SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

IPCC AR6 WG1 Report
The Physical Science Basis

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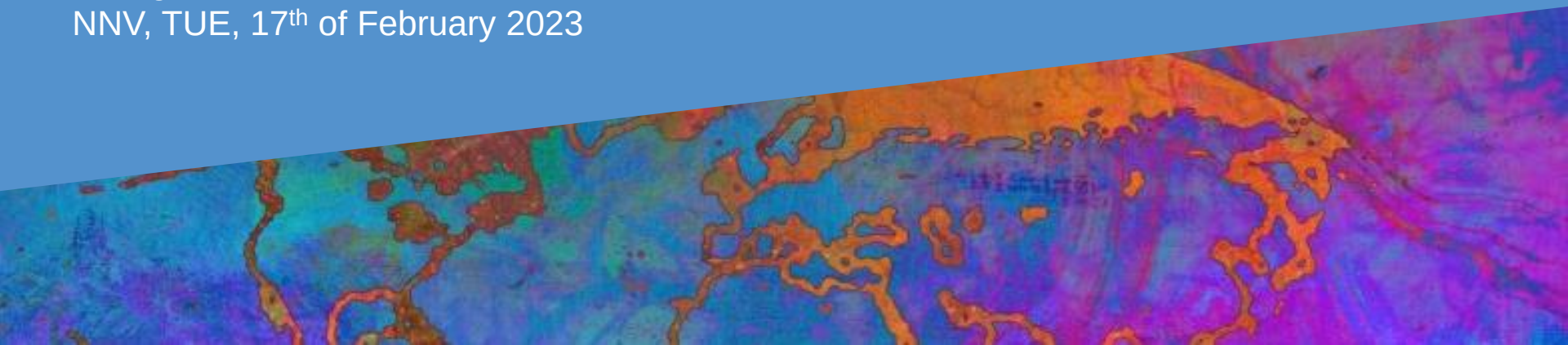
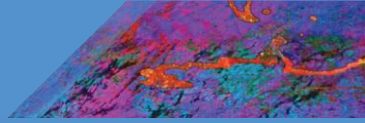
Acting Focal Point IPCC Netherlands
NNV, TUE, 17th of February 2023





BY THE NUMBERS

Author Team

234 authors from **65** countries

28% women, **72%** men

30% new to the **IPCC**

Review Process

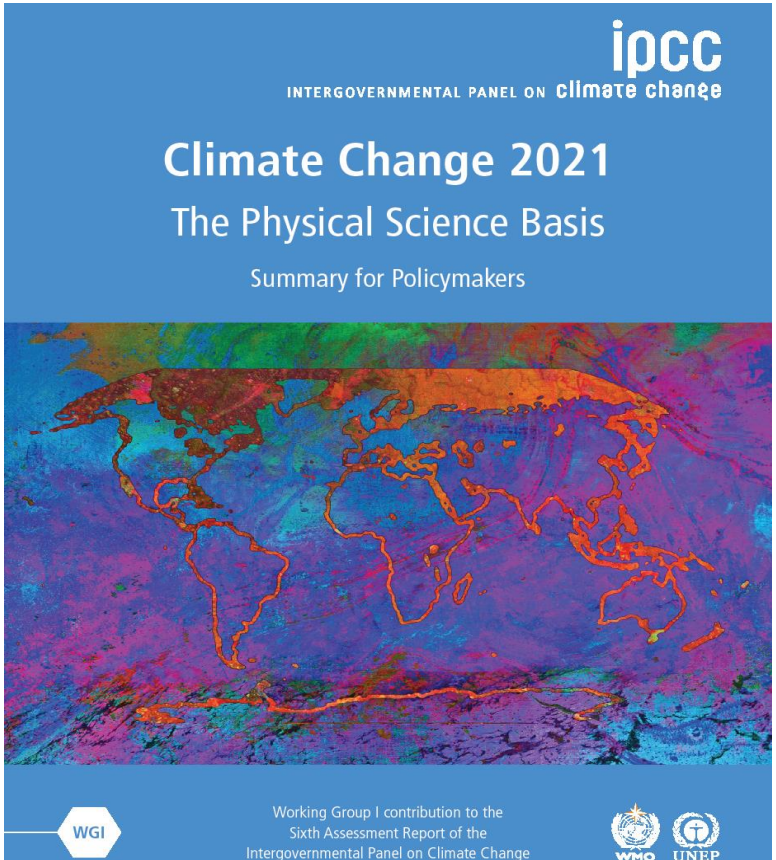
14,000 scientific publications assessed

78,000+ review comments

46 countries commented on Final Government Distribution

Intergovernmental Panel on Climate Change, 2021

- **Detection** ***observation***
- **Attribution** ***cause-effect***
- **Projection** ***future***



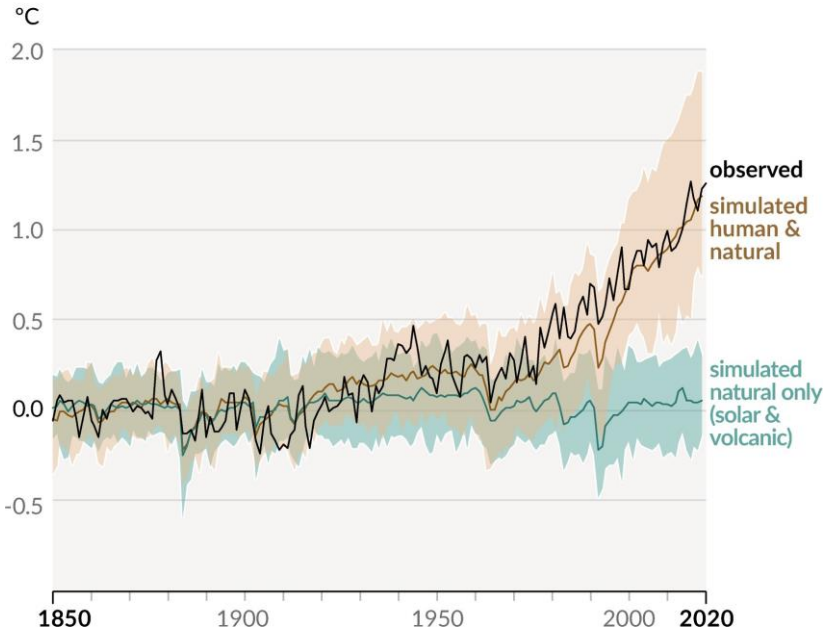
[Credit: Yoda Adaman | Unsplash]

> “It is indisputable that human activities are causing climate change, making extreme climate events, including heat waves, heavy rainfall, and droughts, more frequent and severe.

It is unequivocal that human influence has warmed the climate

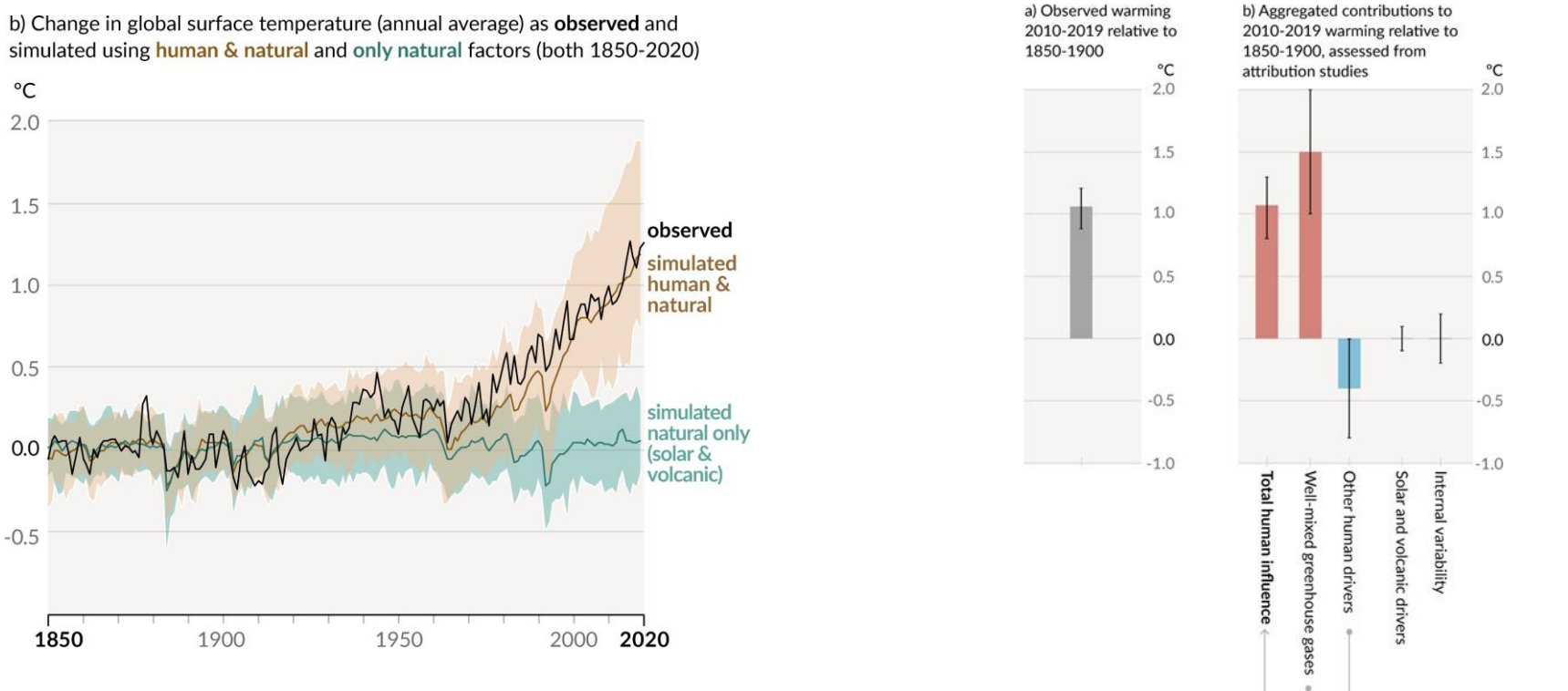
Figure SPM.1

b) Change in global surface temperature (annual average) as **observed** and simulated using human & natural and only natural factors (both 1850-2020)



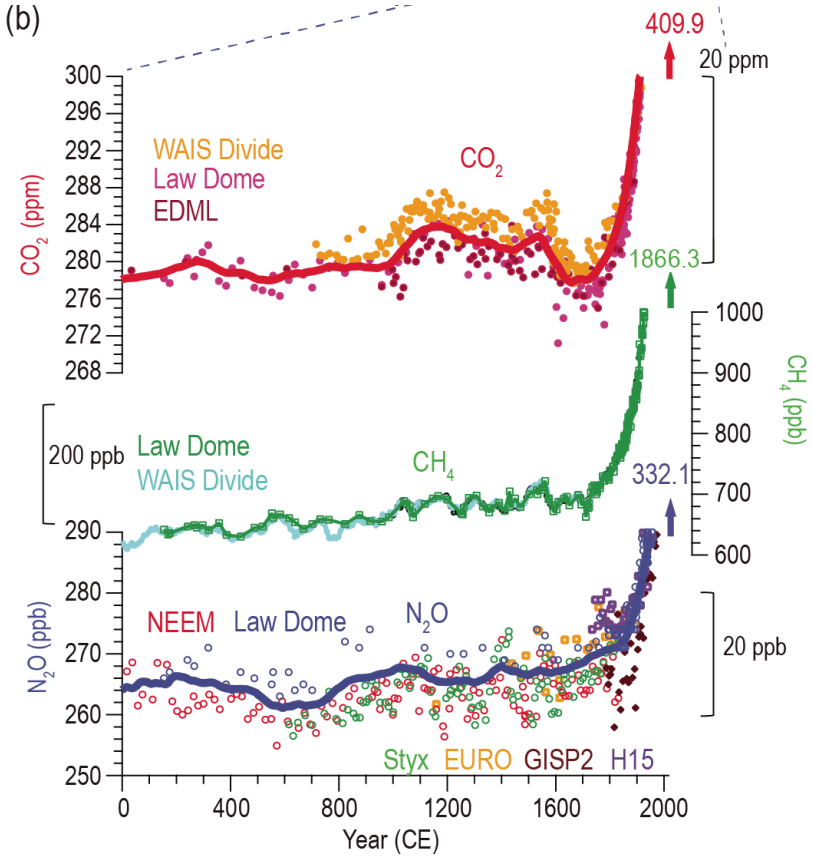
It is unequivocal that human influence has warmed the climate

Figure SPM.2



[Credit: NASA]

“Recent changes in the climate are widespread, rapid, and intensifying, and unprecedented in thousands of years.



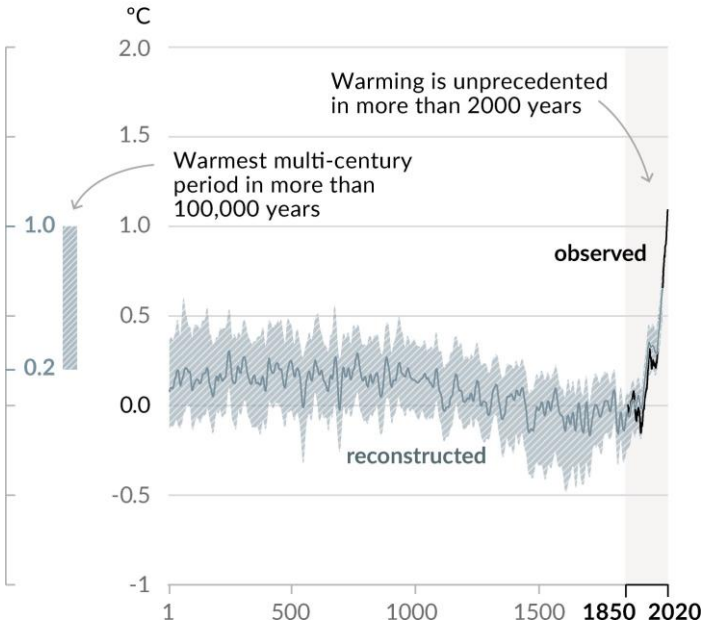
Atmospheric concentration of greenhouse gases CO_2, CH_4 and N_2O in the last 2000 years

Figure 2.4b

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

Figure SPM.1

a) Change in global surface temperature (decadal average) as reconstructed (1-2000) and **observed** (1850-2020)



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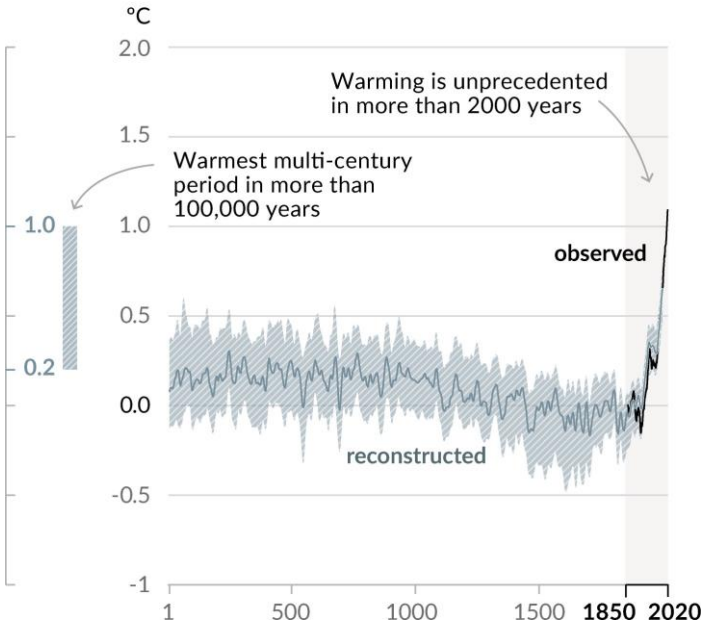


Climate sensitivity

Figure 7.18a

From observations and feedbacks IPCC AR6, 2021:

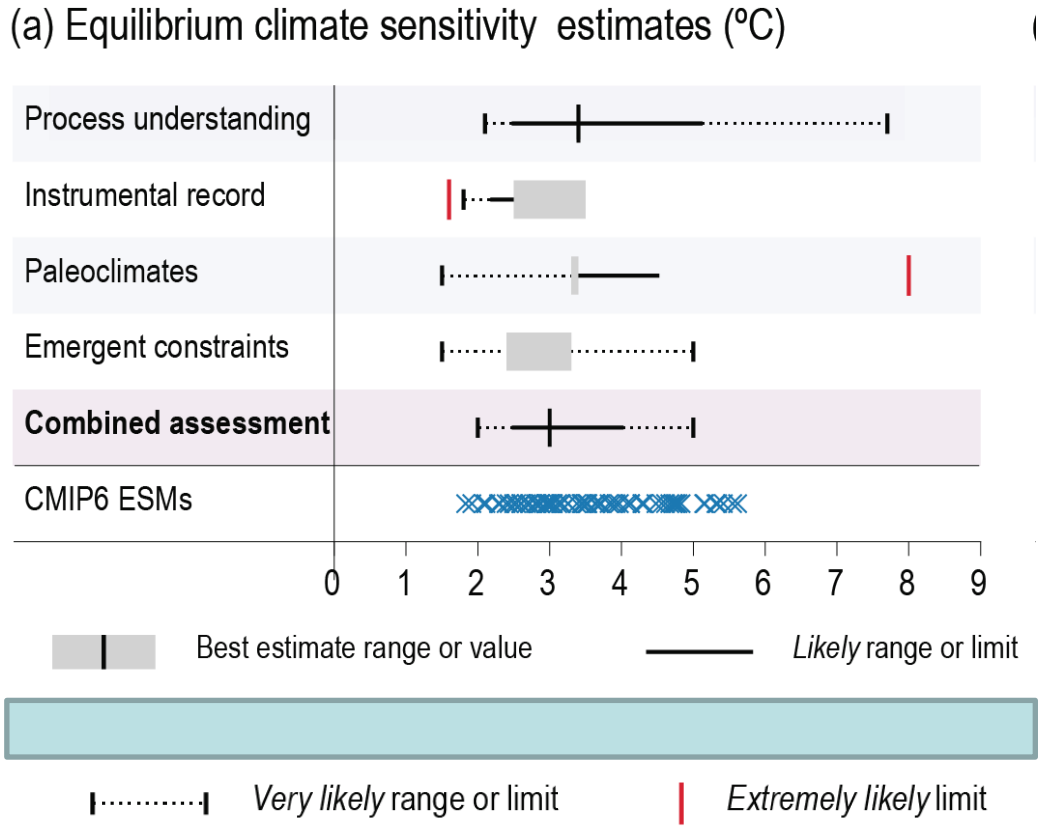
- Likely range (67%):
  2.5 – 4.0ºC

[AR5: 1.5 – 4.5ºC]

- Very likely range (90%)
  2.0 – 5.0ºC

- Best estimate: 3ºC

[AR5: no best estimate]



Attributed global surface air temperature change from 1750 to 2019 forced with radiative forcing of climate drivers.

Shaded uncertainty bands show very likely (5–95%) ranges

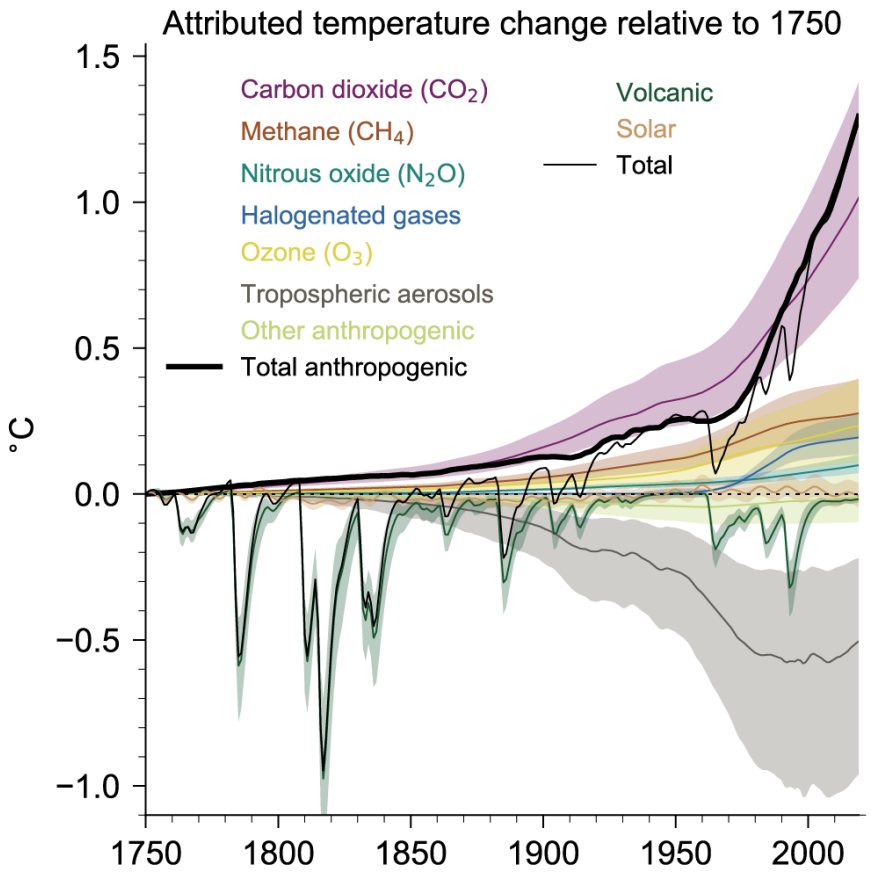
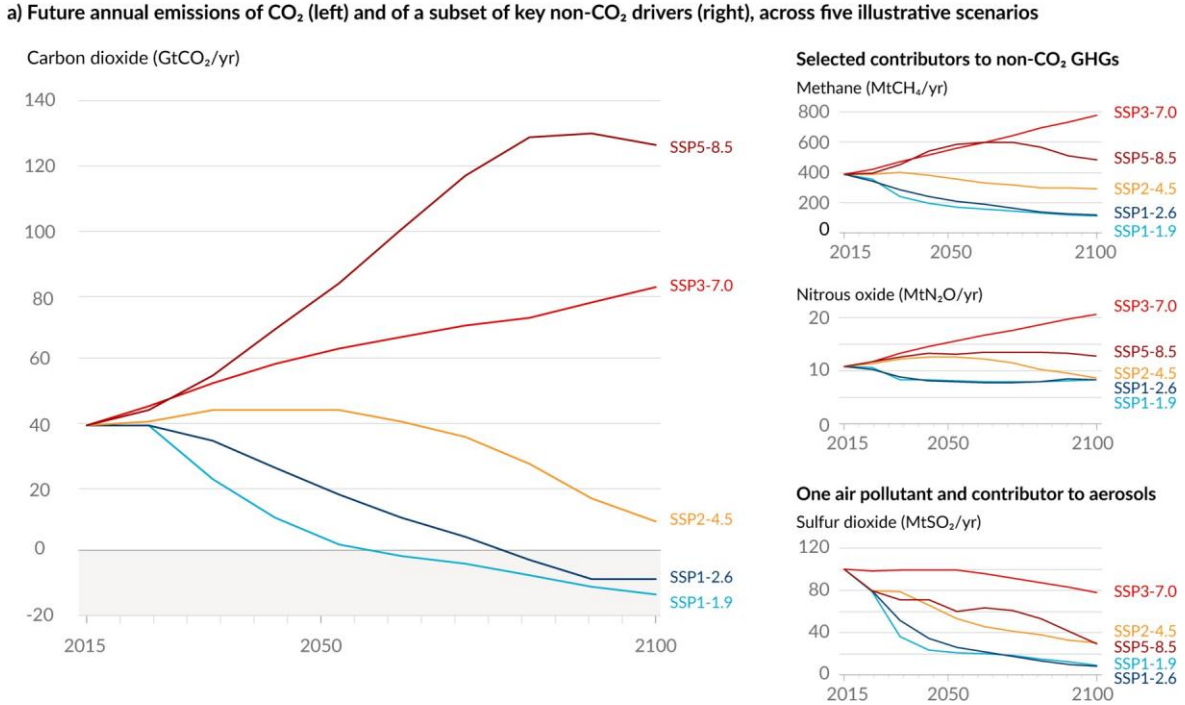


Figure 7.8

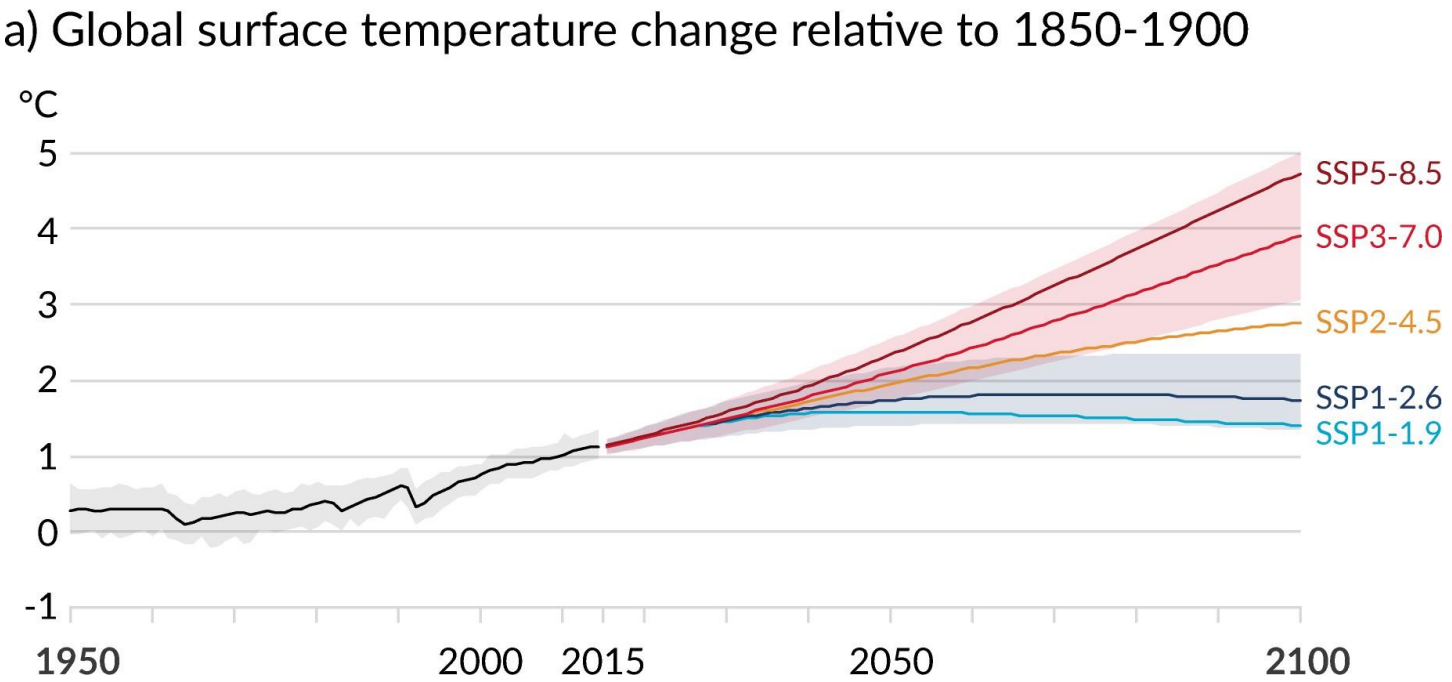
Future emissions cause future additional warming, with total warming dominated by past and future CO_2 emissions

Figure SPM.4



Human activities affect all the major climate system components, with some responding over decades and others over centuries

Figure SPM.8



[Credit: Shari Gearheard | NSIDC]

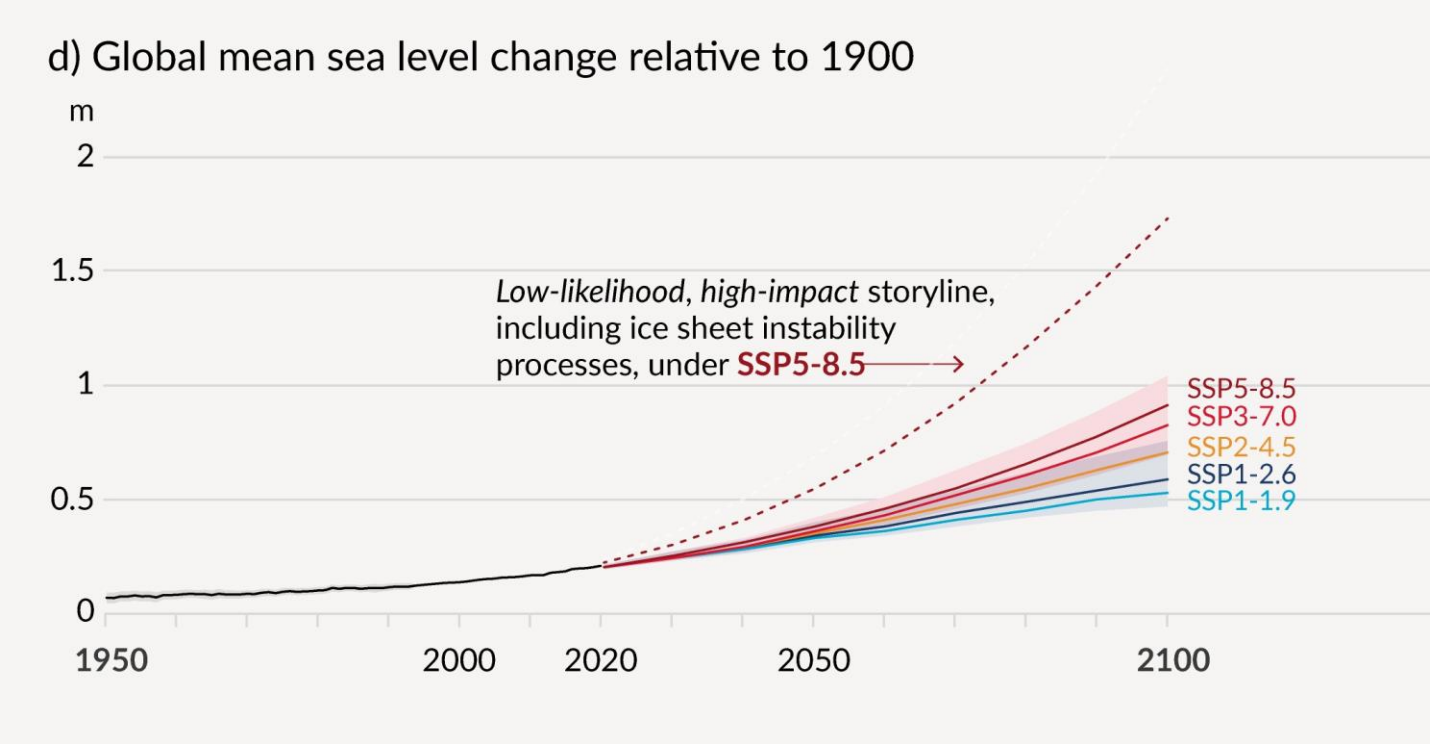
“

There’s no going back from some changes in the climate system.

However, some changes could be slowed and others could be stopped by limiting warming.

Human activities affect all the major climate system components, with some responding over decades and others over centuries

Figure SPM.8



With every increment of global warming, changes get larger in regional mean temperature, precipitation and soil moisture

Figure SPM.5

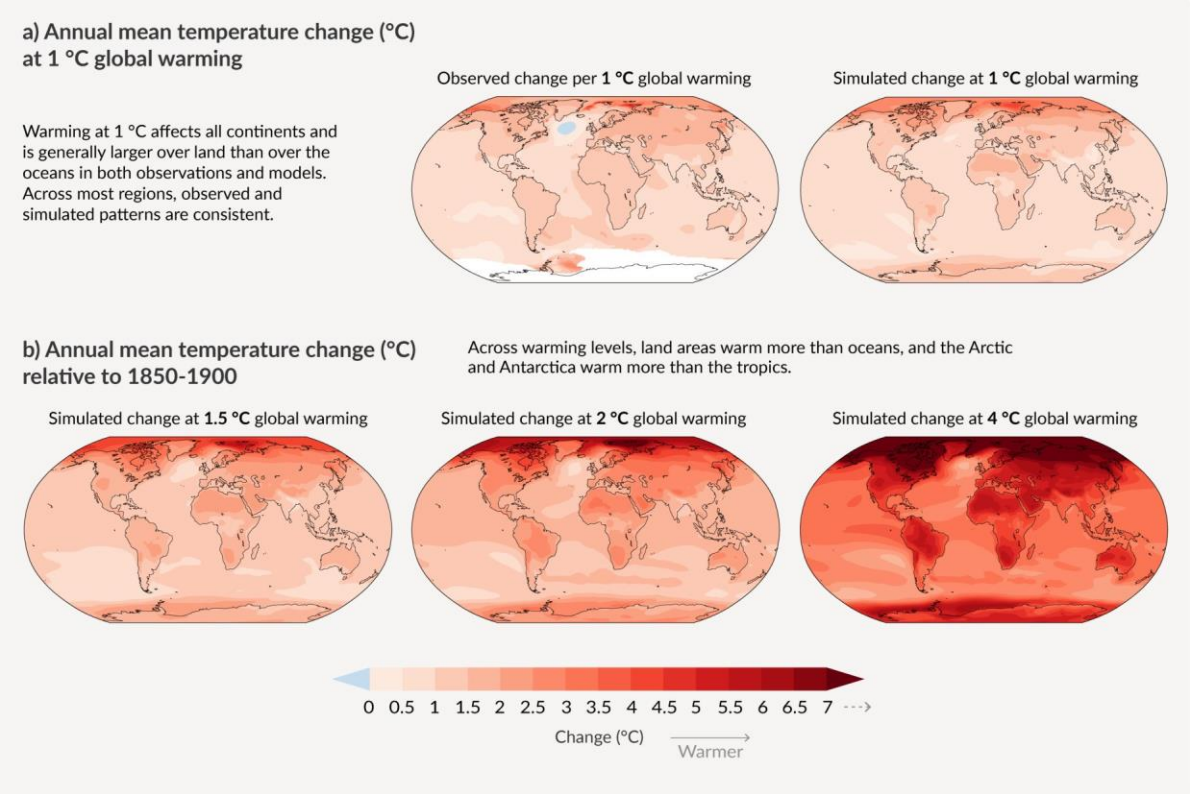


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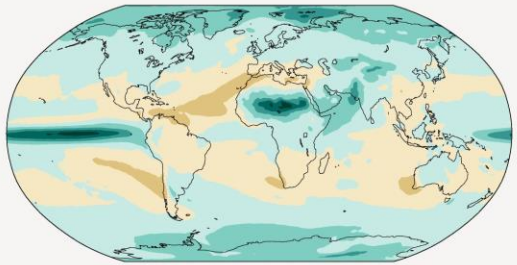
Figure SPM.5

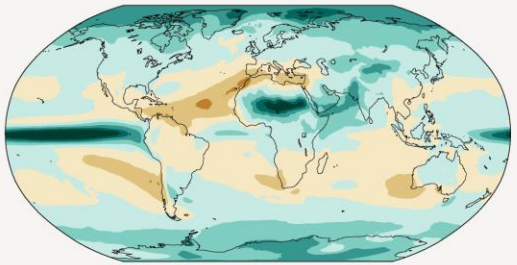
c) Annual mean precipitation change (%) relative to 1850-1900

Precipitation is projected to increase over high latitudes, the equatorial Pacific and parts of the monsoon regions, but decrease over parts of the subtropics and in limited areas of the tropics.

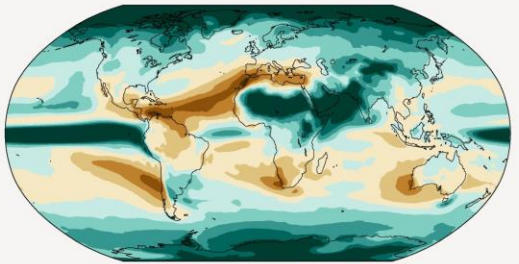
Simulated change at **1.5 °C** global warming



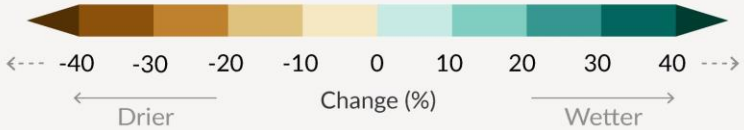
Simulated change at **2 °C** global warming



Simulated change at **4 °C** global warming

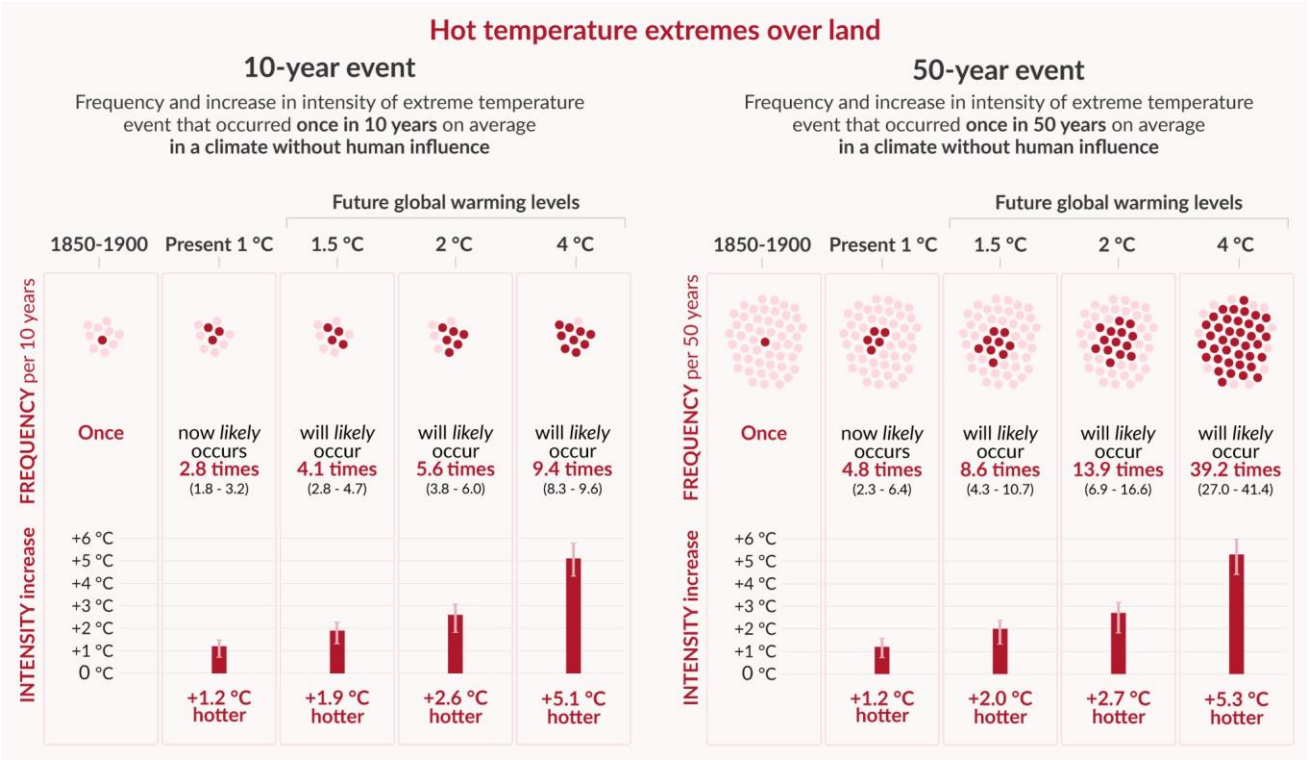


Relatively small absolute changes may appear as large % changes in regions with dry baseline conditions



Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

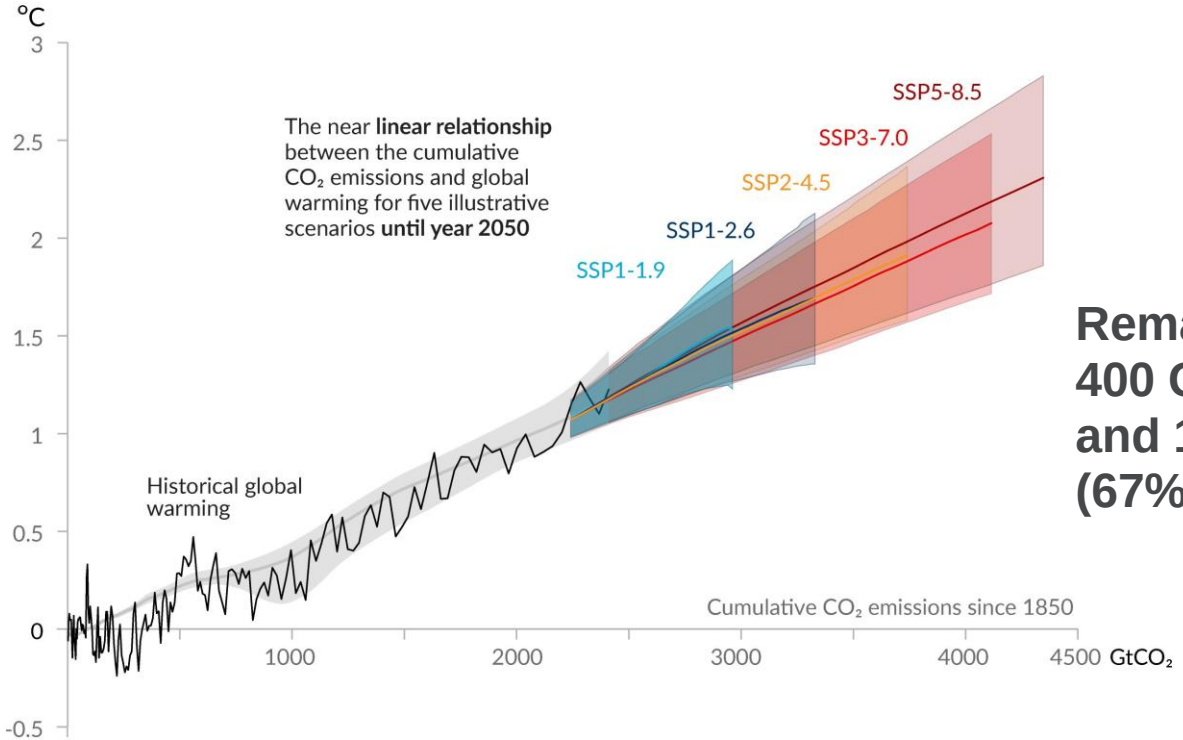
Figure SPM.6



Every tonne of CO_2 emissions adds to global warming

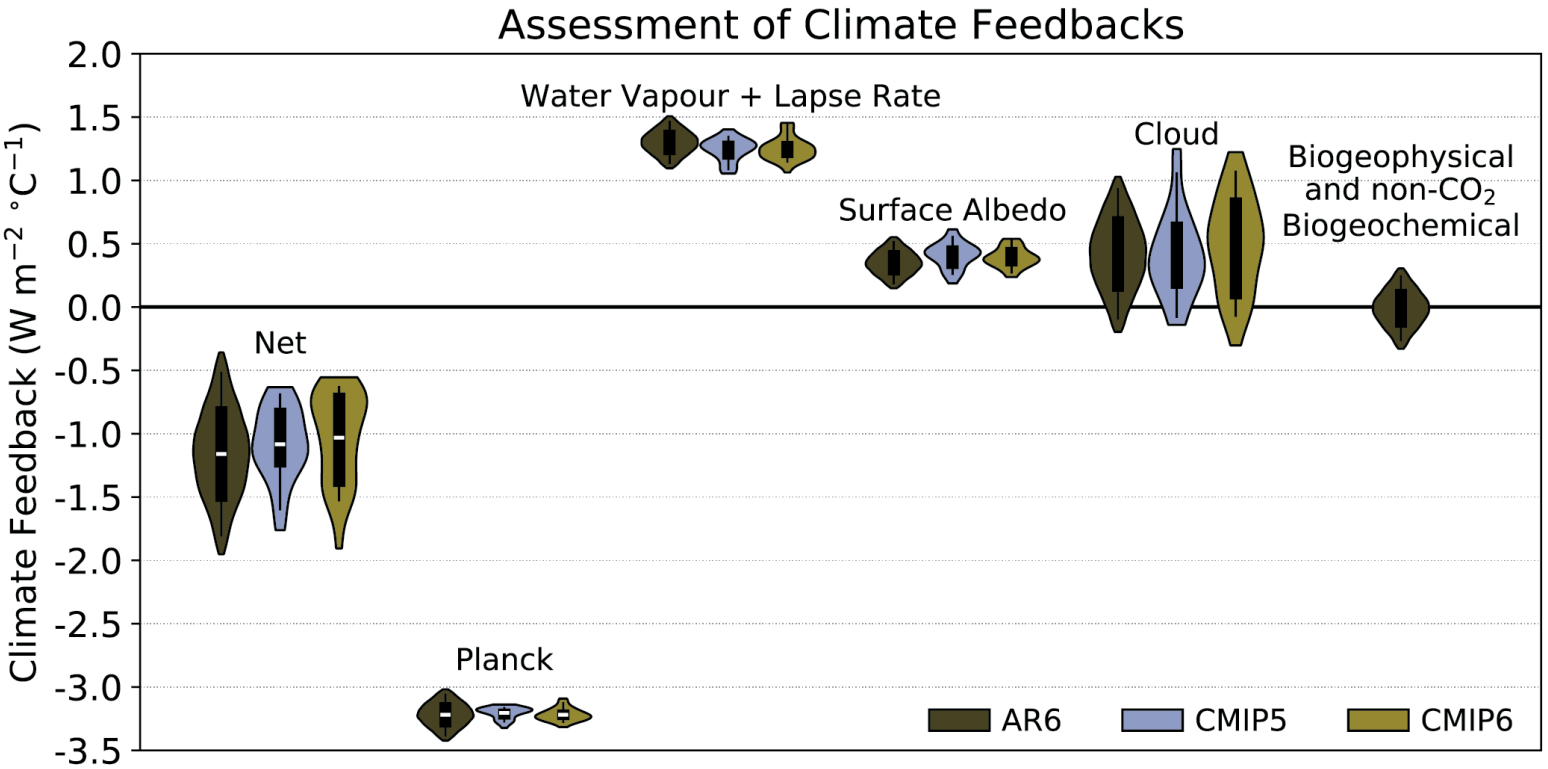
Figure SPM.10

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO_2 emissions ($GtCO_2$)



Remaining carbon budget is 400 $GtCO_2$ for 1.5°C target (50%) and 1150 $GtCO_2$ for 2°C target (67%).

Figure 7.10


Assessment of Climate Feedbacks
Climate Feedback (W m^{-2} °C^{-1})
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
Water Vapour + Lapse Rate
Surface Albedo
Cloud
Biogeophysical and non-CO_2 Biogeochemical
Net
Planck
AR6
CMIP5
CMIP6