

ANU Climate Update, 2026

Prof Sarah Perkins-Kirkpatrick

Fenner School of Environment and Society

Deputy Director, ARC Centre of Excellence for 21st Century Weather

IPCC Convening Lead Author

AMOS President

Sarah.Kirkpatrick@anu.edu.au



Australian
National
University

Please,
take a
moment to
breathe
and
prepare
yourself



Martin Von Stroll
[Unicef.org.au/stories](https://unicef.org.au/stories)

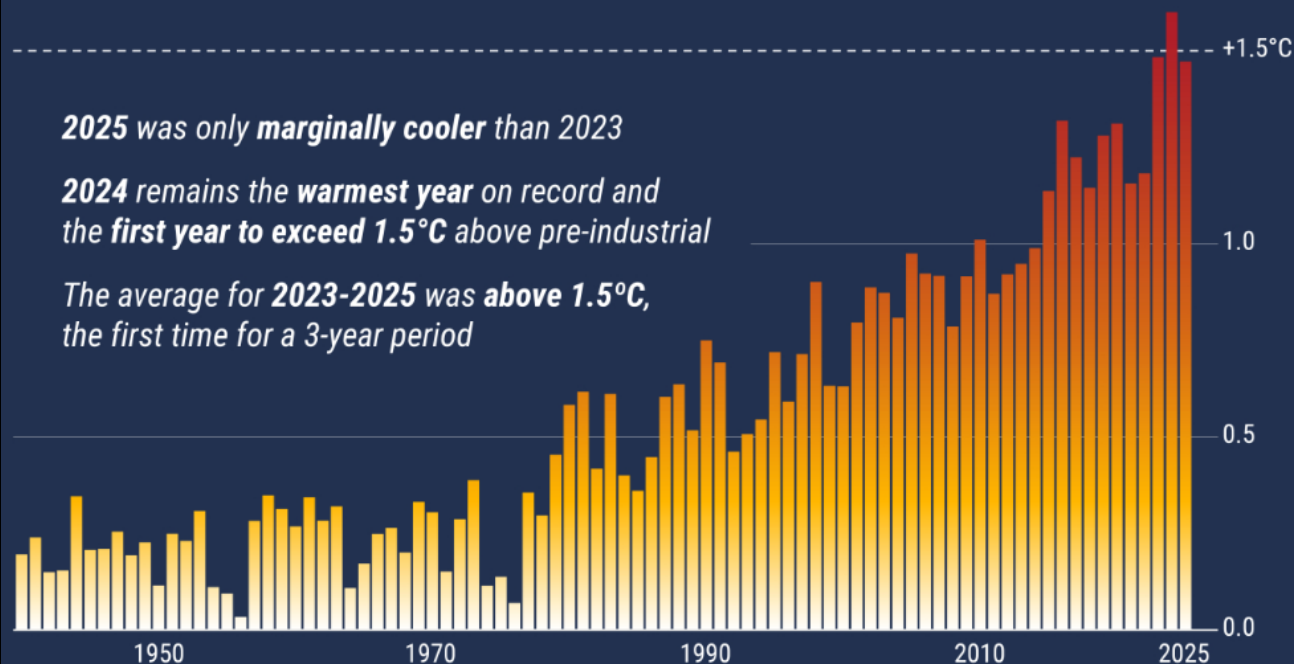


2025 – a year in review

No El Nino to “boost” global temperatures further

Despite this, 2025 not that far behind 2023 and 2024

Global annual surface air temperature increase above pre-industrial level since 1940



Data: ERA5 • Reference period: pre-industrial (1850–1900) • Credit: C3S/ECMWF



PROGRAMME OF
THE EUROPEAN UNION



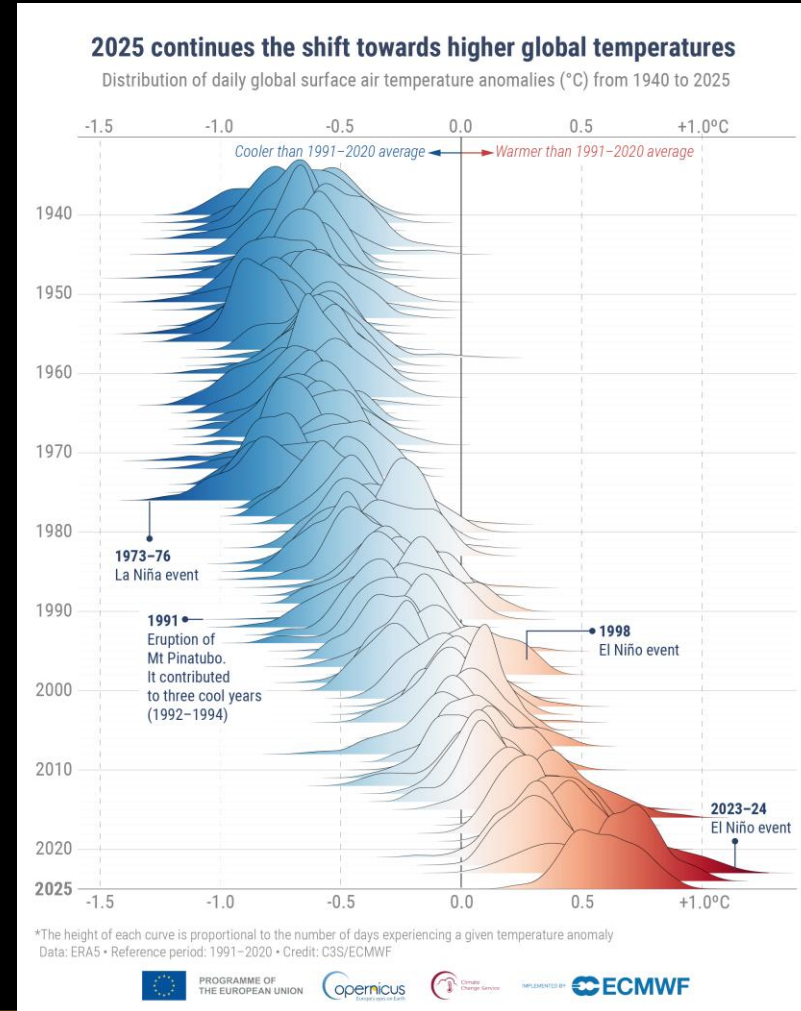
IMPLEMENTED BY



2025 – a year in review

No days in 2025 were below average conditions for 1940-2025

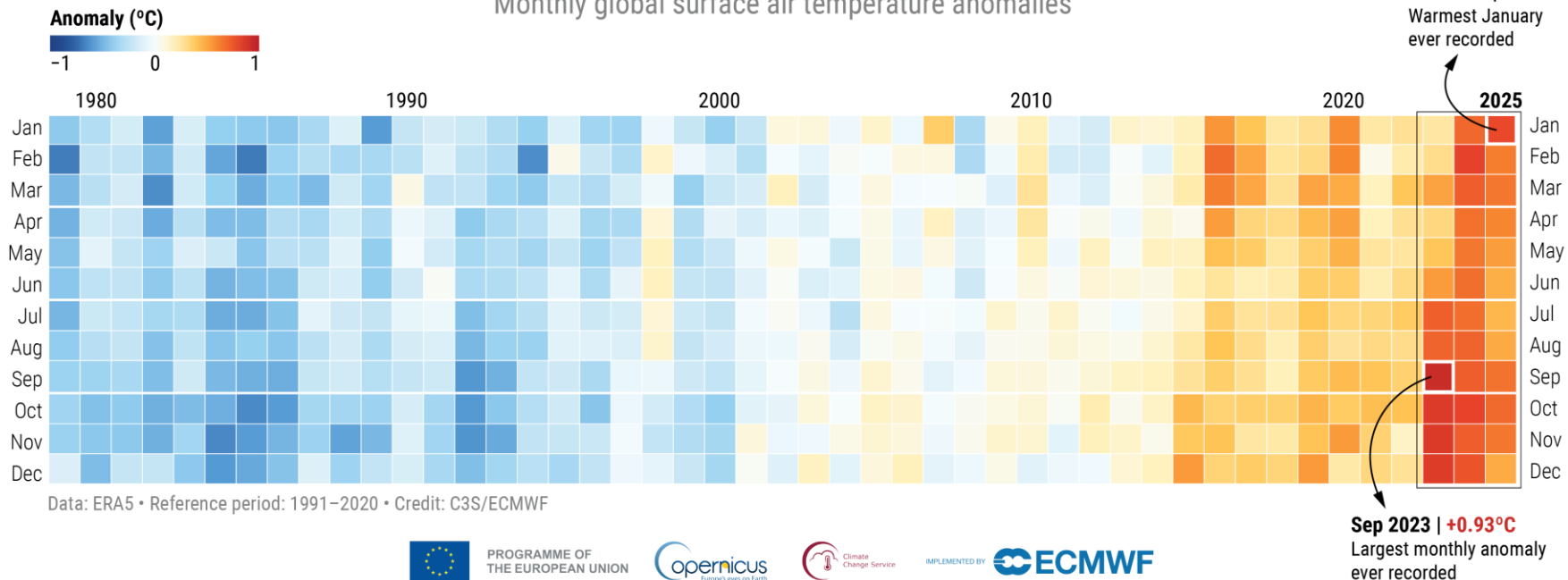
2025 was the first year for this to happen (didn't even happen in 2024....)



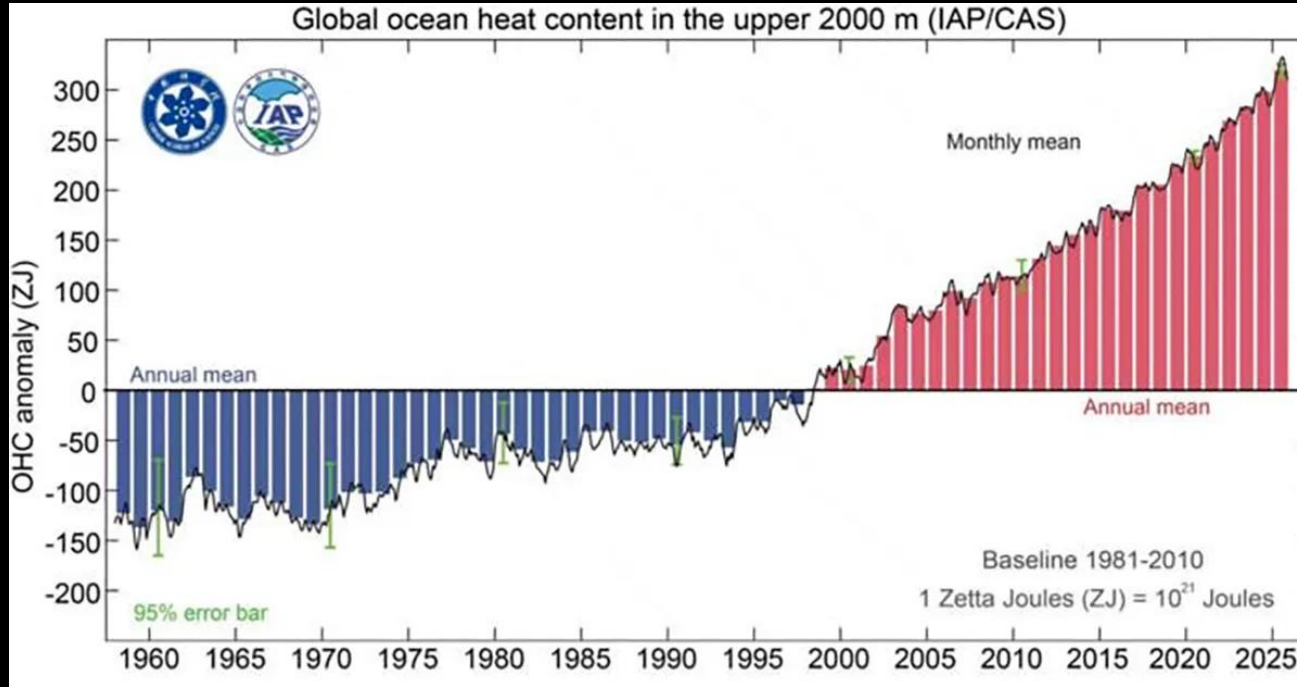
2025 – a year in review

All monthly temperature records have been broken over the past three years

Monthly global surface air temperature anomalies



2025 – a year in review



Ocean heat content is a more stable measure of climate change – largely unaffected by weather

Ocean heat content was a record high – 23 zetta joules more than 2024

Oceans absorb >90% of heat due to human-caused climate change



2025 – a year in review

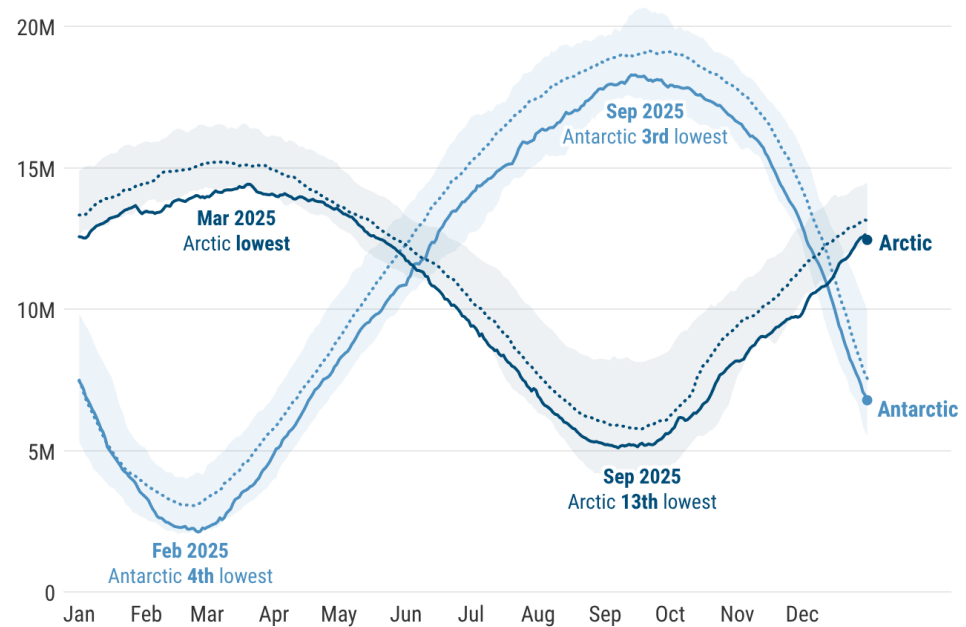
Summer ice extent 4th lowest for Antarctica and 13th lowest for the Arctic

Winter ice extent 3rd lowest for Antarctica and lowest for the Arctic

Venezuela has lost all its glaciers

February 2025 saw lowest global extent of sea ice

Daily sea ice extent in both polar region



Data in square kilometres. Dotted lines show the 1991–2020 median values, the shaded areas illustrate the value range between 1979 and 2024. Rankings are based on monthly sea ice extents.

Data: OSI SAF Sea Ice Index v2.3 • Credit: C3S/ECMWF/EUMETSAT



PROGRAMME OF
THE EUROPEAN UNION



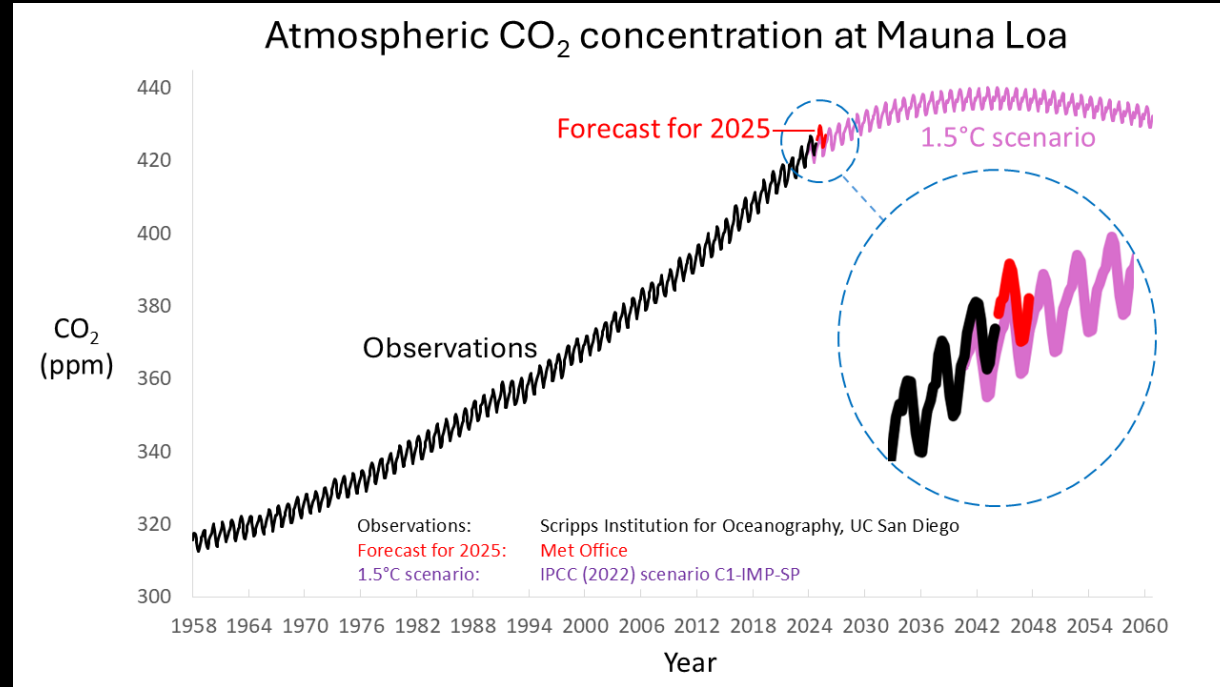
2025 – a year in review

Atmospheric carbon dioxide levels just keep climbing

Currently at 429ish parts per million

Emissions from fossil fuels rose by ~1% in 2025

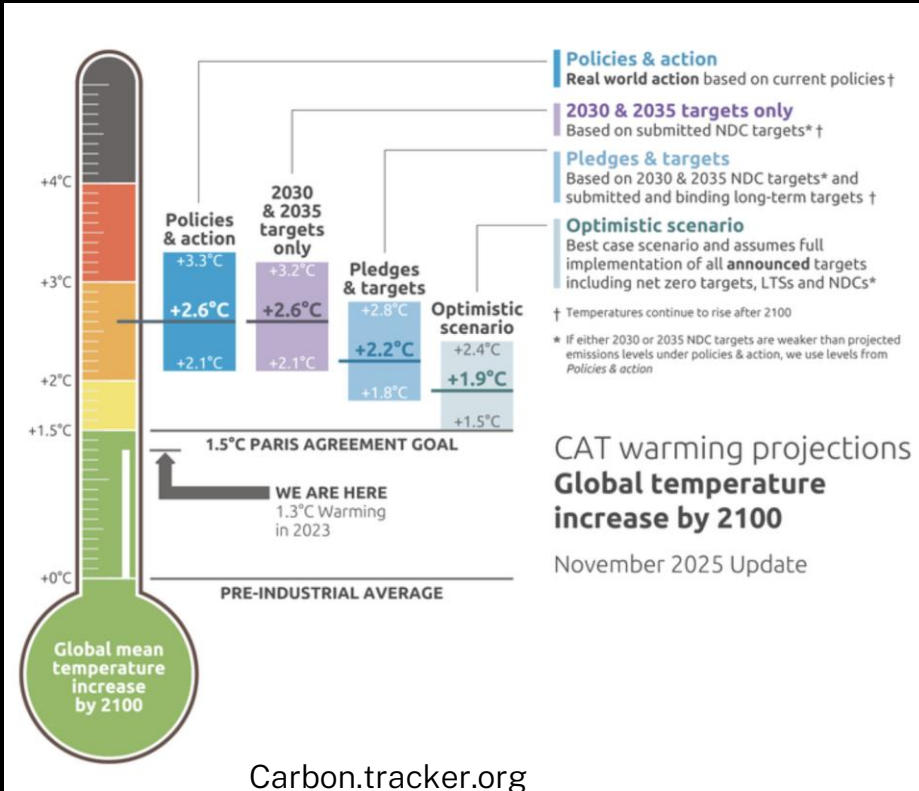
Total emissions slightly lower than 2024 – land sink + deforestation changes



UK Met Office
Scripps Institution for Oceanography
Friedlingstein et al 2026, *Nature*



Global politics



The good : China's emissions seem to have peaked

The Not Great: COP30 didn't achieve much

The Bad: The United States.....



2025 – in Australia

Locally, we had our 4th warmest year on record

2024-2025 summer was 2nd warmest

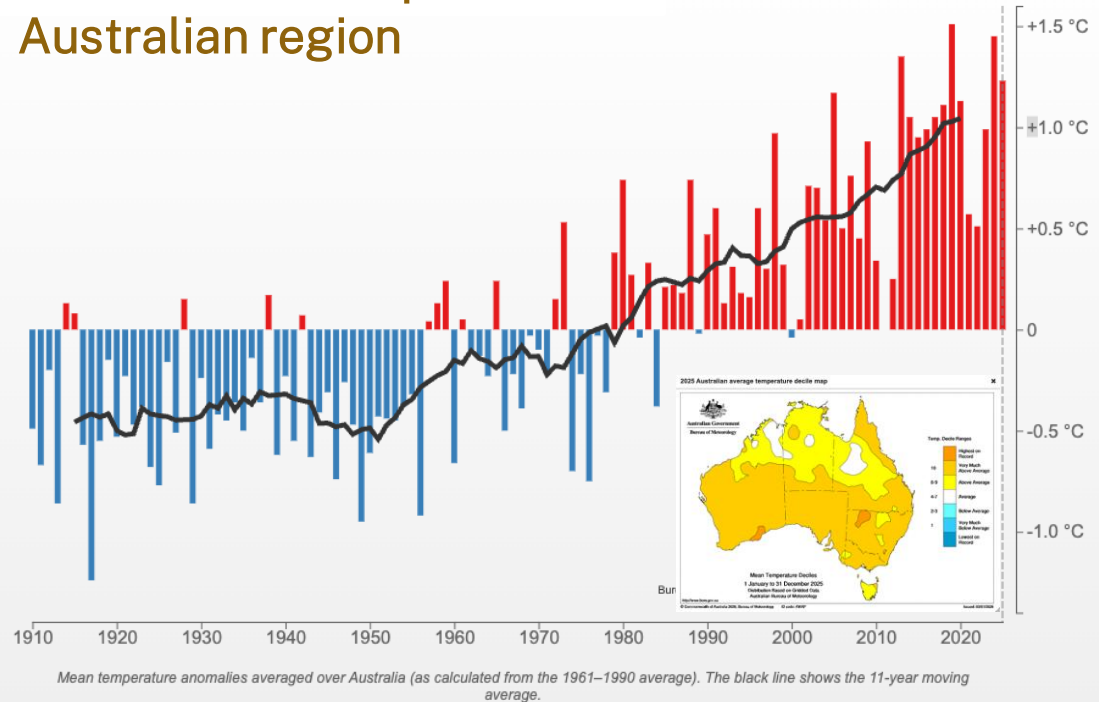
Autumn was 4th warmest

Winter was overall above average

Spring was 9th warmest

Mean annual temperature over the Australian region

2025 +1.23 °C



Australian Bureau of Meteorology



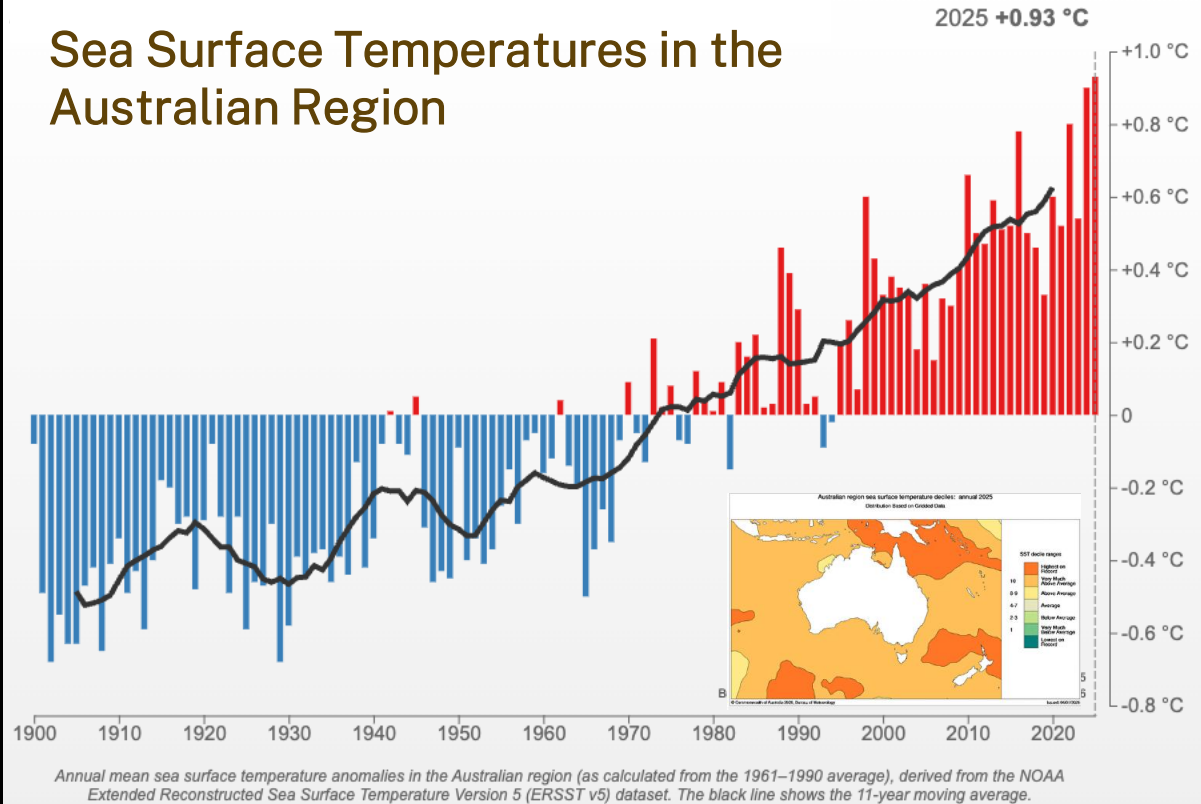
2025 – in Australia

Sea surface temperatures were the highest on record

7 months also had their highest on record, the other 5 either second or third warmest

Across the region, were in the top 10% of all years since records began

Sea Surface Temperatures in the Australian Region



Australian Bureau of Meteorology



2025 – in Australia

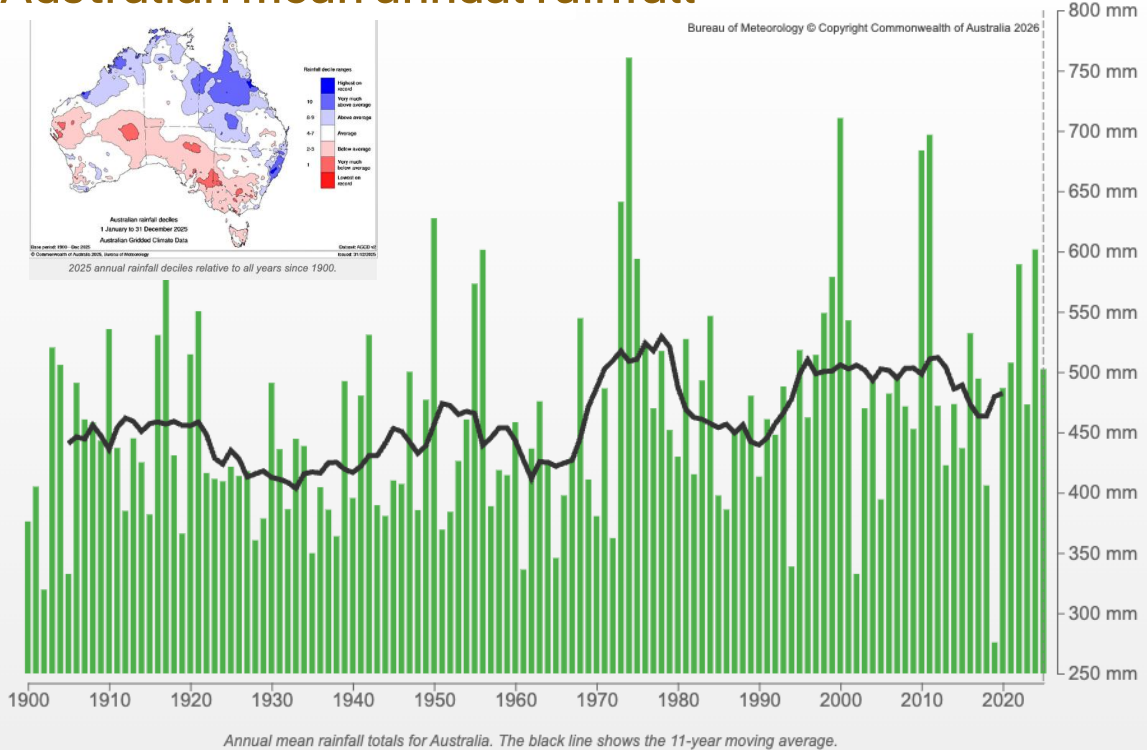
Rainfall was below average in the south, above average in north

18% above average during the northern wet season

12% below average during southern winter

Australian mean annual rainfall

2025 502.24 mm

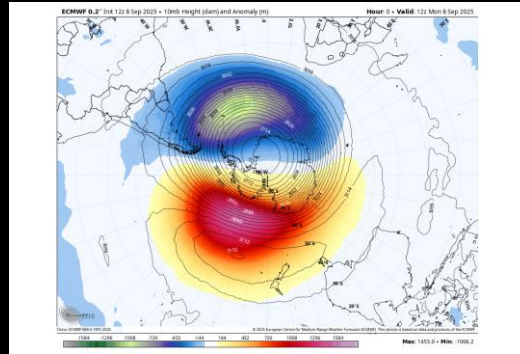


Australian Bureau of Meteorology

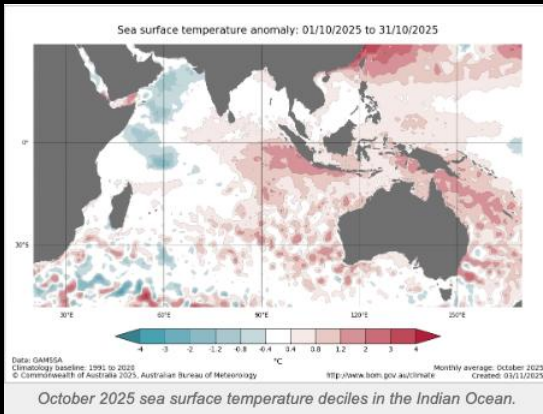


2025 – in Australia

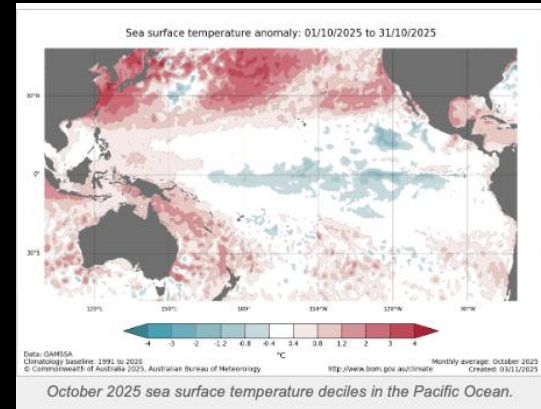
If it weren't for climate change, seasonal variability would have given us an average, below average year



A southern stratospheric warming event threw variability predictors into a little chaos



A very strong negative Indian ocean dipole during spring



A weak La Nina during summer

Australian Bureau of Meteorology



Summer (so far)

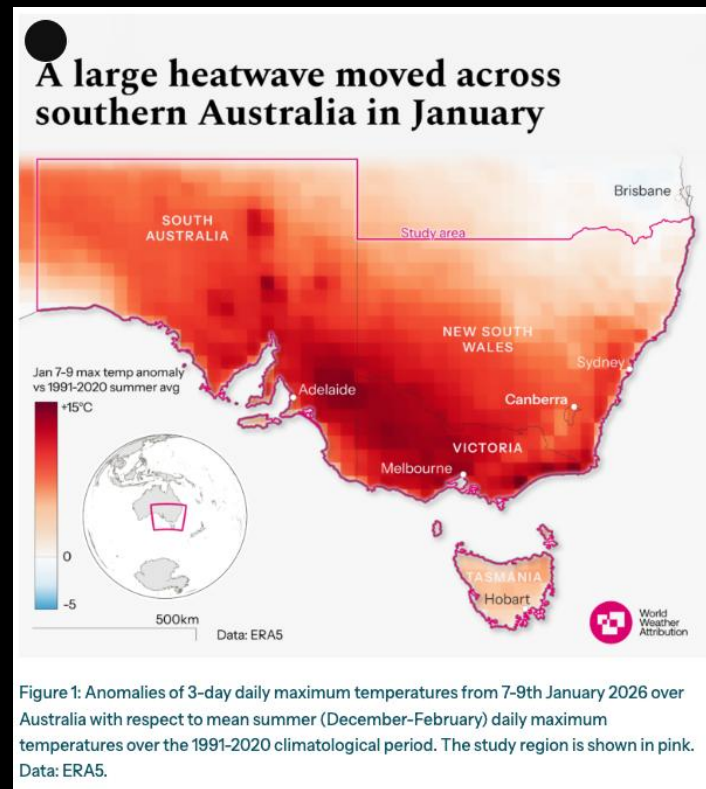
First heatwave – 5-10th January
Worst heatwave since 2019

Ferocious fires in Victoria, burning
435000 hectares

25% increase in health
emergencies in Melbourne

Strong human influence has been
quantified

At the same time, flooding in
Central Queensland



Summer (so far)

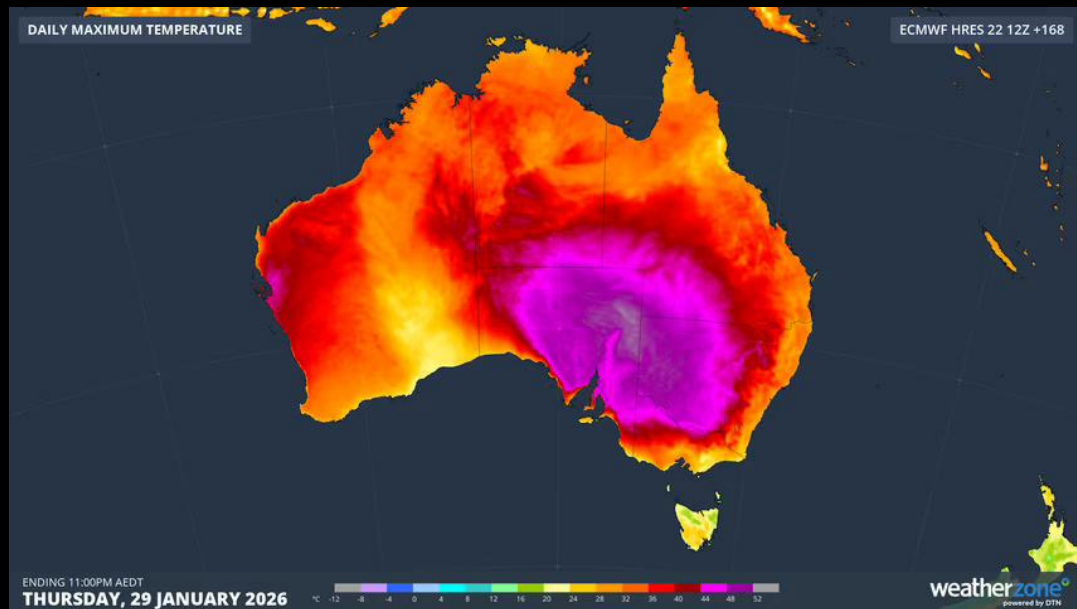
Second heatwave – 24th- 31st Jan

Port Augusta reached 50°C – southern most latitude to occur

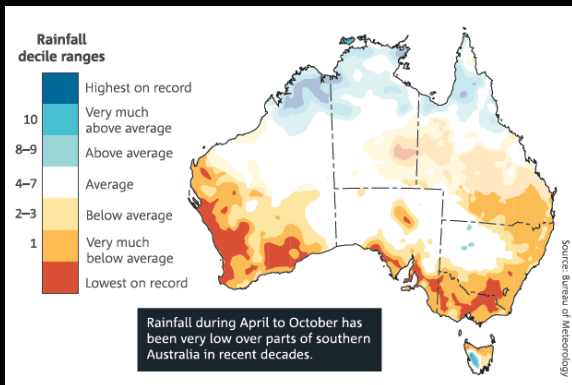
All-state records in Victoria, ski fields reached 30°C

Tuggeranong recorded 43.5°C – hottest ever

Over 50 station records broken

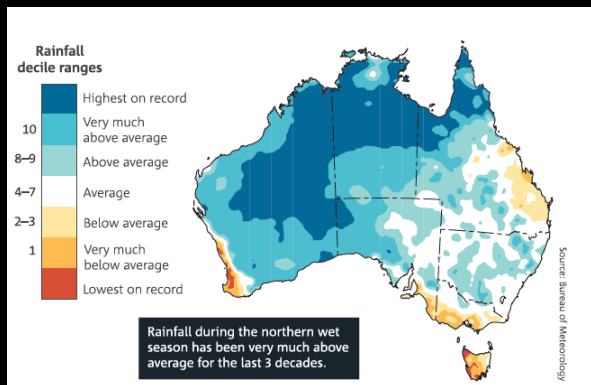
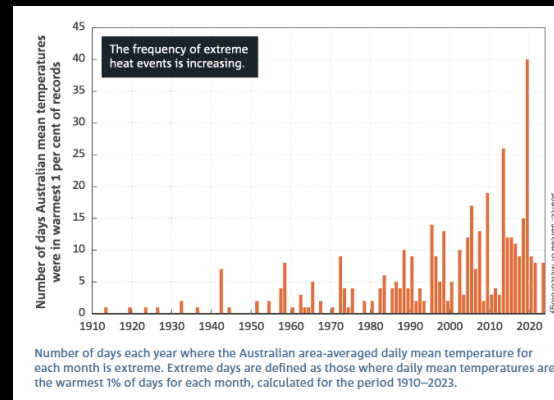


Long-term local climate changes



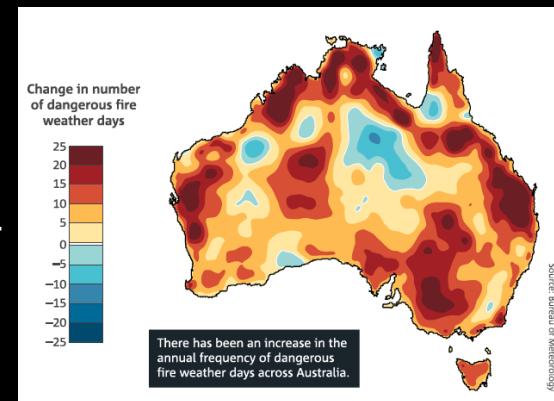
Winter rainfall

Frequency of extreme heat events



Wet season rainfall

Dangerous fire weather



CSIRO & Australian Bureau of Meteorology, 2024



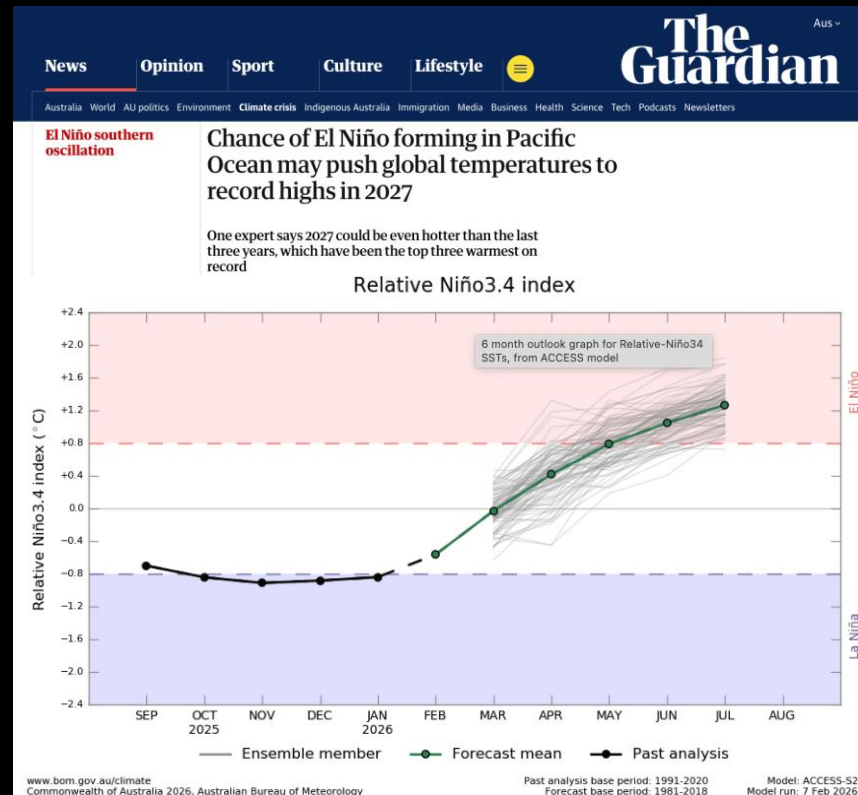
An impending El Nino?

Increasing chatter of an El Nino later this year

While current indicators are surprisingly strong, caution is advised

The *autumn predictability barrier* prevents early official forecasts

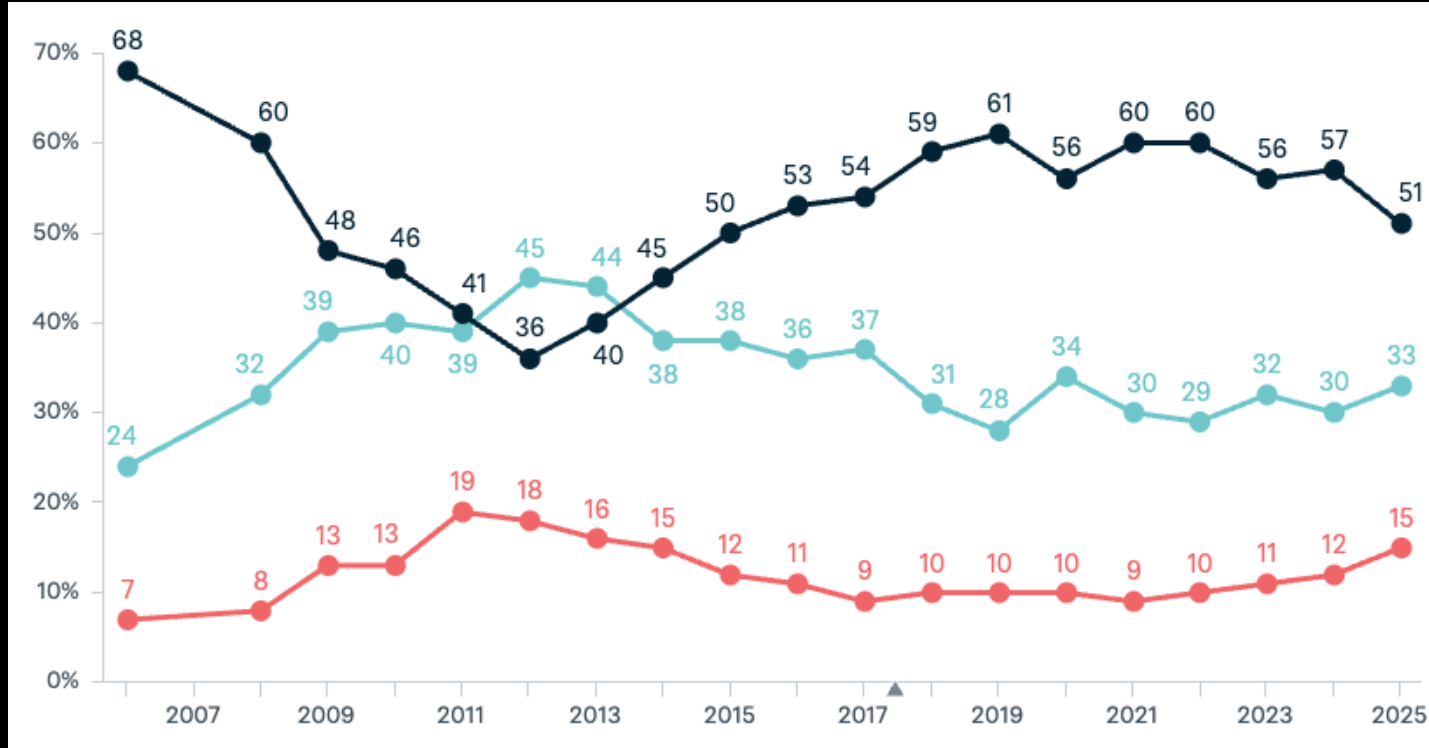
How will weather and climate vary for the next few years??



Australian Bureau of Meteorology



Public perception of climate change



Critical threat,
take action even
if costly

Important but not
critical

No action until
sure

Lowy Institute, 2025

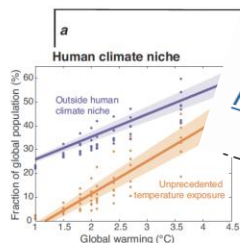


Breakthroughs in holding polluters accountable



876 Mt CO₂ emissions

Additional
(likely range)



516,000 additional people
exposed to unprecedented heat
(likely range of 308,000 to 732,000 people)

356,000 additional people
left outside human climate niche
(likely range of 213,000 to 504,000 people)



Additional 48k
deaths in
(likely range of 8k)

Additional 118 liv
in Europe
(likely range of -161 to 5)

Article | [Open access](#) | Published: 10 September 2025
Systematic attribution of heatwaves to the emissions of carbon majors

[Yann Quilcaille](#) ✉, [Lukas Gudmundsson](#), [Dominik L. Schumacher](#), [Thomas Gasser](#), [Richard Heede](#),
[Corina Heri](#), [Quentin Lejeune](#), [Shruti Nath](#), [Philippe Naveau](#), [Wim Thiery](#), [Carl-Friedrich Schleussner](#) &
[Sonia I. Seneviratne](#)

Nature 645, 392–398 (2025) | [Cite this article](#)

**Perspect
Carbon
liability**

[Christopher W. Callahan](#)
Nature 640, 893–901 (2025) |

Additional 4.7 million to 37 million
corals
bleaching event

npj | climate action

for climate

Article



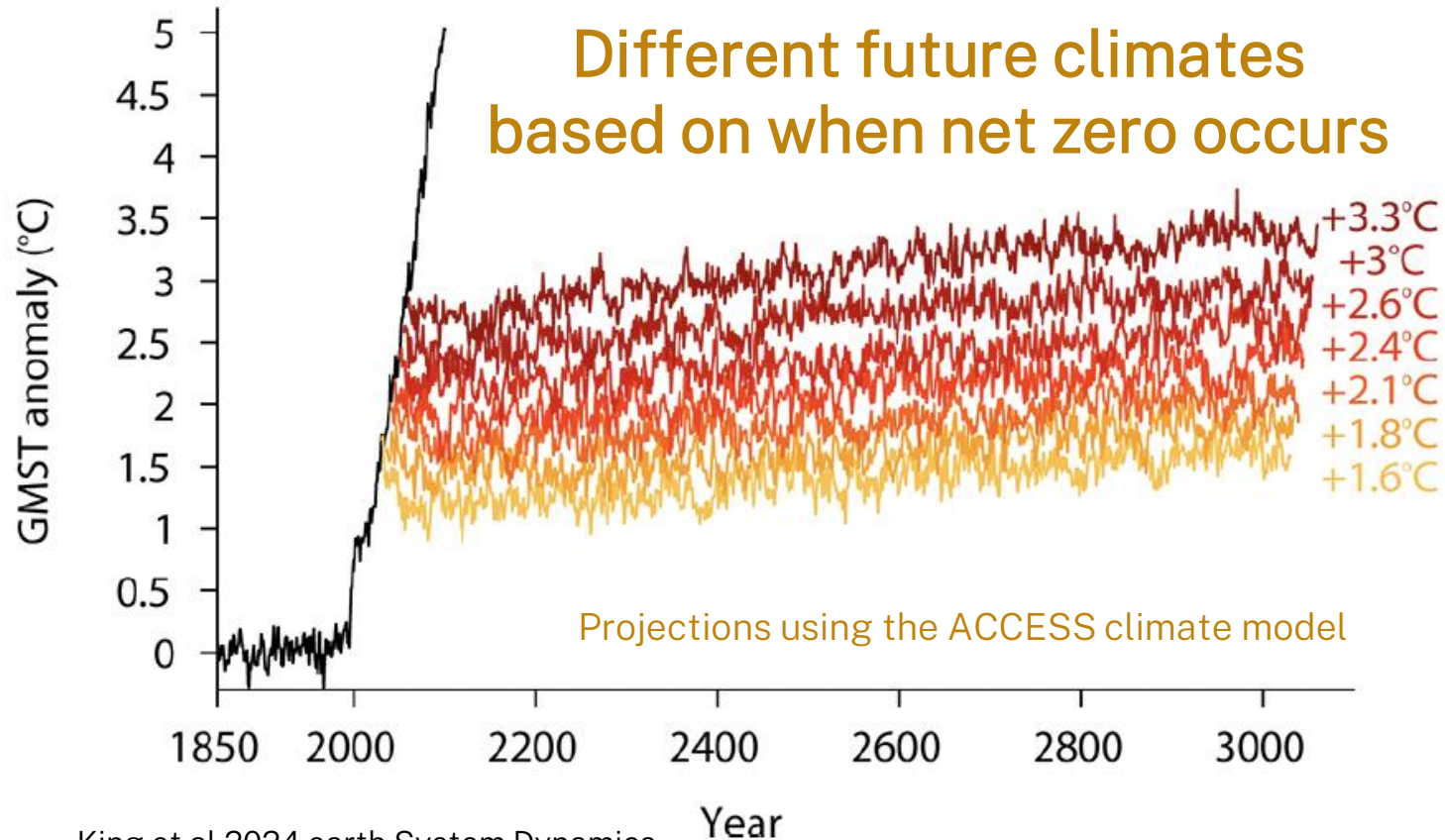
<https://doi.org/10.1038/s44168-025-00296-5>

**global climate
projects to**

Check for updates



Scratching the surface on climate after net zero

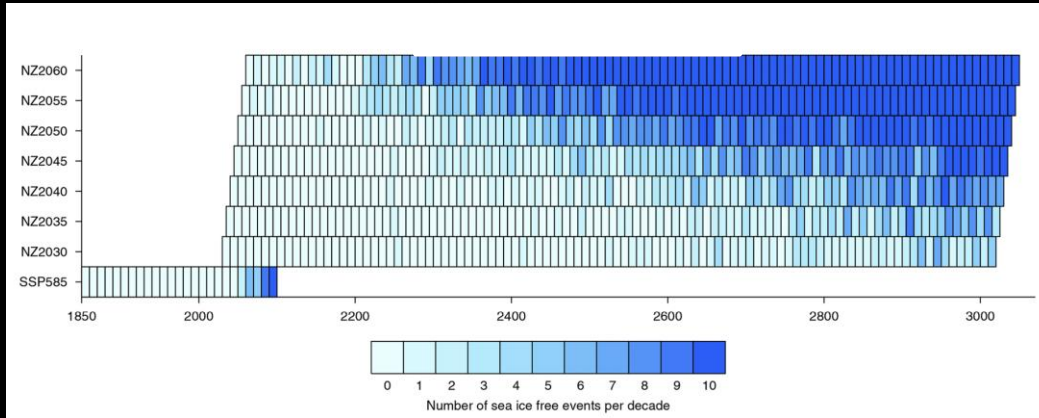


King et al 2024 earth System Dynamics



But unfortunately, the news isn't so good...

Ice-free summers over Antarctica

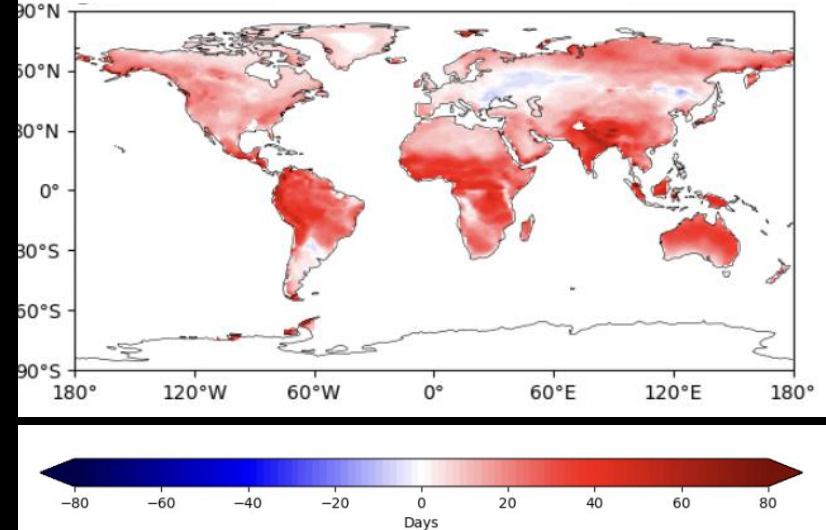


Delaying net zero by 5-10 years results in drastically different climate regimes
Little improvement at the millennial-scale

King et al 2024 earth System Dynamics

Heatwaves compared to 2°C global warming

500 years after net zero at 2060



Heatwave days per season

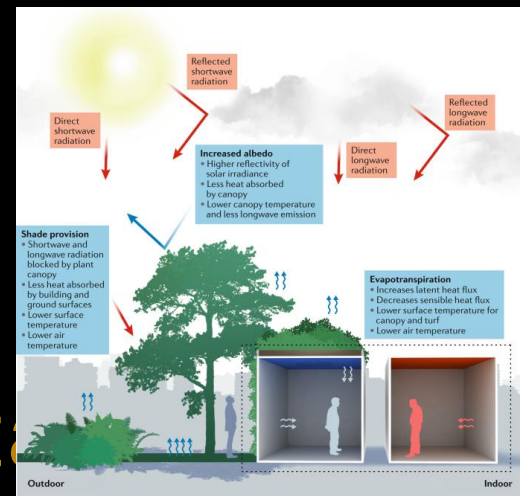
Perkins-Kirkpatrick et al 2025 Environmental Research: Climate



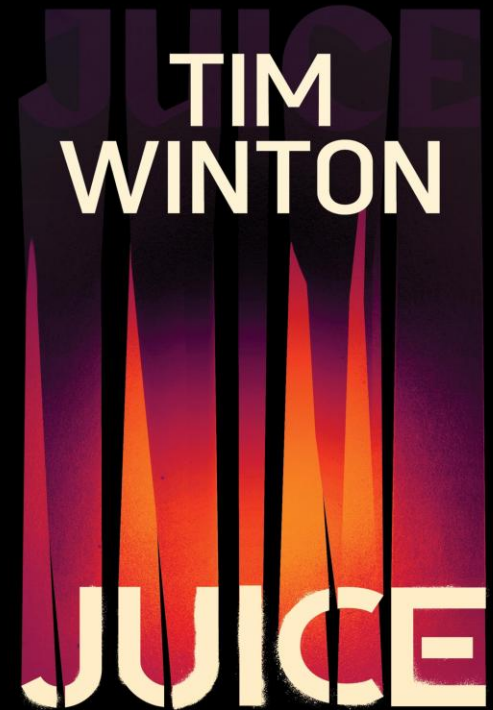
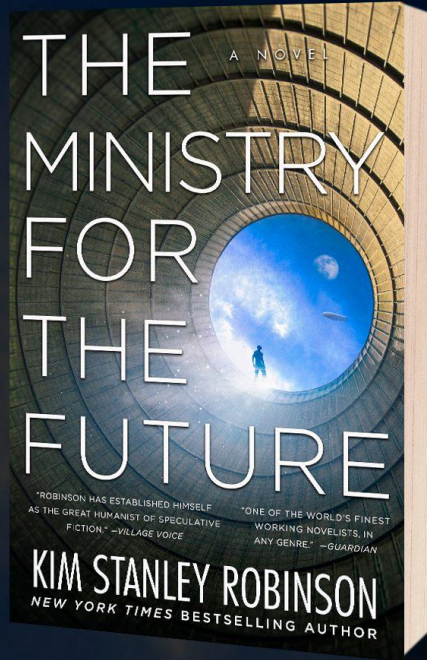
Mitigation of carbon emissions now no longer enough



But we take adaptation seriously as net zero



Surely we can agree



On where we DON'T want to be



Thank you

Prof Sarah Perkins-Kirkpatrick

Fenner School of Environment and Society

Sarah.Kirkpatrick@anu.edu.au

@Sarahinscience.bsky.social



Australian
National
University

TEQSA PROVIDER ID: PRV12002 (AUSTRALIAN UNIVERSITY)
CRICOS PROVIDER CODE: 00120C