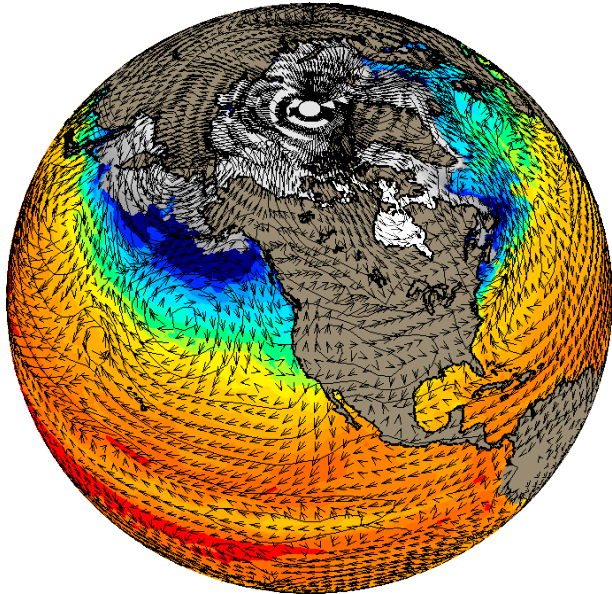


Climate Change Working Group: 2010-2013

Co-chairs: Gerald A. Meehl, Warren M. Washington, Karl Taylor



The challenge for the CCWG:
run and analyze a profusion of
new models, new model
configurations, model
resolutions, model experiments

New model versions that will have future climate change simulations

CCSM4, 1 degree atmosphere, full suite of CMIP5 simulations

CCSM4, 2 degree atmosphere, 20th century and single member RCP simulations

CCSM4, 0.5 degree atmosphere, 100 year control, single member 20th century and RCP4.5; decadal prediction experiments

CESM1 (WACCM) (2 degree atmosphere, stratospheric dynamics, ozone chemistry): 20th century and at least one RCP4.5 to 2100

CESM1 (CAM5); (1 degree atmosphere) pre-industrial control, 20th century and several RCP 21st century simulations

CESM1 (BGC): CMIP5 carbon cycle feedback experiments, 20th and 21st century RCP4.5

HOMME 0.25°, T341 CCSM4, 0.25° CCSM4: atmosphere-only time slice experiments (20 yrs end of 20th century; 20 yrs end of 21st century)

CESM1 (Glimmer-CISM), 20th century, RCP4.5, RCP8.5

CMIP5 Decadal prediction experiments

Multi-ensemble member sets of CMIP5 decadal hindcast and prediction experiments with two initialization schemes:

1. Ocean-Ice Hindcast (CORE)
2. DART weakly coupled scheme (ocean data assimilation weakly coupled to atmosphere data assimilation)

Some results so far

The context:

Equilibrium climate sensitivity

PCM: 2.1°C

CCSM3: 2.7°C

CCSM4: 3.1°C

CESM1 CAM5: 4.5°C

Transient climate response (TCR)

PCM: 1.30°C

CCSM3: 1.46°C

CCSM4: 1.56°C

CESM1 CAM5: unknown at this time

Aerosol radiative forcing

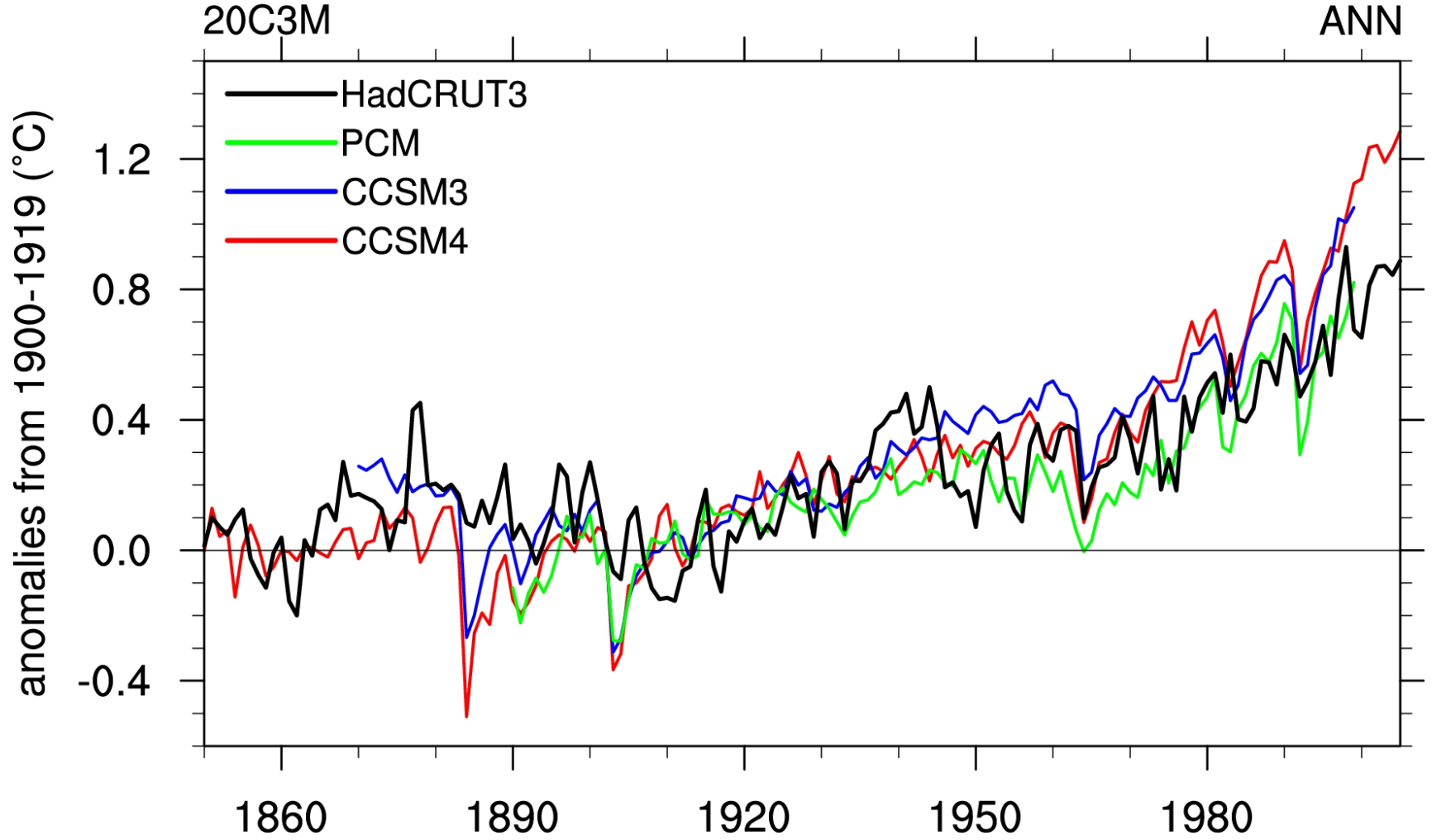
PCM: sulfate direct $\sim -0.8 \text{ Wm}^{-2}$

CCSM3: sulfate direct $\sim -0.8 \text{ Wm}^{-2}$

CCSM4: sulfate direct -0.8 Wm^{-2}

CESM CAM5: sulfate direct -0.5 Wm^{-2} ; indirect -1.6 Wm^{-2}

Globally averaged surface air temperature



Globally averaged surface air temperature

20C3M

ANN

anomalies from 1900-1919 (°C)

- HadCRUT3
- CESM-FSCHEM
- CESM WACCM
- CCSM4

1.2
0.8
0.4
0.0
-0.4

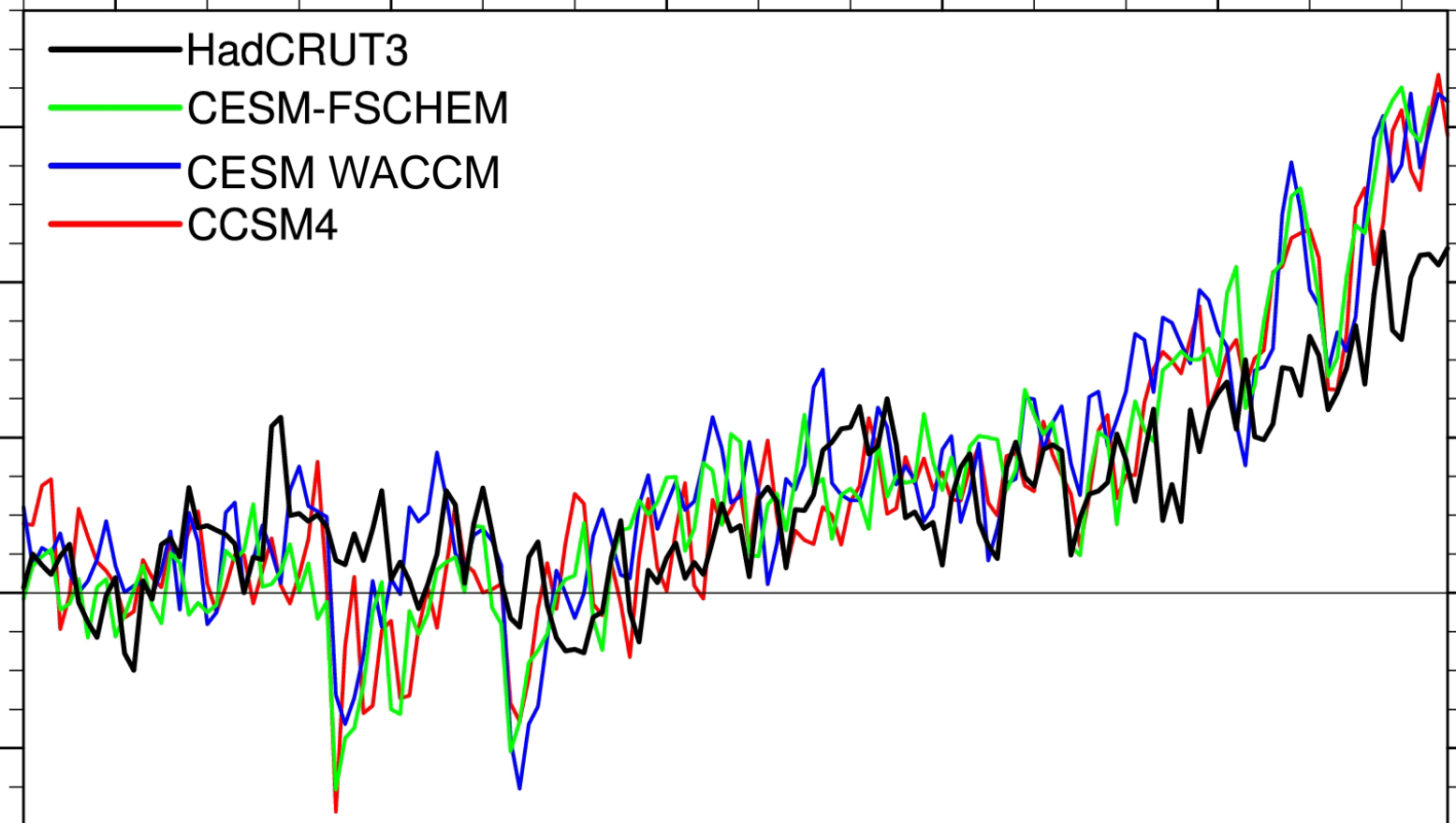
1860

1890

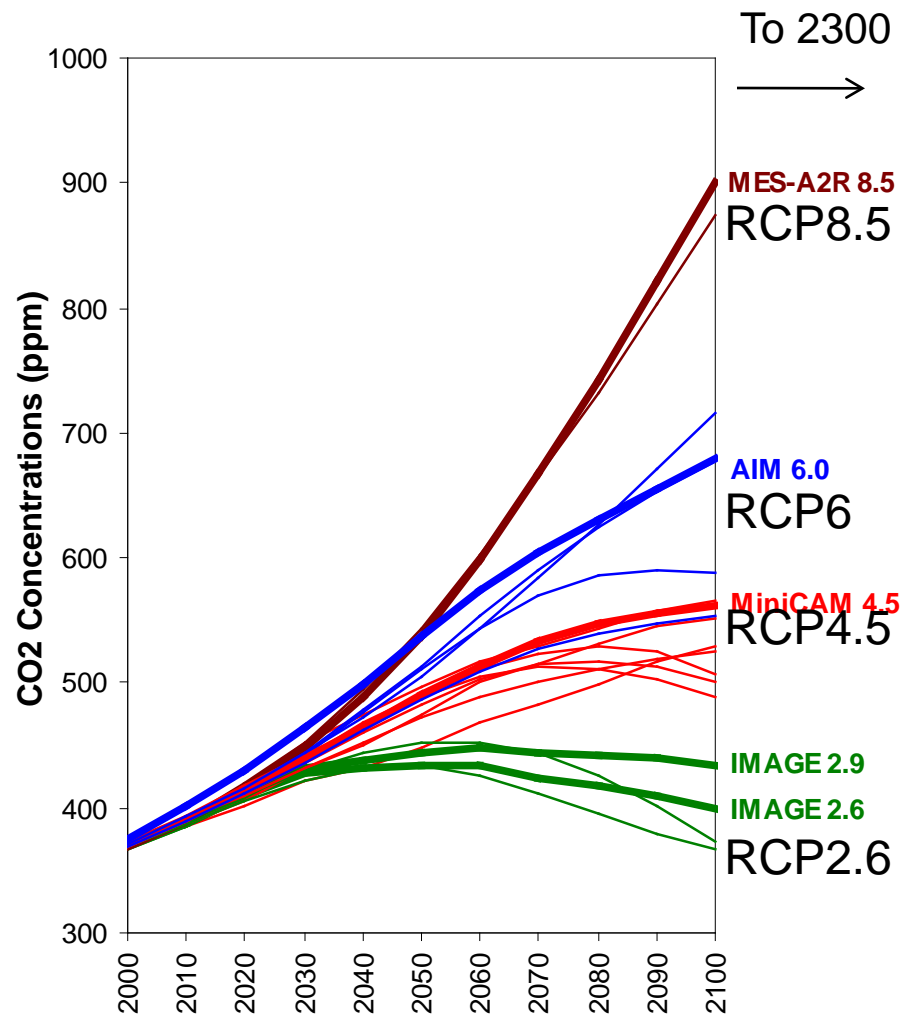
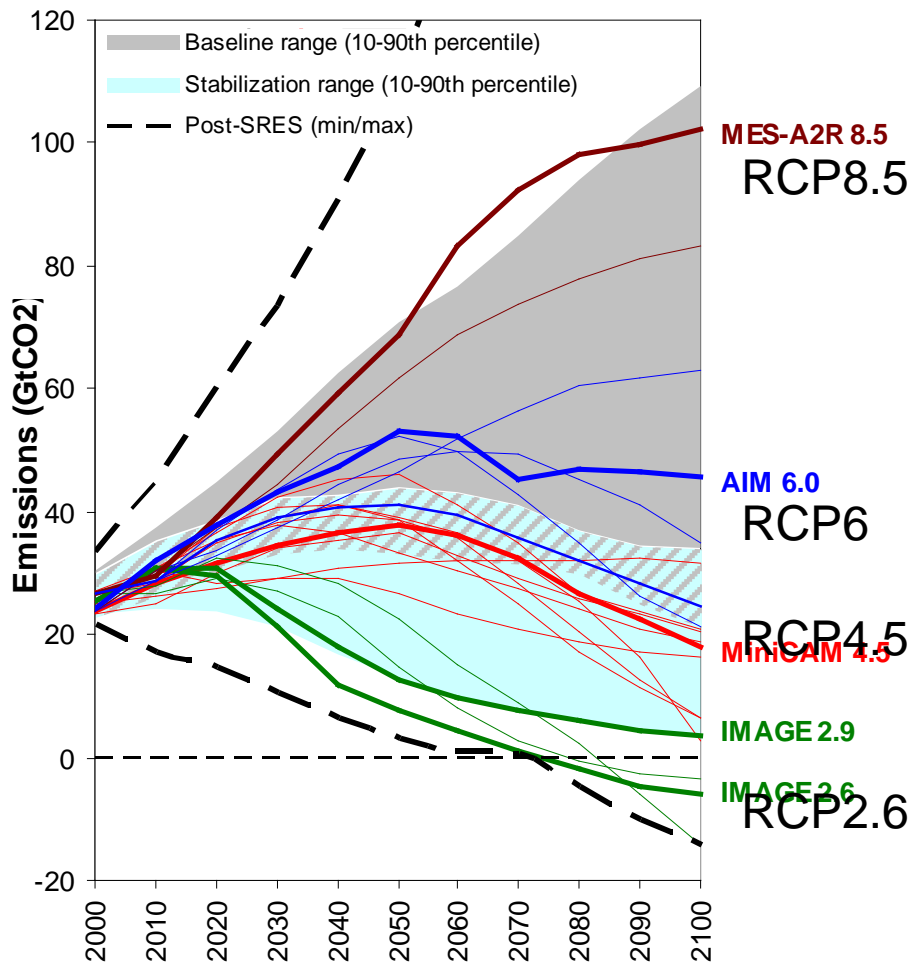
1920

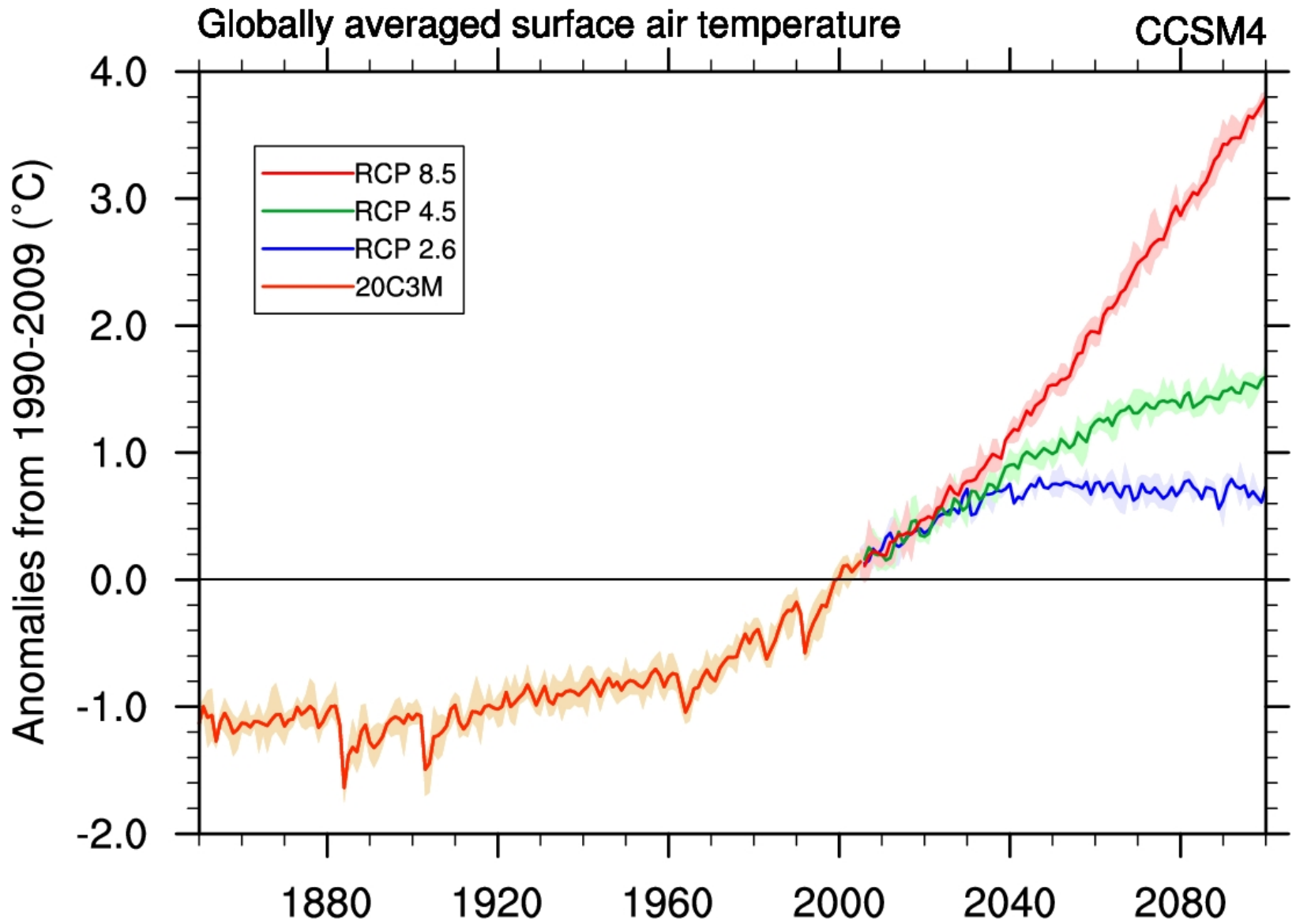
1950

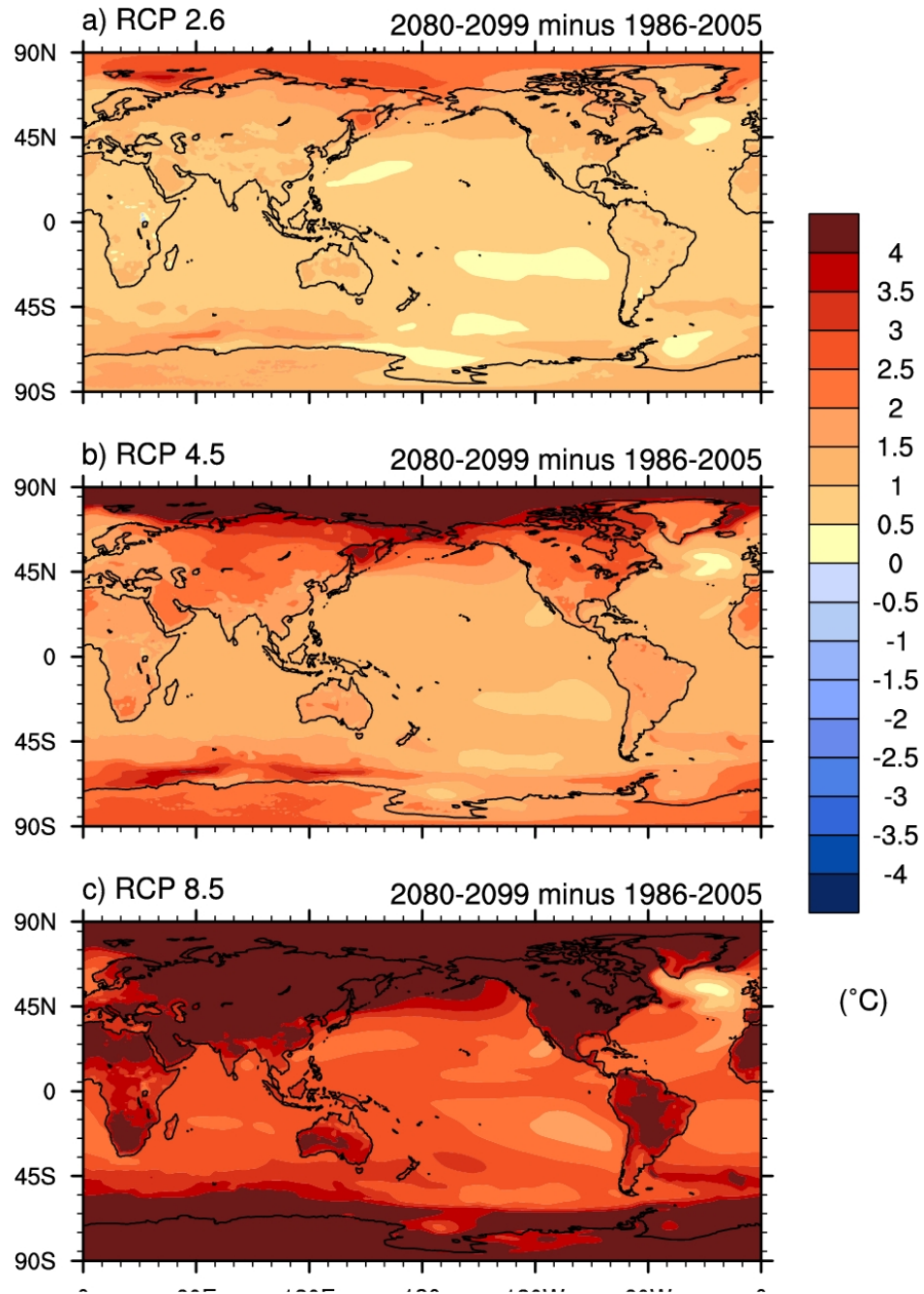
1980



Representative Concentration Pathways (RCPs)







CCWG Model Runs

2010

CMIP5 runs

2011-2013

CESM1 & high resolution



CMIP5 experiments; climate variability/change analyses; CCSM4 aerosol sensitivity experiments
CCSM4 20th-century & RCP scenarios

Analysis of climate variability and climate change; geoengineering runs; continue CMIP5 experiments; cloud-resolving CESM



CMIP5 Long-term stabilization scenarios; CCSM4 single forcing experiments
CESM CMIP5 20th century and RCPs

High-resolution decadal prediction experiments; CCSM4/CESM perturbed physics ensembles
CESM single forcing experiments



CCSM4 decadal prediction runs
 $\frac{1}{2}^\circ$ CCSM4 simulations
High-resolution time slices (0.25° HOMME, T341, CCSM4)

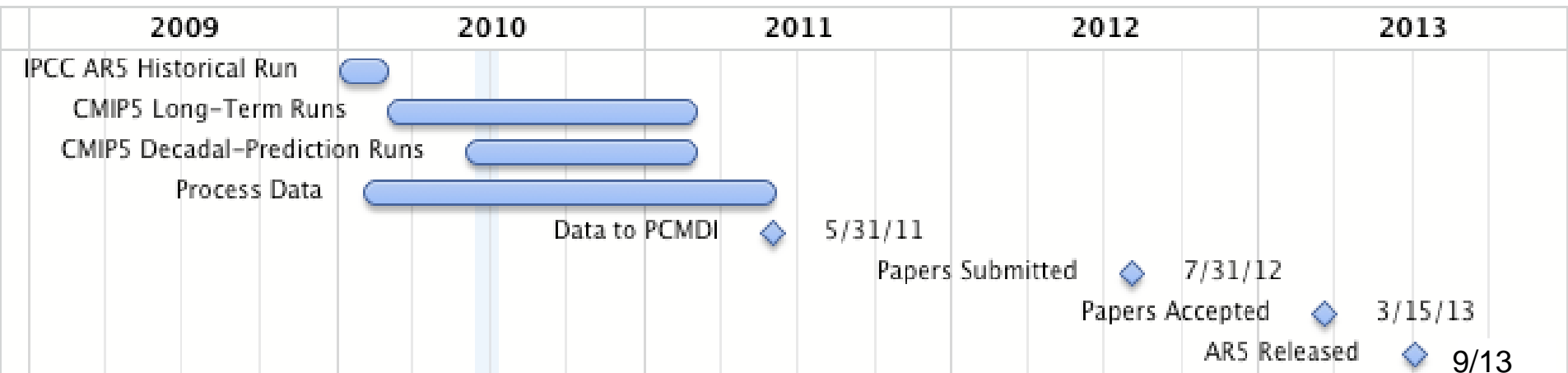
CESM decadal prediction experiments; High-resolution coupled experiments; Special DOE scenarios for future US energy strategies



CAM-HOMME runs, CCSM4

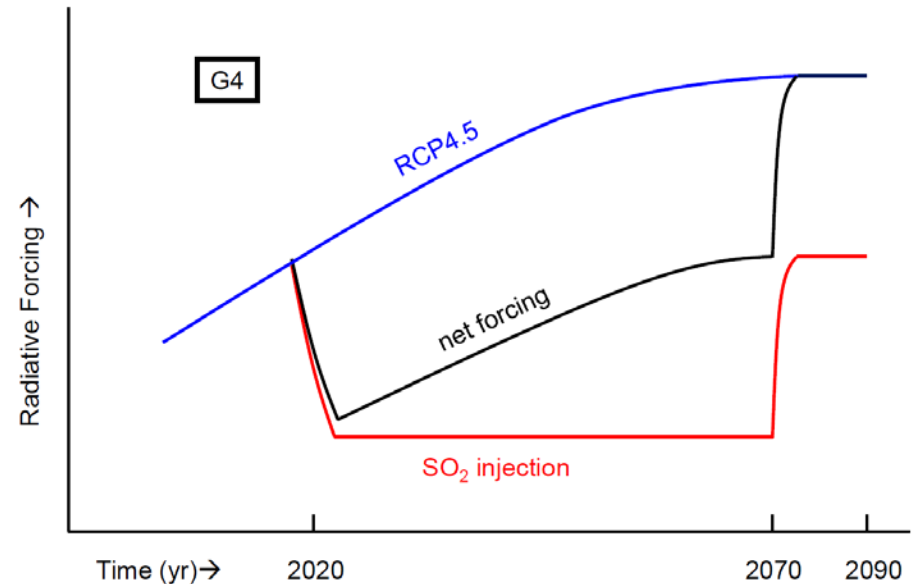
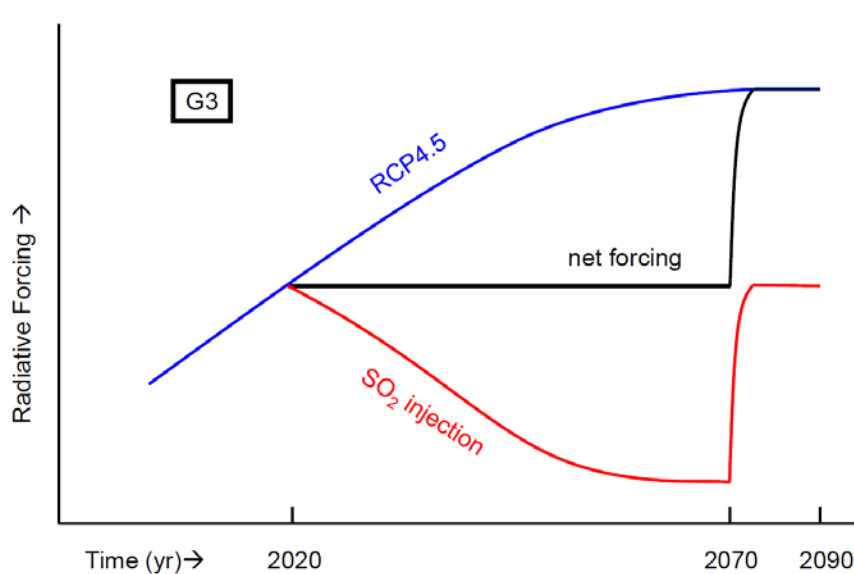
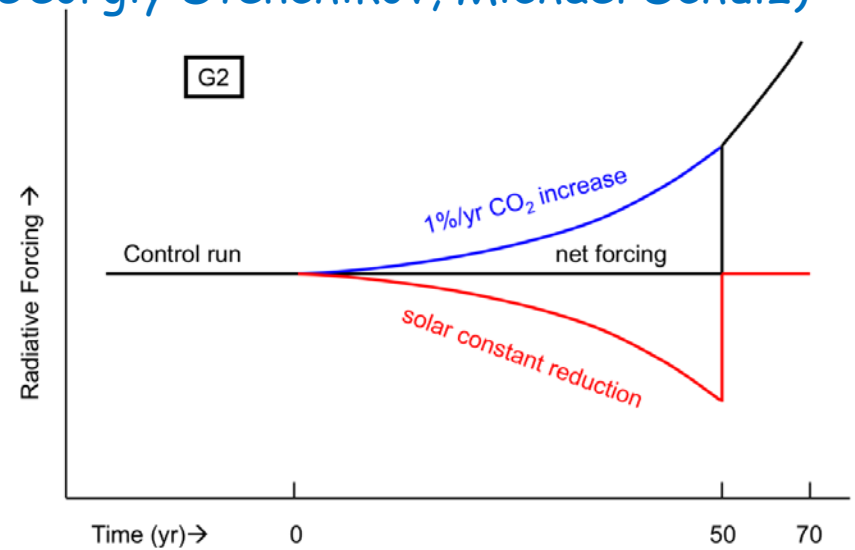
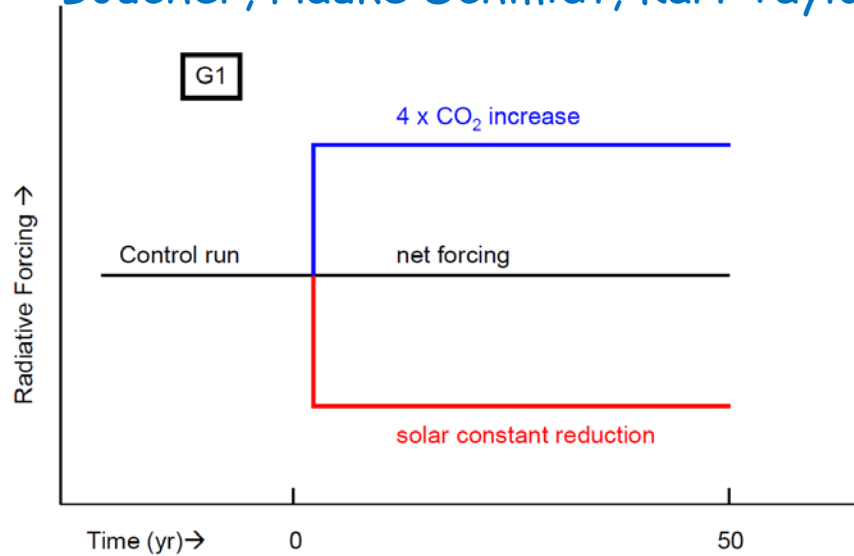
CCSM4/CESM, CAM-HOMME

CCWG CMIP5 experiments for assessment in IPCC AR5 Estimated Timeline



—————→
CMIP5 experiments performed

The Geoengineering Model Intercomparison Project, GeoMIP, a CMIP Coordinated Experiment (Ben Kravitz, Alan Robock, Olivier Boucher, Hauke Schmidt, Karl Taylor, Georgiy Stenchikov, Michael Schulz)



Globally averaged surface air temperature

