SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

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INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Global climate change aspects
Key findings from the 2021 IPCC climate report

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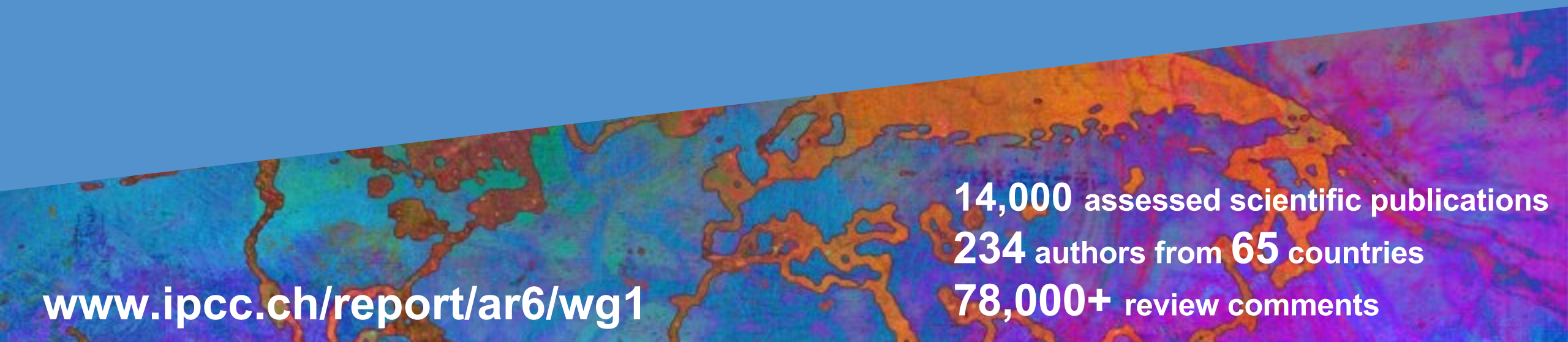

14,000 assessed scientific publications
234 authors from **65** countries
78,000+ review comments

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Human influence has warmed the climate

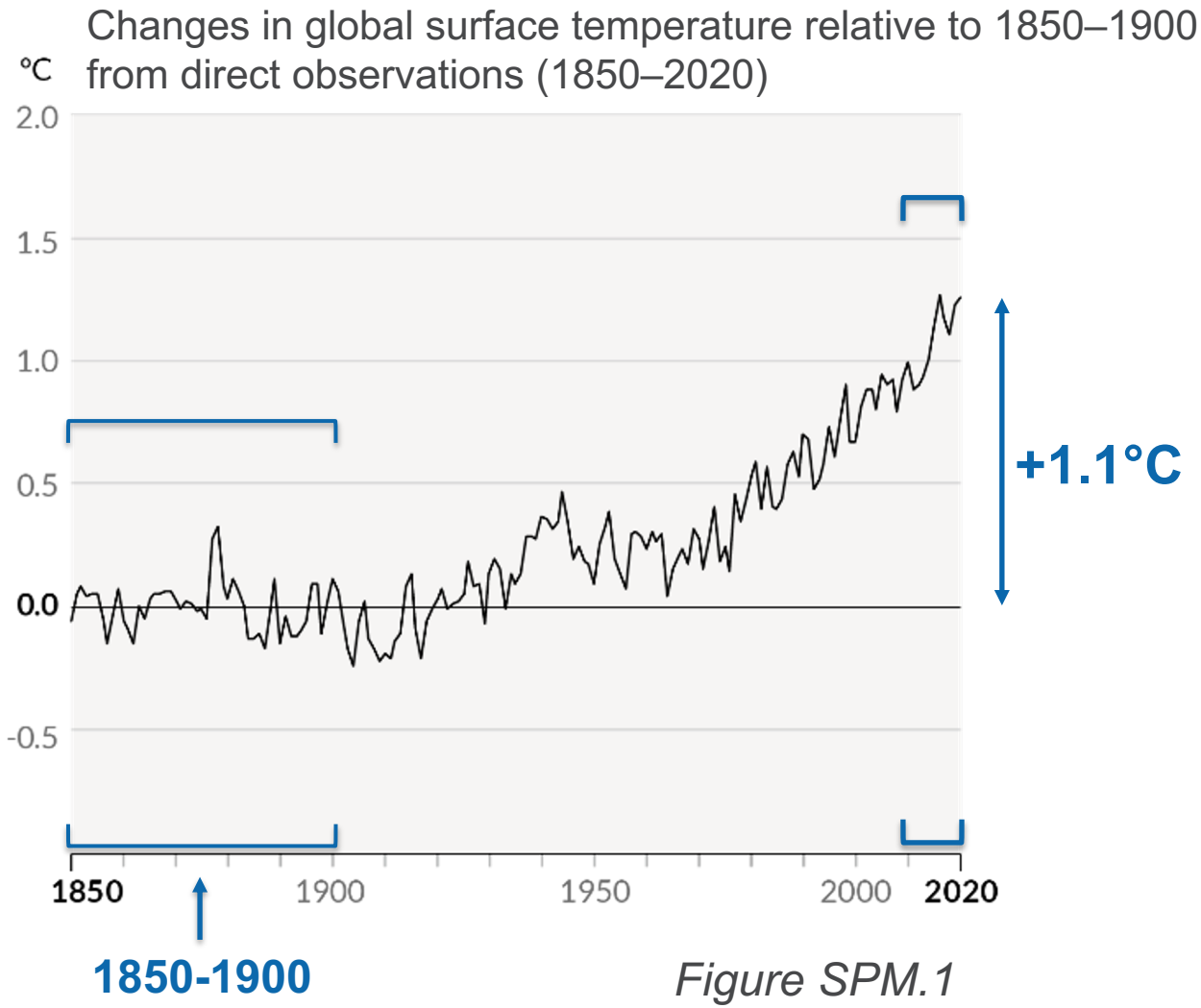


Figure SPM.1

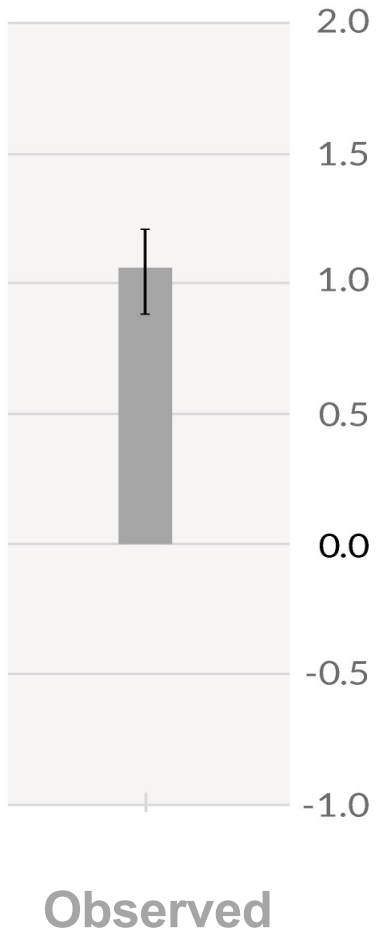
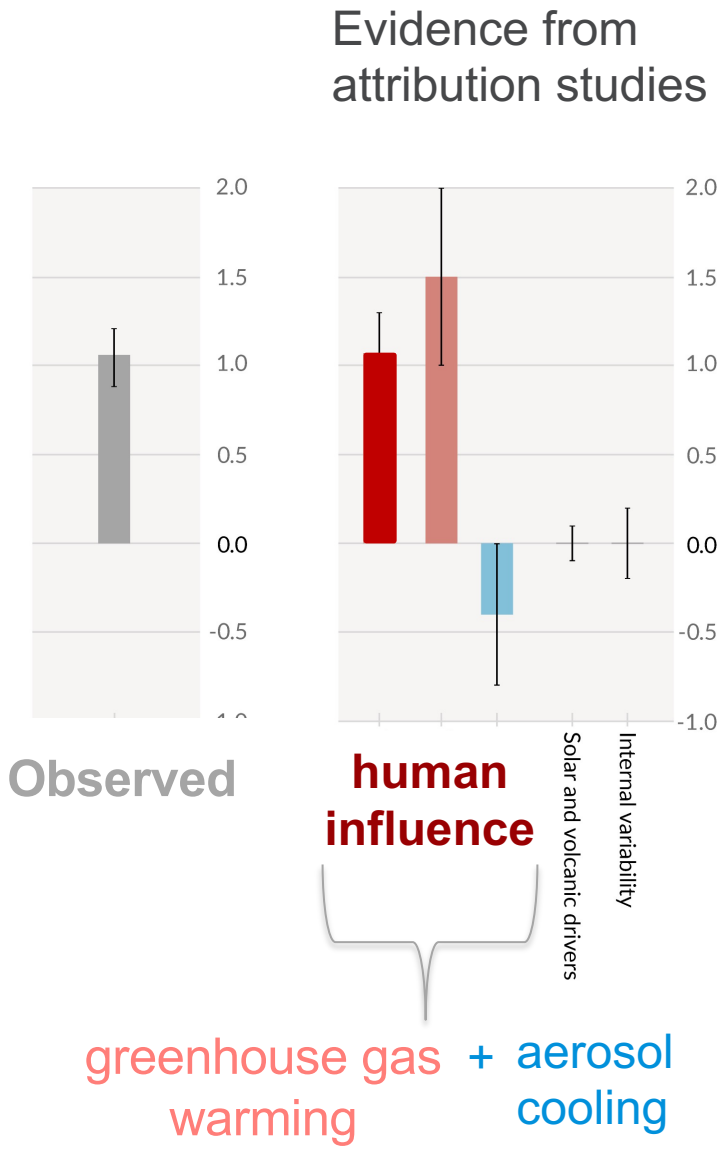


Figure SPM.2

Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling



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Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling

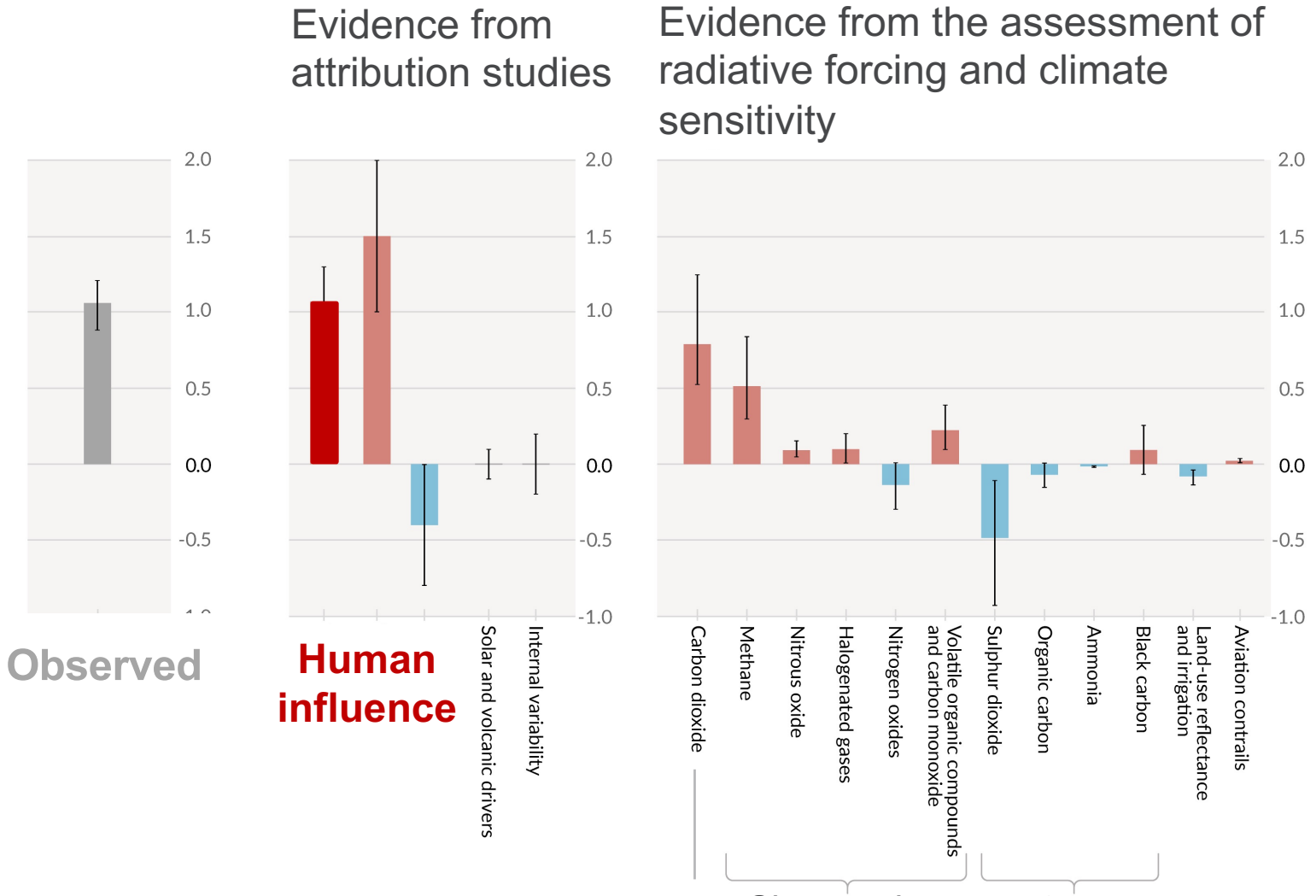
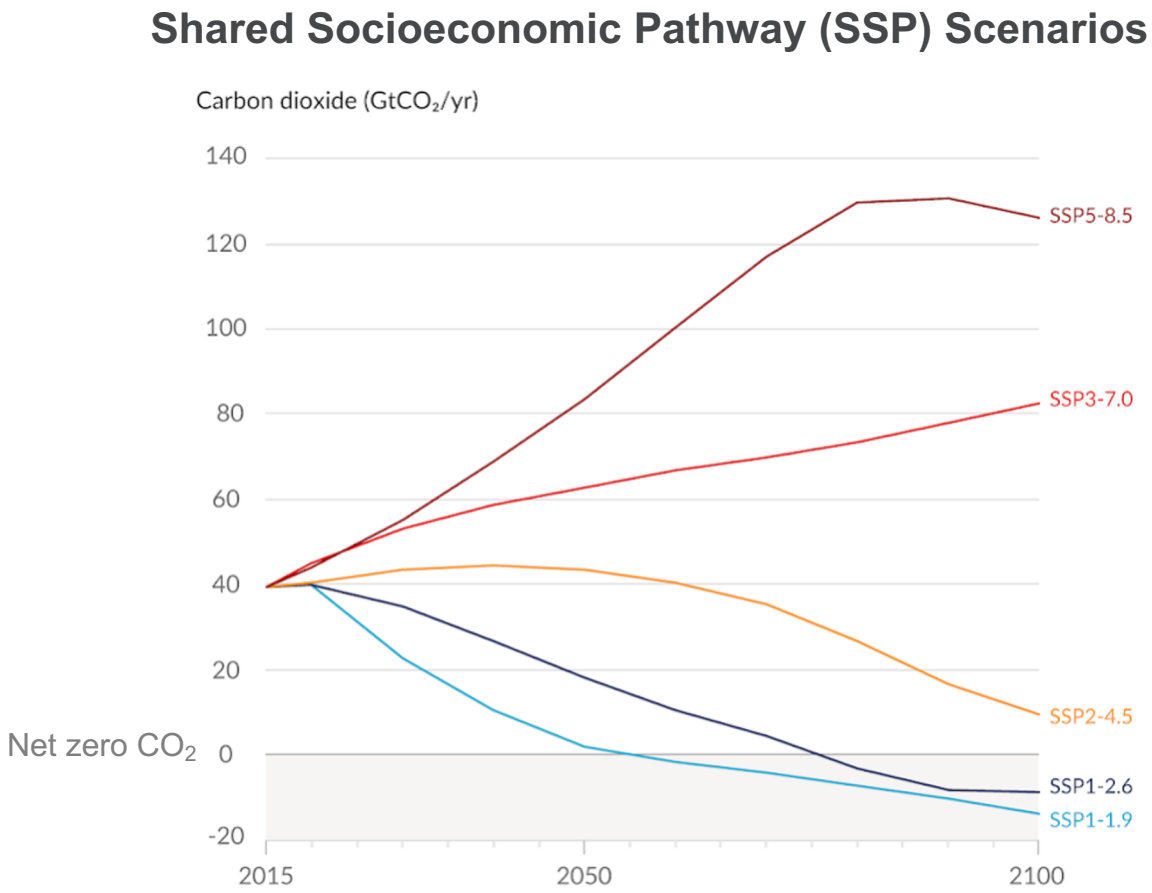


Figure SPM.2

The illustrative set of five SSP scenarios span a broader range of greenhouse gas and air pollutant futures than assessed in earlier WGI reports.



Very high

High

CO_2 emission pathways without any climate change mitigation

Intermediate CO_2 emission pathway

Low

Very low

CO_2 emission pathways in which CO_2 emissions decline to net zero around or after 2050

Box SPM.1, Figure SPM.4

Assessed future global surface temperature is based on multiple lines of evidence

Scenario-based CMIP6 projections

Three different approaches with observational constraints

Constrained projected change

Equilibrium climate sensitivity (ECS): 3°C (*very likely* 2°C-5°C)
Transient climate response (TCR): 1.8°C (*very likely* 1.2°C-2.4°C)

A 2-layer energy balance (emulator) model

Emulated change

Assessed future global surface temperature change

Global surface temperature will continue to increase until at least the mid-century under all emission scenarios considered

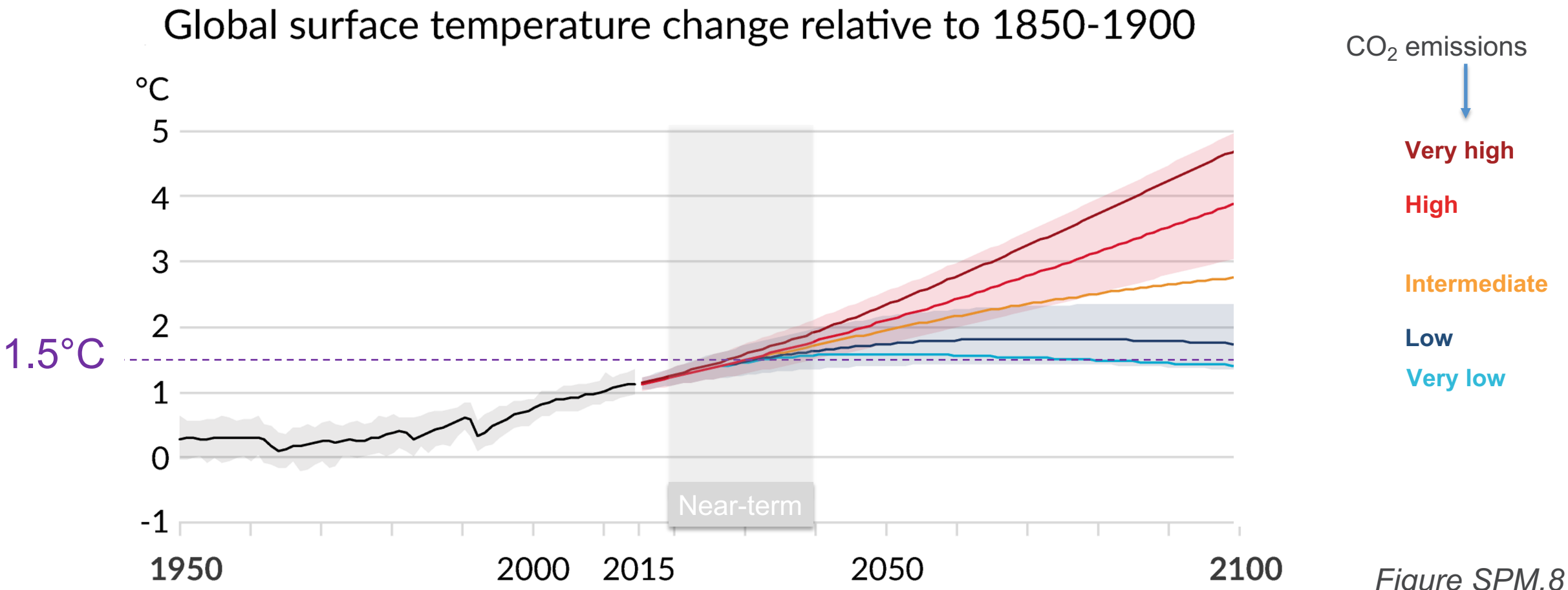


Figure SPM.8

Global warming of 1.5°C and 2°C will be exceeded unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades

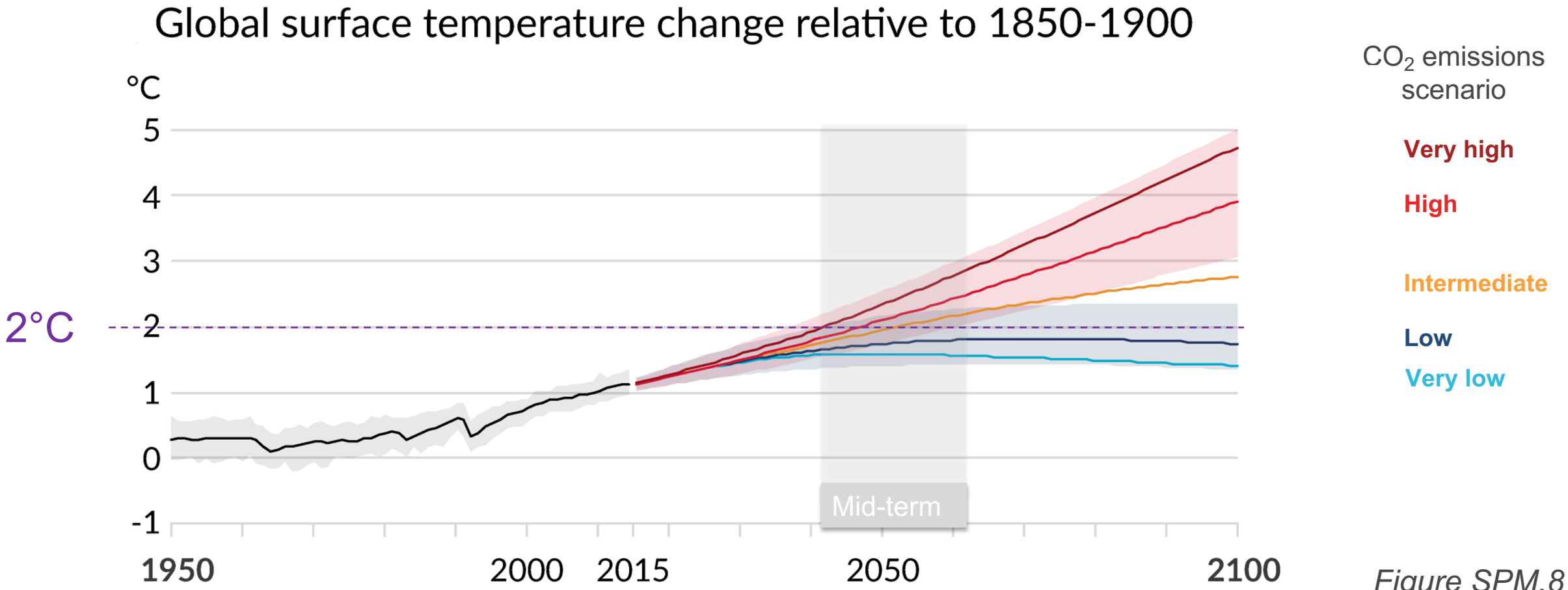
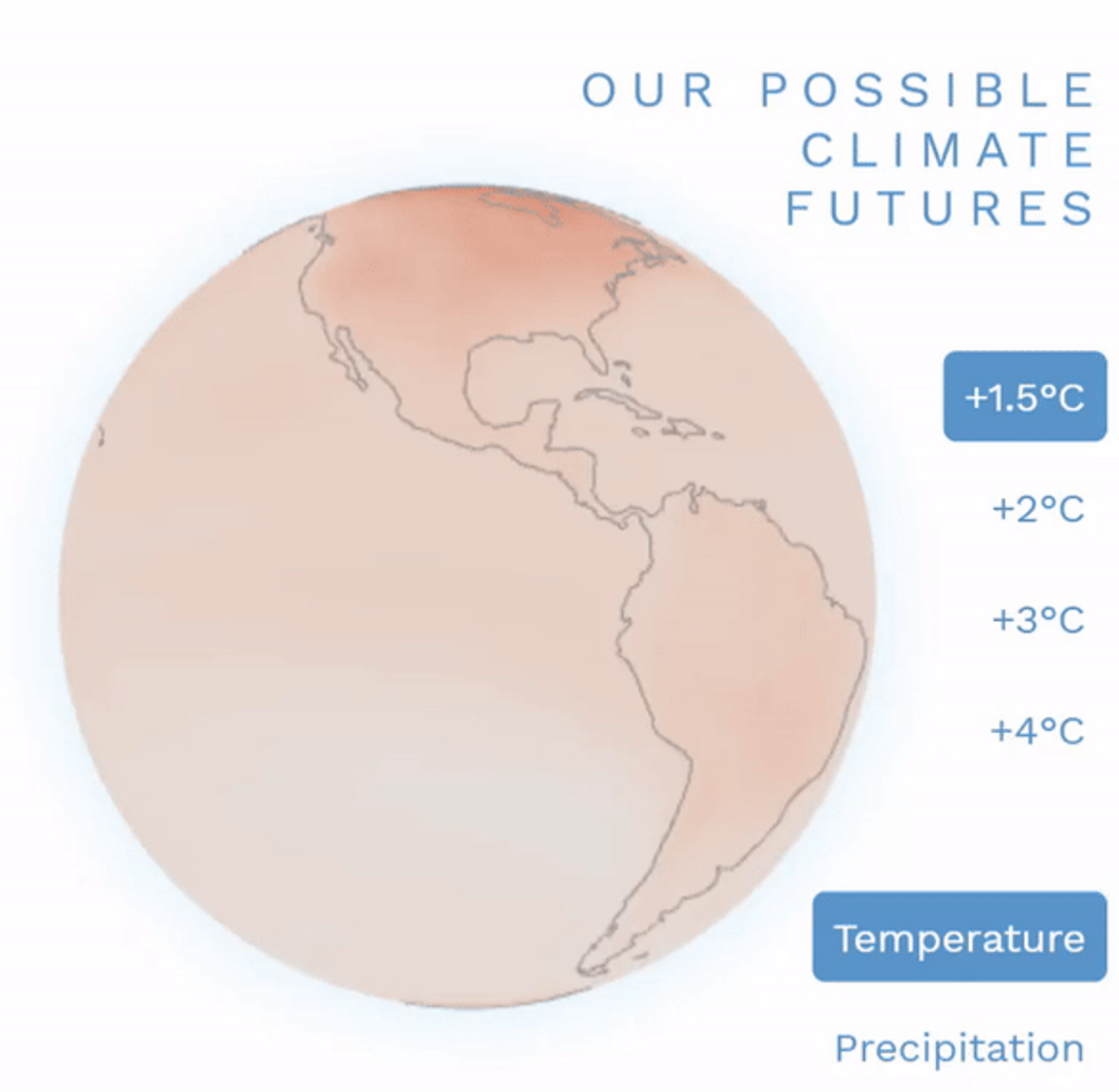


Figure SPM.8

With every increment of global warming, changes in regional mean temperature, precipitation, and soil moisture and changes in extremes and climatic impact-drivers get larger



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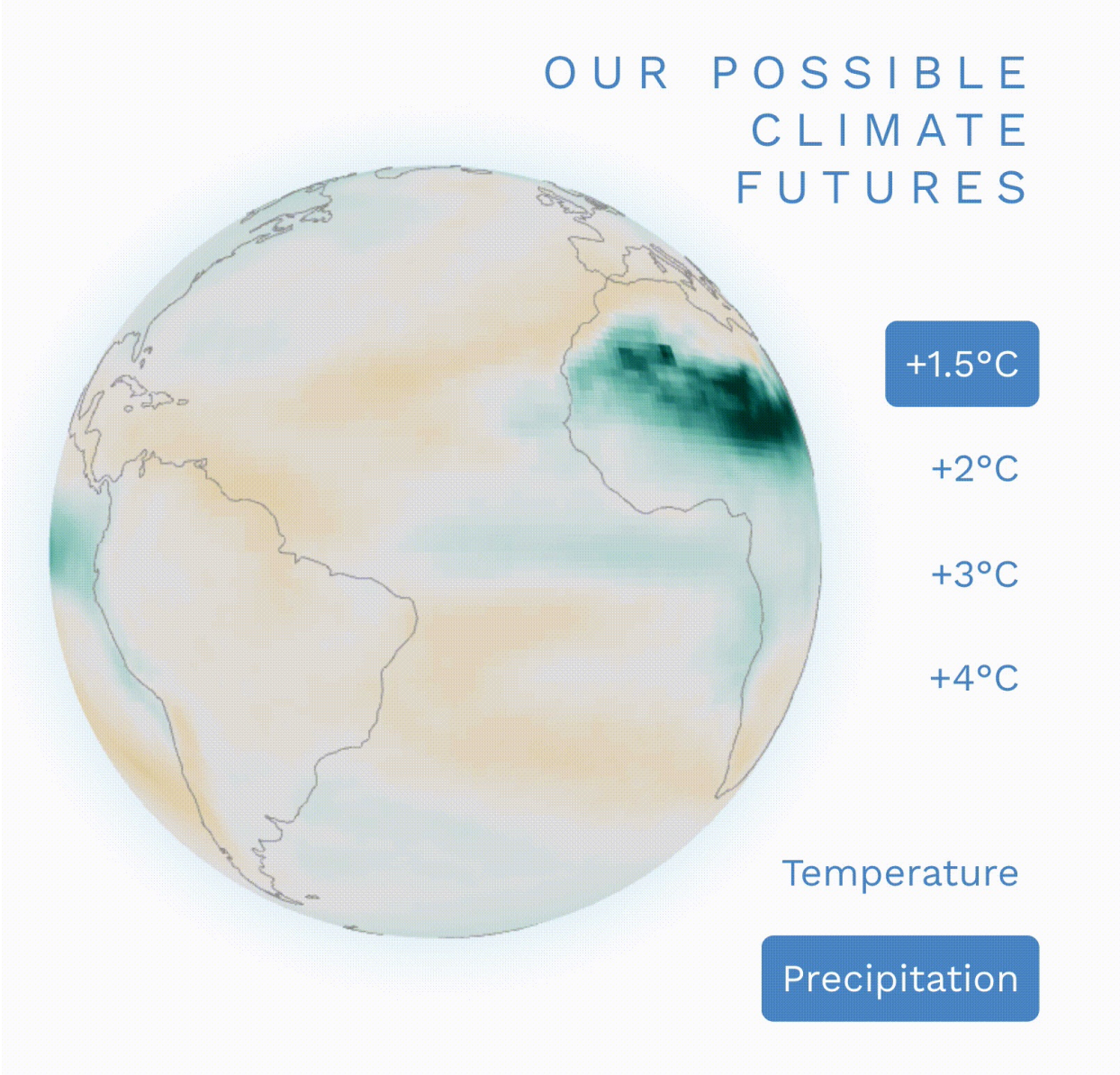
Continued global warming is projected to further intensify the global water cycle, including its variability, global monsoon precipitation and the severity of wet and dry events



https://interactive-atlas.ipcc.ch/

Many changes in the climate system become larger with increasing global warming

↑ frequency and intensity
- hot extremes and marine heatwaves
- heavy precipitation (+7% per °C)
- drought in some regions

↑ proportion of intense tropical cyclones

↓ snow cover, permafrost, Arctic sea ice loss

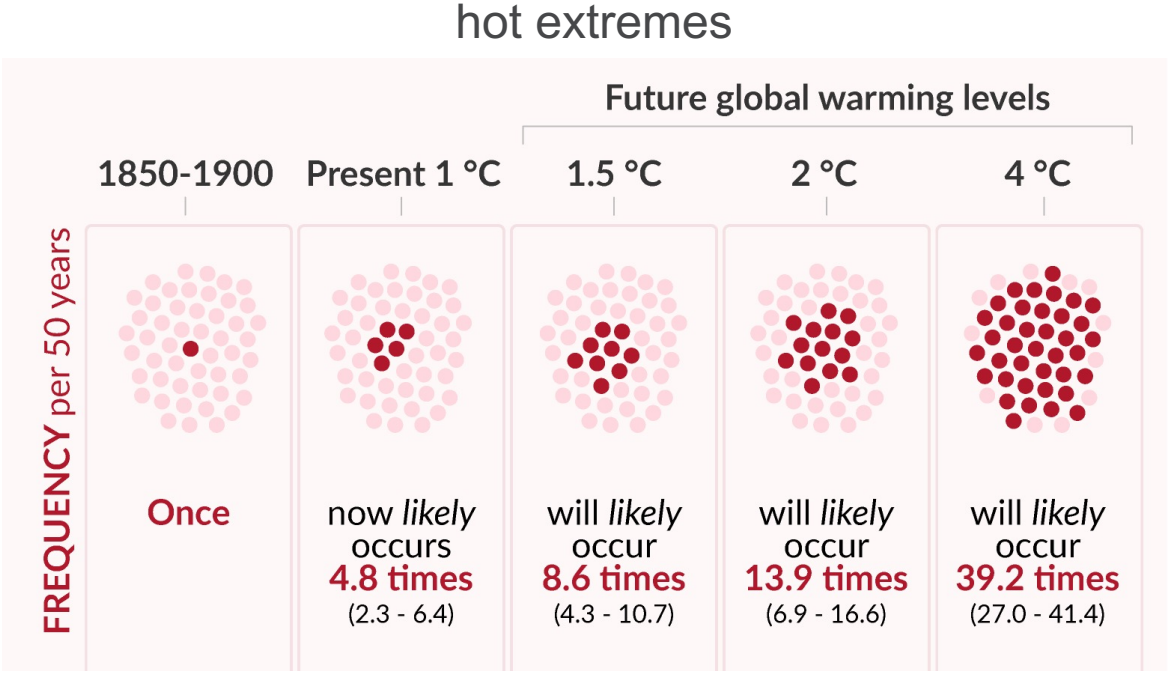
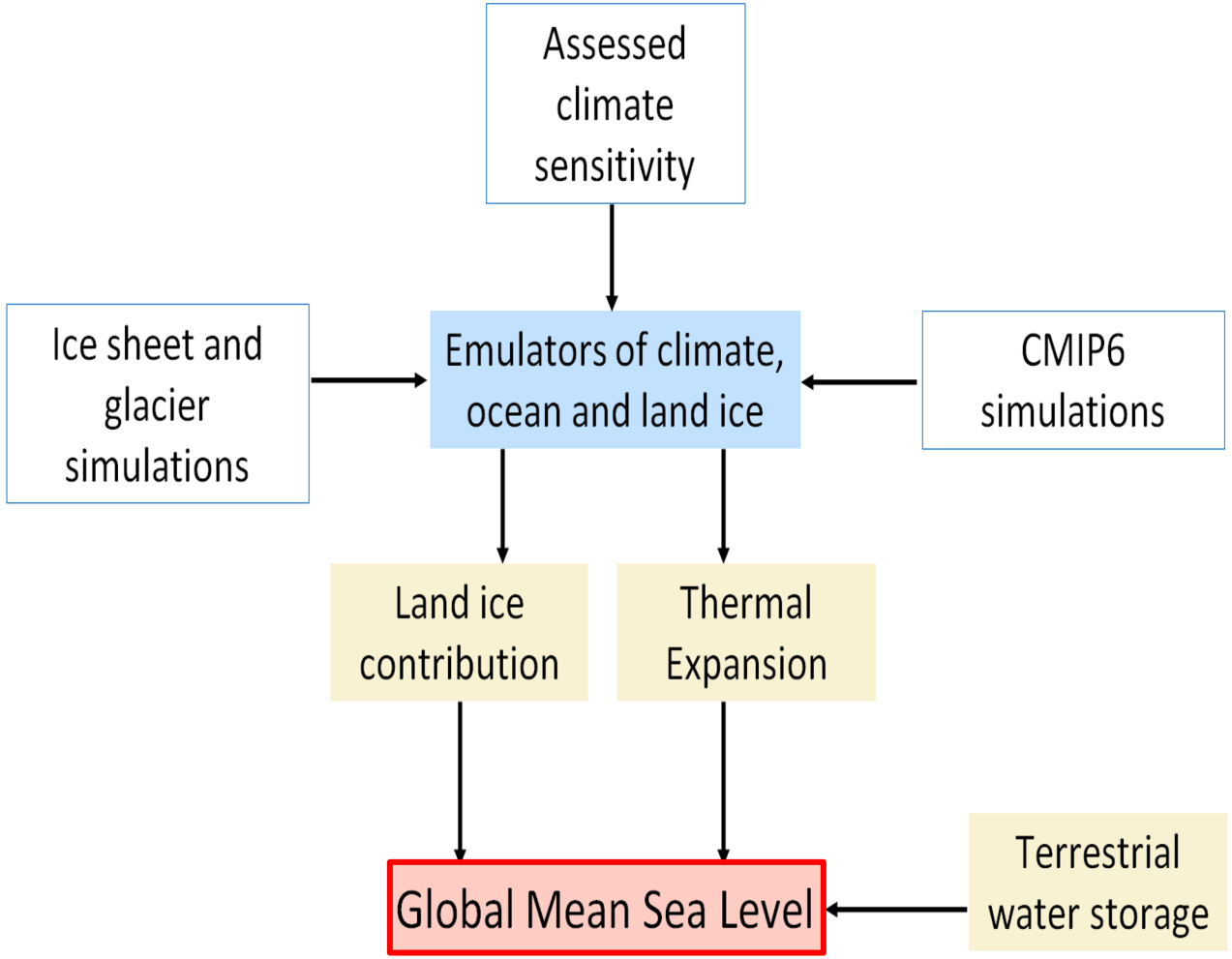


Figure SPM.5

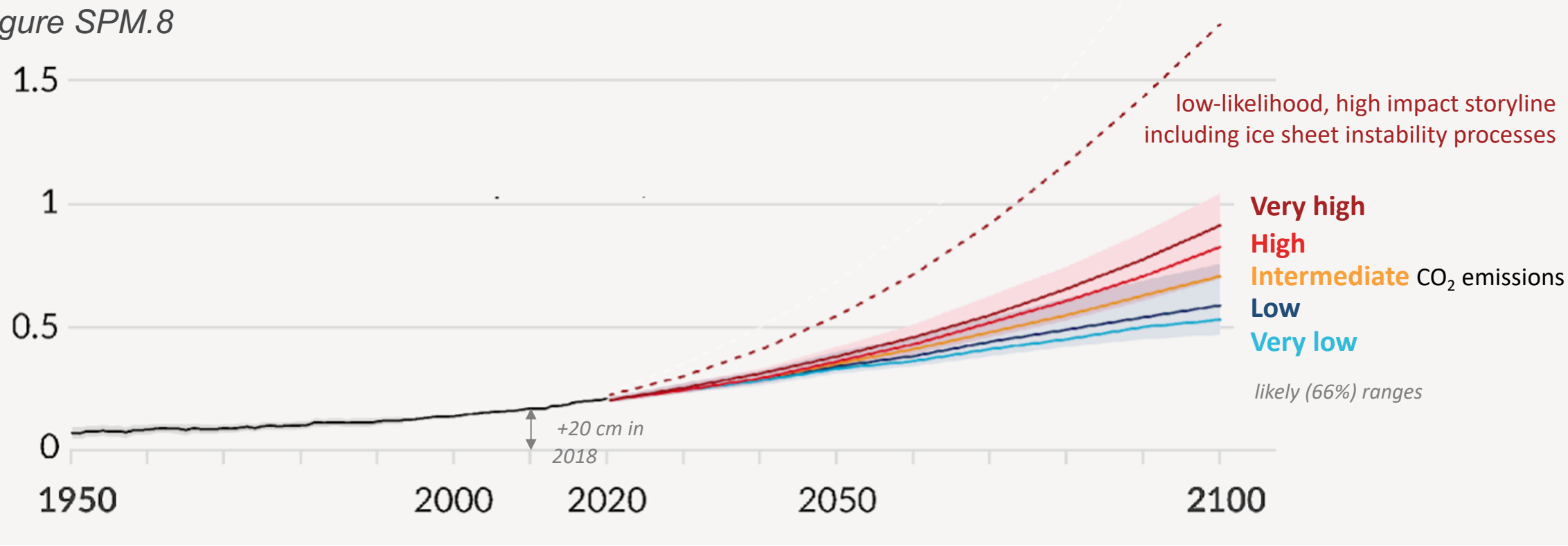
Projections of global mean sea level are consistent with assessed changes in global surface temperature



Global mean sea level will continue to rise over thousands of years with a rate and magnitude depending on global greenhouse gas emissions

Global mean sea level rise relative to 1900 (m)

Figure SPM.8



Global mean sea level will continue to rise over thousands of years with a rate and magnitude depending on global greenhouse gas emissions

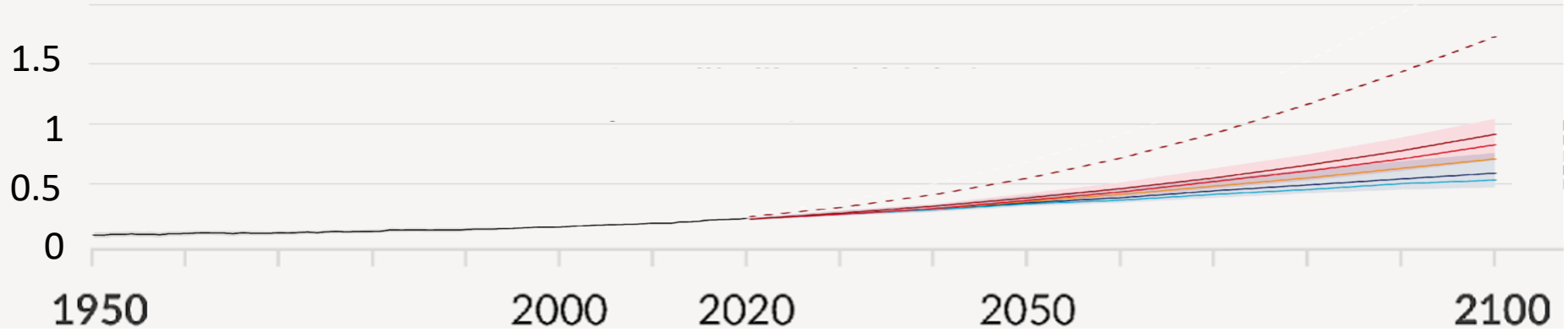
Global mean sea level rise relative to 1900 (m)

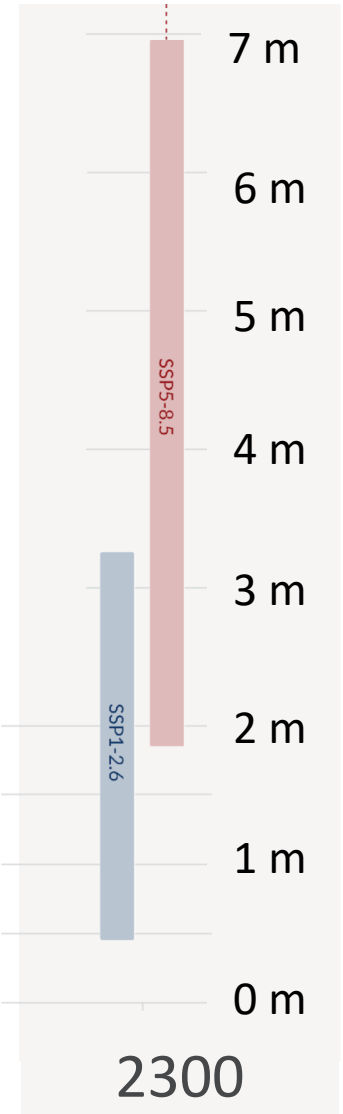
Very high CO_2 emissions

likely (66% ranges

Low CO_2 emissions

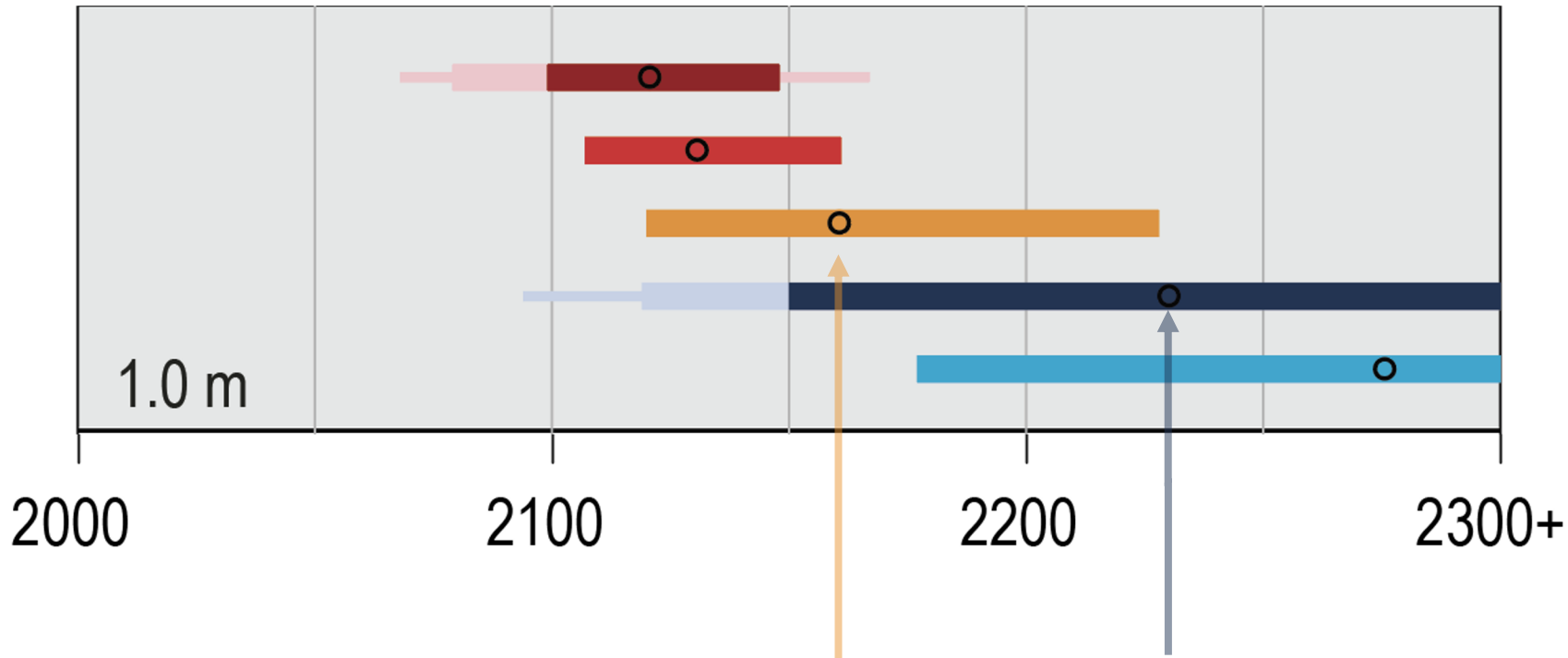
Figure SPM.8





Global mean sea level will continue to rise over thousands of years with a rate and magnitude depending on global greenhouse gas emissions

Global mean sea level rise exceeding **1 m** above 1995-2014 level



by around **2160** (2120 - 2230)
for **intermediate emissions** (3°C)

by around **2200** (2150 – 2300+)
for **low emissions** (<2°C)

Box TS.4, Figure 1

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

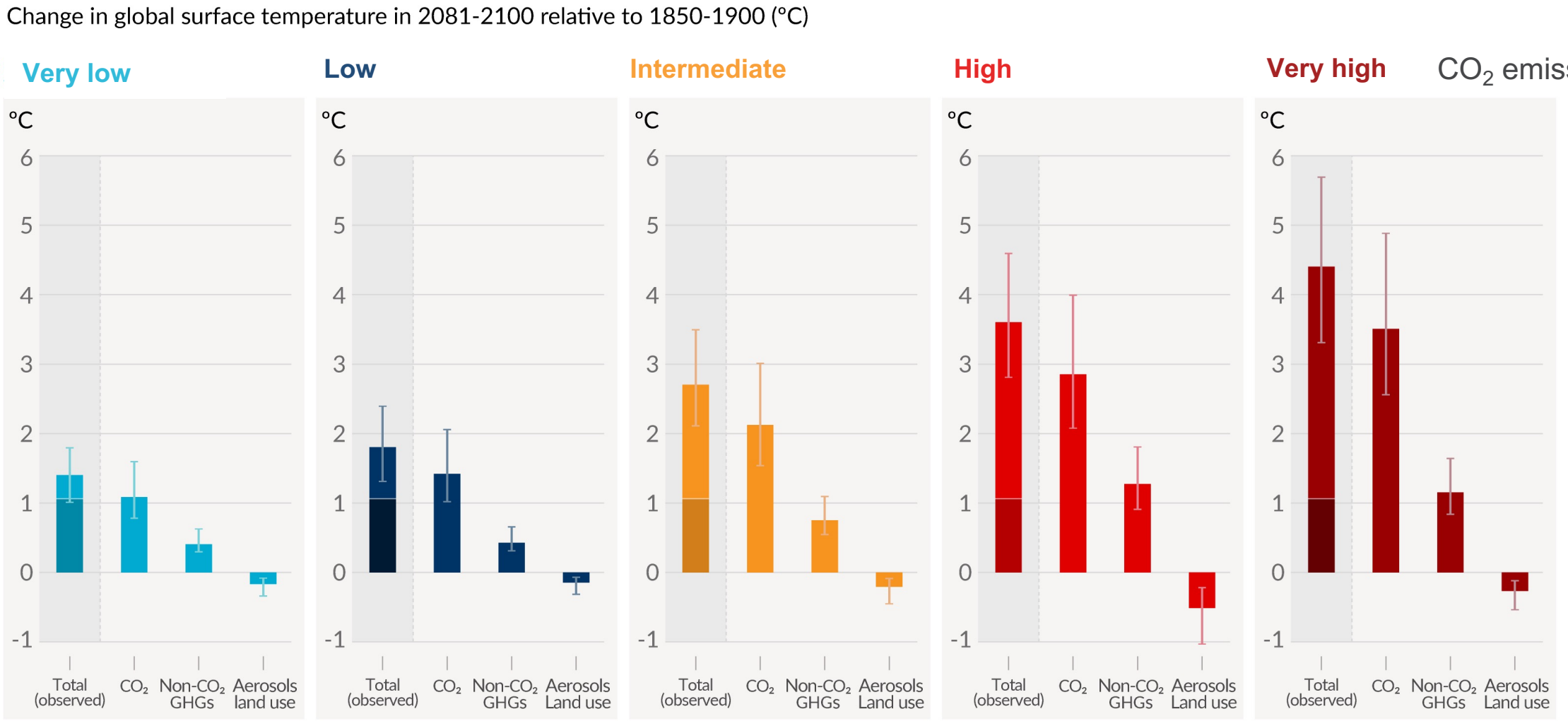


Figure SPM.4

Every tonne of CO_2 emissions adds to global warming

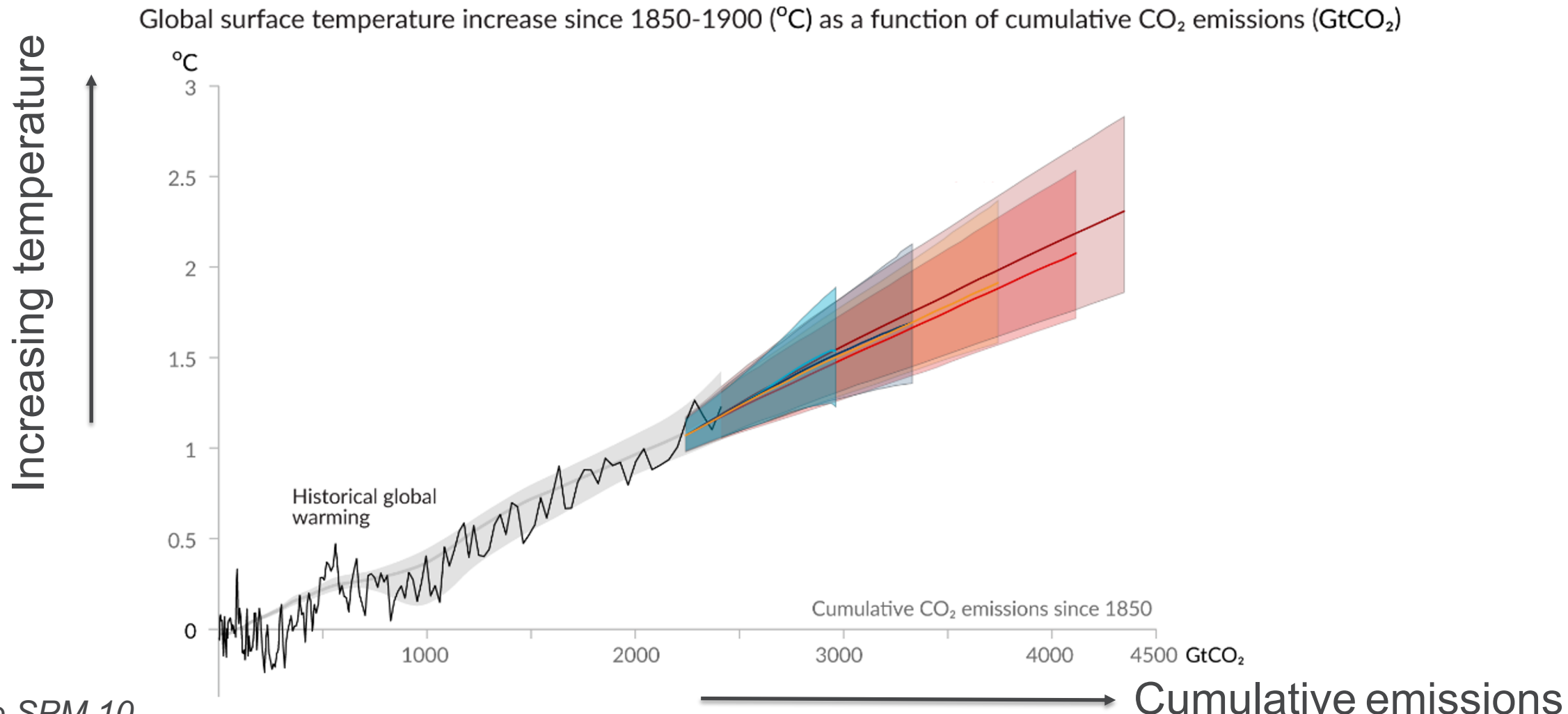
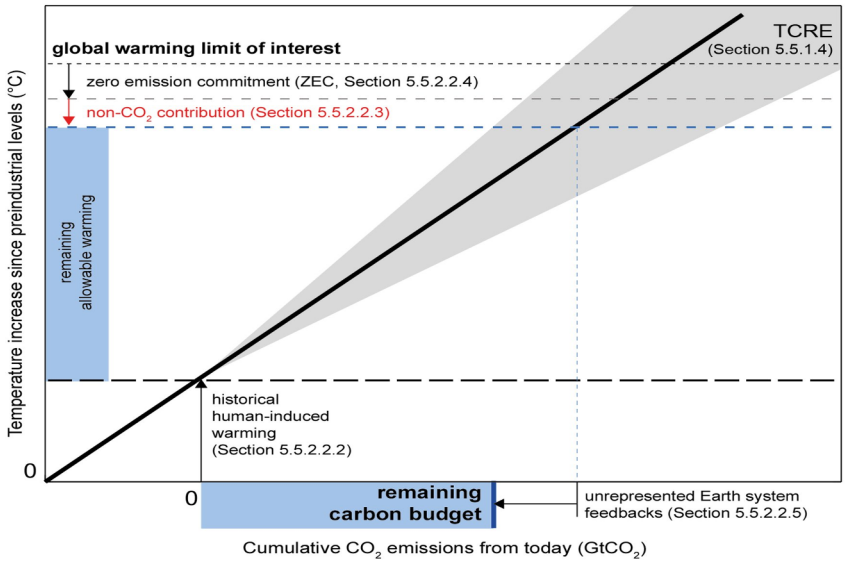


Figure SPM.10

An updated assessment of the total and remaining carbon budget



Global warming between 1850–1900 and 2010–2019 *(°C)*	Historical cumulative CO_2 emissions from 1850 to 2019 *($GtCO_2$)*
1.07 (0.8–1.3; *likely* range)	2390 (± 240; *likely* range)

Approximate global warming relative to 1850–1900 until temperature limit *(°C)**(1)	Additional global warming relative to 2010–2019 until temperature limit *(°C)*	Estimated remaining carbon budgets from the beginning of 2020 *($GtCO_2$)* — *Likelihood of limiting global warming to temperature limit*(2)*					Variations in reductions in non-CO_2 emissions*(3)
		17%	*33%*	*50%*	*67%*	*83%*	
1.5	0.43	900	650	500	400	300	Higher or lower reductions in accompanying non-CO_2 emissions can increase or decrease the values on the left by 220 $GtCO_2$ or more
1.7	0.63	1450	1050	850	700	550	
2.0	0.93	2300	1700	1350	1150	900	

Contributions of updated terms compensate leading to remaining budgets similar to SR1.5

- Emissions to date: 2390 $GtCO_2$ over 1850-2019 period
- Human-induced historical warming
- Warming per tonne CO_2 emitted
- Warming evolution after CO_2 emissions reach net zero
- Future warming from non- CO_2 emissions
- Earth system feedback otherwise not captured

The proportion of CO_2 emissions taken up by land and ocean carbon sinks is smaller in scenarios with higher cumulative CO_2 emissions

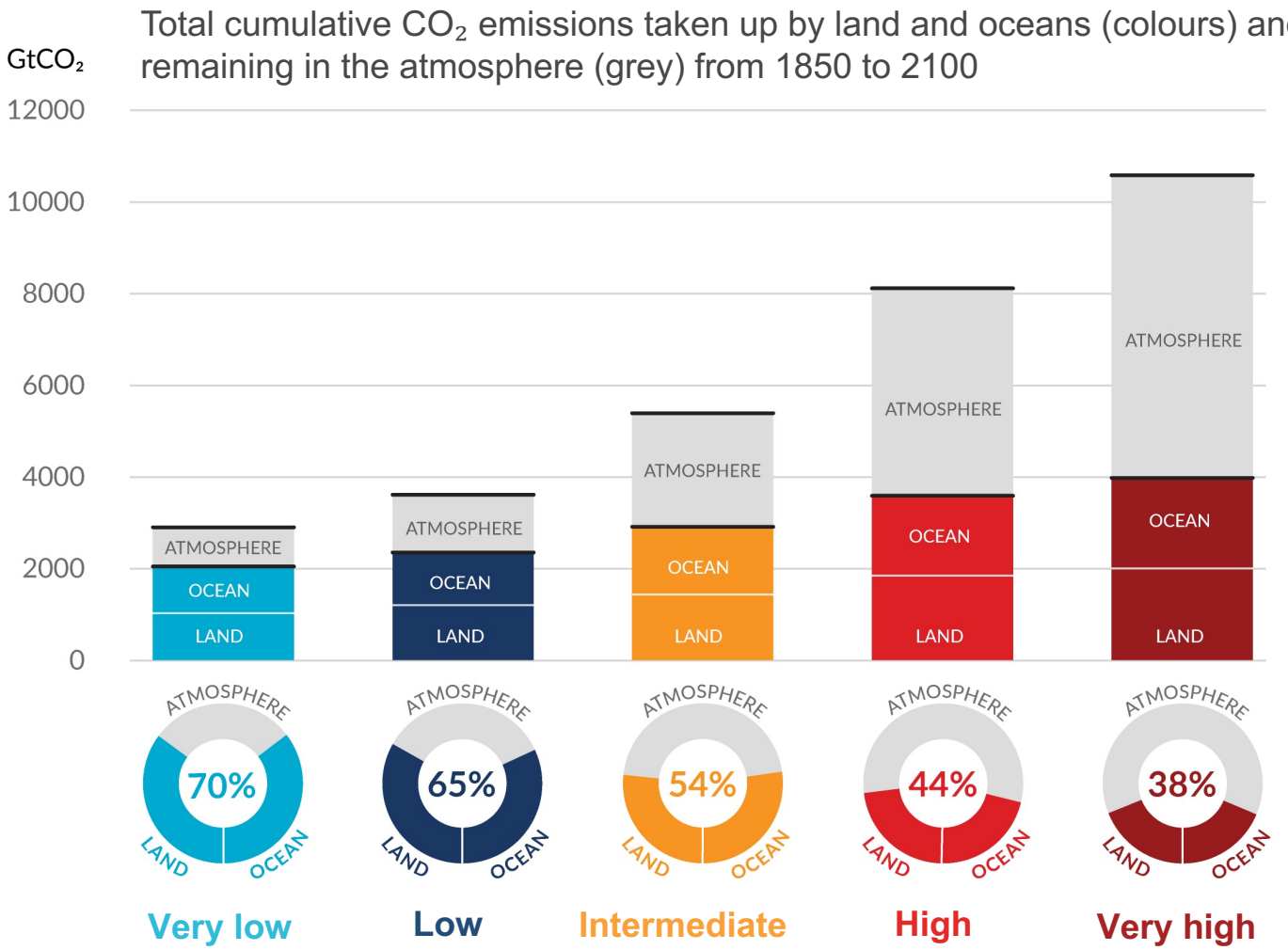
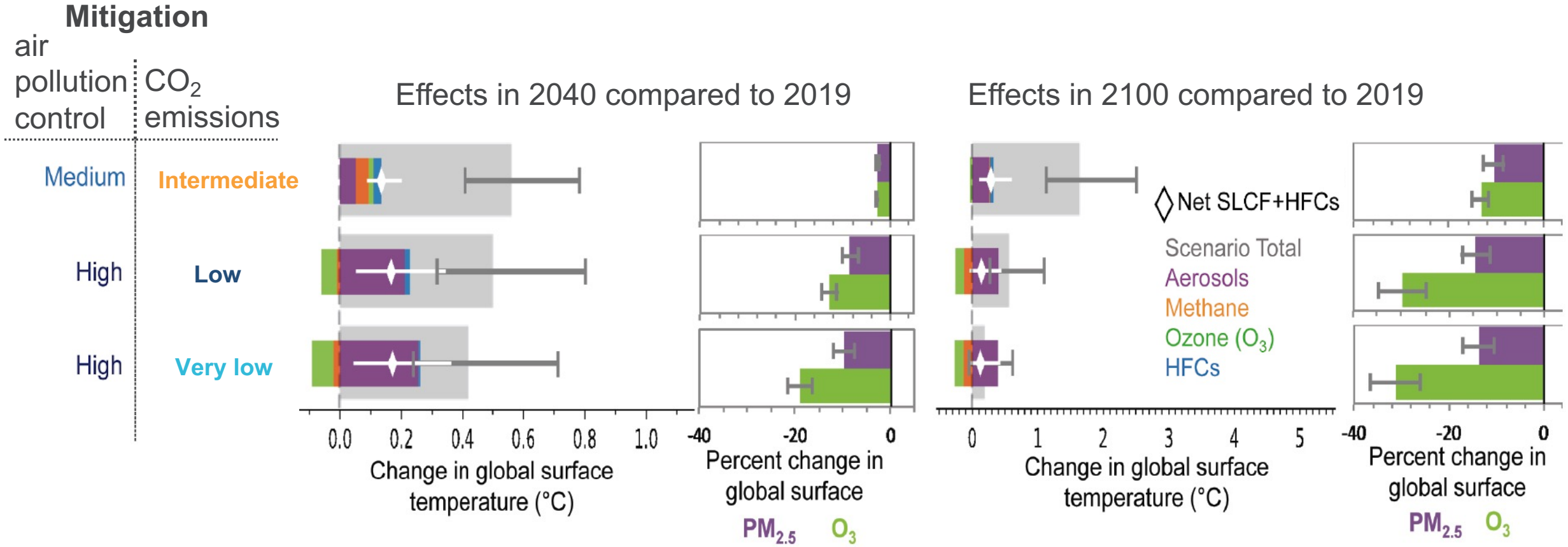


Figure SPM.7

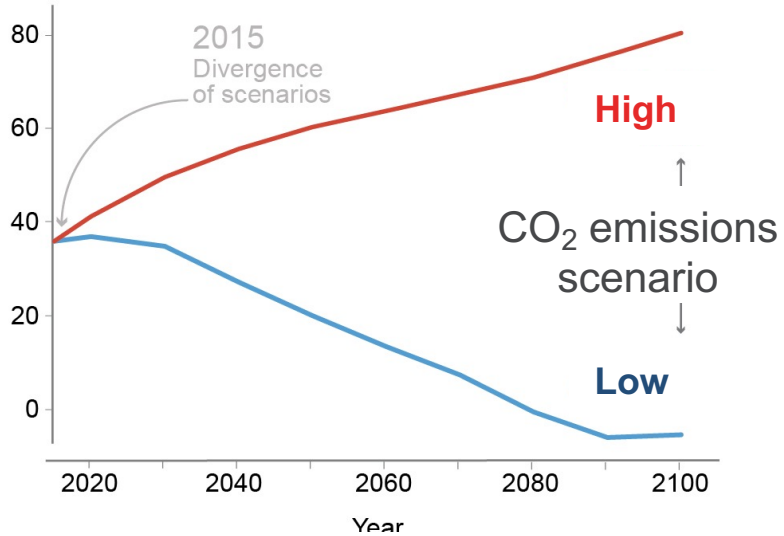
Strong, rapid and sustained reductions in CH_4 emissions would limit the warming effect resulting from declining aerosol pollution and improve air quality



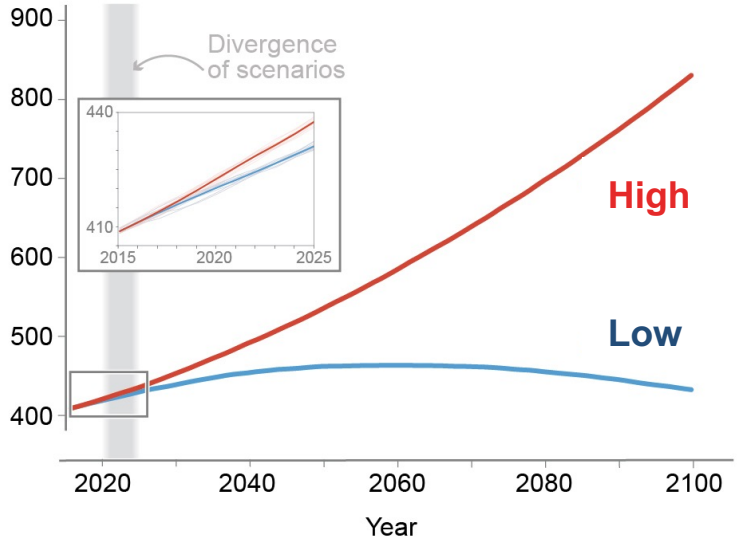
Box TS.7, Figure 1

Differences in trends in global surface temperature would begin to emerge from natural variability within around the next 20 years

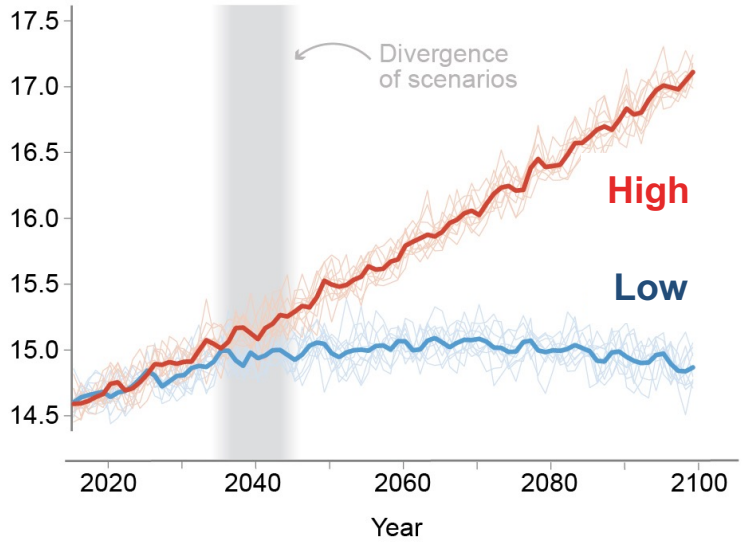
CO_2 emissions (billion tonnes of CO2 per year)



CO_2 concentration in the atmposphere (ppm)

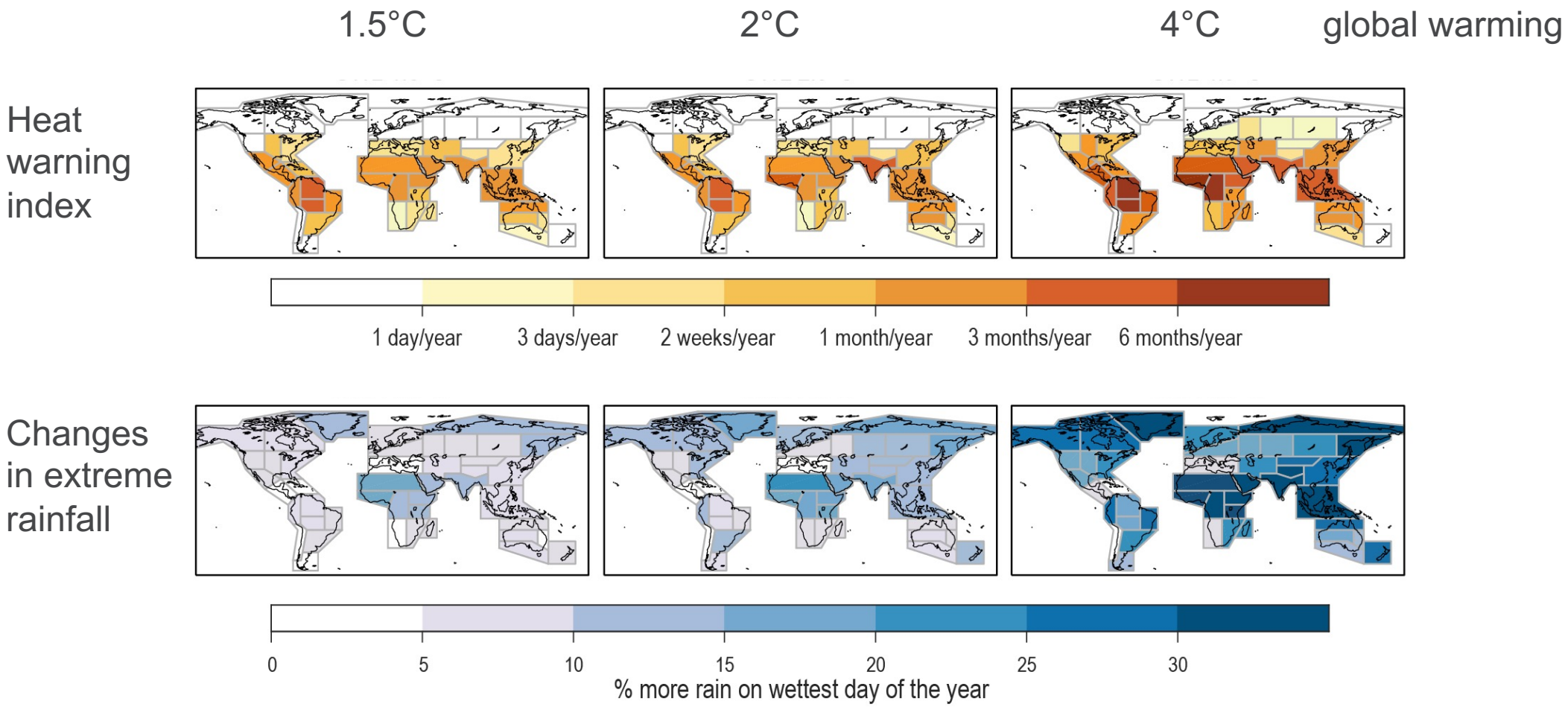


Global surface temperature (°C)



FAQ4.2, Figure 1

Limiting global warming reduces consequences of climate change that can impact society and natural systems



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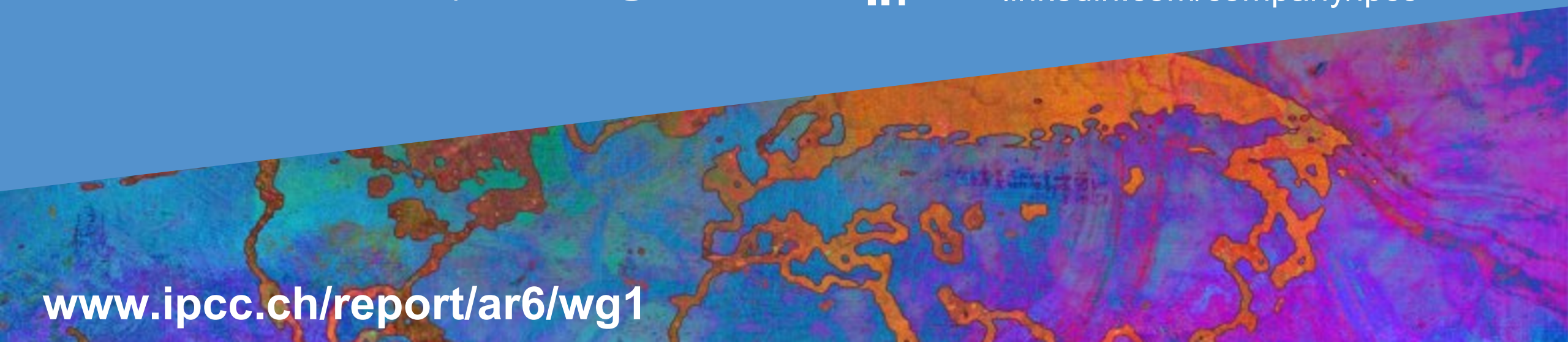

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