

Highlights from the IPCC 2021 report

the physical science basis

Valérie Masson-Delmotte, IPCC WGI Co-Chair

www.ipcc.ch/report/ar6/wg1



SIXTH ASSESSMENT REPORT

Working Group I – The Physical Science Basis

ipcc

INTERGOVERNMENTAL PANEL ON climate change



14 000 scientific publications
multiple lines of evidence

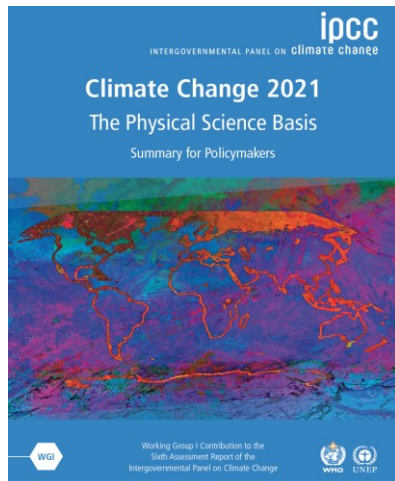
234 authors from 65 countries

600 contributors

1890 reviewers

78,000+ review comments

186 hours online approval



Climate Science: A Summary for Actuaries

What the IPCC Climate Change Report 2021 Means for the Actuarial Profession



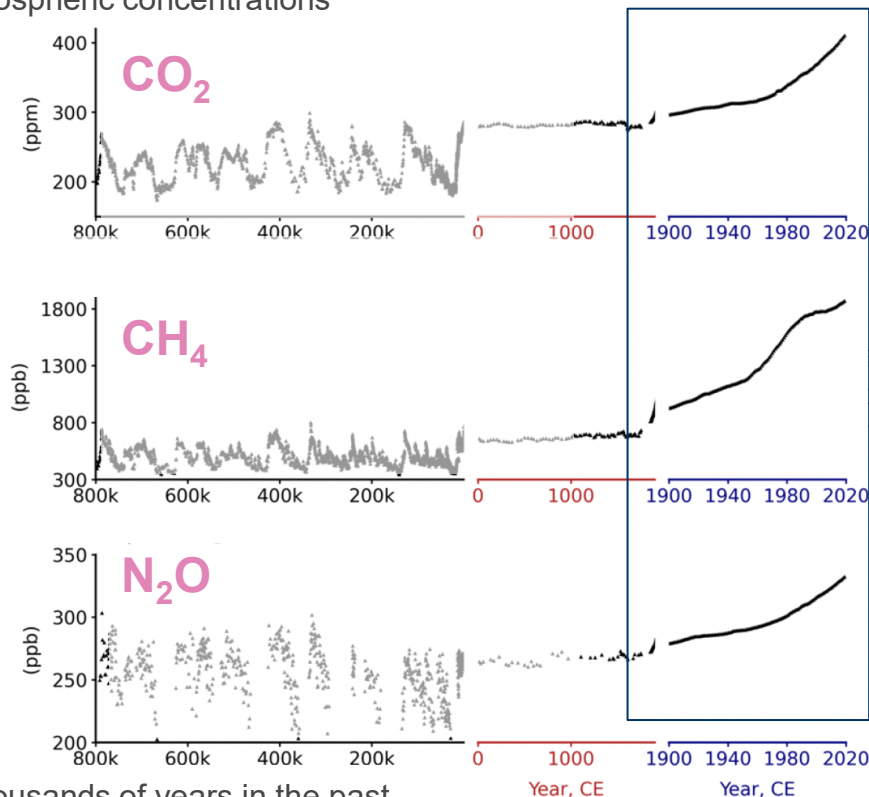
Where are we now?

What are our possible climate futures?

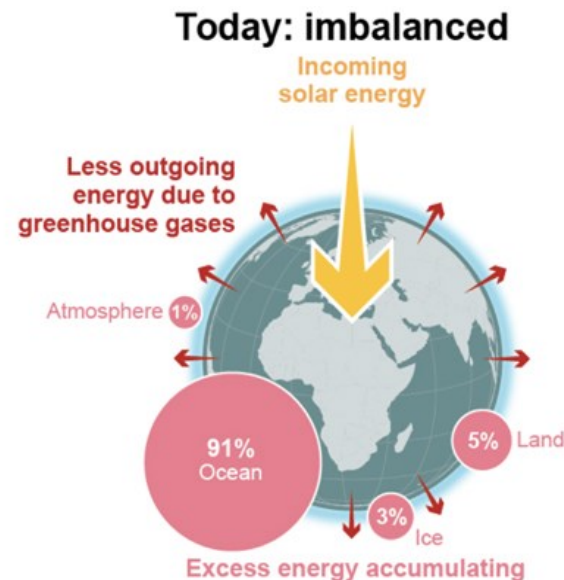
How to limit future climate change?

Our greenhouse gas emissions drive global heating

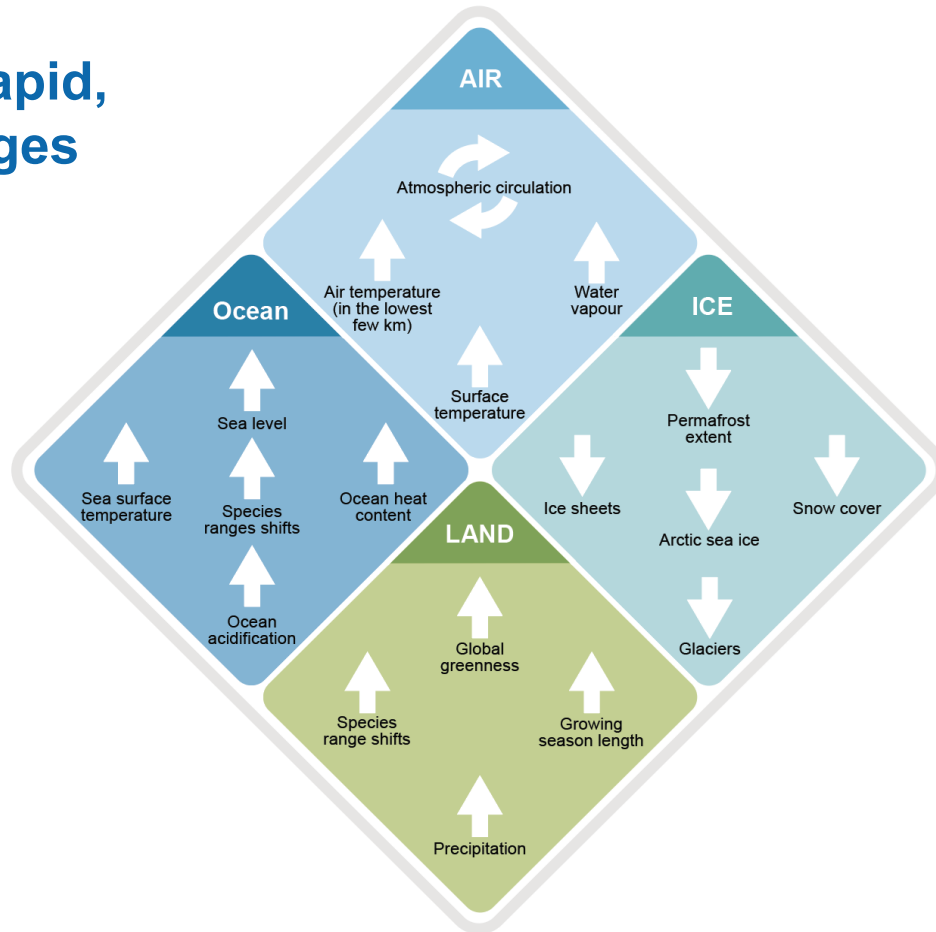
Atmospheric concentrations



thousands of years in the past

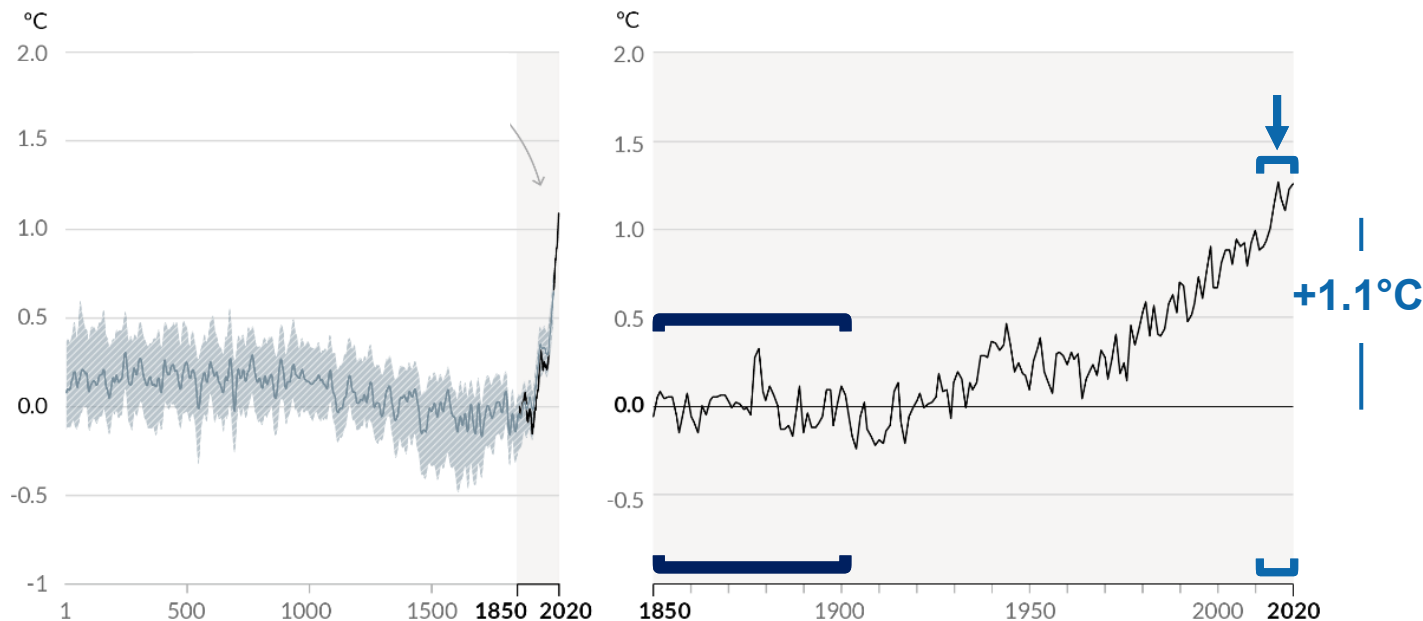


Leading to widespread, rapid, and unprecedented changes

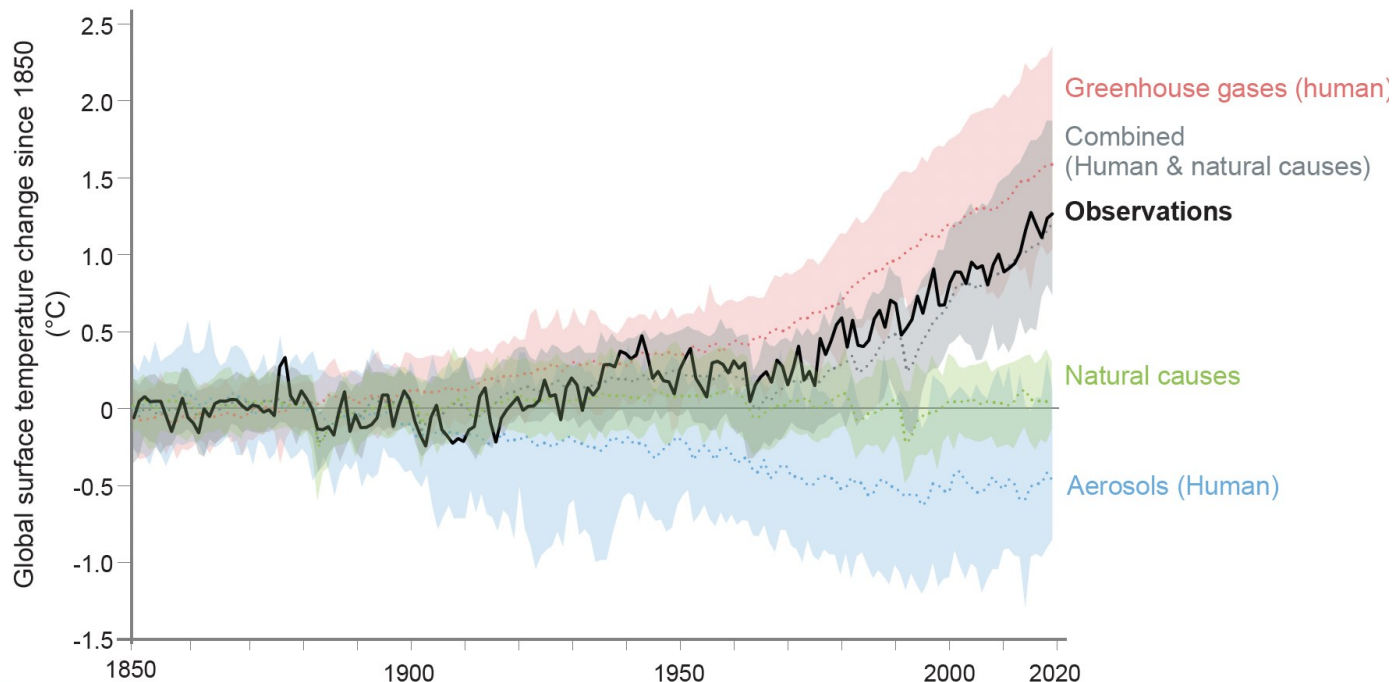


Observed warming of 1.1°C is unusual in more than 2,000 years

Global surface temperature change since 1850-1900



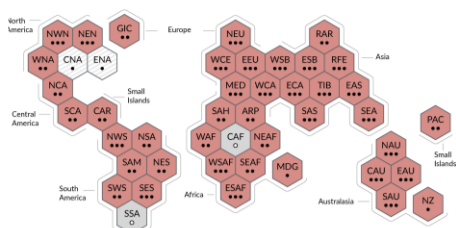
Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling



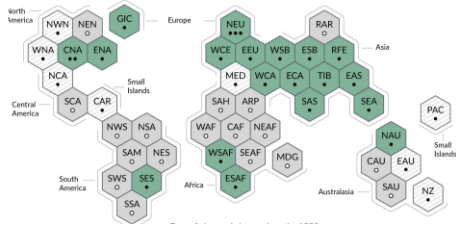
Every region is affected in multiple ways

Human-caused climate change is making extreme events more frequent and more severe

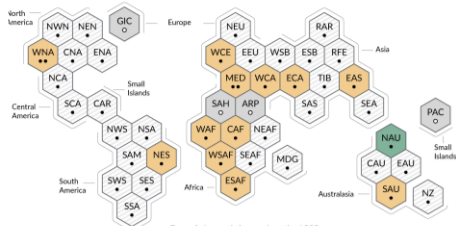
Hot extremes



Heavy rainfall



Agricultural drought



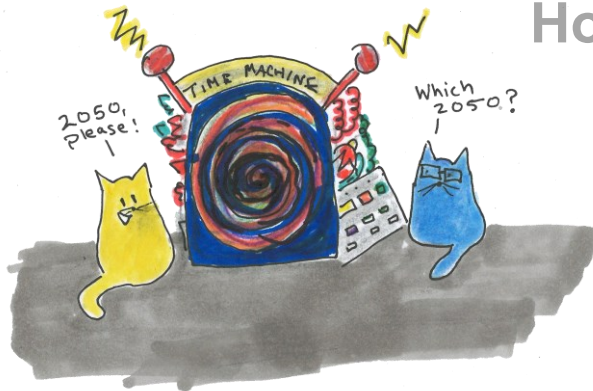
Type of observed change since the 1950s



Where are we now ?

What are our possible climate futures ?

How to scale up action ?



Future emissions cause future additional warming, with total warming dominated by past and future CO₂ emissions

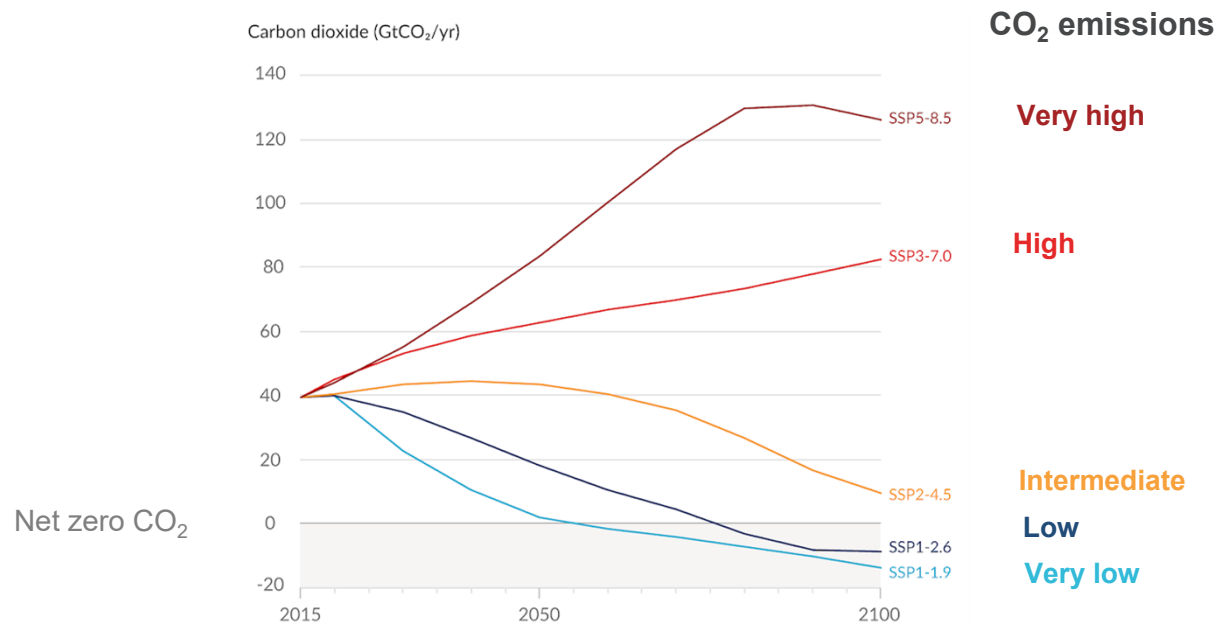
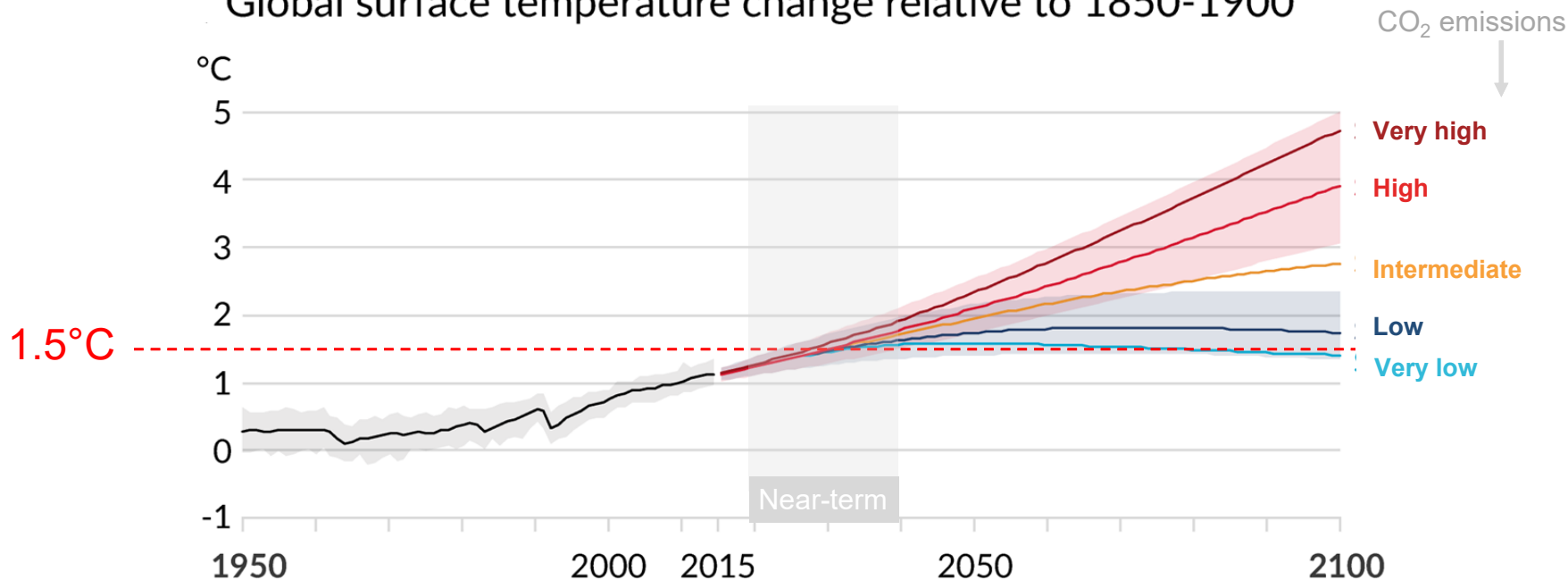


Figure SPM.4

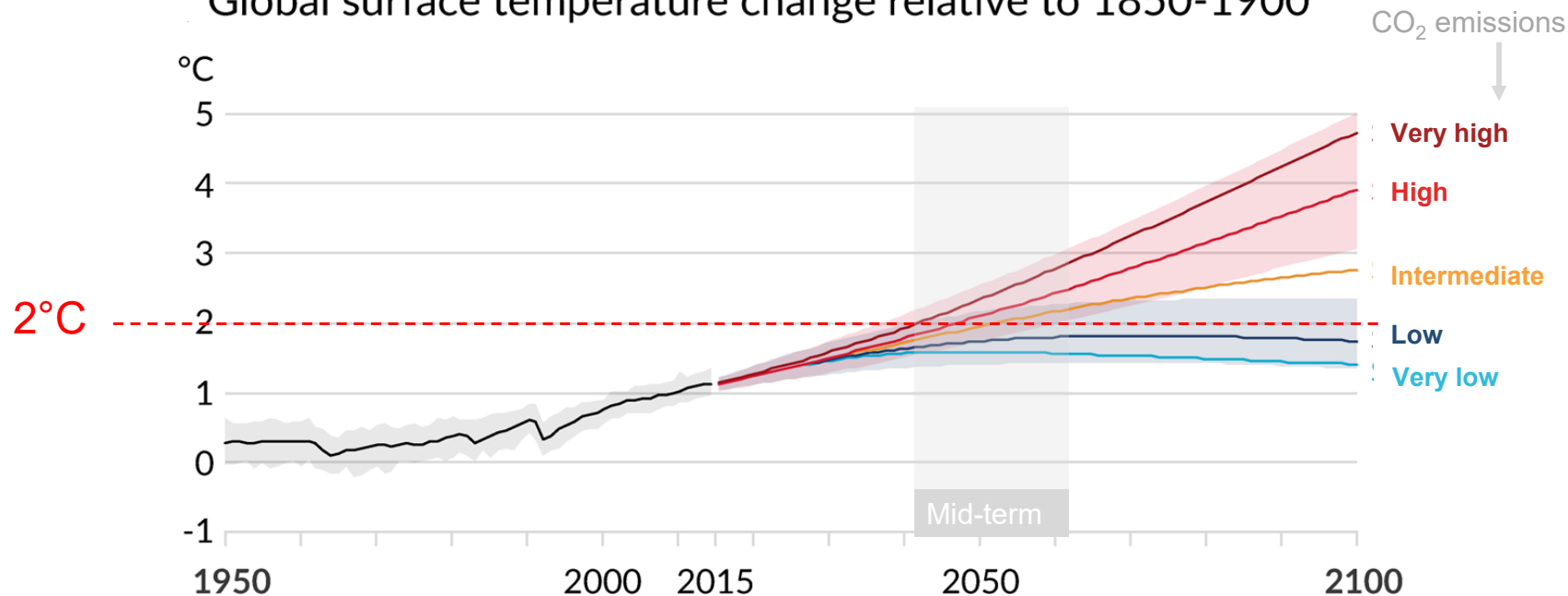
Global surface temperature will continue to increase until at least the mid-century under all emission scenarios considered

Global surface temperature change relative to 1850-1900



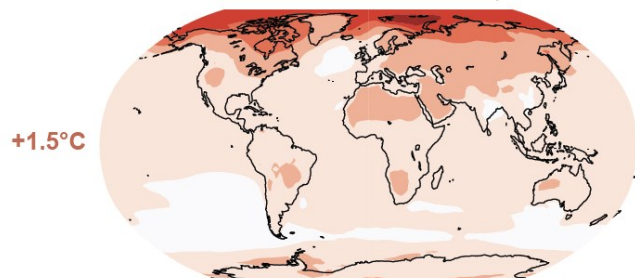
Future warming depends on future emissions

Global surface temperature change relative to 1850-1900

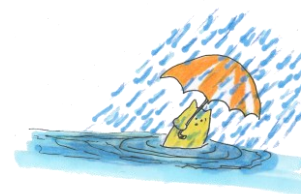
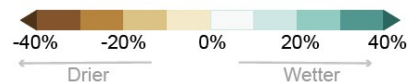
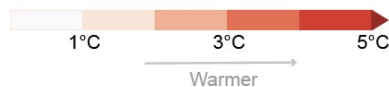
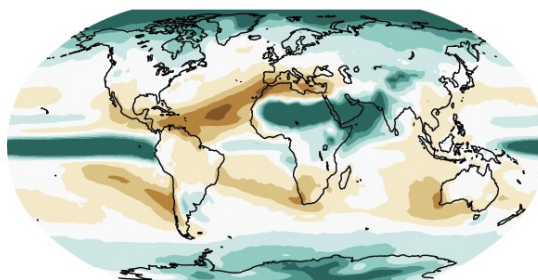
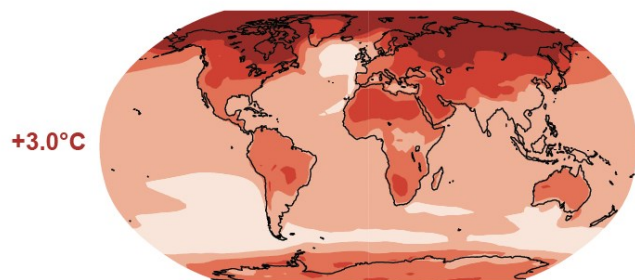
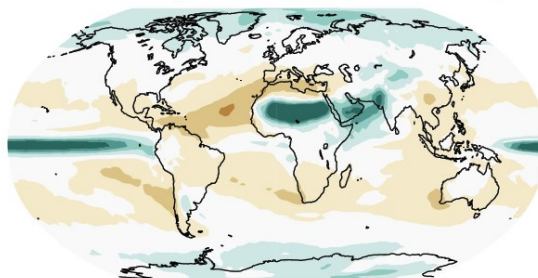


Many changes in the climate system become larger in direct relation to increasing global warming

Warming will be **stronger** in the Arctic, on land and in the Northern Hemisphere



Precipitation will **increase** in high latitudes, the tropics and monsoon regions and **decrease** in the subtropics



Many changes in the climate system become larger in direct relation to increasing global warming

↑ frequency and intensity

- marine heatwaves and hot extremes
- heavy precipitation
- drought in some regions

↑ proportion of intense tropical cyclones

↓ Arctic sea ice, snow cover, permafrost



Larger magnitude



Increased frequency



New locations

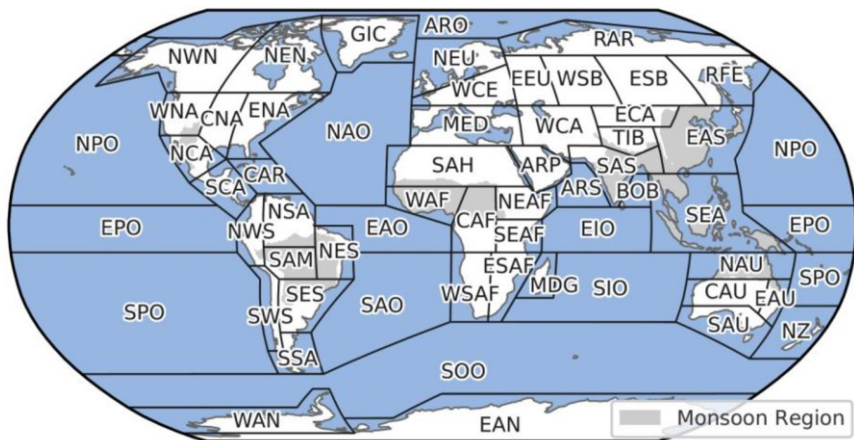


Different timing



New combinations (compound)

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



FACT SHEETS

Agricultural and Pasture Systems

Cities, Buildings and Transport

Disaster Management and Insurance

Energy sector

Forestry

Health

Marine Ecosystems, Fisheries and Aquaculture

Terrestrial and Freshwater Ecosystems

Tourism

Water resources management

Africa

Asia

Australasia

Central and South America

Europe

Mountains

North and Central America

Ocean

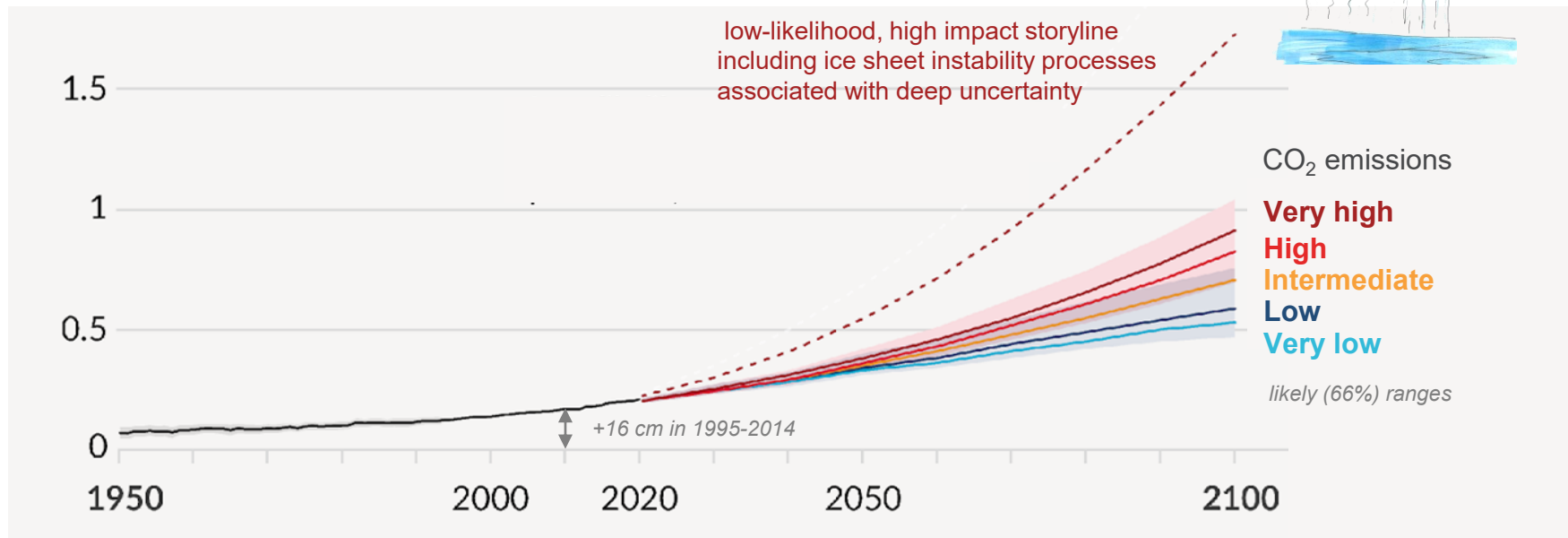
Polar regions

Small Islands

Urban areas

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

Global mean sea level rise relative to 1900 (m)



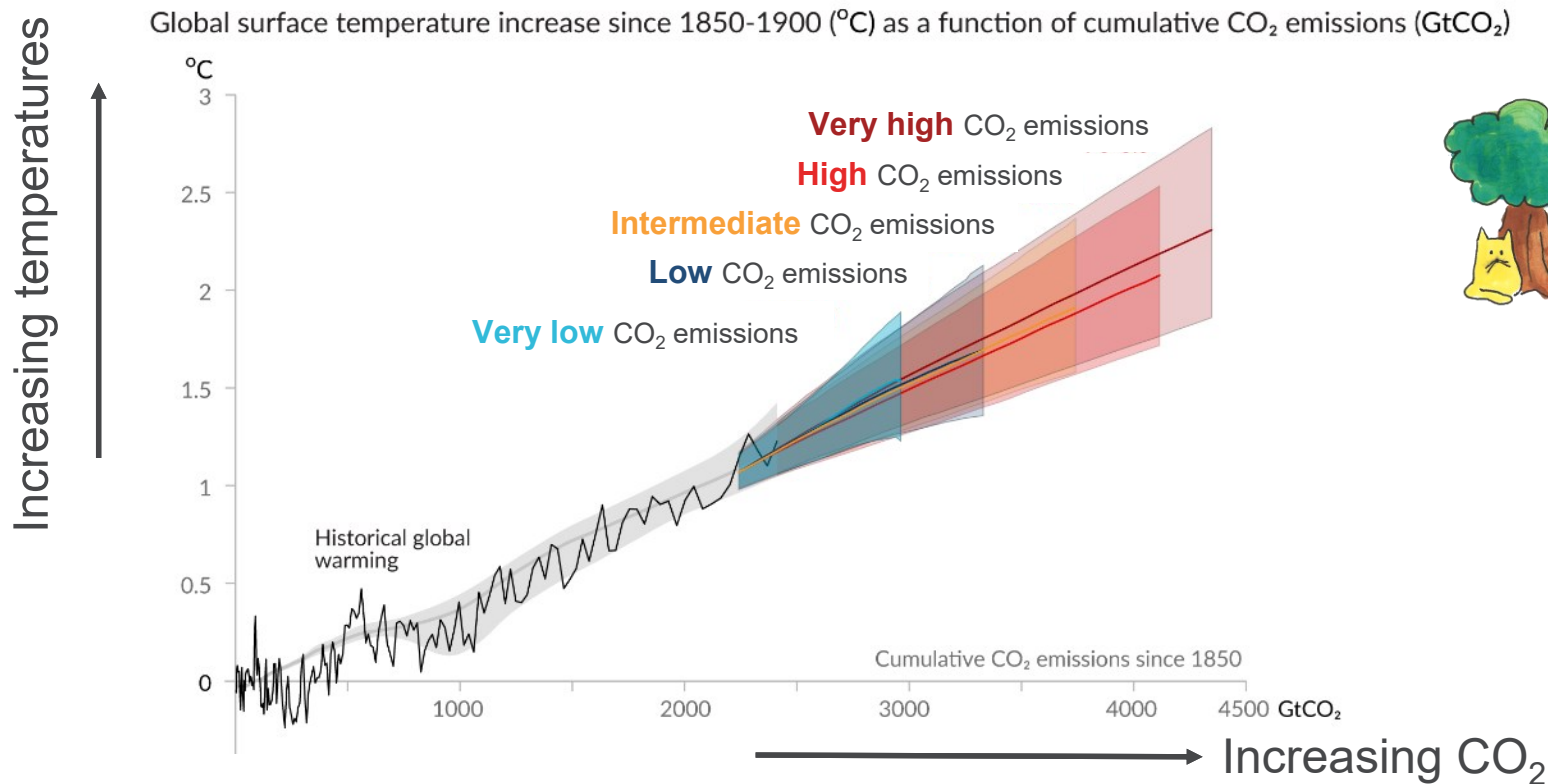
Where are we now?

What are our possible climate futures?

How to limit future climate change?

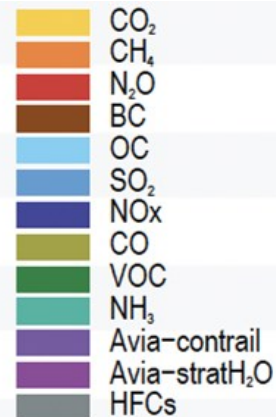
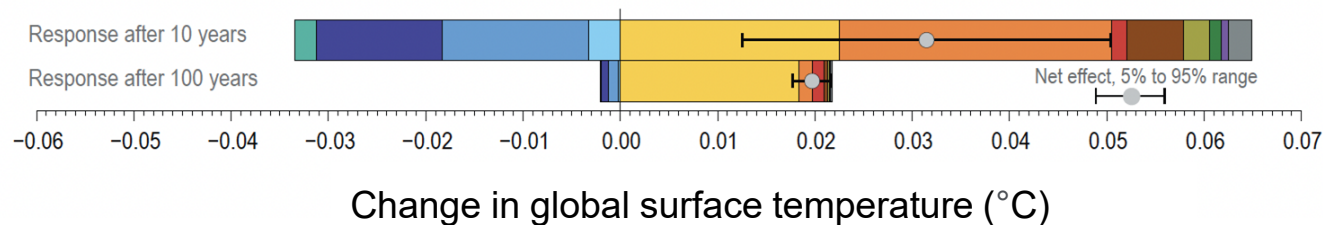


Every ton of CO₂ emissions adds to global warming



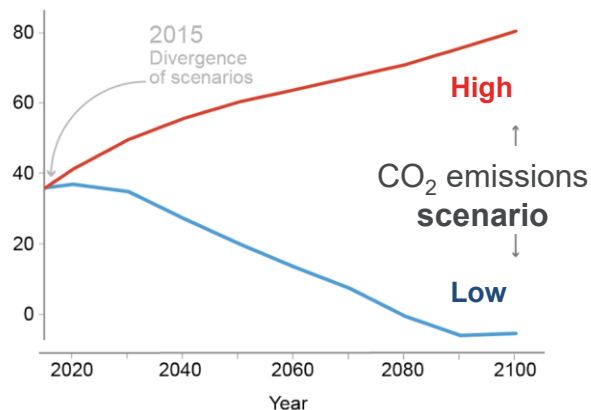
Reaching net zero CO₂ emissions is a key condition to limit long-term warming ; reducing methane emissions is critical to limit near-term warming and improve air quality

Effect of a one year pulse of present-day emissions on global surface temperature

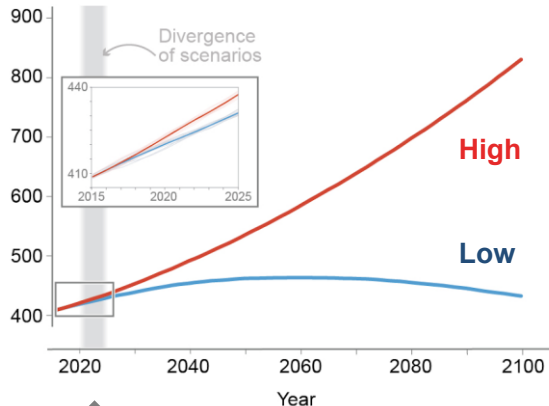


Differences in trends in global surface temperature would begin to emerge from natural variability within around the next 20 years

CO₂ emissions (billion tonnes of CO₂ per year)

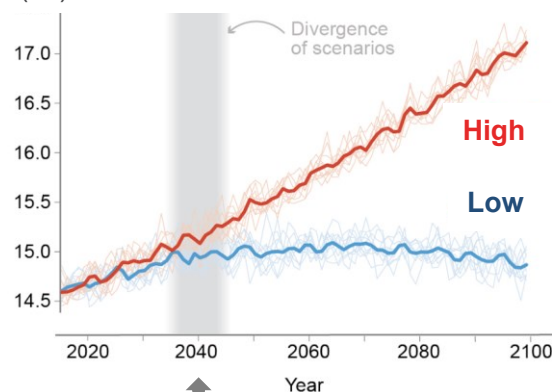


CO₂ concentration in the atmosphere (ppm)



differences in the 2020s

Global surface temperature (°C)



differences in the 2040s



<https://www.ipcc.ch/report/ar6/wg1>

“ The climate we experience in the future depends on our decisions now