & excessive temperature trends in UTLS)
- Solar maximum SST response not robust

Thanks to those that contributed slides and in particular to Mike Mills, Chris Fischer and CSEG for support in conducting the WACCM CMIP5 simulations