



**SKD**  
CENTRE FOR  
CLIMATE DYNAMICS  
AT THE BJERKNES CENTRE

# First results from the Norwegian climate model NorESM

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**The NorESM-Team**  
(Helge Drange)

# Background

## Bergen



### Bergen Climate Model (BCM)

ARPEGE + MICOM

1 of 4 European (global)  
climate models used in  
IPCC AR4

## Oslo



### Aerosols, clouds and atmospheric chemistry

CAM-based research



## NorESM

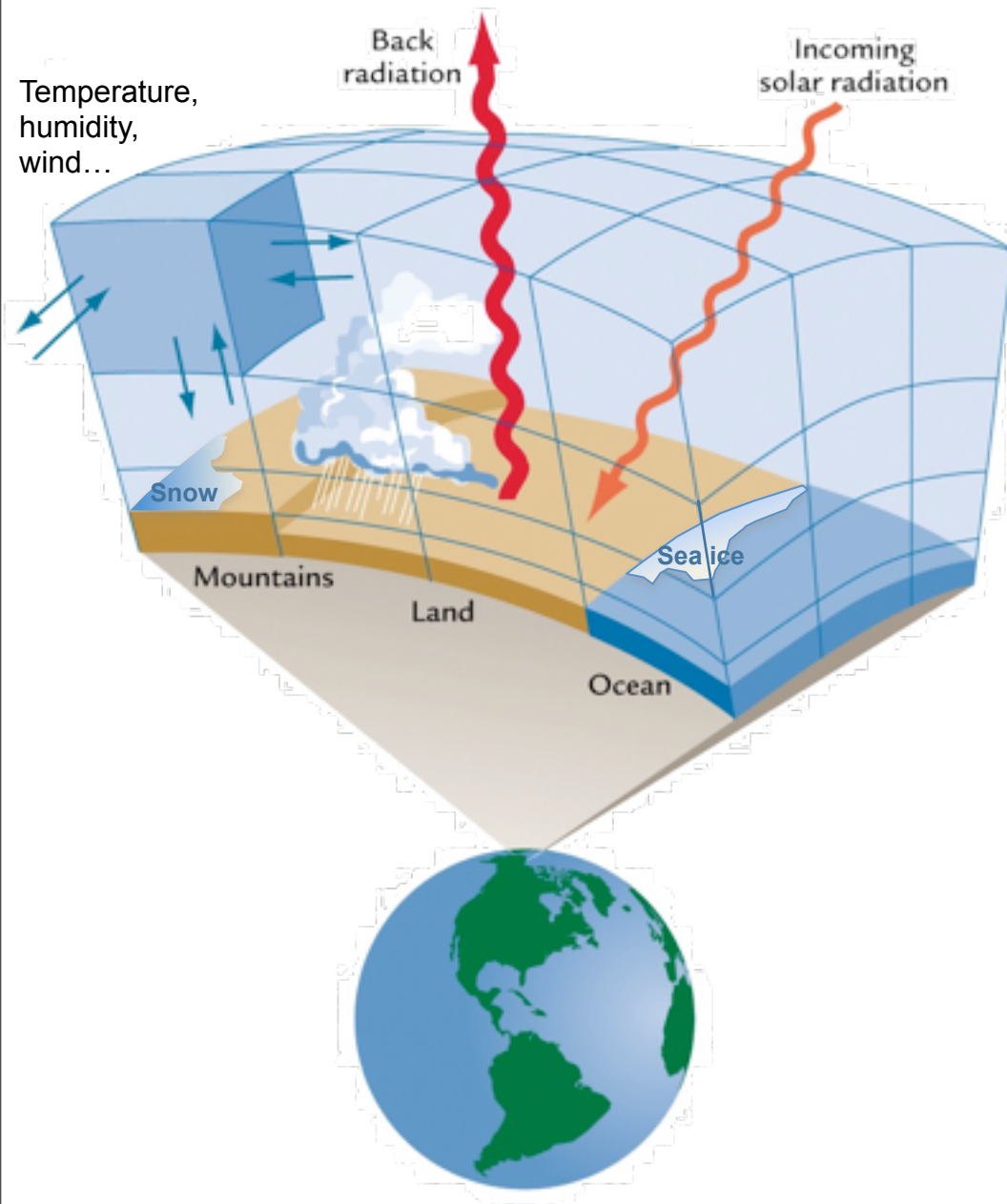
CAM + Isopycnic ocean model + HAMOCC

Trond Iversen (met.no)  
Mats Bentsen (Bjerknes)



Funded by the Research Council of Norway  
<http://gfi.uib.no/EarthClim>





## Some NorESM-figures

**360 thousand grid cells** in the atmosphere

**6,5 million grid cells** in ocean

**Resolution  $1.9^\circ \times 2.5^\circ$**  (vertical layers: 26 (atm), 53 (ocean))

**2,500 simulation years** for CMIP5 production runs

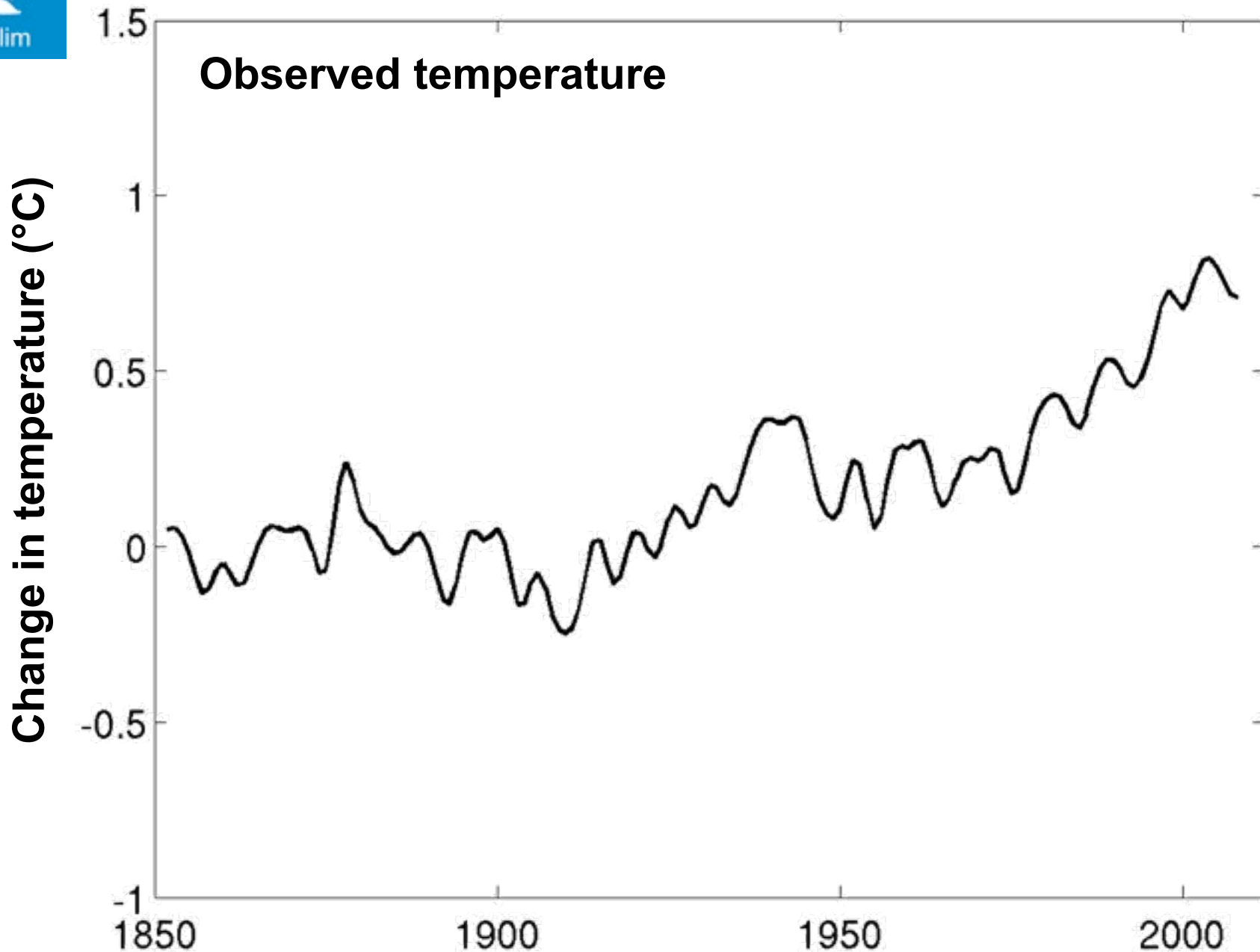
**250 days** to complete the CMIP5 simulations

**Run on CRAY XT4** at University of Bergen, on **312 processors**

# Historical simulations 1850-2010

# Global temperature relative to 1850-1900

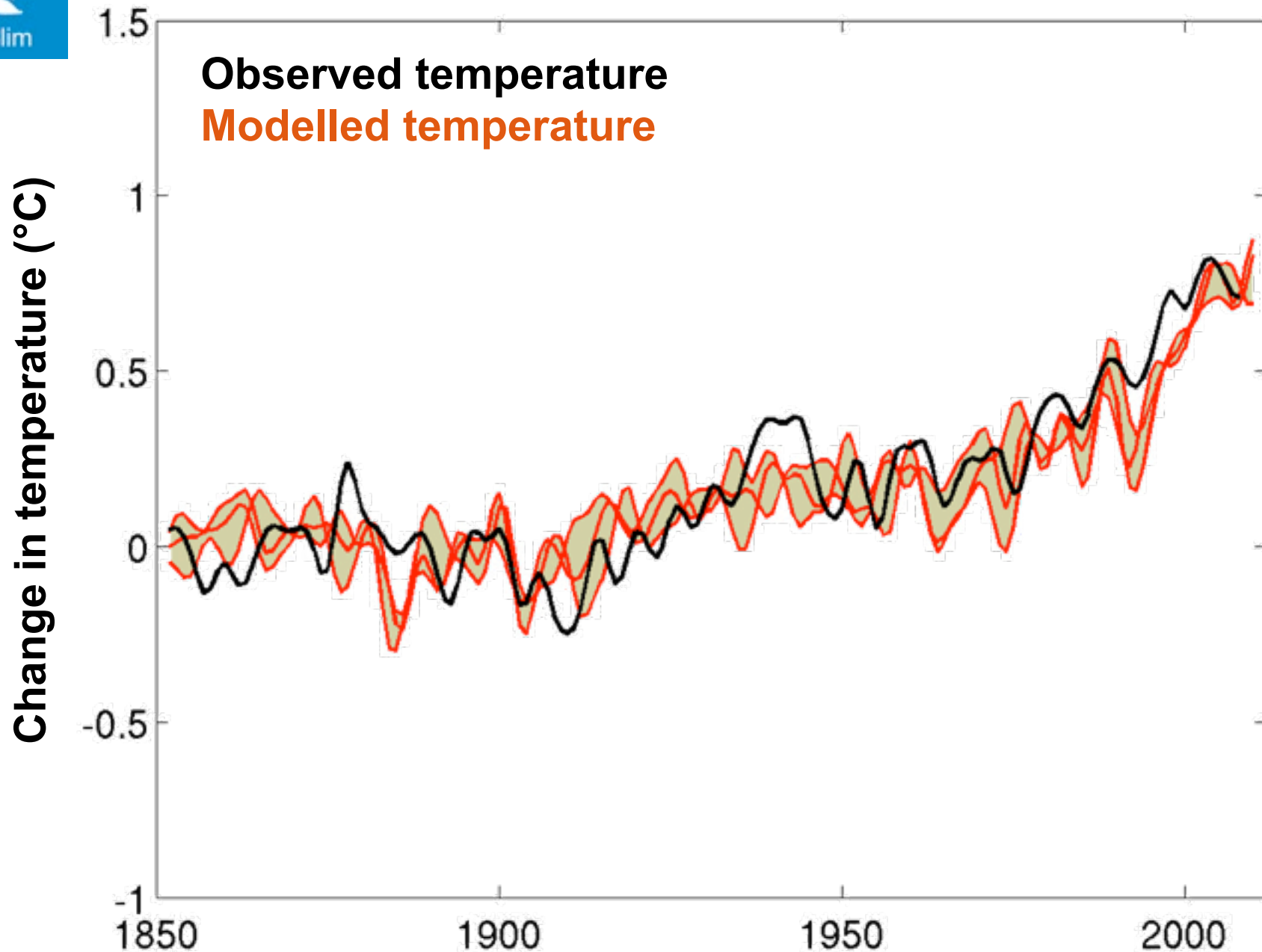
(°C, 5-yr filtered)





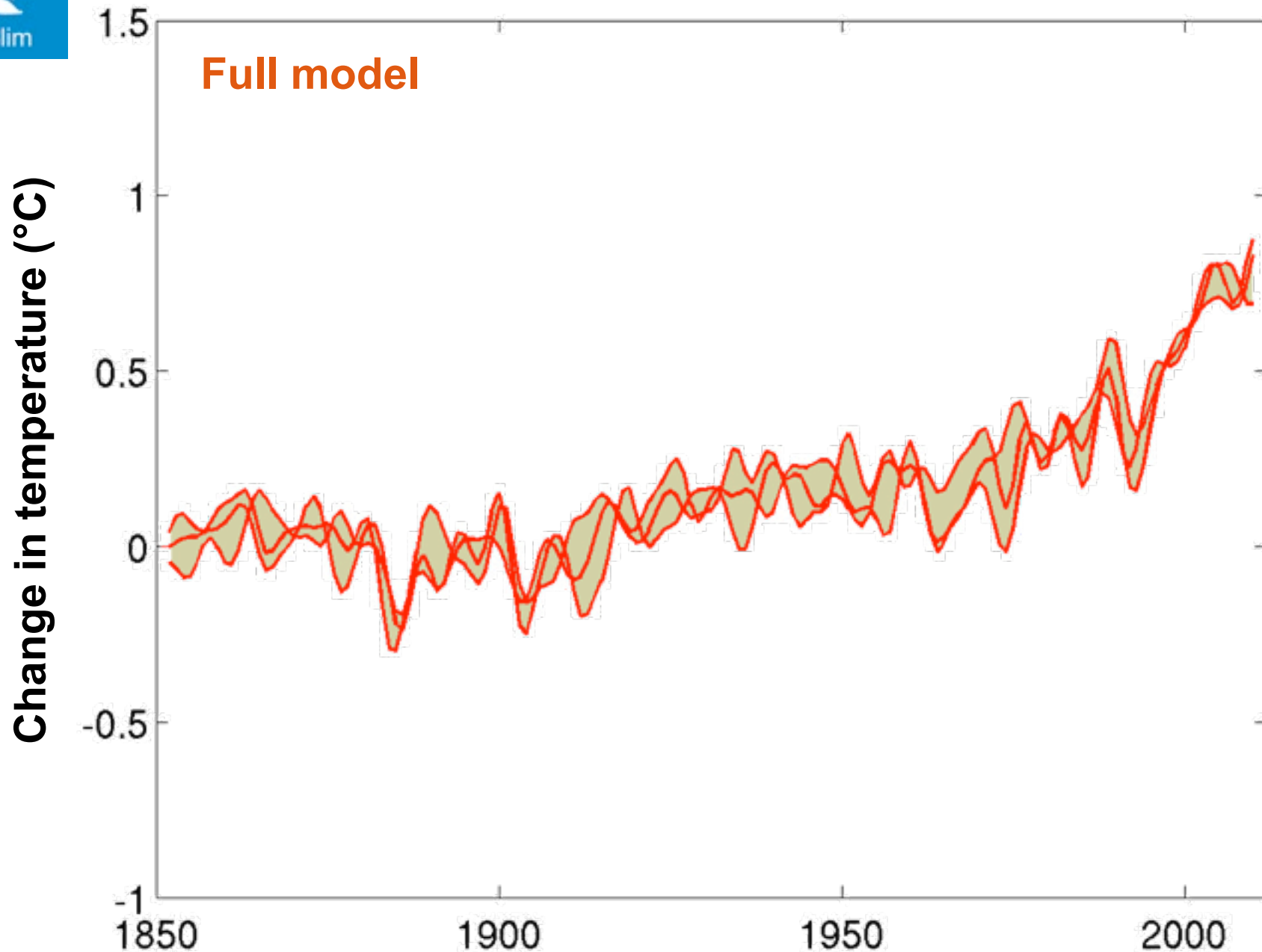
# Global temperature relative to 1850-1900

(°C, 5-yr filtered)



# Global temperature relative to 1850-1900

(°C, 5-yr filtered)

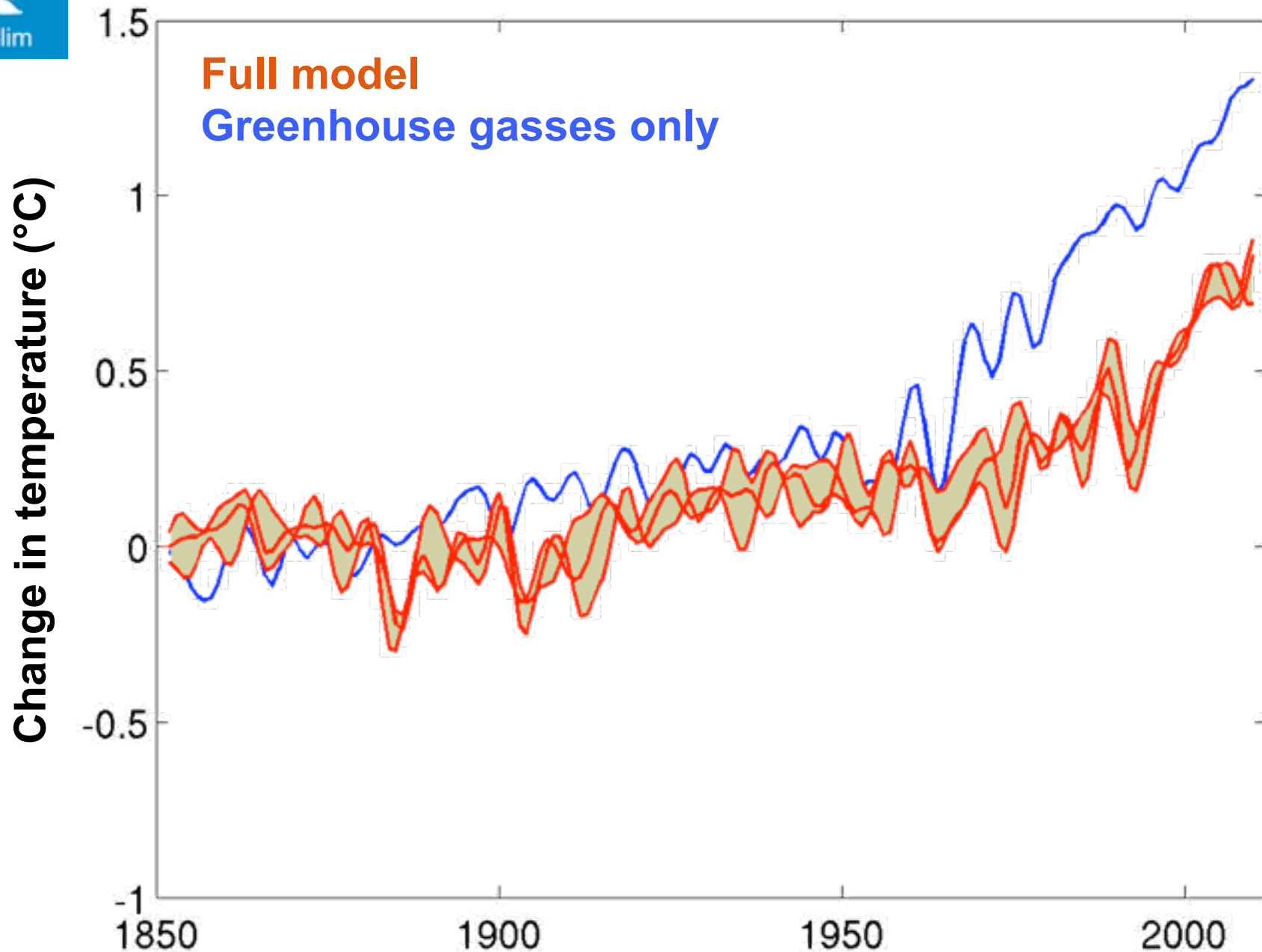






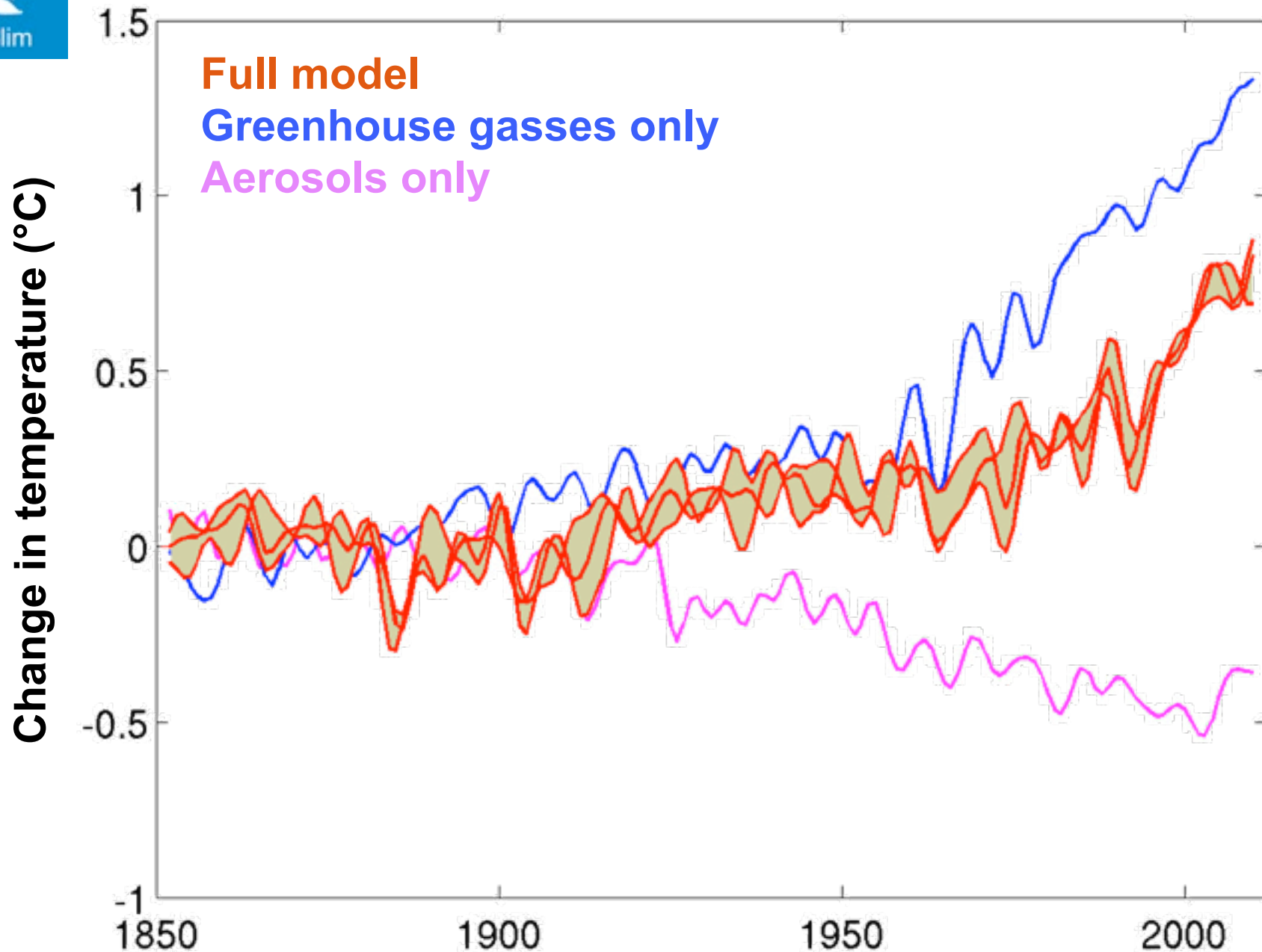
# Global temperature relative to 1850-1900

(°C, 5-yr filtered)



# Global temperature relative to 1850-1900

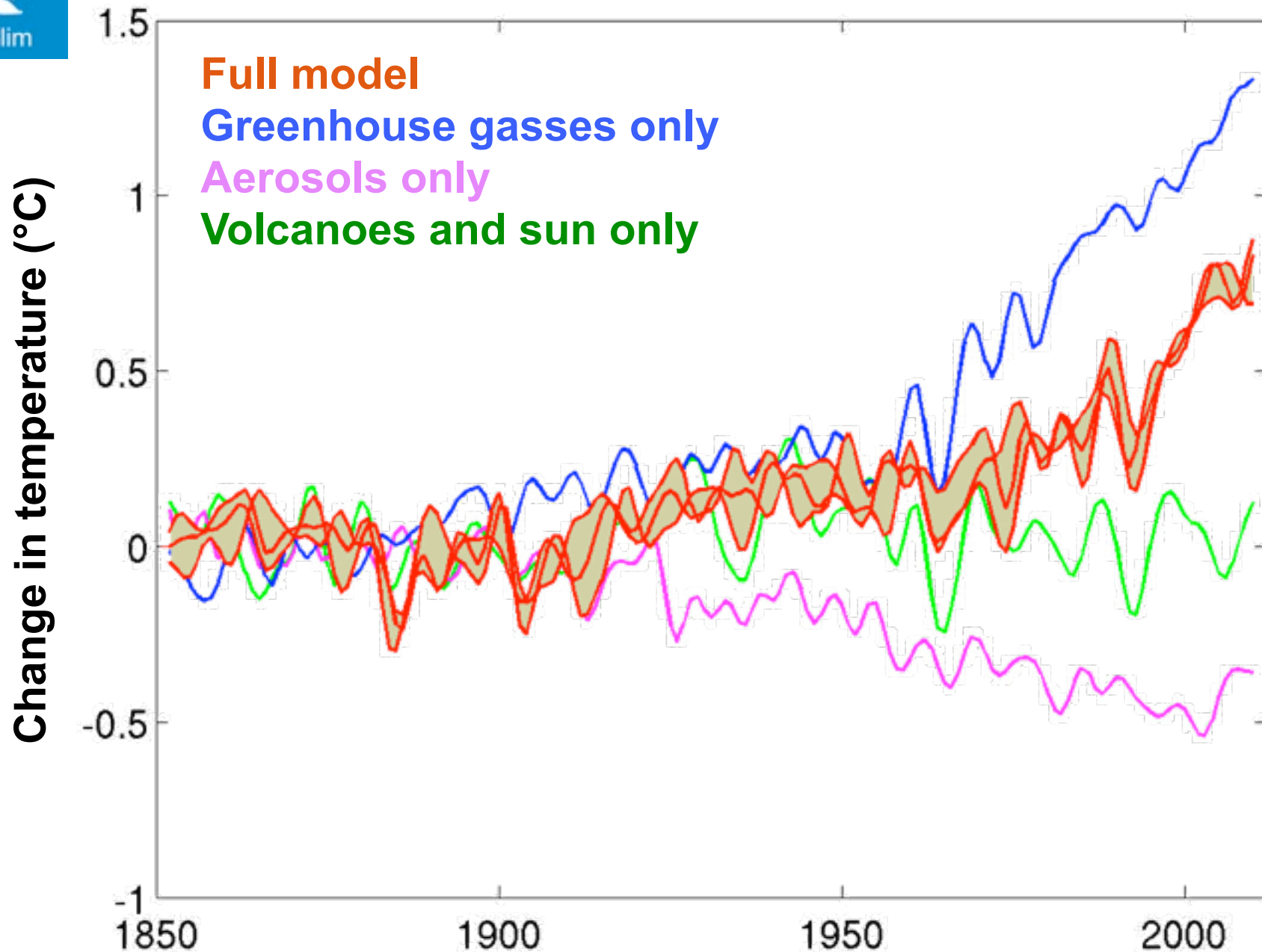
(°C, 5-yr filtered)



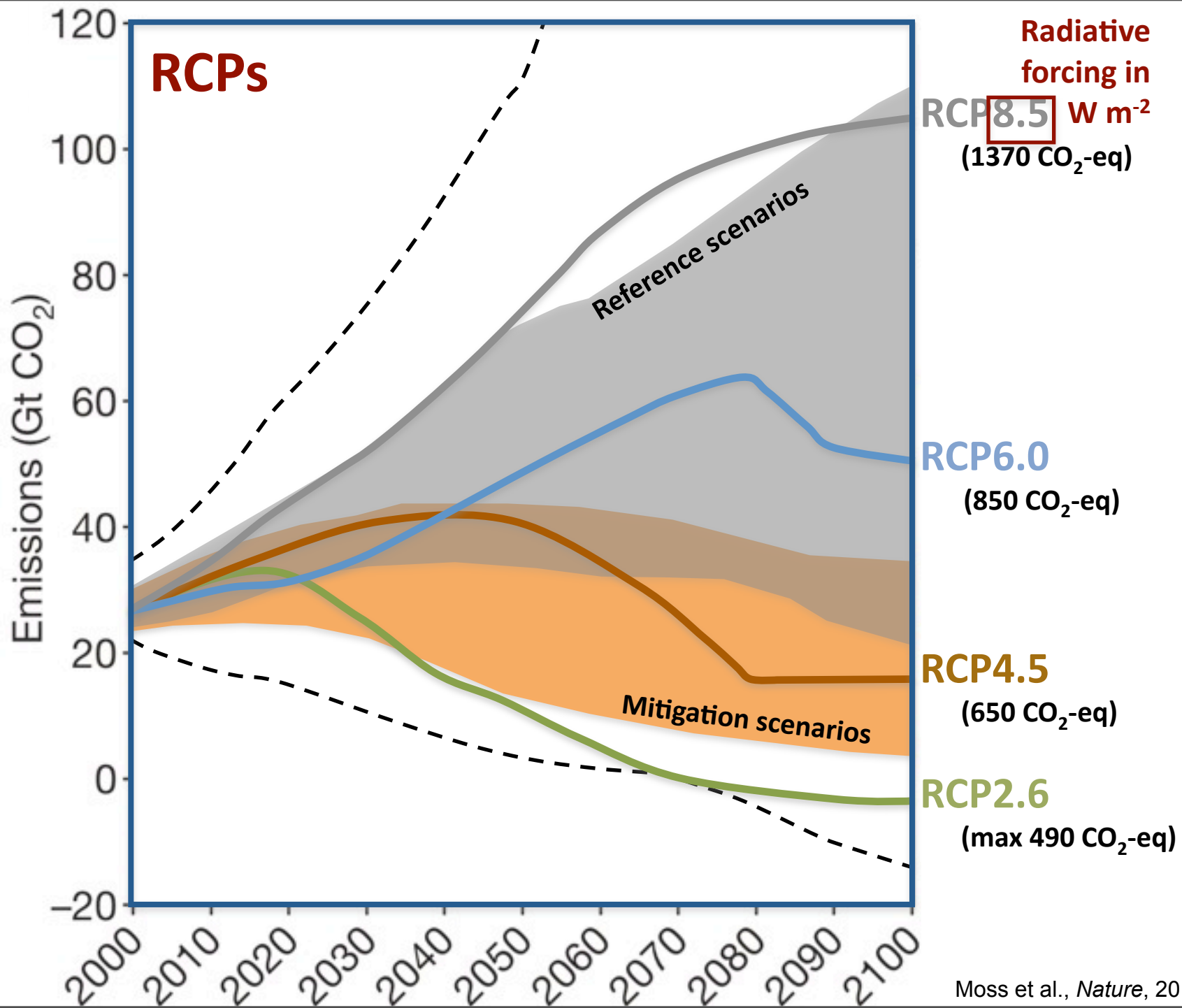


# Global temperature relative to 1850-1900

(°C, 5-yr filtered)

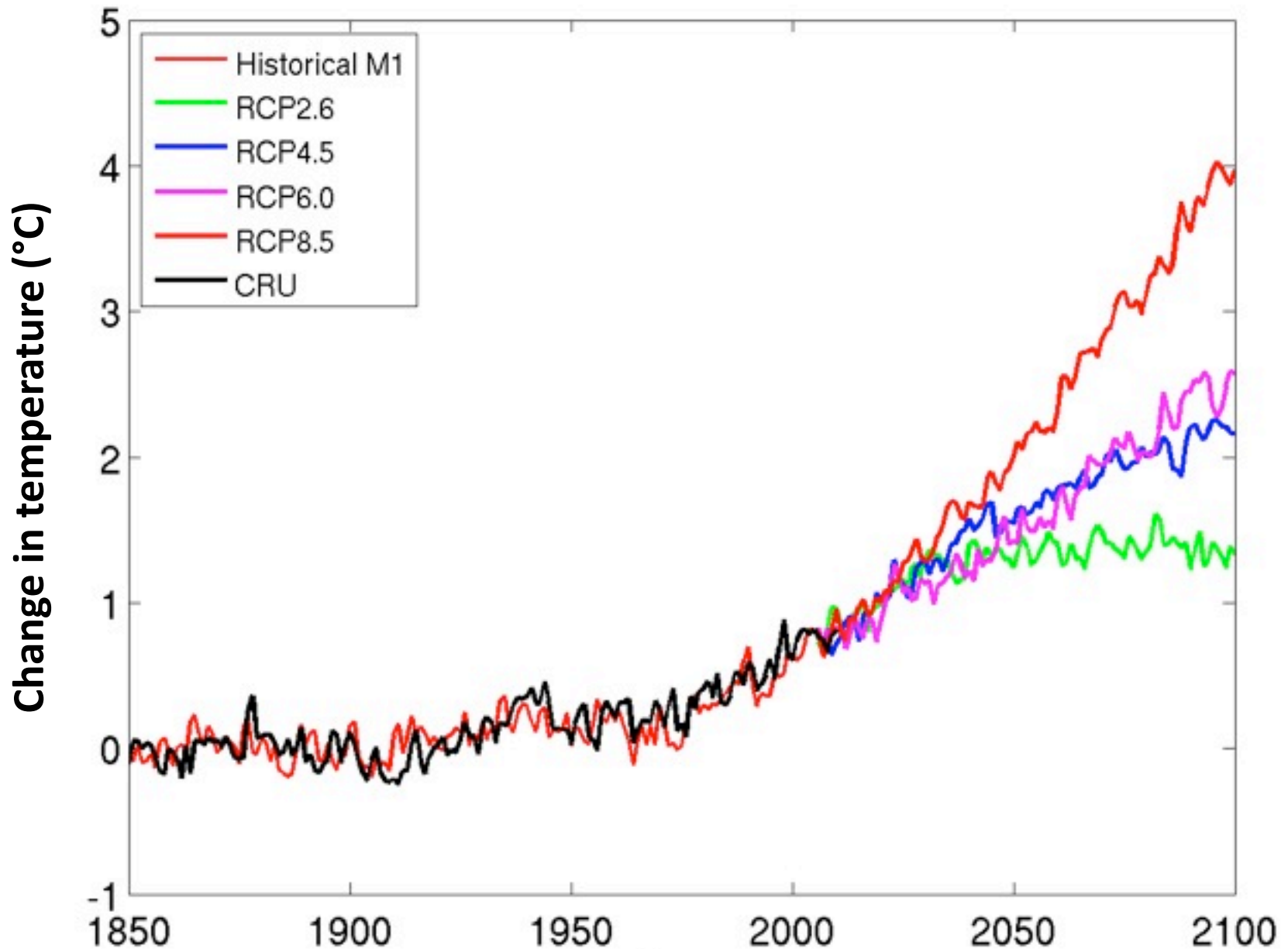


# 21<sup>st</sup> century climate



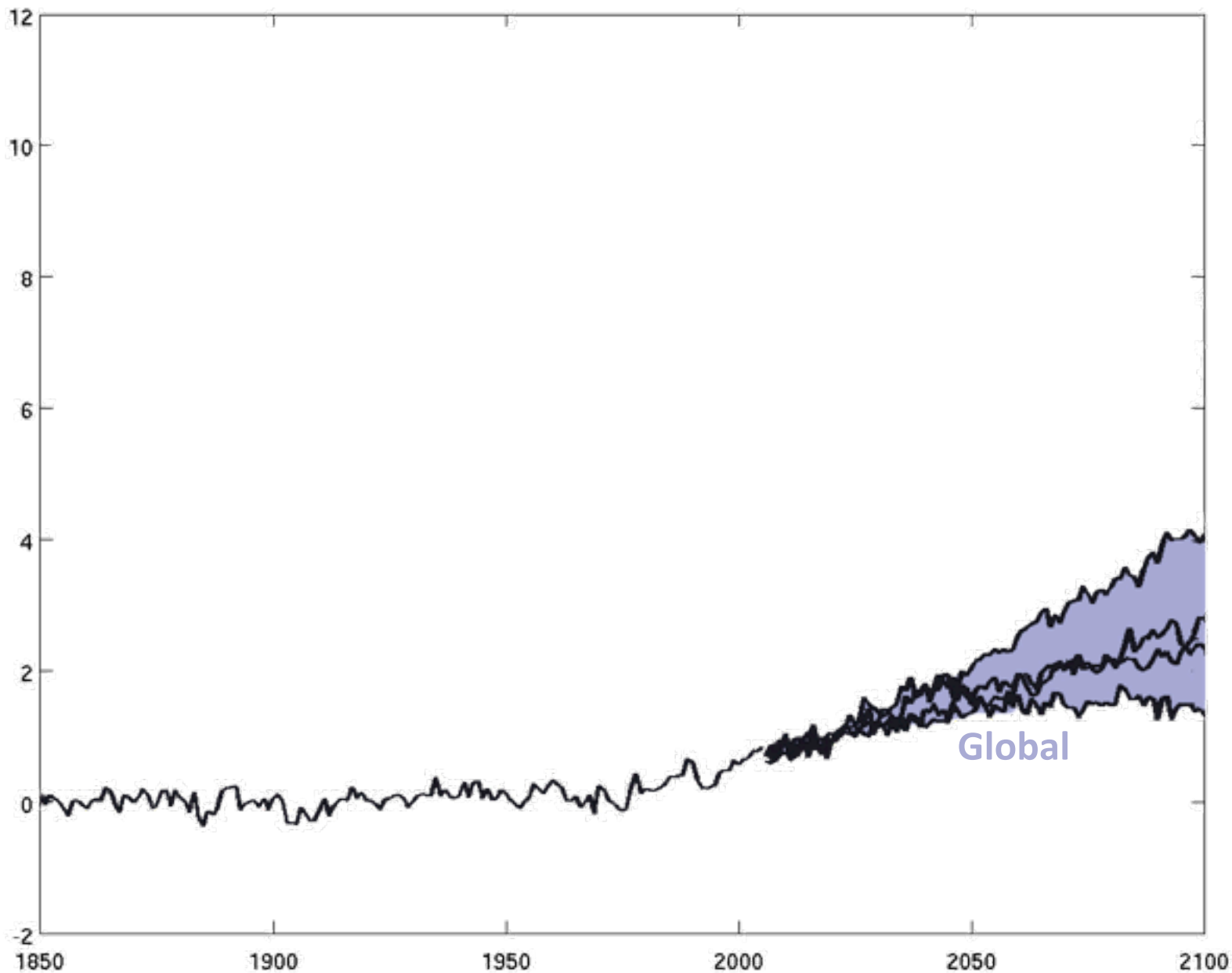
# Change in global mean surface temperature

(°C, relative to 1850-1900)

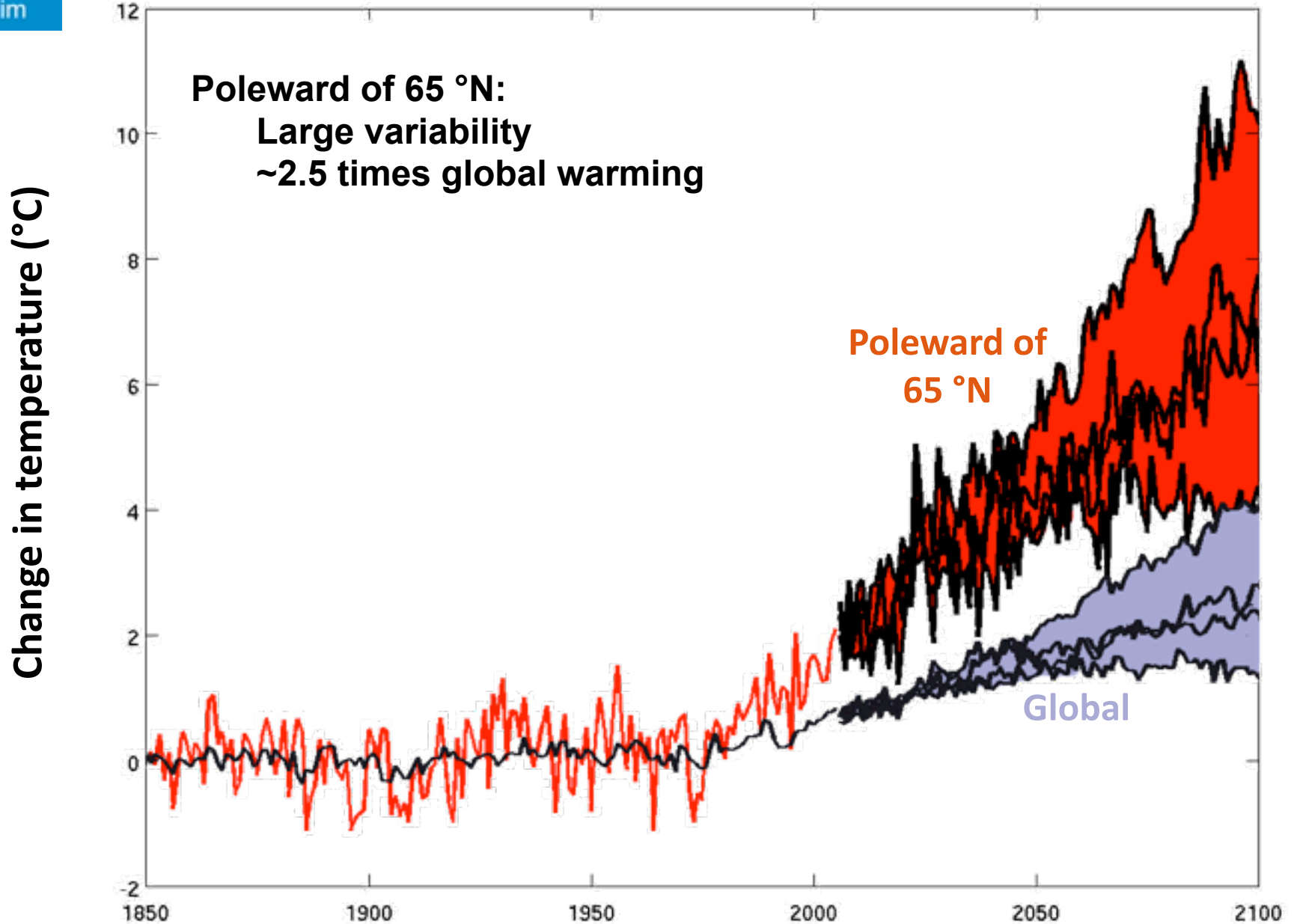


# Change in global mean surface temperature global vs poleward of 65 °N

Change in temperature (°C)



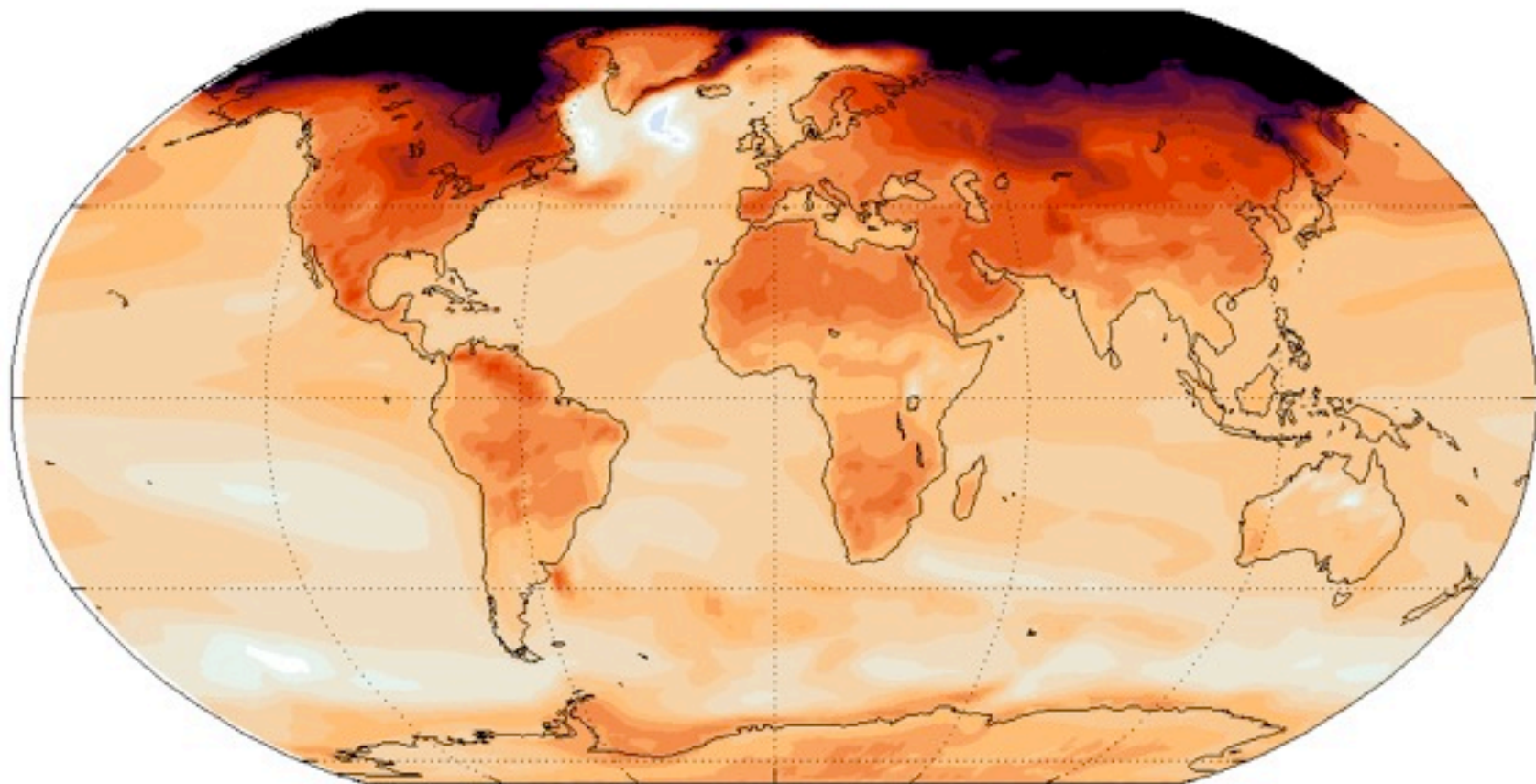
# Change in global mean surface temperature global vs poleward of 65 °N





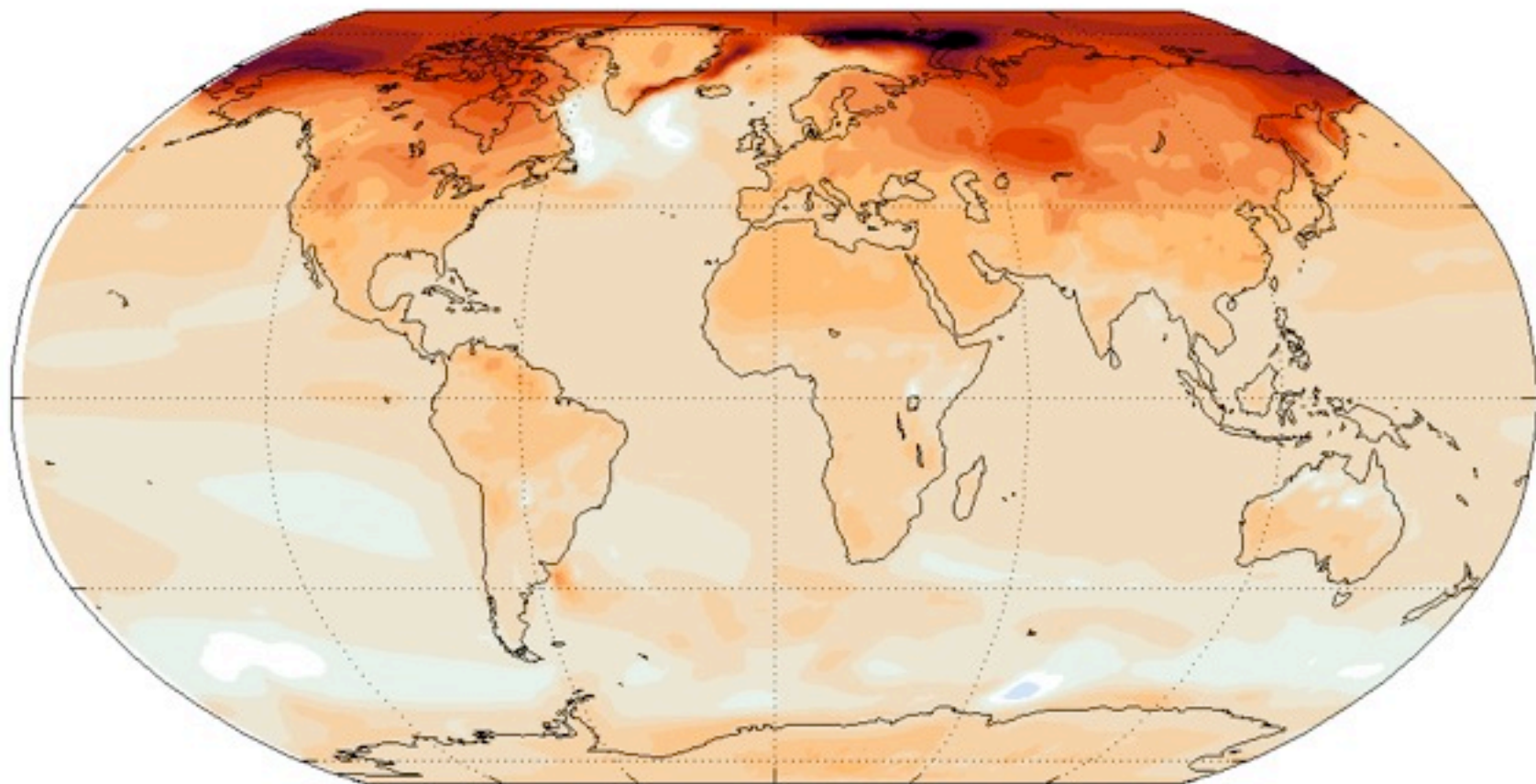
# Change in surface temperature, RCP8.5

(°C, 2090-99 vs 1961-90)



# Change in surface temperature, RCP6.0

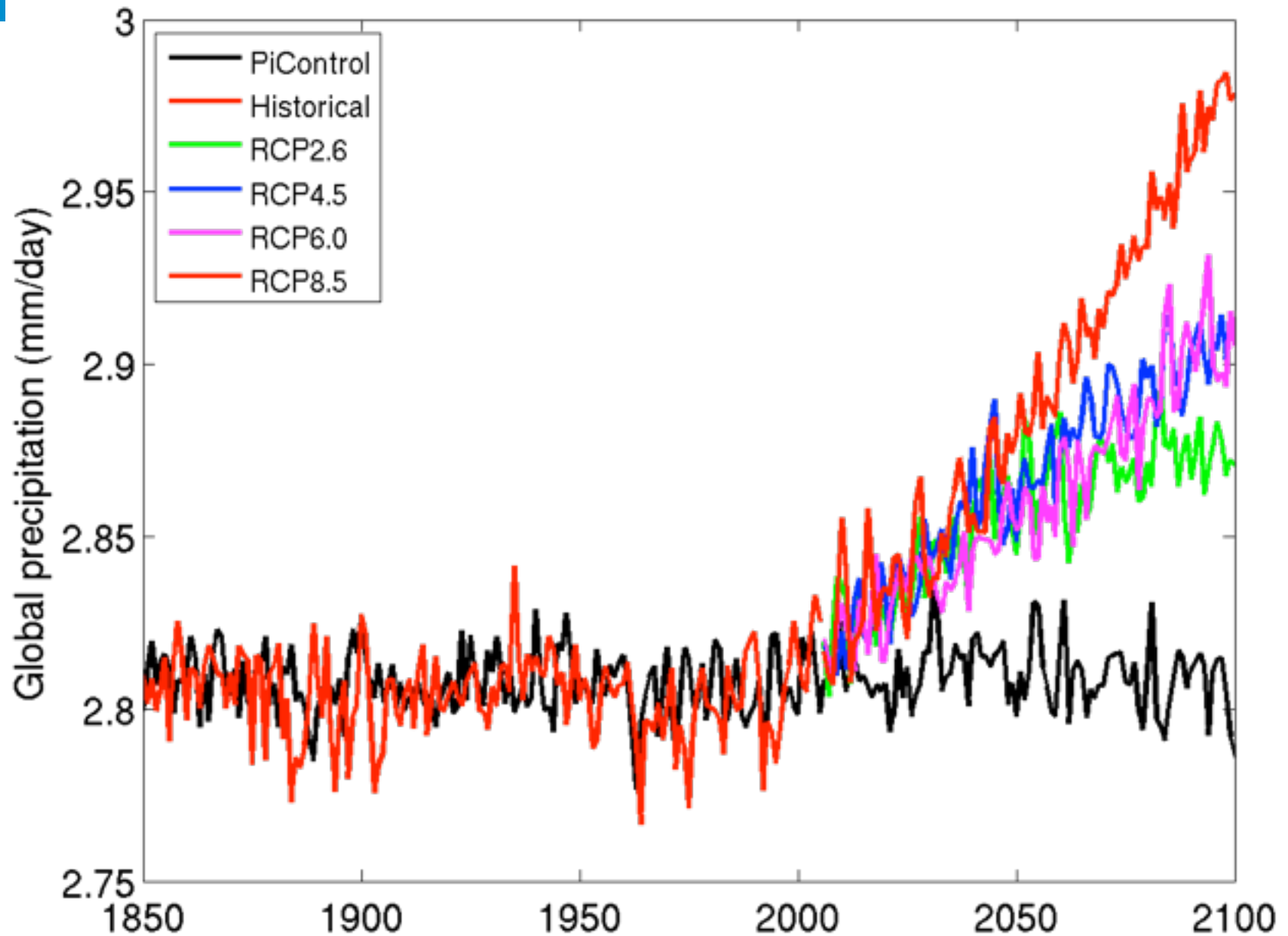
(°C, 2090-99 vs 1961-90)



# Simulated precipitation

# Precipitation, 1850-2100

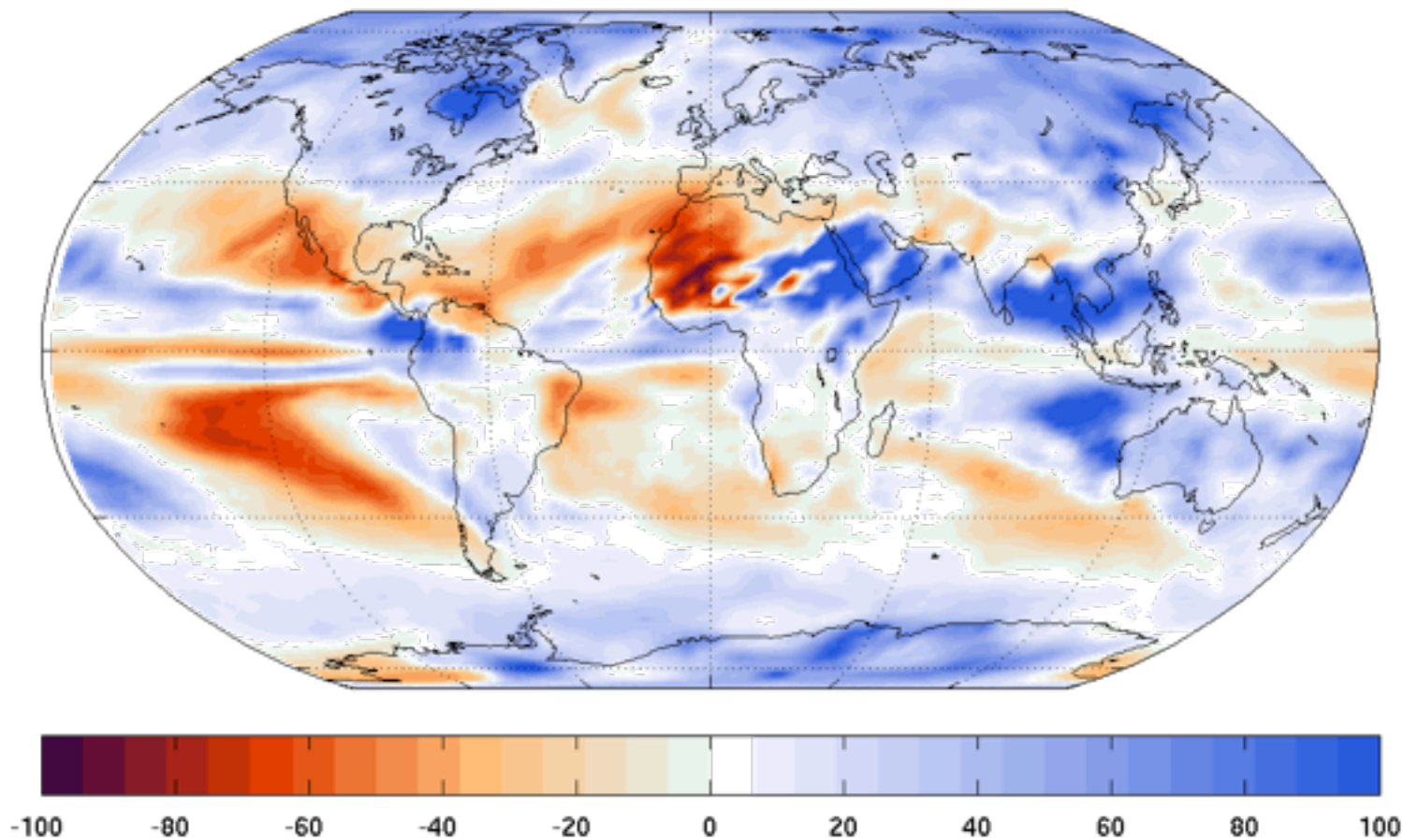
(mm/day)



# Simulated change in precipitation, RCP8.5

(percent, 2080-99 vs 1961-90)

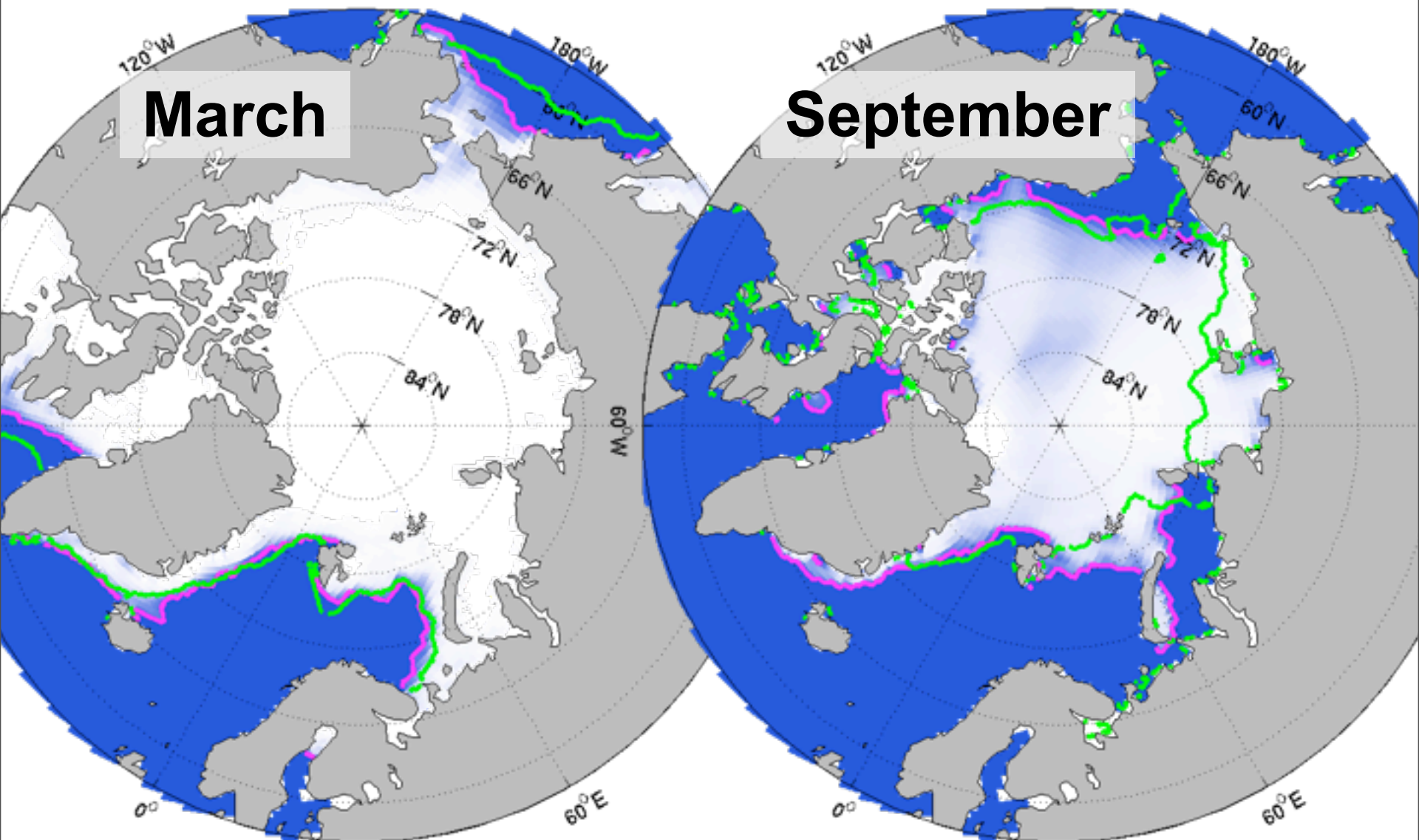
## December-January-February



# Observed and simulated sea ice

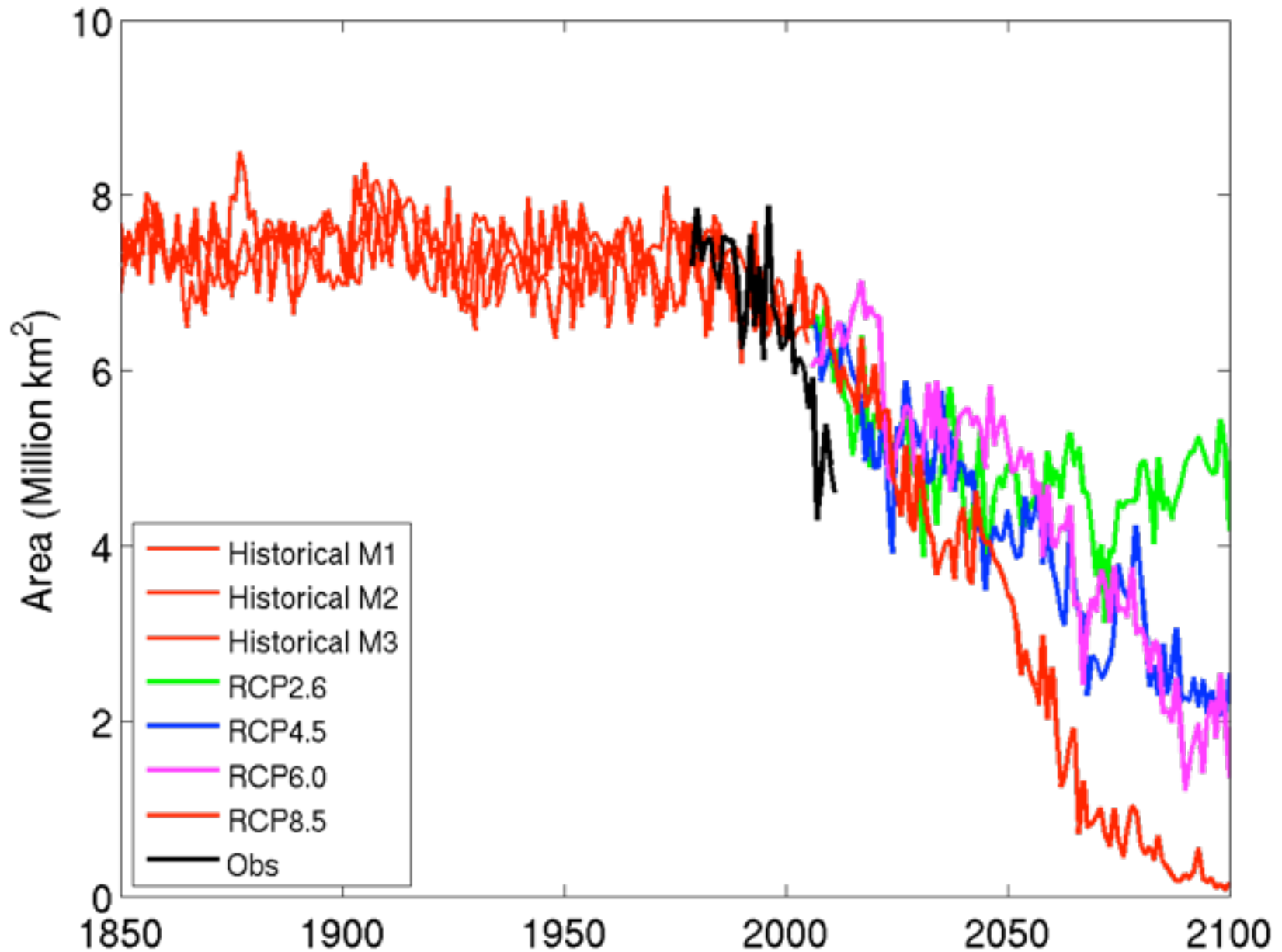
# Observed and simulated sea ice extent, year 2000

(fraction, **observed**, **simulated**)



# Observed and simulated sea ice extent, Sep

( $10^6 \text{ km}^2$ , ice edge at 15 percent concentration)







## CMIP5 Coupled Model Intercomparison Project

WCRP World Climate Research Programme

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### CMIP5 - Data Access - Availability

# <http://cmip-pcmdi.llnl.gov/>

- [Total ESGF Archive View](#)

The CMIP5 model output is available via the following ESG Data Portals (or gateways):

- PCMDI: <http://pcmdi3.llnl.gov/esgocet/home.htm>
- BADC: <http://cmip-gw.badc.rl.ac.uk/home.htm>
- DKRZ: <http://pcc-ar5.dkrz.de/home.htm>

Modeling Center	Model	Institution	term of use
BCC	BCC-CSM1.1	Beijing Climate Center, China Meteorological Administration	unrestricted
CCCma	CanESM2 CanCM4 CanAM4	Canadian Centre for Climate Modelling and Analysis	unrestricted
CNRM-CERFACS	CNRM-CM5	Centre National de Recherches Meteorologiques / Centre Europeen de Recherche et Formation Avancees en Calcul Scientifique	non-commercial only
CSIRO-QCCCE	CSIRO-Mk3.6	Commonwealth Scientific and Industrial Research Organisation and the Queensland Climate Change Centre of Excellence	non-commercial only
INM	INM-CM4	Institute for Numerical Mathematics	unrestricted
IPSL	IPSL-CM5A-LR	Institut Pierre-Simon Laplace	unrestricted
MIROC	MIROC-ESM MIROC4h MIROC5 MIROC-ESM-CHEM	Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology	non-commercial only
MOHC	HadGEM2-ES HadGEM2-A HadGEM2-CC HadCM3	Met Office Hadley Centre	unrestricted
MPI-M	MPI-ESM-LR MPI-ESM-P	Max Planck Institute for Meteorology (MPI-M)	unrestricted
MRI	MRI-AGCM3-2S MRI-AGCM3-2H MRI-CGCM3	Meteorological Research Institute	non-commercial only
NASA-GISS	GISS-E2-H GISS-E2-R	NASA Goddard Institute for Space Studies	unrestricted
NCAR	CCSM4	NCAR Community Climate System Model	unrestricted
NCC	NorESM1-M	Norwegian Climate Centre	unrestricted
NOAA-GFDL	GFDL-CM3 GFDL-HIRAM-C360 GFDL-HIRAM-C180 GFDL-ESM2M	Geophysical Fluid Dynamics Laboratory	unrestricted