SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

25 August 2021

IPCC Working Group I Report Pacific Outreach

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Vice Chair, Working Group II
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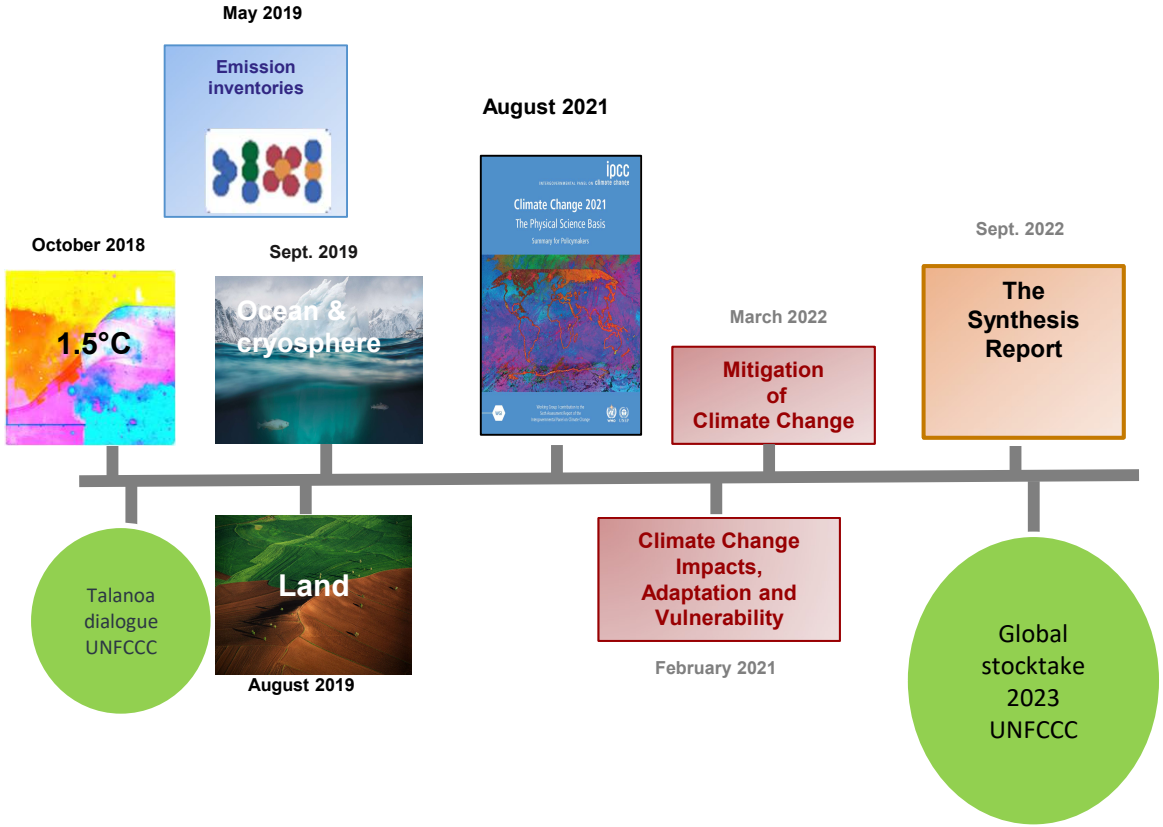
https://iceds.anu.edu.au/public-policy-outreach/ipcc-pacific/factsheets

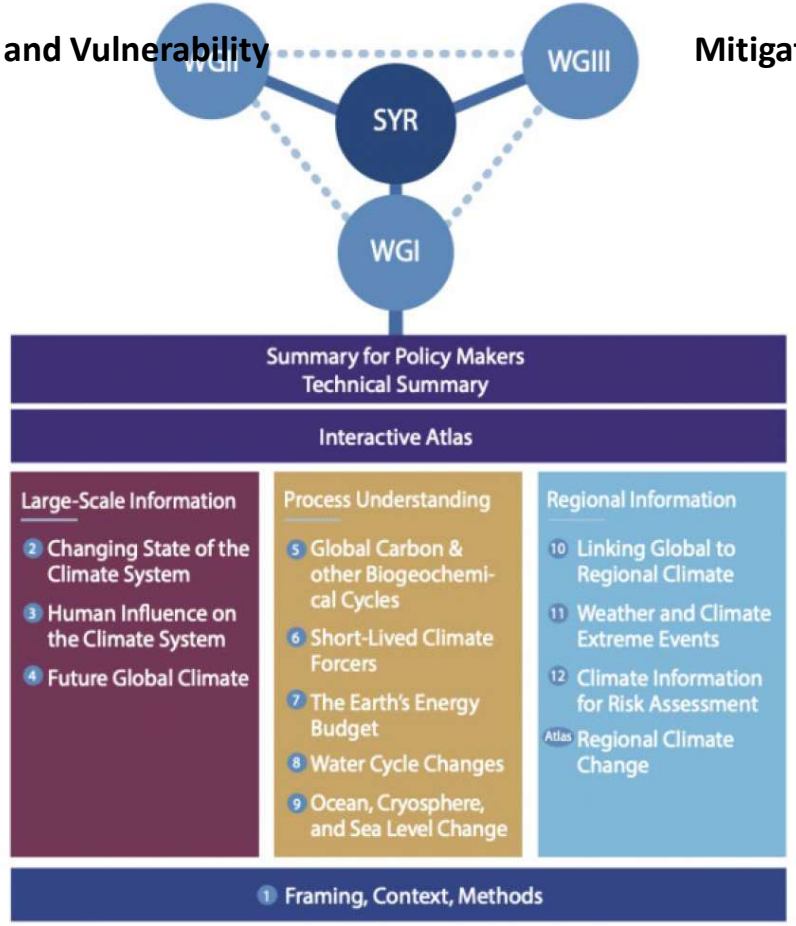
The 6th IPCC Assessment Cycle



IPCC 6th Assessment Reports

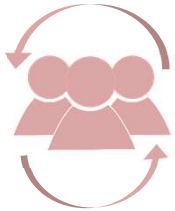
Impacts, Adaptation and Vulnerability

Mitigation of Climate Change



Huge amount of information and expertise

14,000 scientific publications assessed



78,000+ review comments

234 authors from 65 countries

[Credit: NASA]

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

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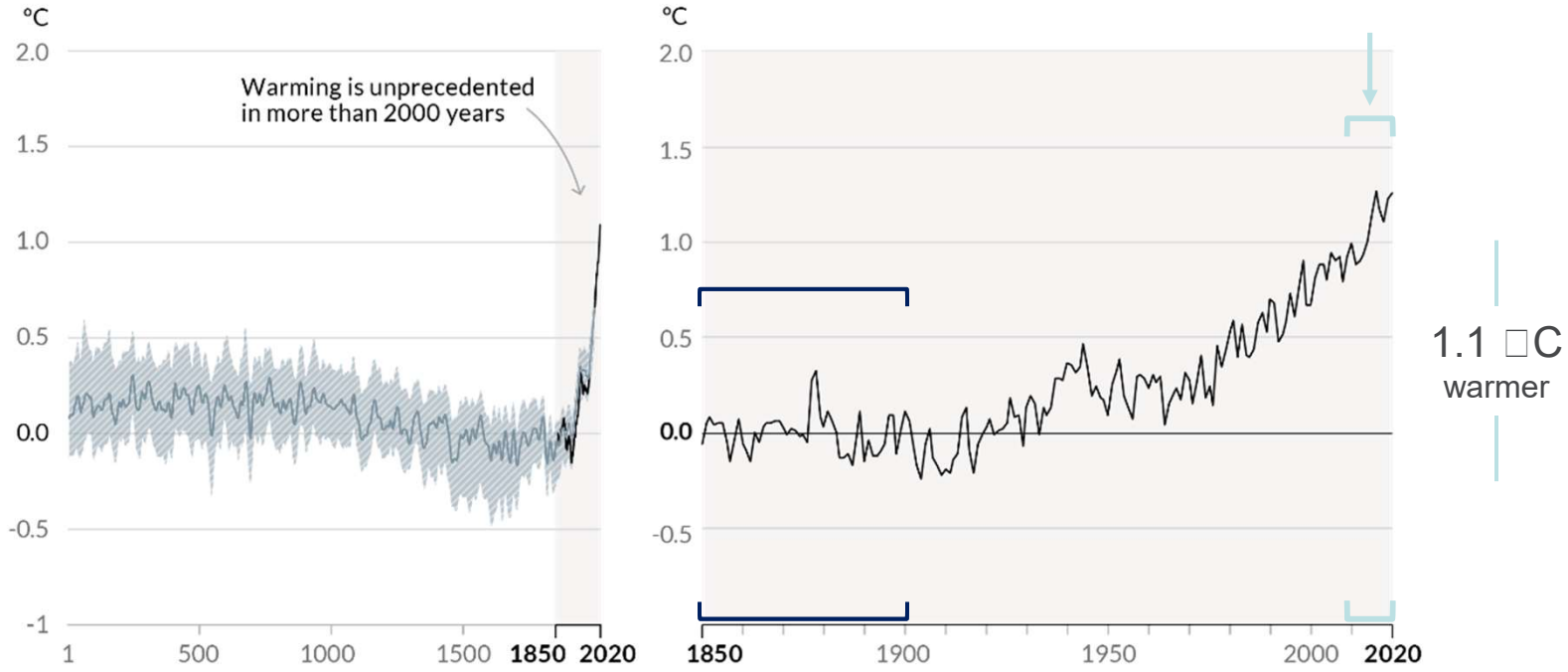
Warming: unprecedented in at least 2000 years

Changes in global surface temperature relative to 1850-1900



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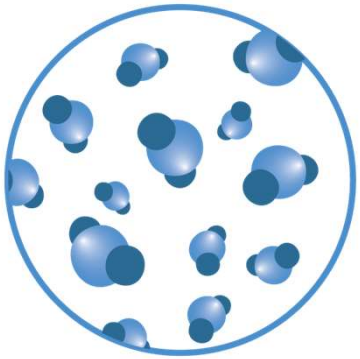
Key indicators: unprecedented

CO_2
concentration



Highest

in at least

2 million years

Sea level
rise

Fastest rates

in at least

3000 years

Arctic sea ice
area

Lowest level

in at least

1000 years

Glaciers
retreat

Unprecedented

in at least

2000 years

https://iceds.anu.edu.au/public-policy-outreach/ipcc-pacific/factsheets IPCC 2021

[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.

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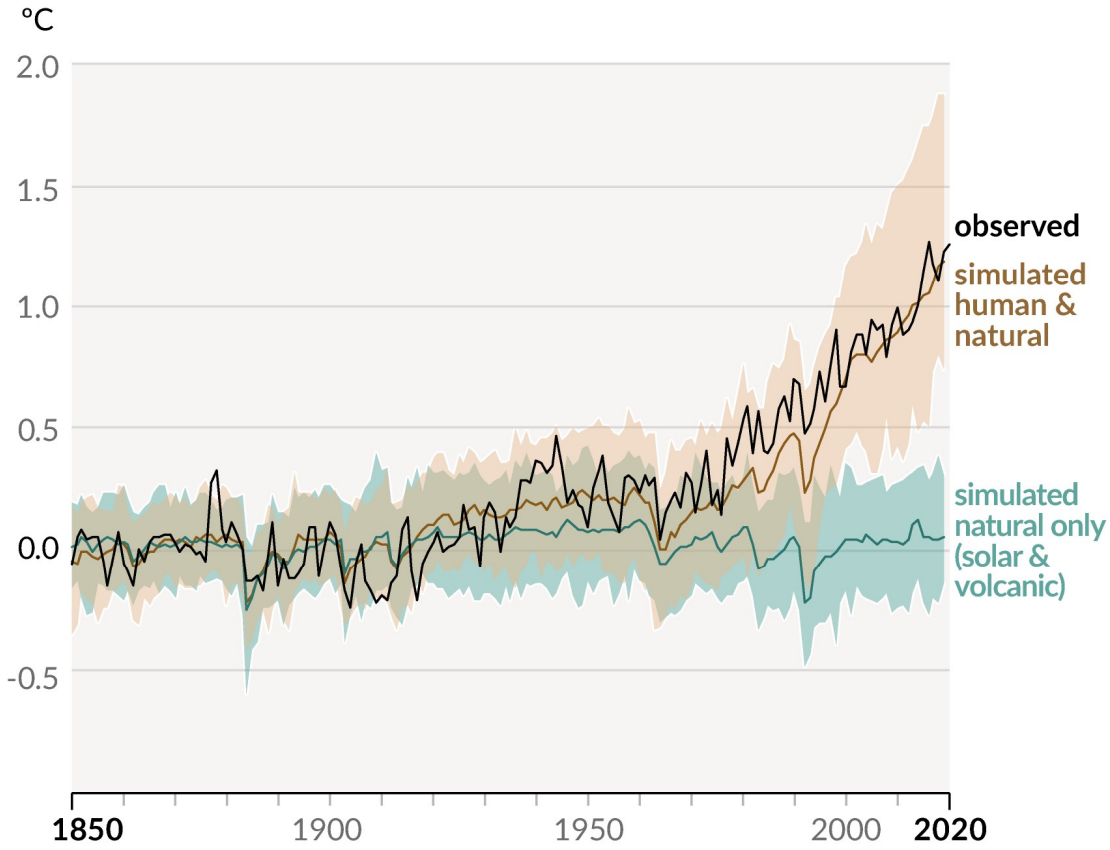
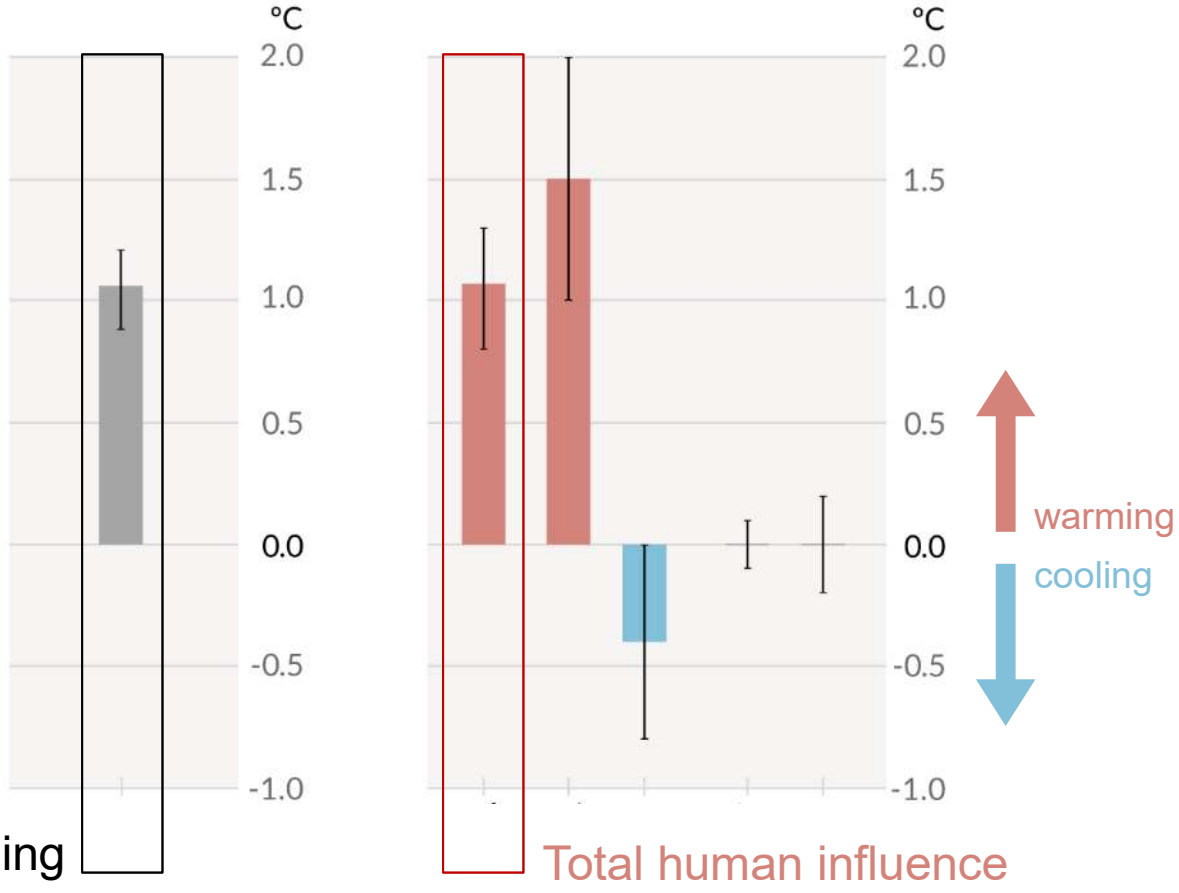
Human influence on climate is unequivocal



IPCC 2021

Warming partly masked by aerosols

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



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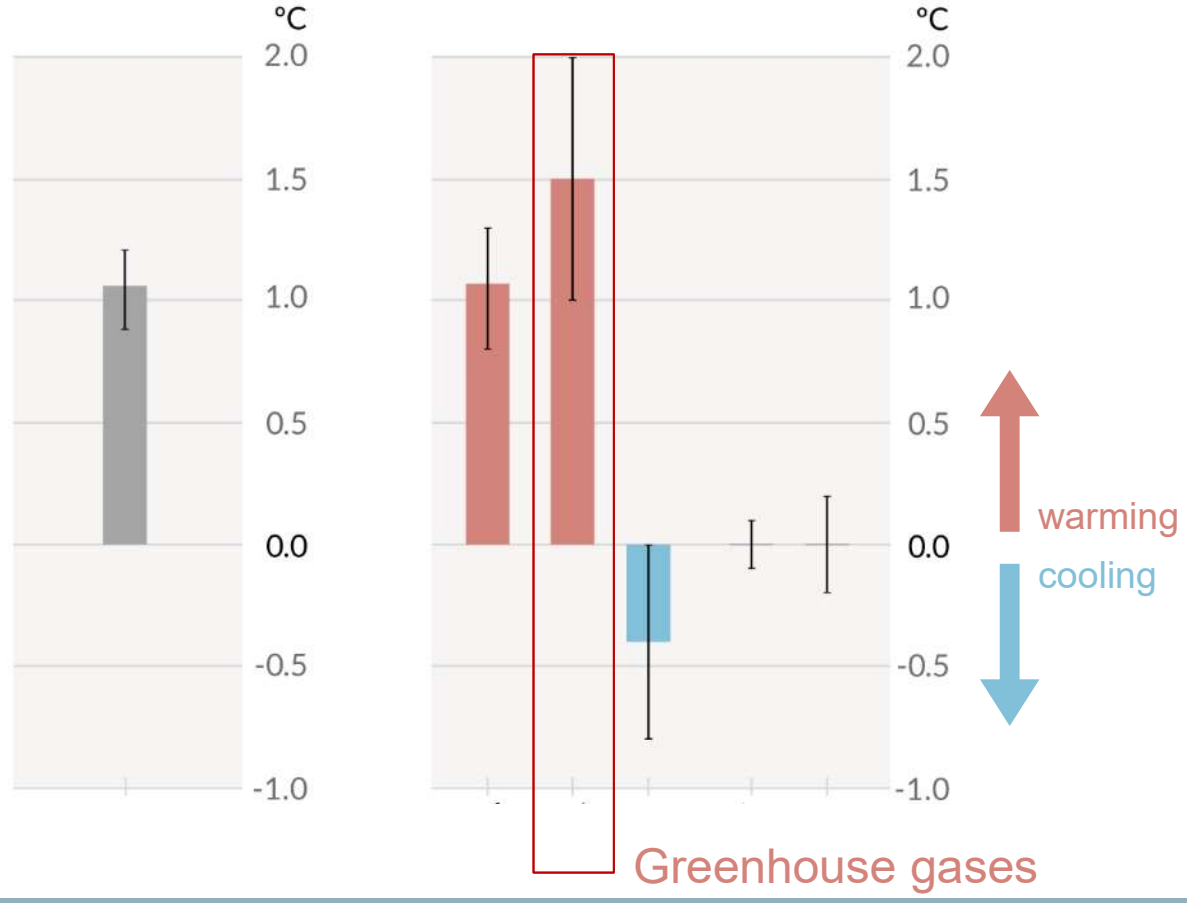

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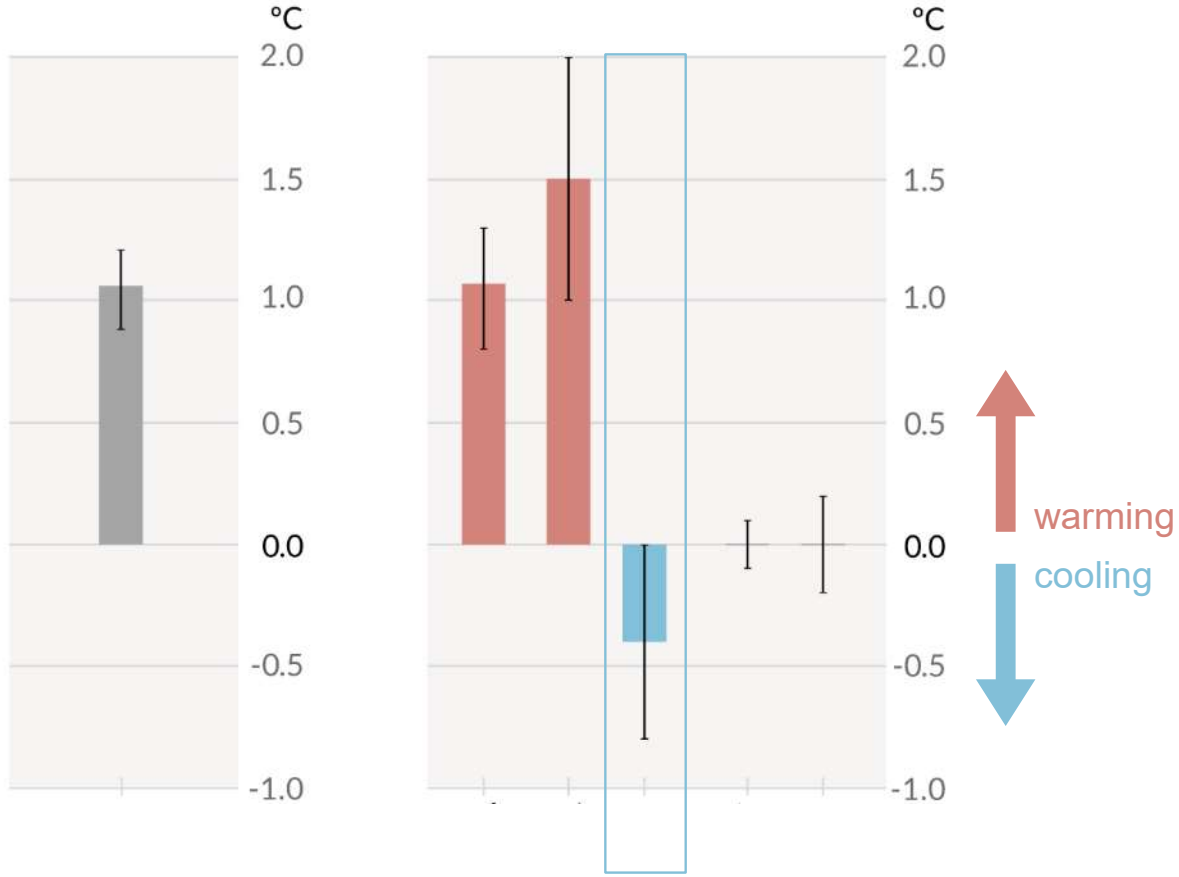

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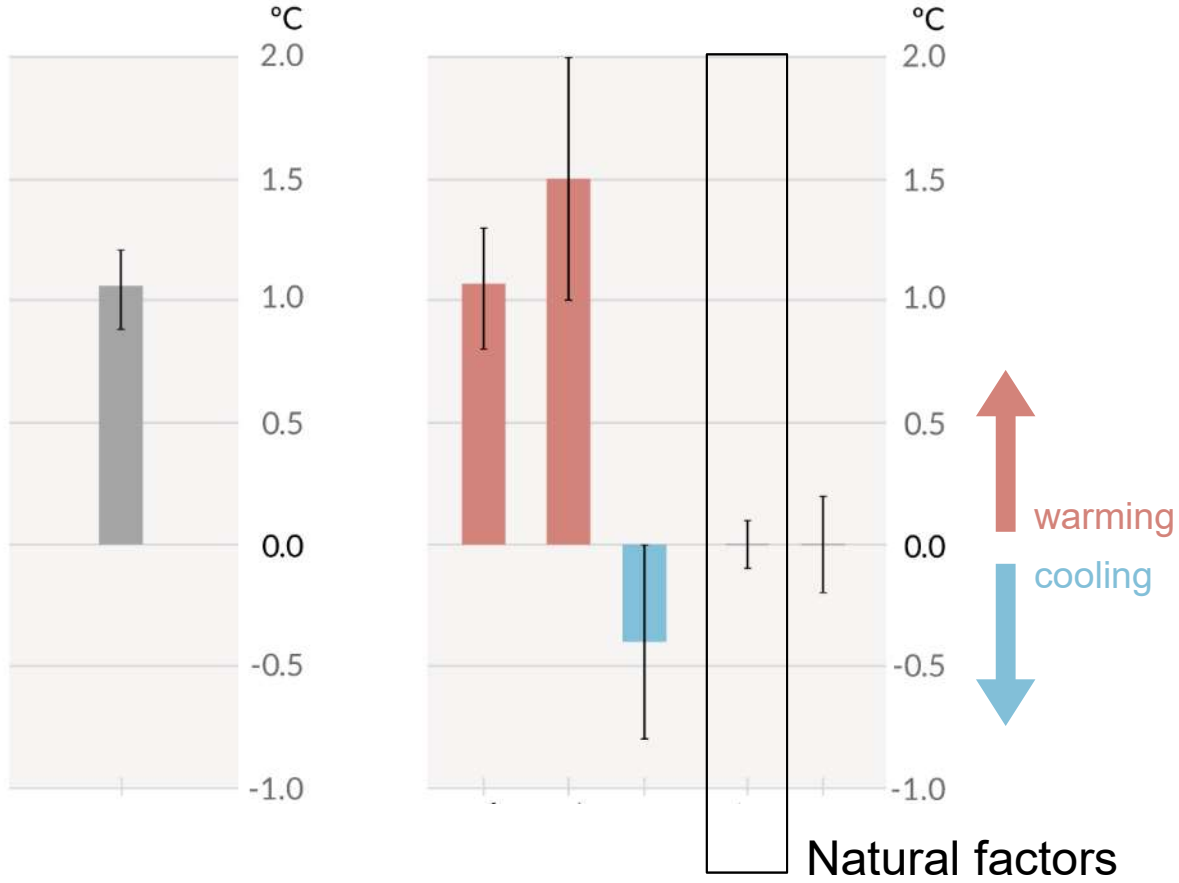

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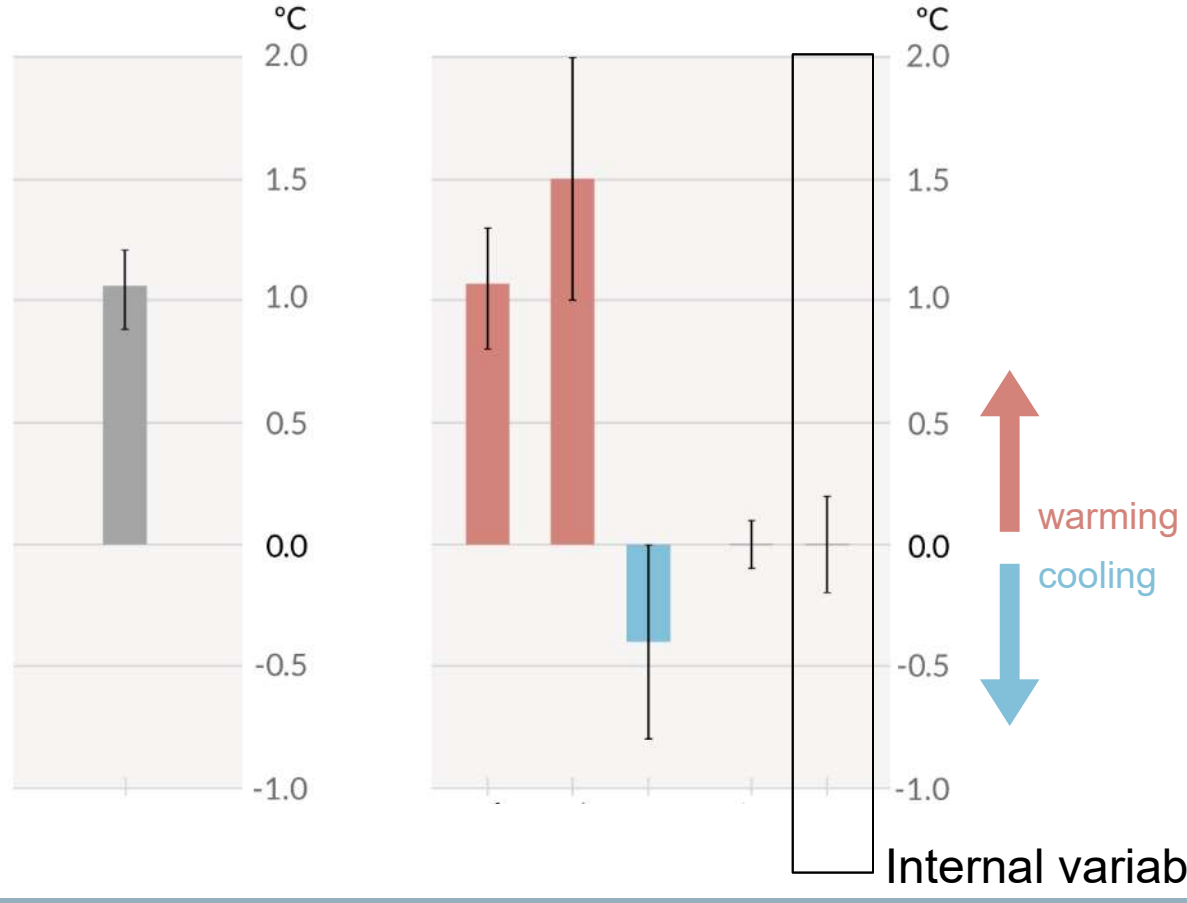

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Human influence on extremes

- **Extreme heat**
- More frequent
- More intense

- **Heavy rainfall**
- More frequent
- More intense
- Increased severe cyclones

- **Drought**
- Increase in some regions

- **Fire weather**
- More frequent

- **Ocean**
- Warming
- Acidifying
- Losing oxygen

Photo Credits from left: 1. Luiz Guimaraes 2. Jonathan Ford 3. Peter Burdon 4. Ben Kuo 5. NOAA

[Credit: Peter John Maridable]

> “Unless there are immediate, rapid, and large-scale reductions in greenhouse gas emissions, limiting warming to 1.5°C will be beyond reach.

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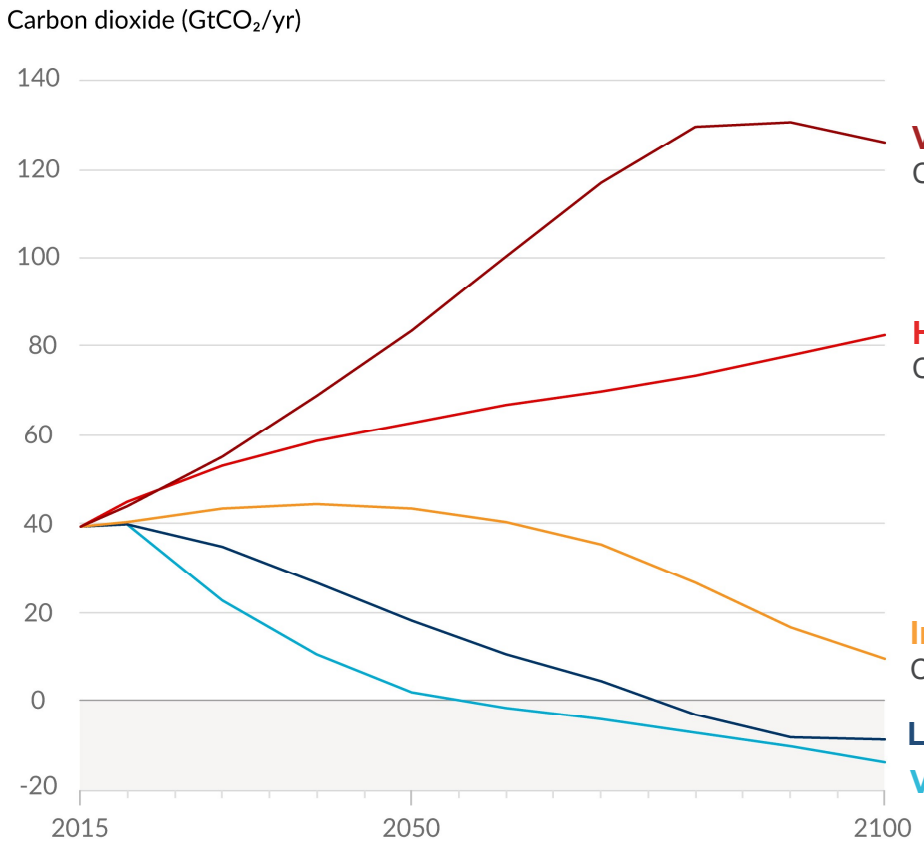
Choices about our future



Very high CO_2 emissions — ~5°C

High CO_2 emissions — **~4°C**

Current trajectory

Intermediate CO_2 emissions — ~3°C

Paris Agreement commitments

Low CO_2 emissions — ~2°C

Very low CO_2 emissions — ~1.5°C

Paris Agreement goals

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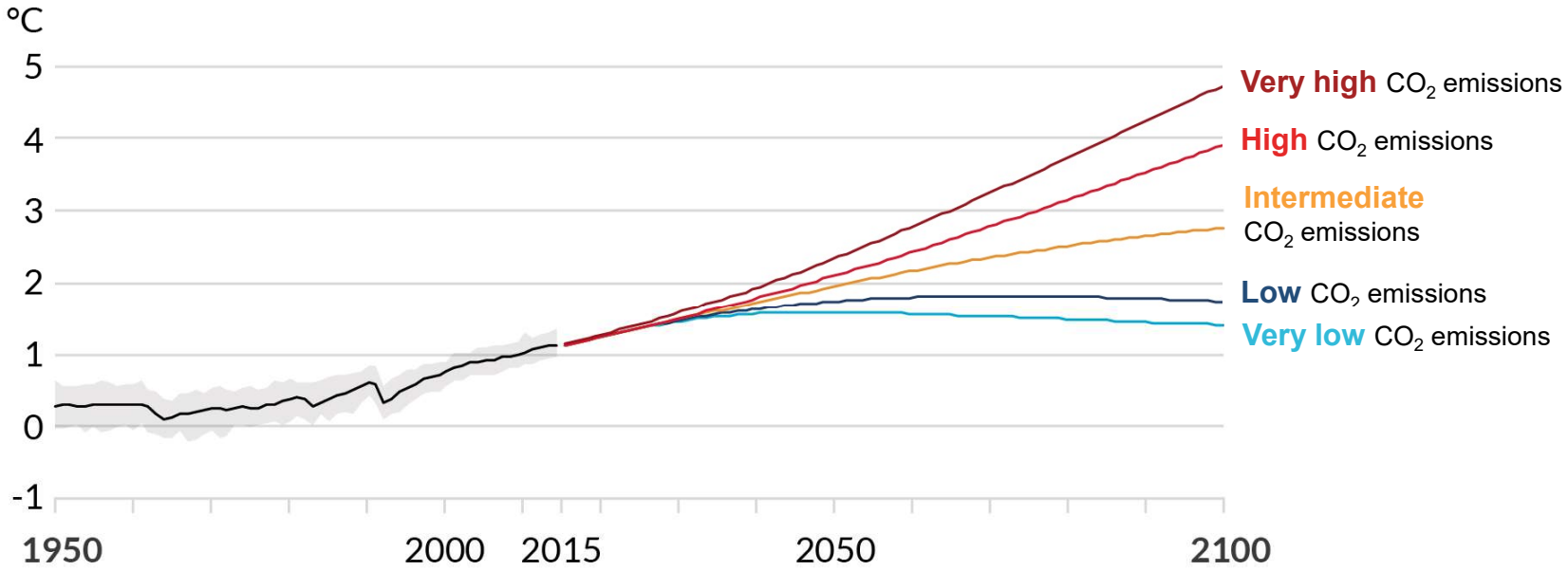
Choices about our future



- Under all emission scenarios we are likely to exceed 1.5°C in the 2030's. Earlier under high emissions.
- The Very Low scenario has us temporarily exceeding 1.5°C then coming back under

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[Credit: Hong Nguyen | Unsplash]

"Climate change is already affecting every region on Earth, in multiple ways.

The changes we experience will increase with further warming.

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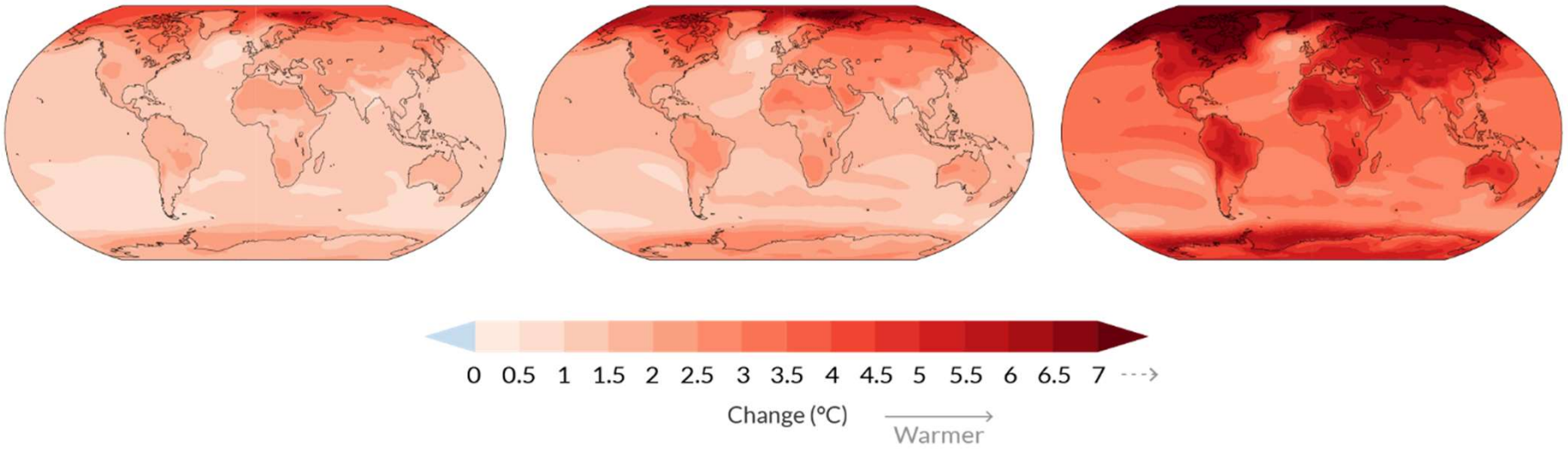
Variation in temperature projections

…at 1.5°C

…at 2°C

…at 4°C



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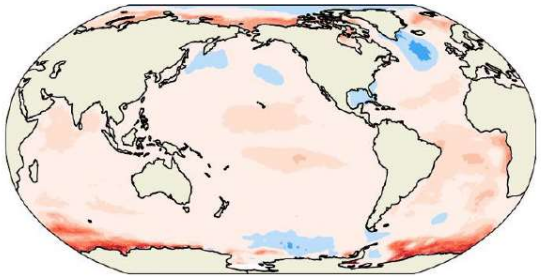
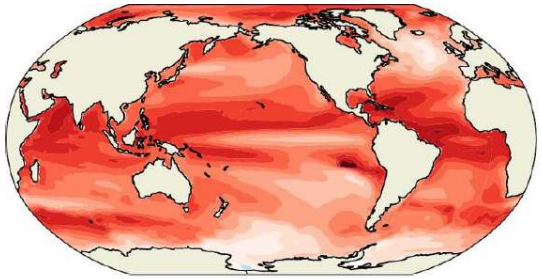
Marine heatwave changes

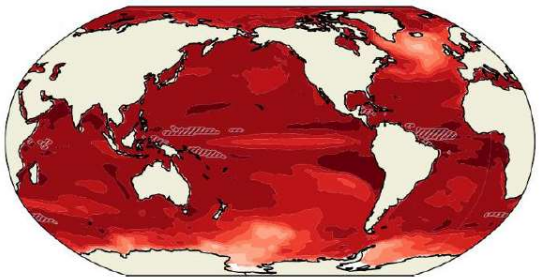
Observed
1985-2014

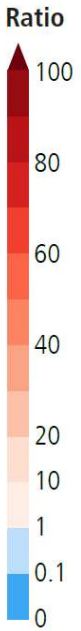


Low
2081-2100



Very High
2081-2100





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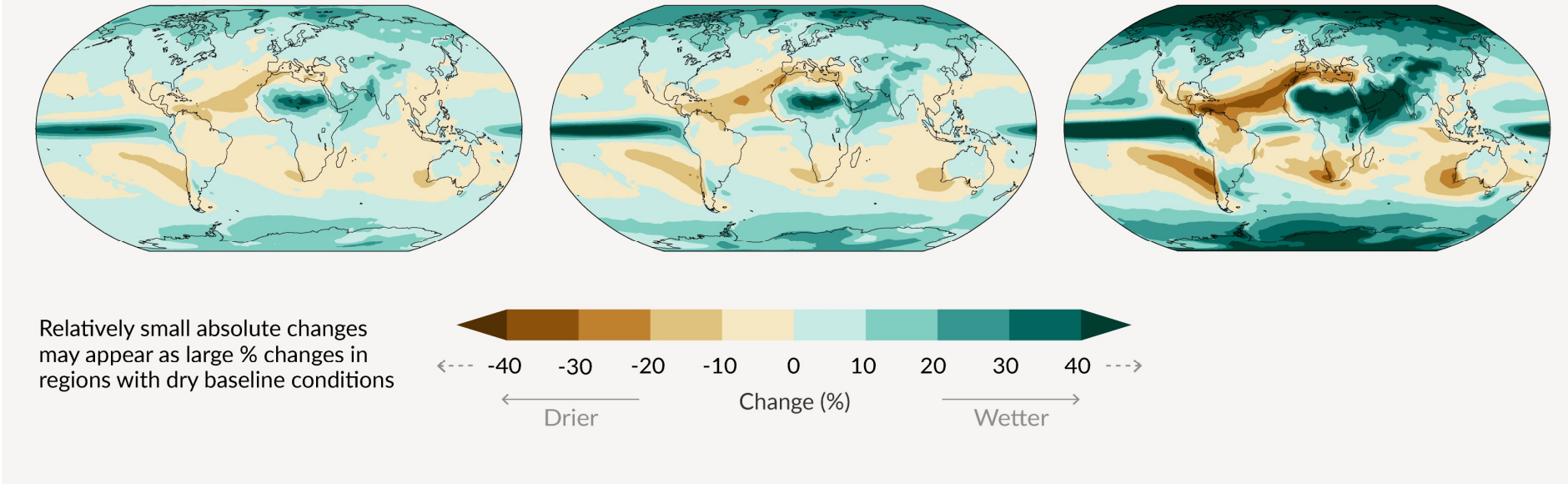
Changes in rainfall: spatially variable

…at 1.5°C …at 2°C …at 4°C



- Increased potential evaporation can cause drying
- Intensification of the sub-tropical ridge and changes to the SPCZ

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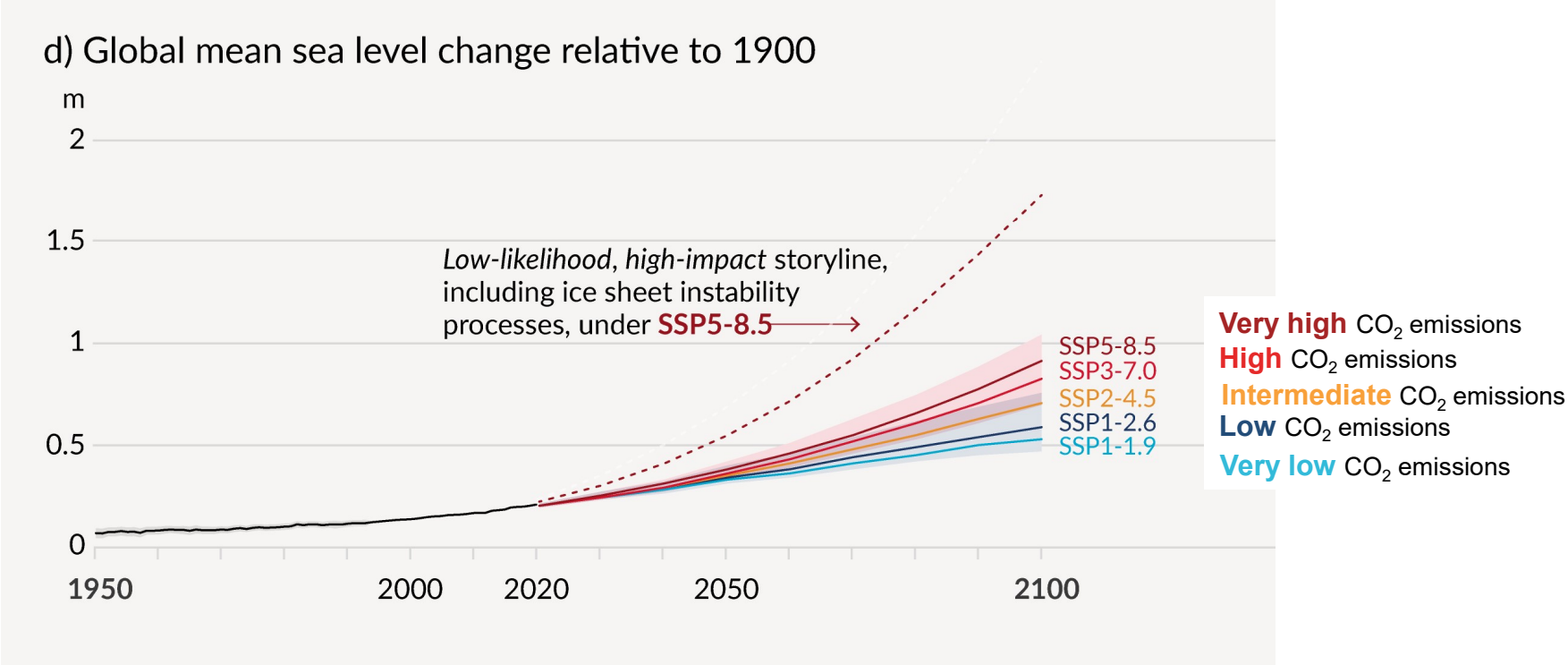
Cyclones

- The Pacific overall is projected to face fewer but more intense tropical cyclones under all emissions scenarios
  - but more frequent in the subtropical central Pacific
- Proportionally more Category 4-5 cyclones
- Sea level rise exacerbating the potential for storm surge
- Rainfall intensity will increase with all emissions scenarios, doubling at 4°C
- Some continuing poleward movement of cyclonic activity in the western North Pacific

El Niño–Southern Oscillation (ENSO) changes

- ENSO will remain the dominant mode of interannual variability (virtually certain)
- ENSO influence is projected to strengthen and shift eastward (medium confidence)
- It is very likely that ENSO rainfall variability will increase significantly from 2050 in the intermediate to very high emissions scenarios

Sea level rise



- Accelerating: 1901-1971 was 1.3 mm/yr; 2006-2018 was 3.7mm/yr
- Can't rule out increases of 5m by year 2150

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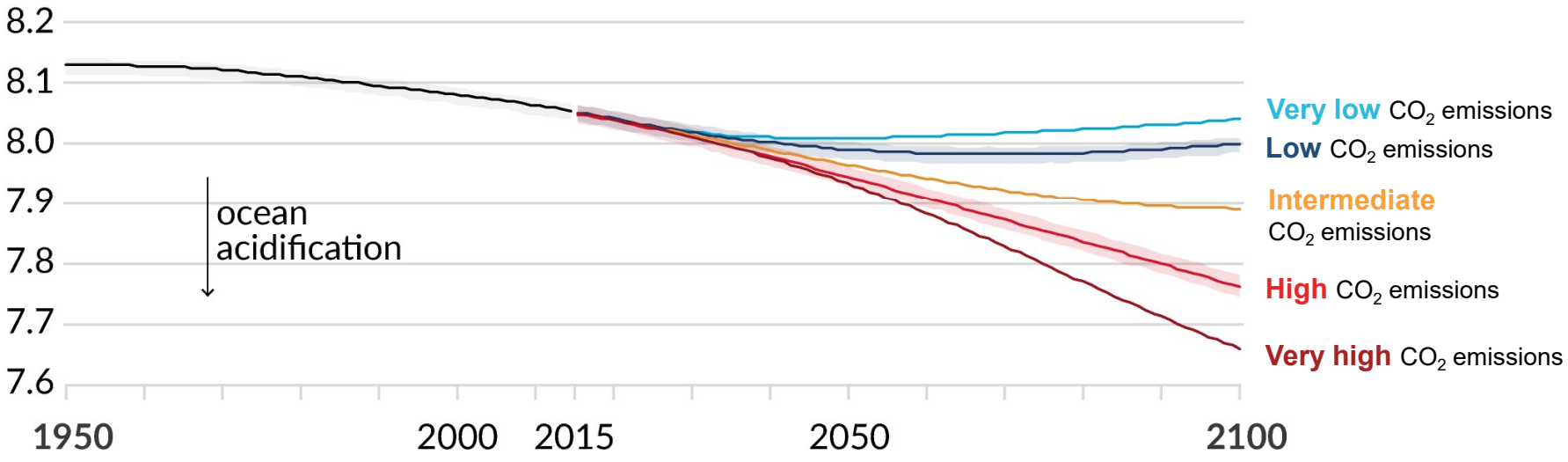
Ocean acidification

c) Global ocean surface pH (a measure of acidity)



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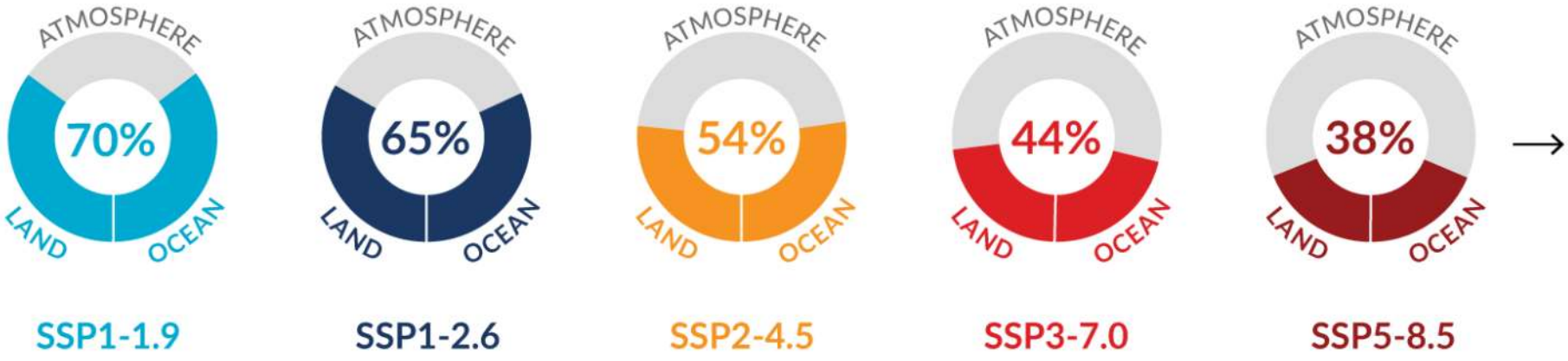
Higher emissions – less % CO_2 is taken up



Very Low **Low** **Intermediate** **High** **Very High**

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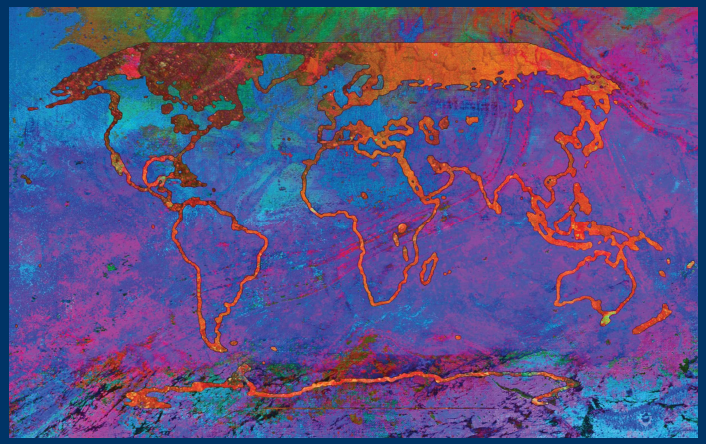

“

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

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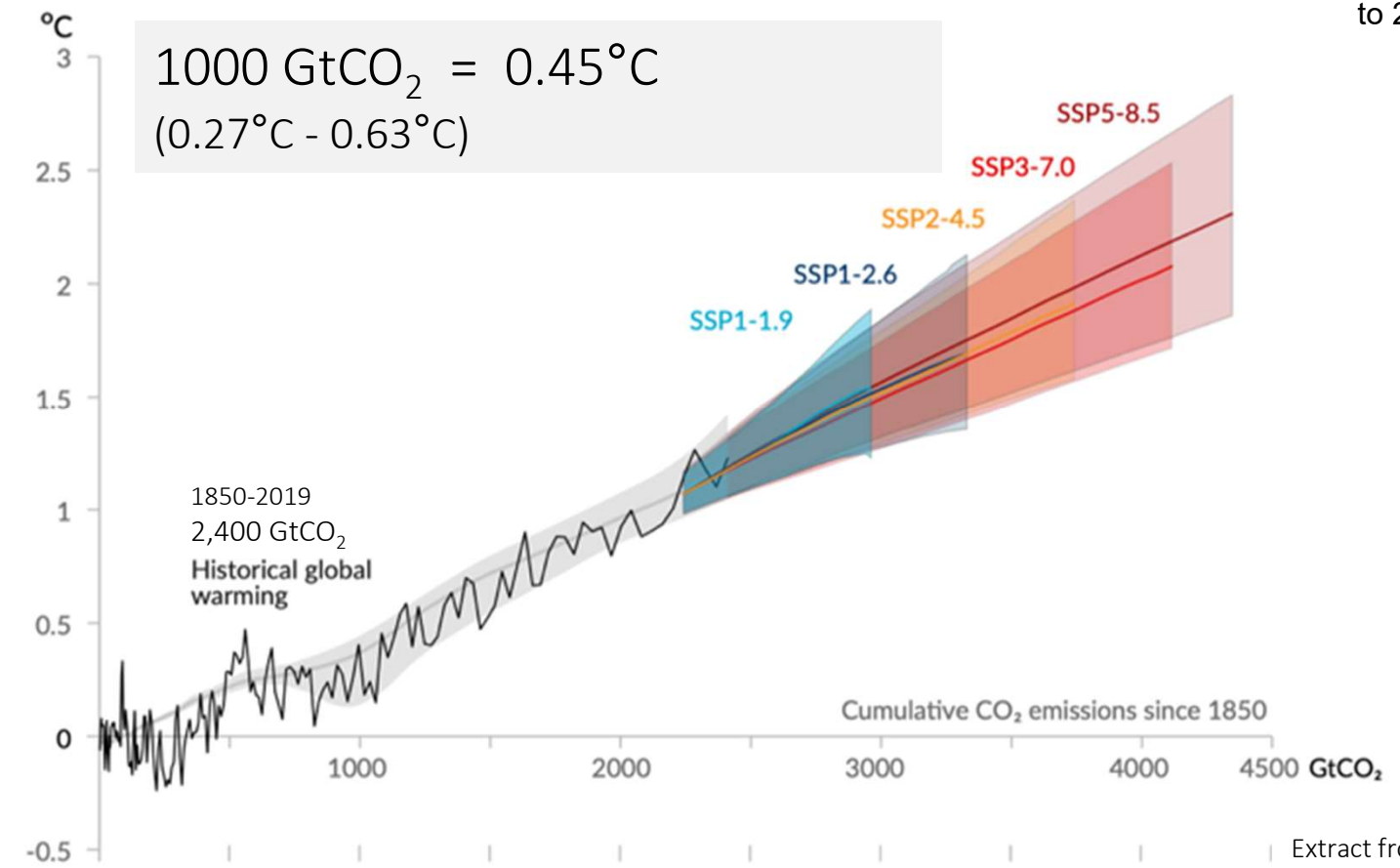
The basis of the carbon budget approach

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO_2 emissions ($GtCO_2$) to 2050

$1000\ GtCO_2 = 0.45°C$

(0.27°C - 0.63°C)



Extract from Figure SPM.4

‘C-budget’ for different temperatures & probabilities

	Probability				
T^a Target (ºC)	*17%*	*33%*	*50%*	*67%*	*83%*
1.5	900	650	500	400	300
1.7	1450	1050	850	700	550
2.0	2300	1700	1350	1150	900

- Stay within a carbon budget
- Reach net zero CO_2 emissions
- Strong and sustained reductions in other GHGs

IPCC 2021 (Extract from Table SPM.2)

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Thankyou

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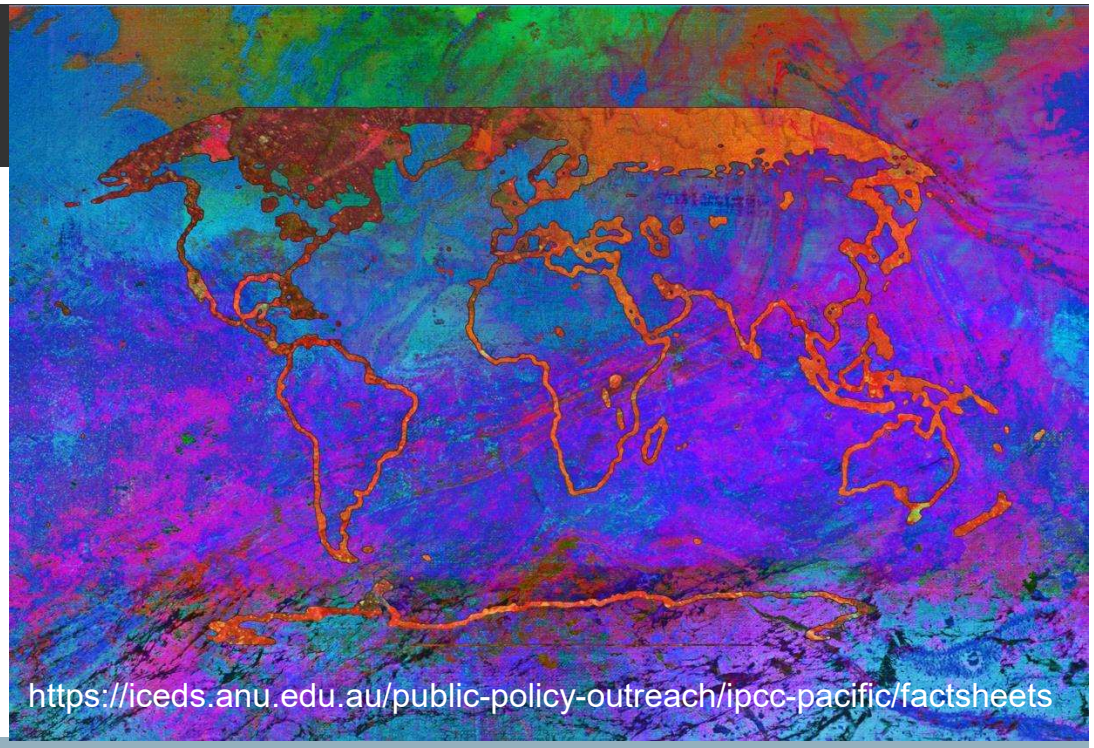

Every half a degree matters
Every year matters
Every choice matters

Howden and Colvin 2018