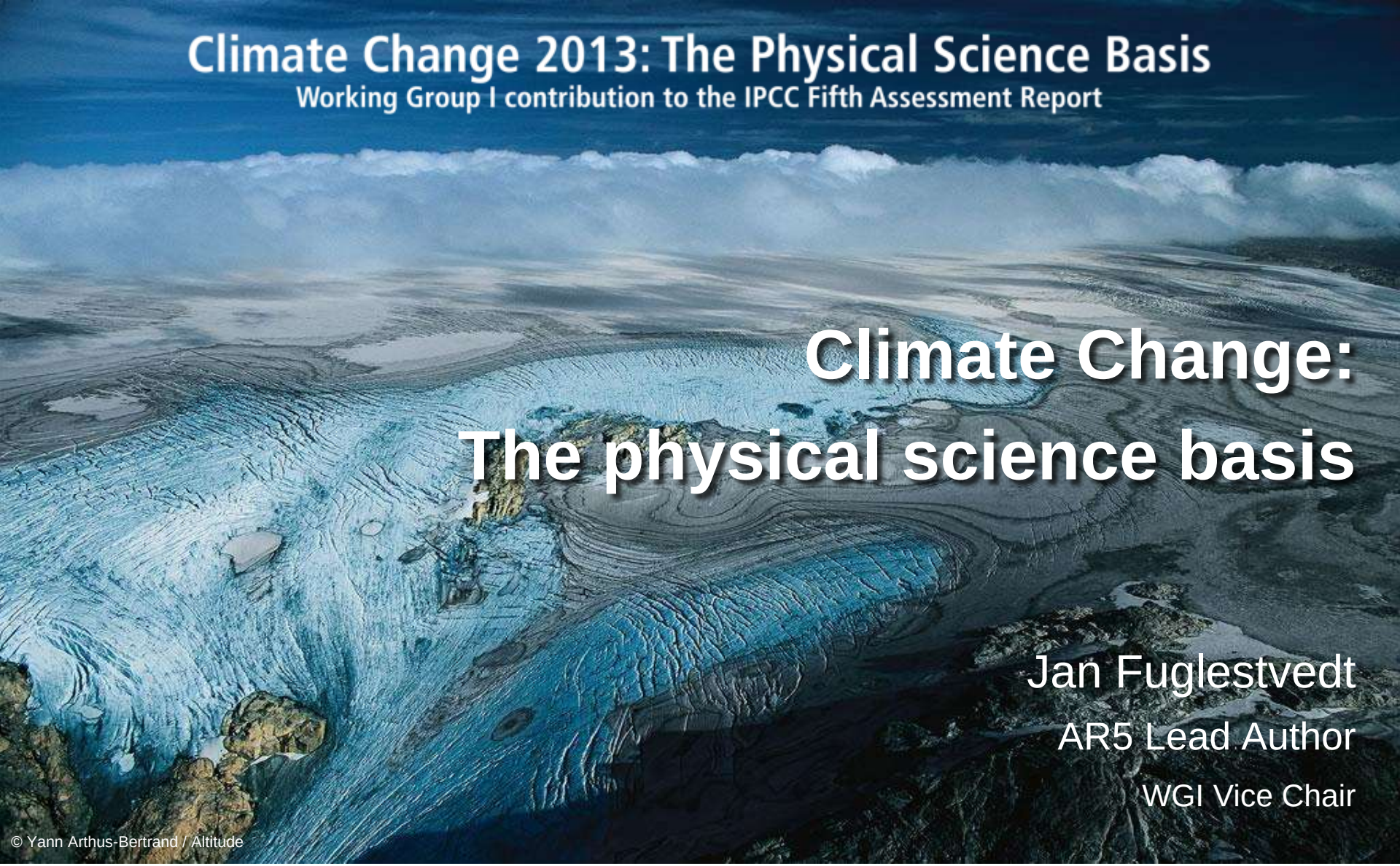


Climate Change: The physical science basis

Jan Fuglestvedt
AR5 Lead Author
WGI Vice Chair

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Observations

Understanding

Future

www.climatechange2013.org

Warming in the climate system is unequivocal, […]

Human influence on the climate system is clear.

Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

Observations

What has changed?

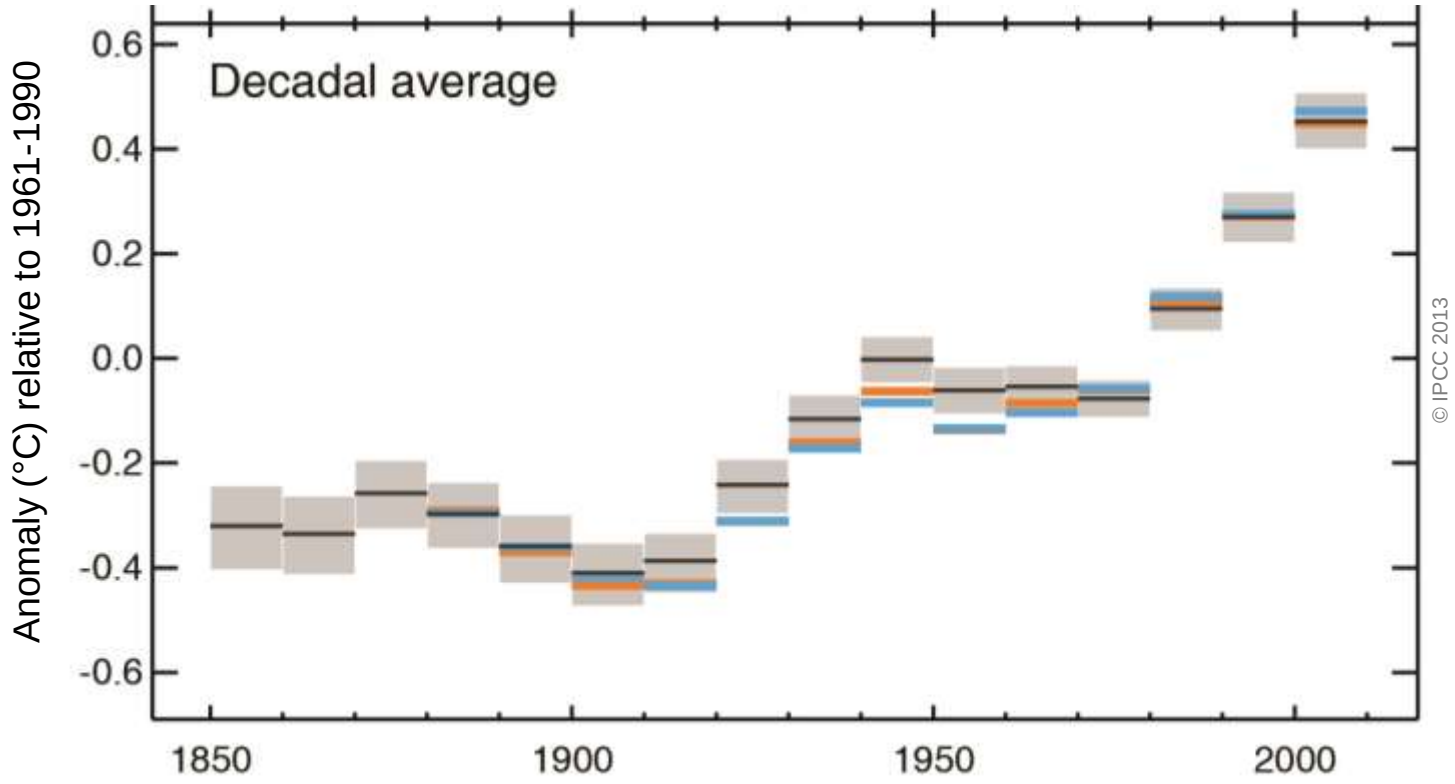
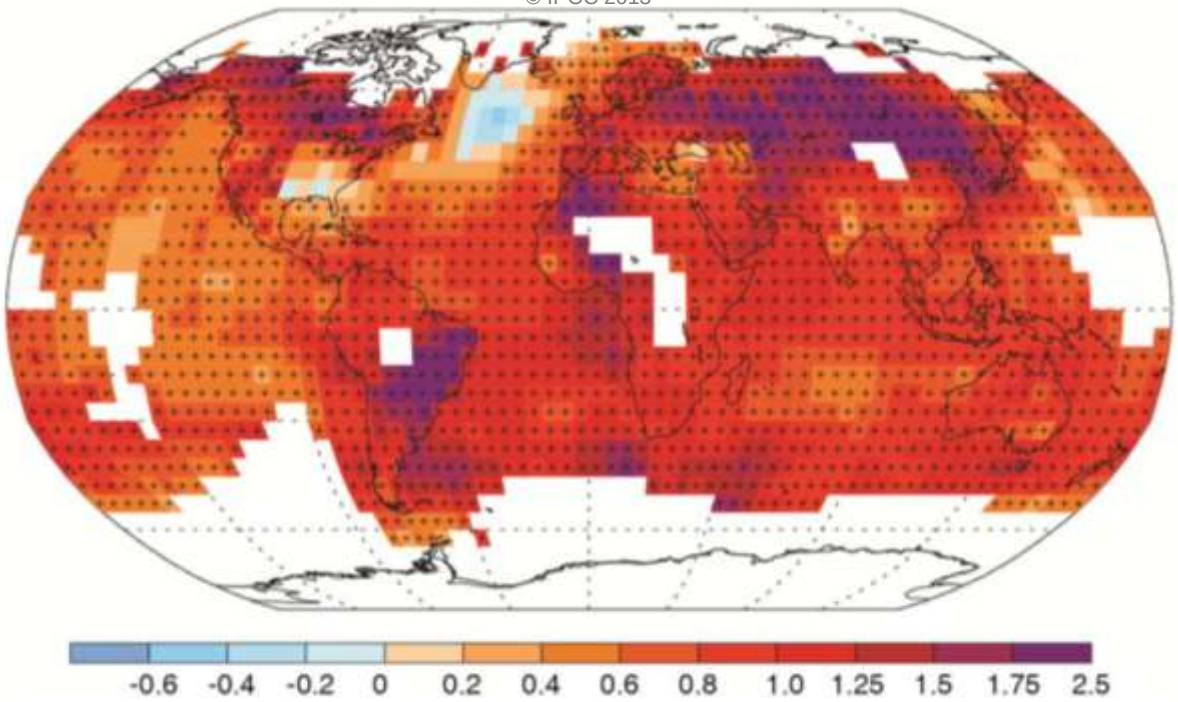


Fig. SPM.1a

Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850.

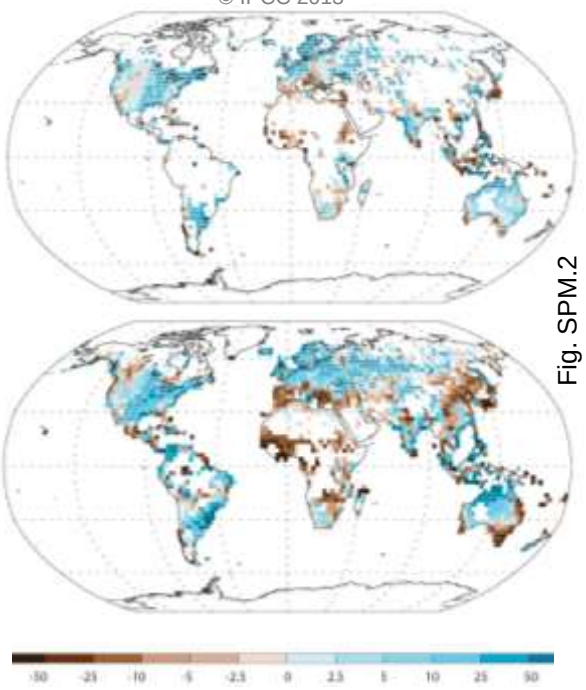
In the Northern Hemisphere, 1983–2012 was *likely* the warmest 30-year period of the last 1400 years (*medium confidence*).

Fig. SPM.1b



Temperature Difference 1901 to 2012 based on trend (°C)

Fig. SPM.2



Precipitation Trend (mm/yr per decade)

Warming of the climate system is unequivocal, […]

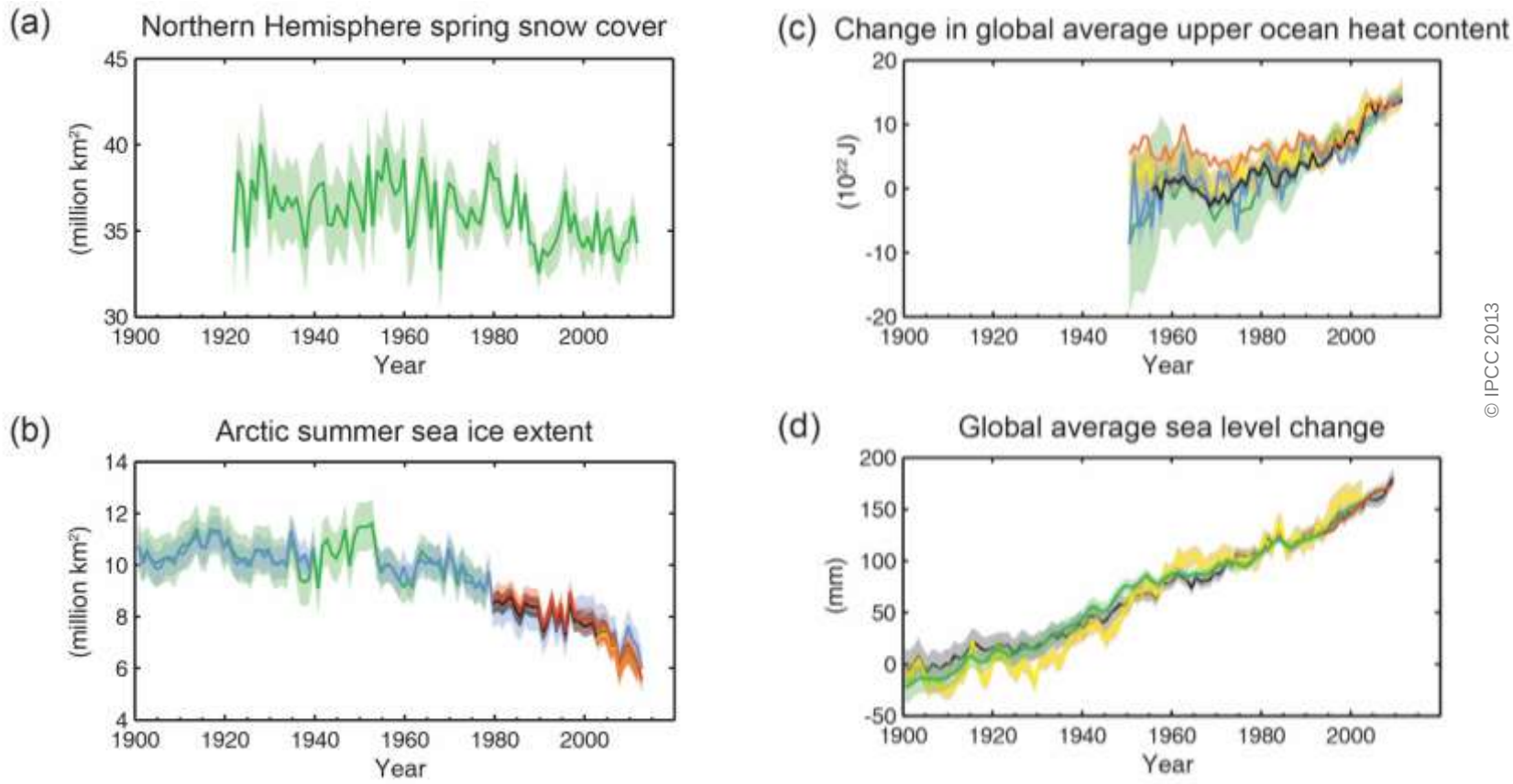
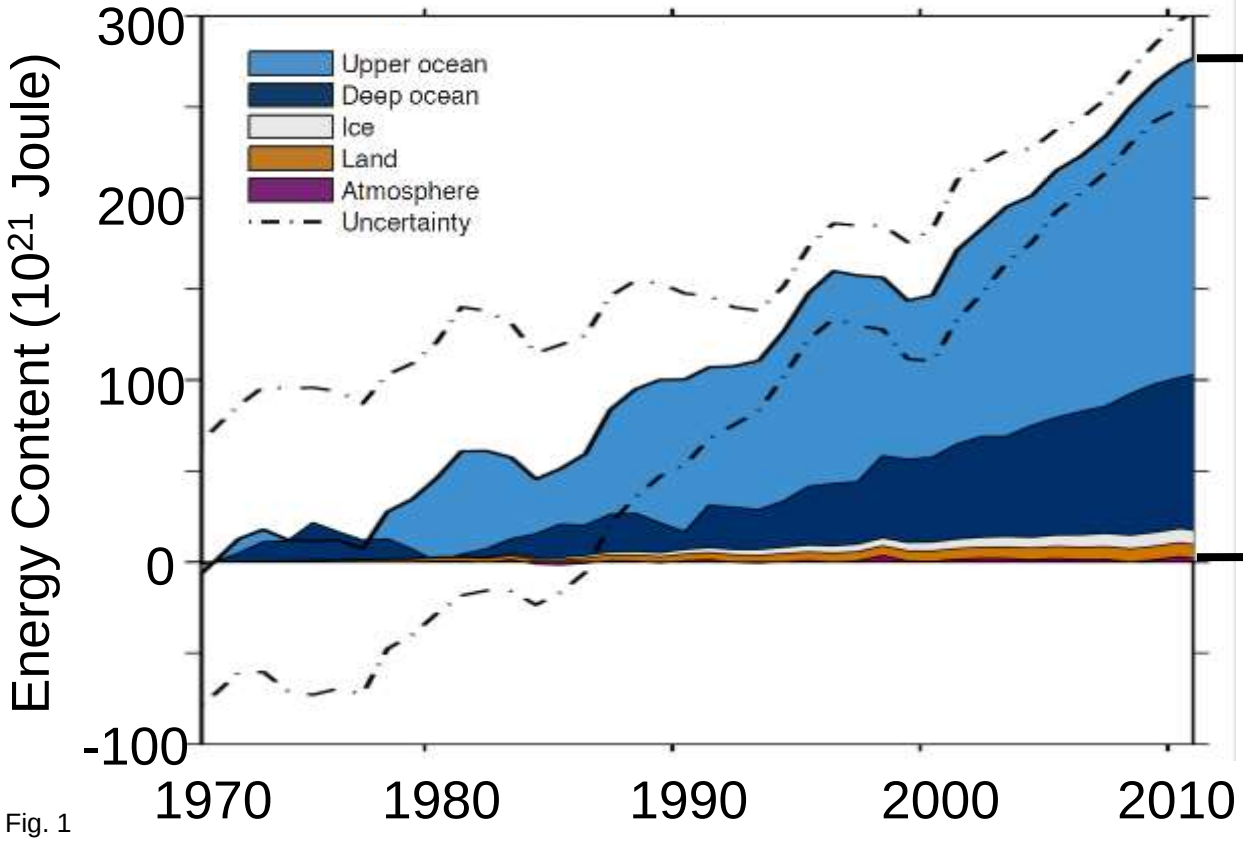


Fig. SPM.3

Warming of the climate system is unequivocal, […]



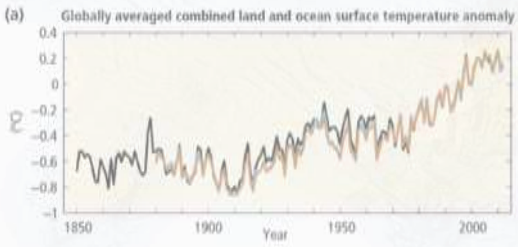
70 Mill. TWh

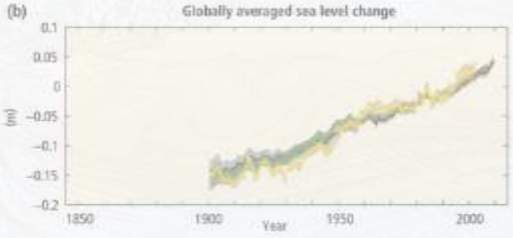
Box 3.1, Fig. 1

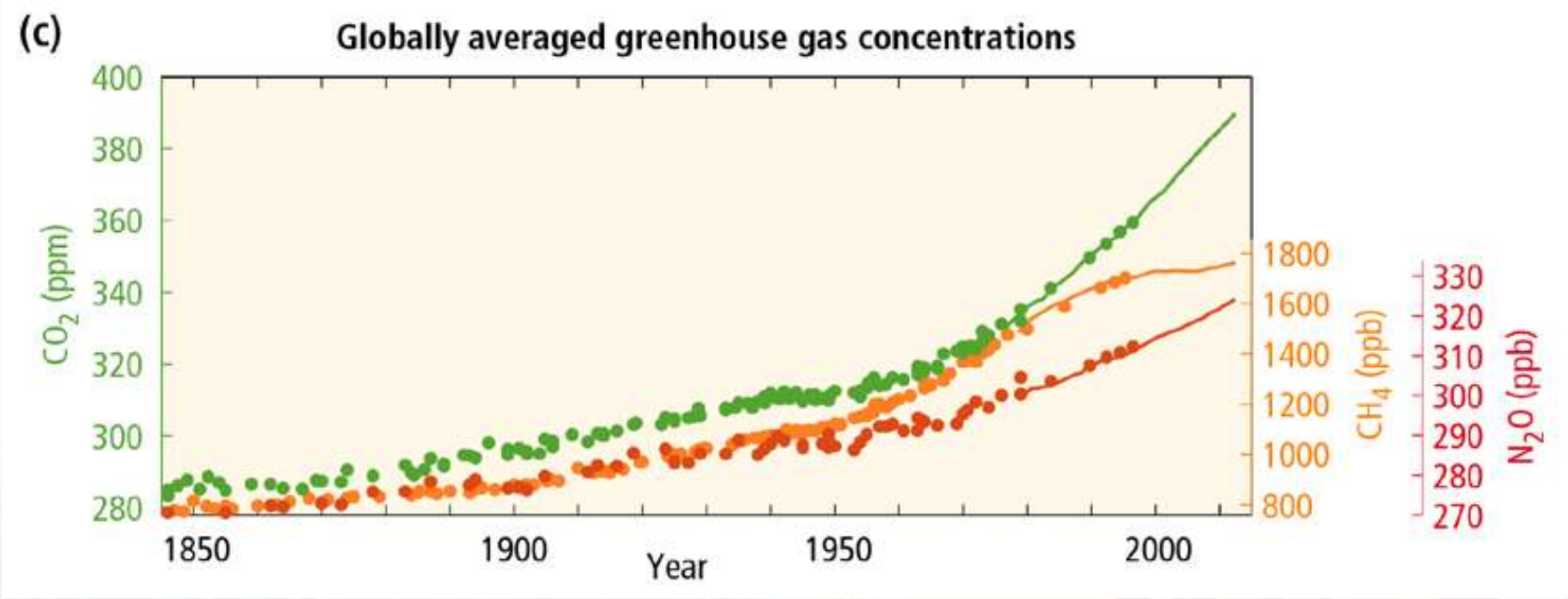
Ocean warming dominates the increase in energy stored in the climate system.

Understanding

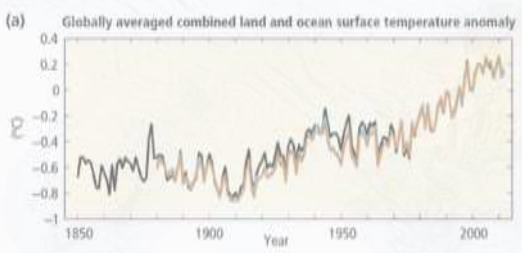
Why has it changed?

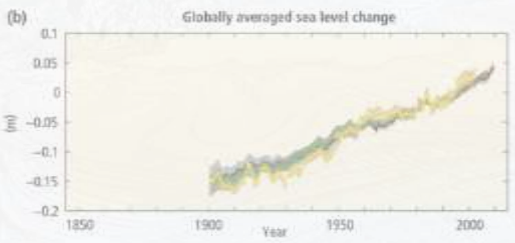

(a)
Globally averaged combined land and ocean surface temperature anomaly
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
1850
1900
Year
1950
2000

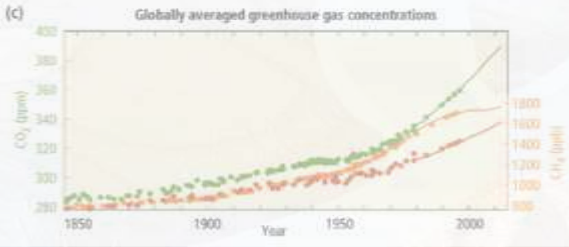

(b)
Globally averaged sea level change
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
1850
1900
Year
1950
2000

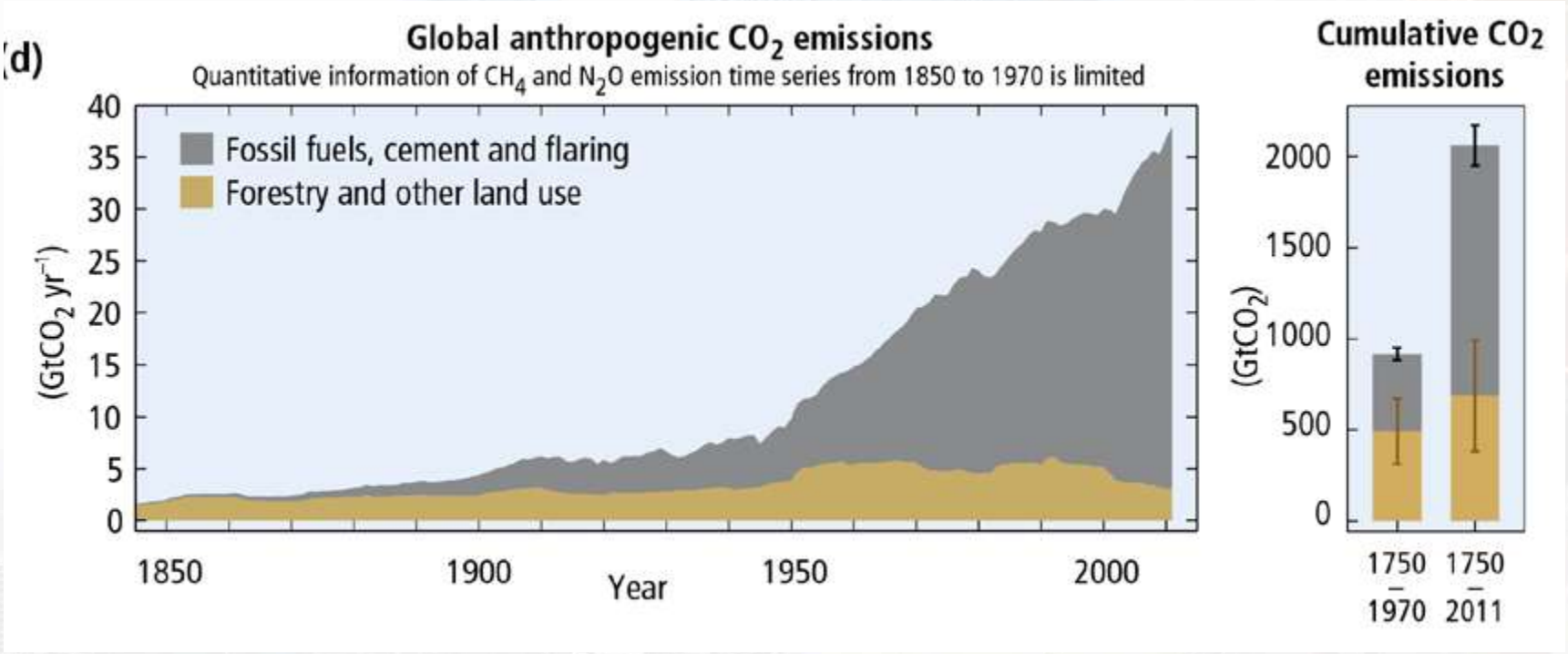

(c)
Globally averaged greenhouse gas concentrations
400
380
360
340
320
300
280
CO2 (ppm)
1800
1600
1400
1200
1000
800
CH4 (ppb)
330
320
310
300
290
280
270
N2O (ppb)
1850
1900
Year
1950
2000

AR5 SYR SPM



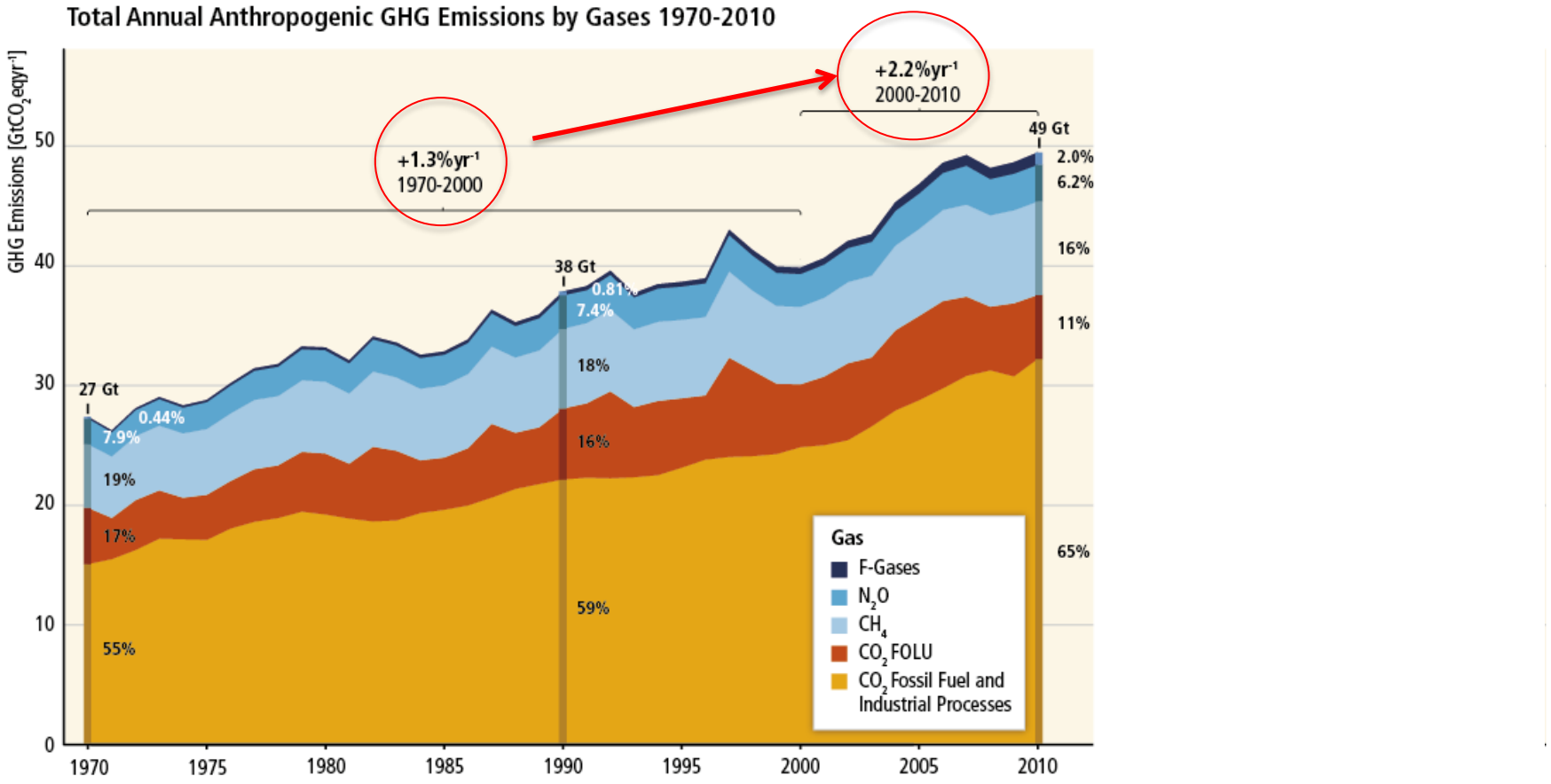




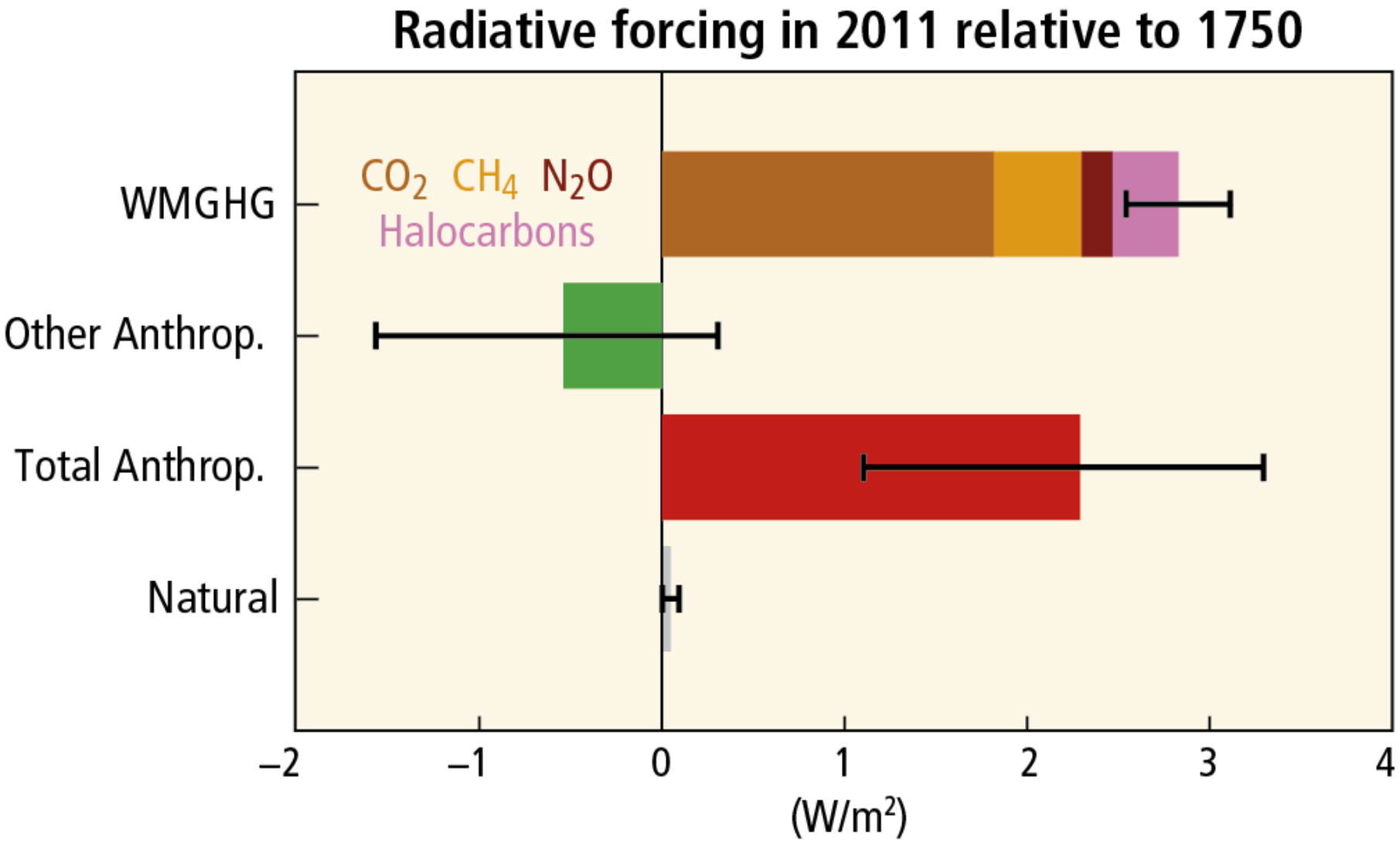


AR5 SYR SPM

More recent data (1970-2010) and other gases than CO2

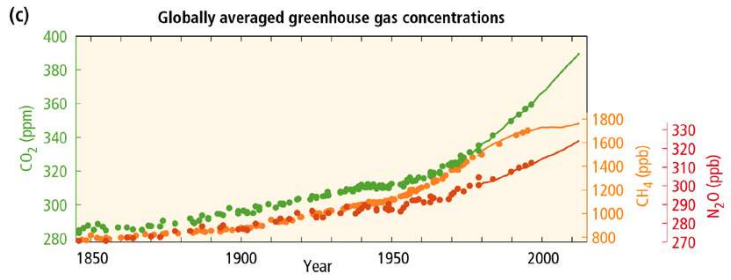


Climate impact of various components



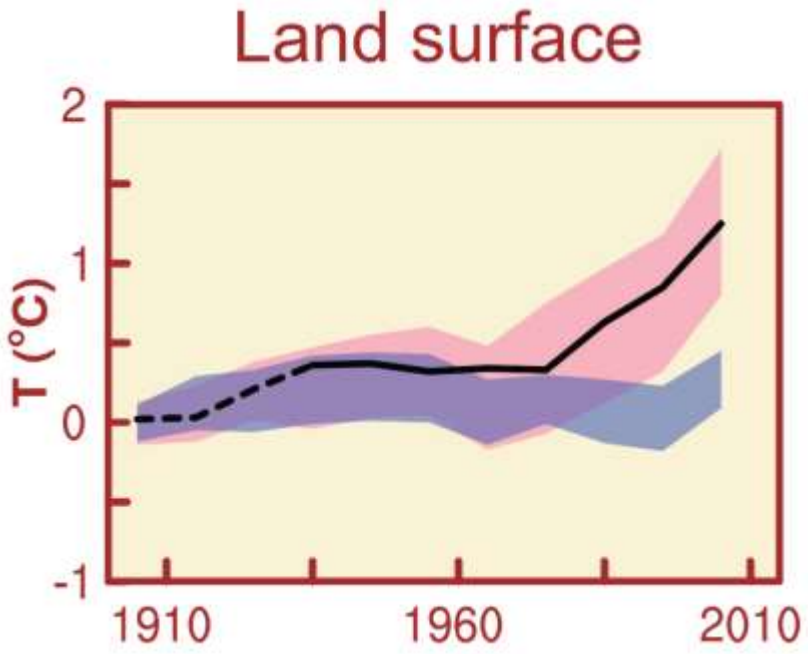
Worldwide Effects

Cause



- atmosphere, land, ocean
- extreme events
- water cycle
- sea ice, glaciers, ice sheets
- global mean sea level

Human influence on the climate system is clear.



Human influence on the climate system is clear.

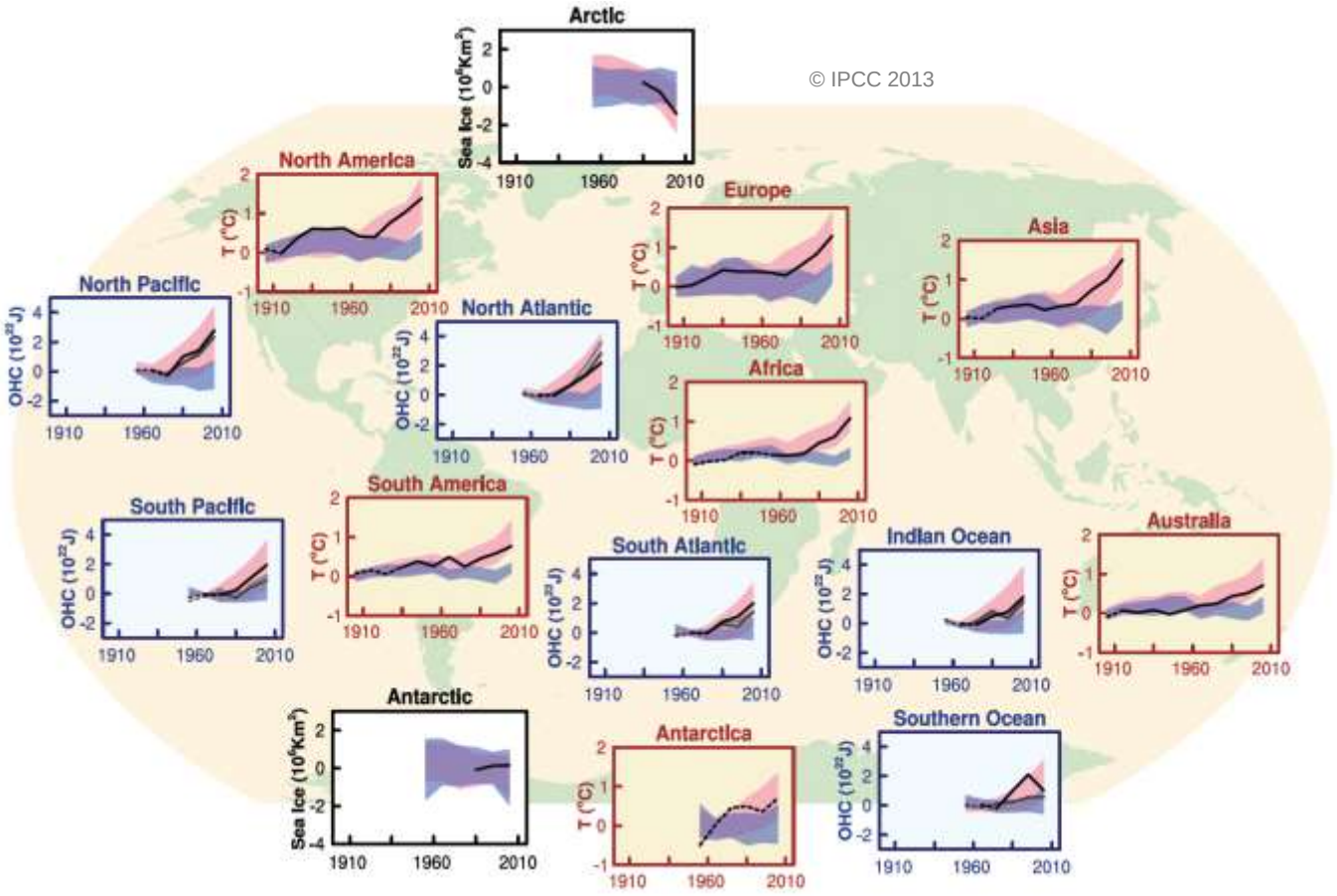
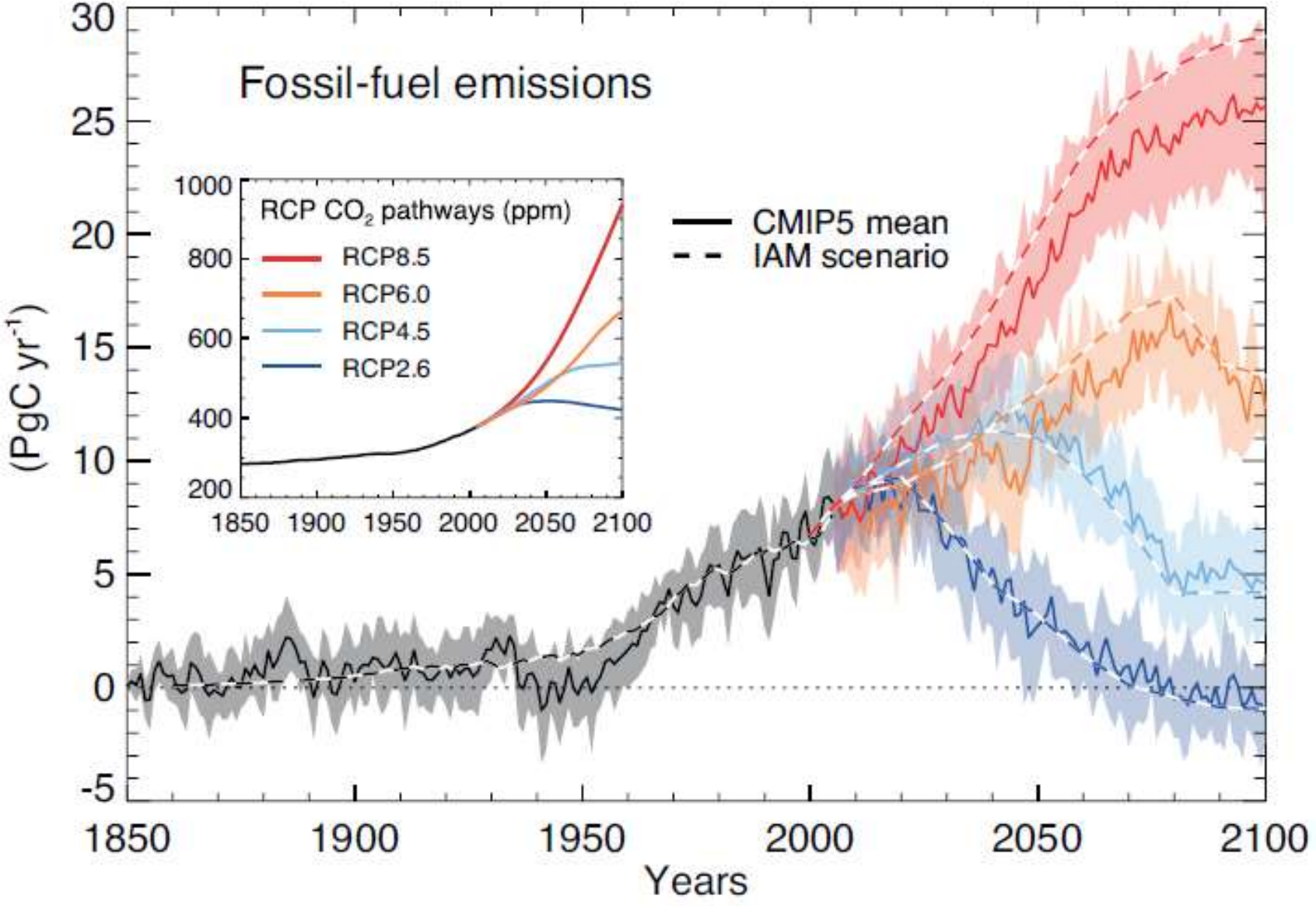


Fig. SPM.6

Human influence on the climate system is clear.

Future

How will it change?



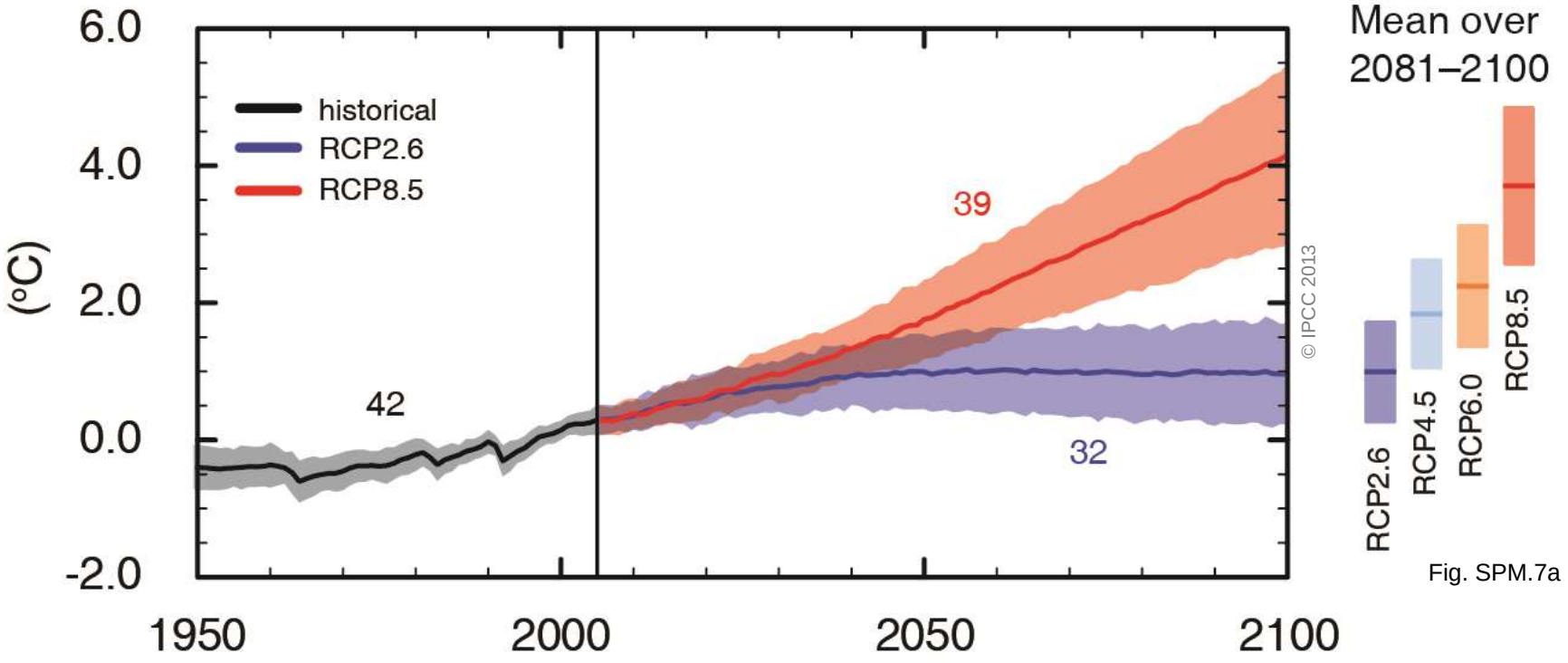


Fig. SPM.7a

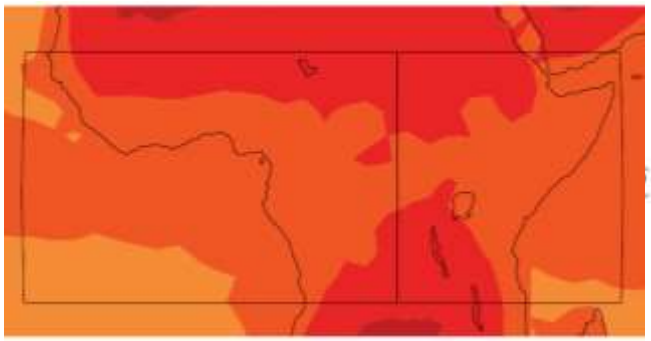
Global surface temperature change for the end of the 21st century is *likely* to exceed 1.5°C relative to 1850−1900 for all scenarios except RCP2.6.

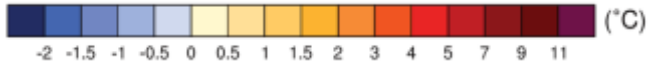
IPCC 2013: Atlas of Global and Regional Climate Projections

Regional Changes in East Africa (2081-2100)

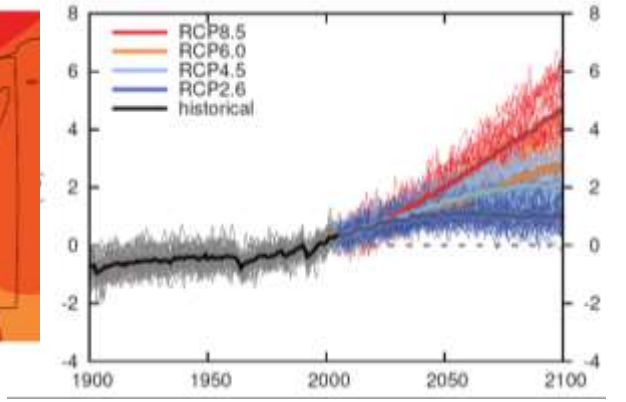
RCP 2.6 (annual)

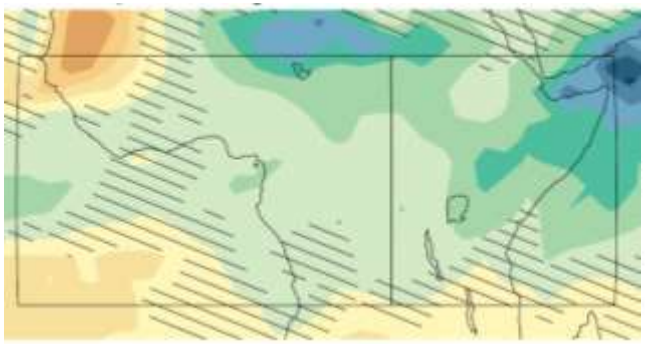
RCP 8.5 (annual)

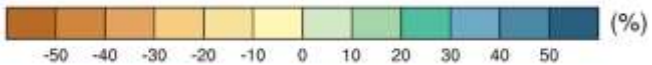


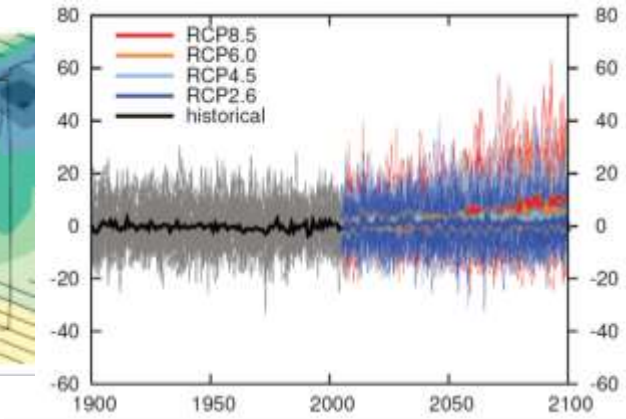


All RCPs (annual)









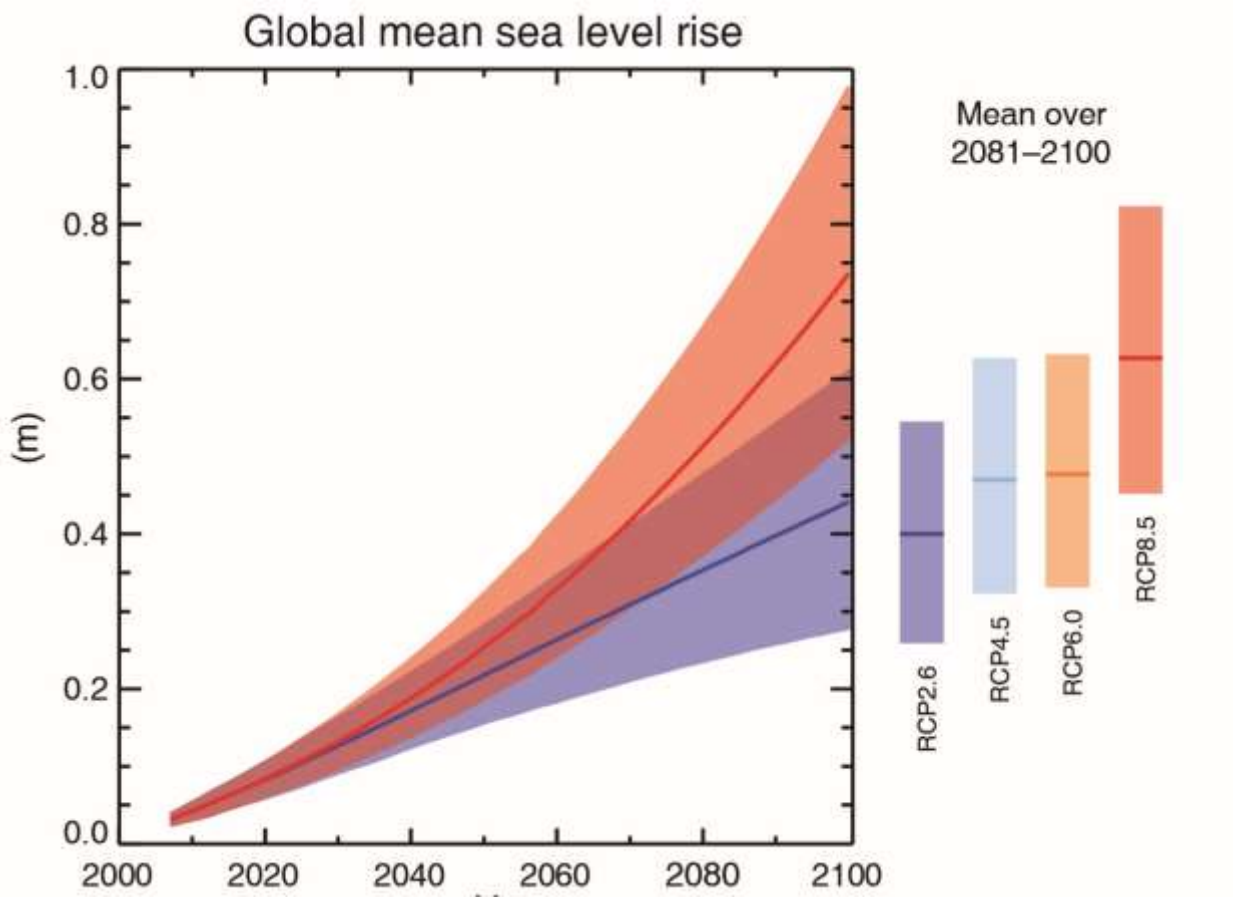
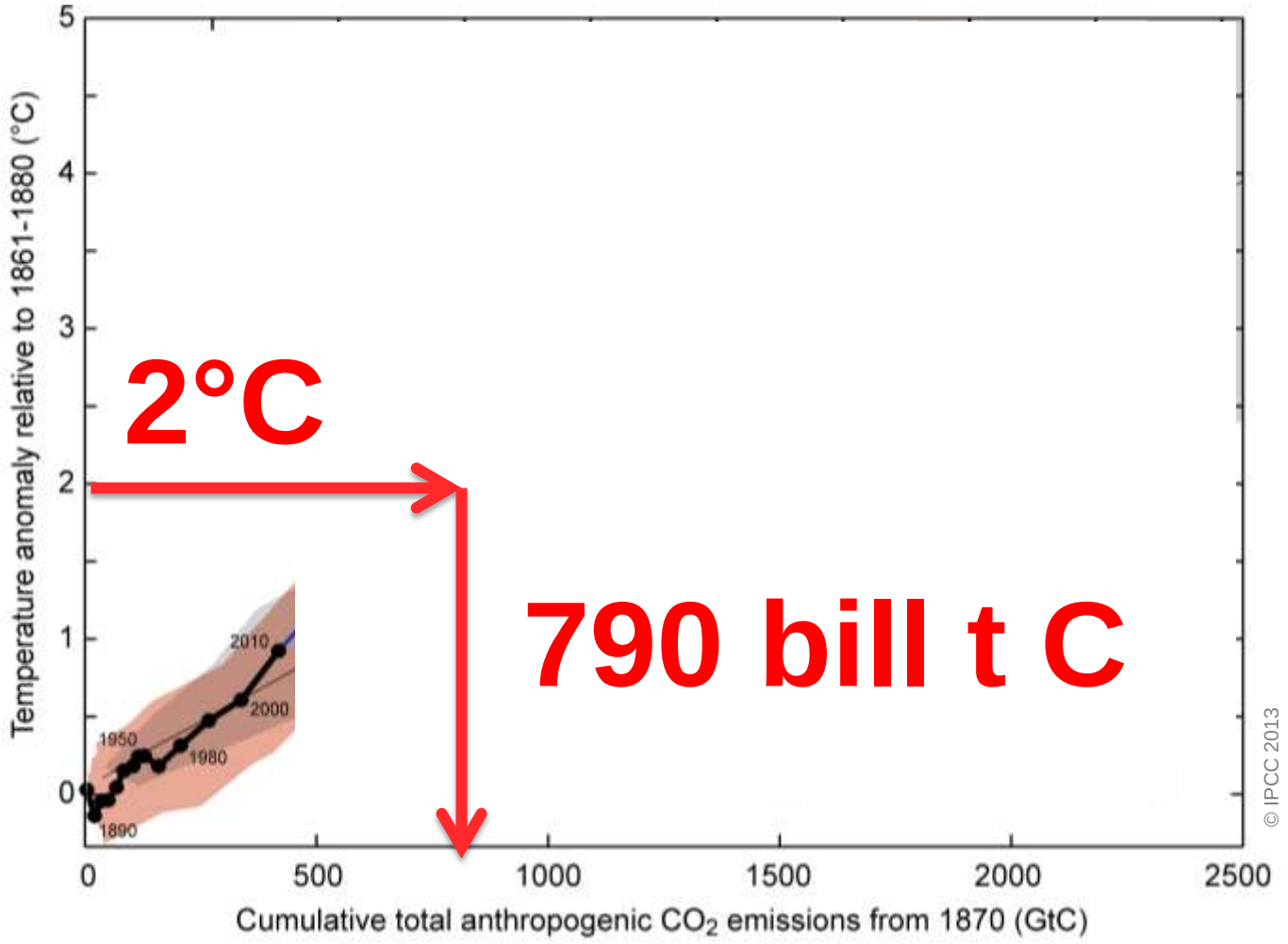


Fig. SPM.9

Global mean sea level will continue to rise over the 21st century.

Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond.

Limiting human-induced warming

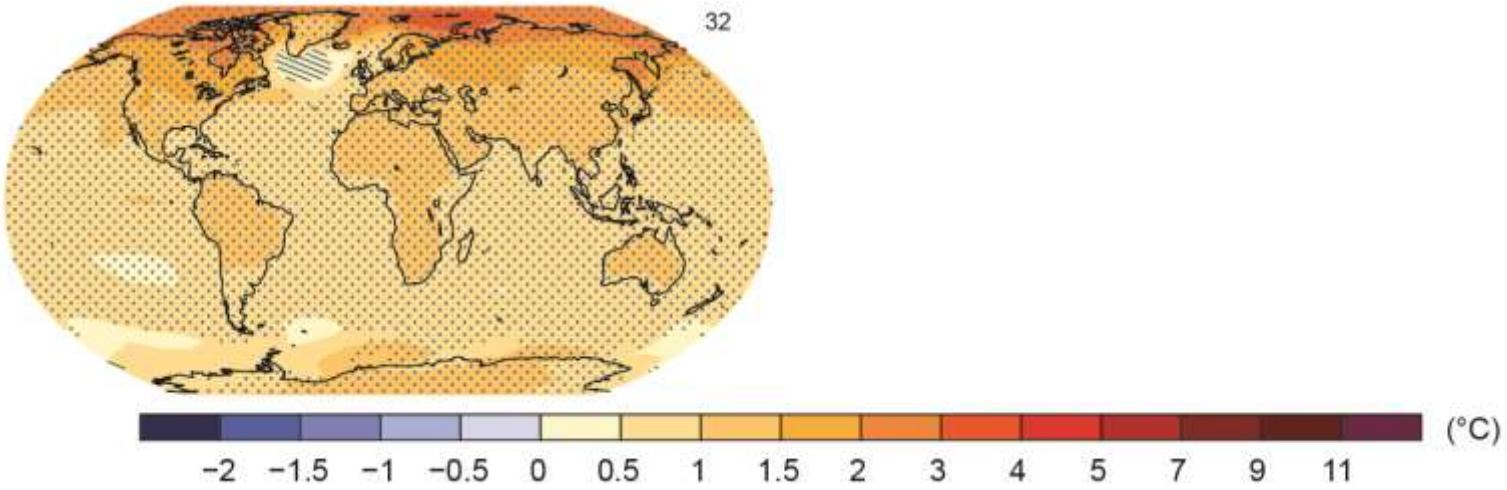


Budget for 2°C target:	790 bill t C
CO_2 emissions until 2016*:	−565 bill t C
Remaining CO_2 emissions:	**225 bill t C**
CO_2 emissions in 2016 *:	***9.9 bill t C***

* updated from IPCC 2013, WGI SPM

Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

2°C world



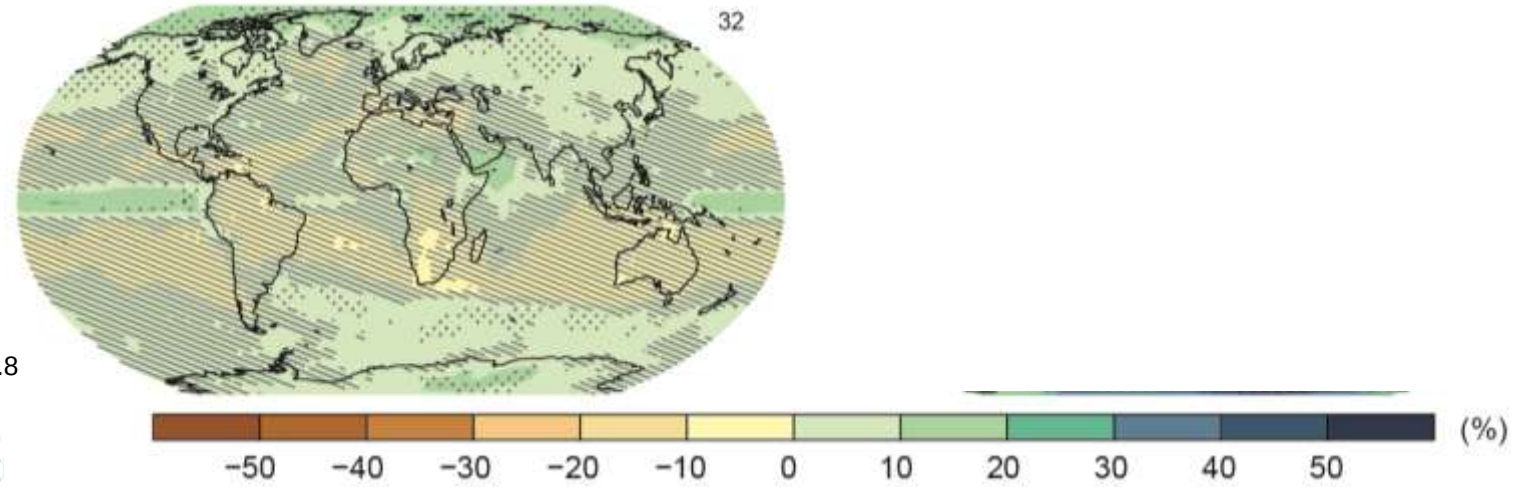


Fig. SPM.8

2°C world

4.5°C world

The Choices We Make Will Create Different Outcomes

Fig. SPM.8

Climate Change 2013: The Physical Science Basis

Working Group I contribution to the IPCC Fifth Assessment Report

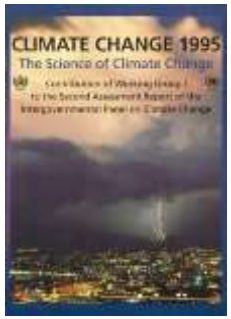
Further Information

www.climatechange2013.org

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

1990

Gave a broad overview of climate change science, discussion of uncertainties and evidence of warming



1995

"The balance of evidence suggests a **discernible** human influence on global climate"

2001

"There is new and **stronger evidence** that most of the warming observed over the last 50 years is attributable to human activities"

2007

"Warming of the climate system is **unequivocal**…"

2013

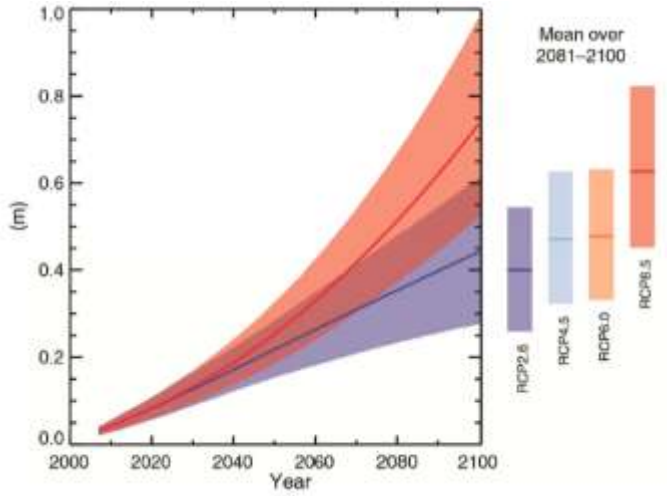
"Human influence on the climate system is **clear**."

Improvements:

Assessing «known unknowns»

Example: Sea level and contribution from Antarctic marine ice sheet instability

Global mean sea level rise



"…. only the collapse of marine-based sectors of the Antarctic ice sheet, if initiated, could cause global mean sea level to rise substantially above the likely range during the 21st century.