

State of the Climate Update 2024

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State of the Climate Update – new format

Consists of

- Key Climate Indicators
- A discussion on assessing current warming levels in the context of the Paris Agreement
- A selection of extreme events and socio-economic impacts
- Summaries of other reports, progress on climate action:
 - WMO State of Global Water Resources 2023
 - Renewable energy
 - WMO State of Climate Services 2024
 - Early Warnings for All



Global mean temperature: 2024 on track to be the warmest year on record

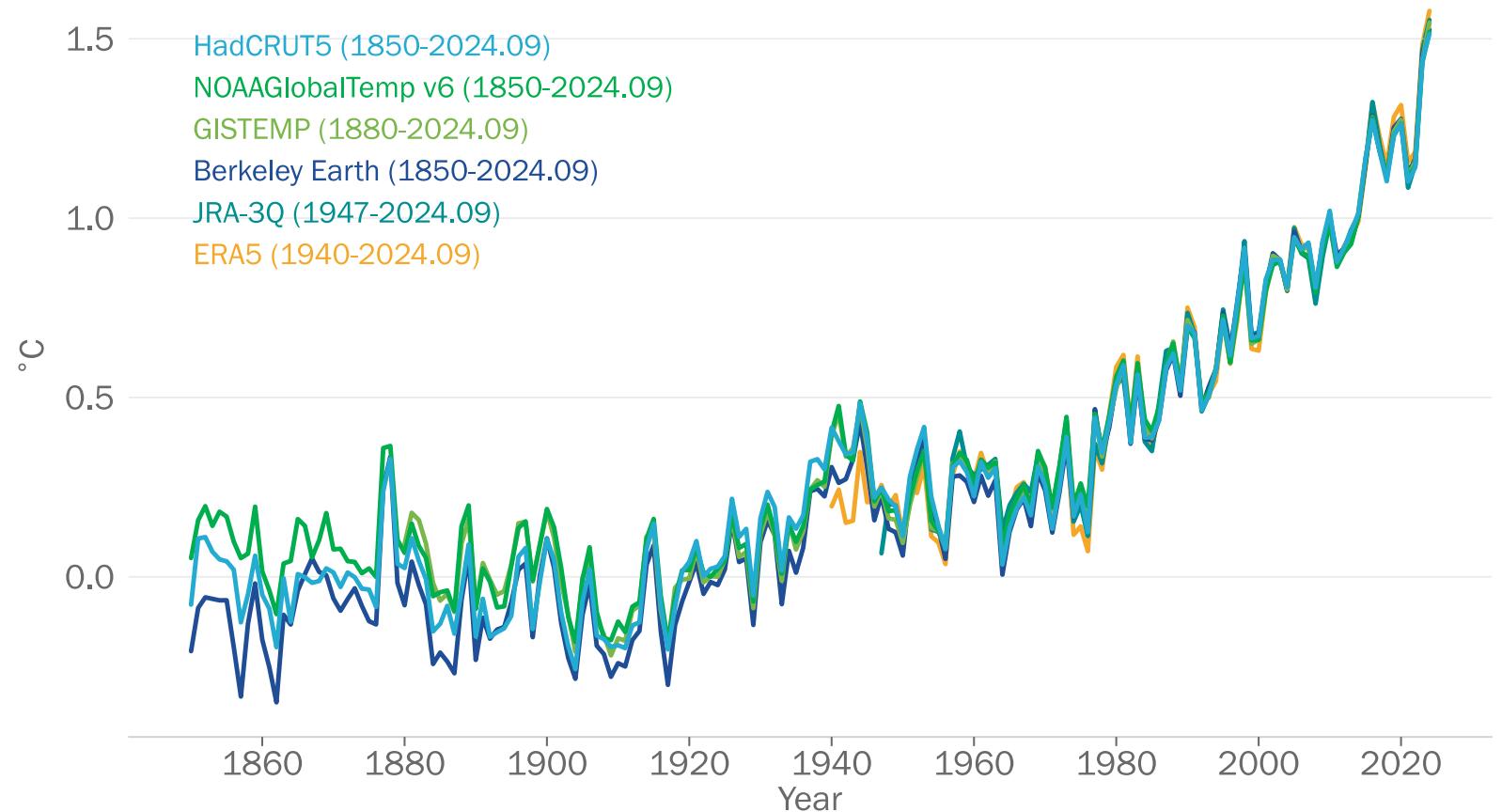
Global mean temperature
January-September 2024
 $1.54 \pm 0.13^{\circ}\text{C}$

Note that a single year above 1.5°C does not mean that we have passed the warming levels in the Paris Agreement

On track to be the warmest year in all six datasets

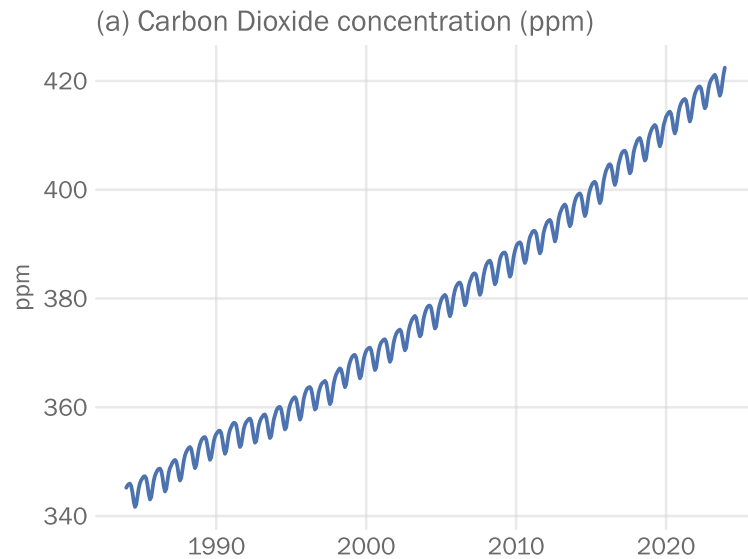
The past 10 years 2015-2024 are the 10 warmest years on record

Global mean temperature 1850-2024
Difference from 1850-1900 average



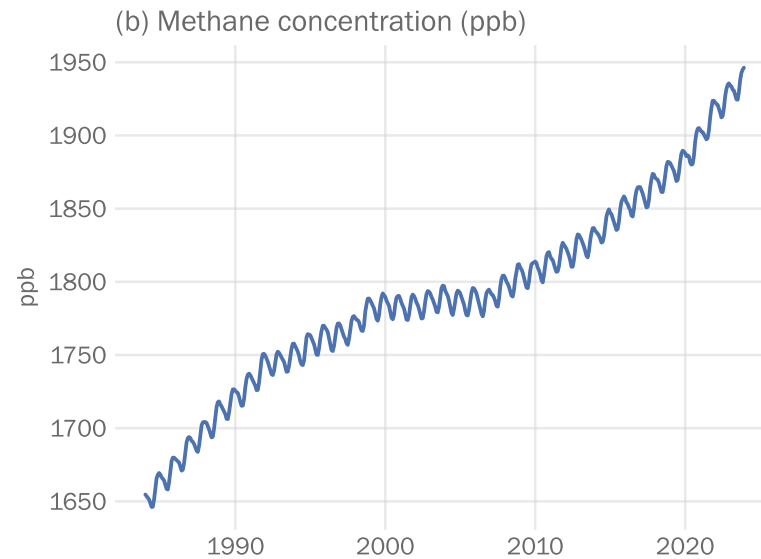
Greenhouse gas concentrations in the atmosphere reached record observed levels in 2023

Carbon Dioxide



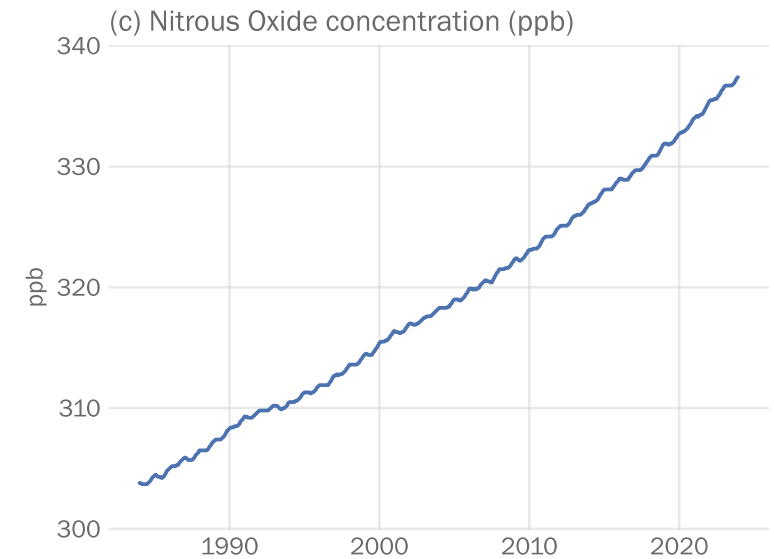
CO₂ in 2023
420.0±0.1 ppm
151% of 1750

Methane



CH₄ in 2023
1934±2 ppb
265% of 1750

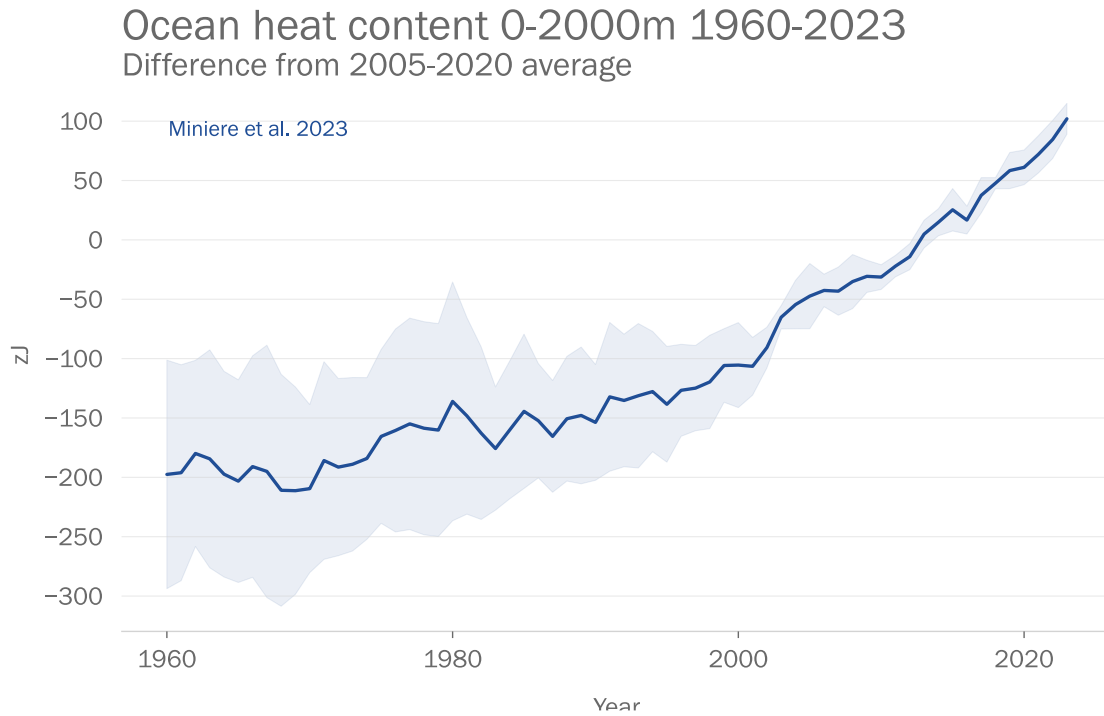
Nitrous Oxide



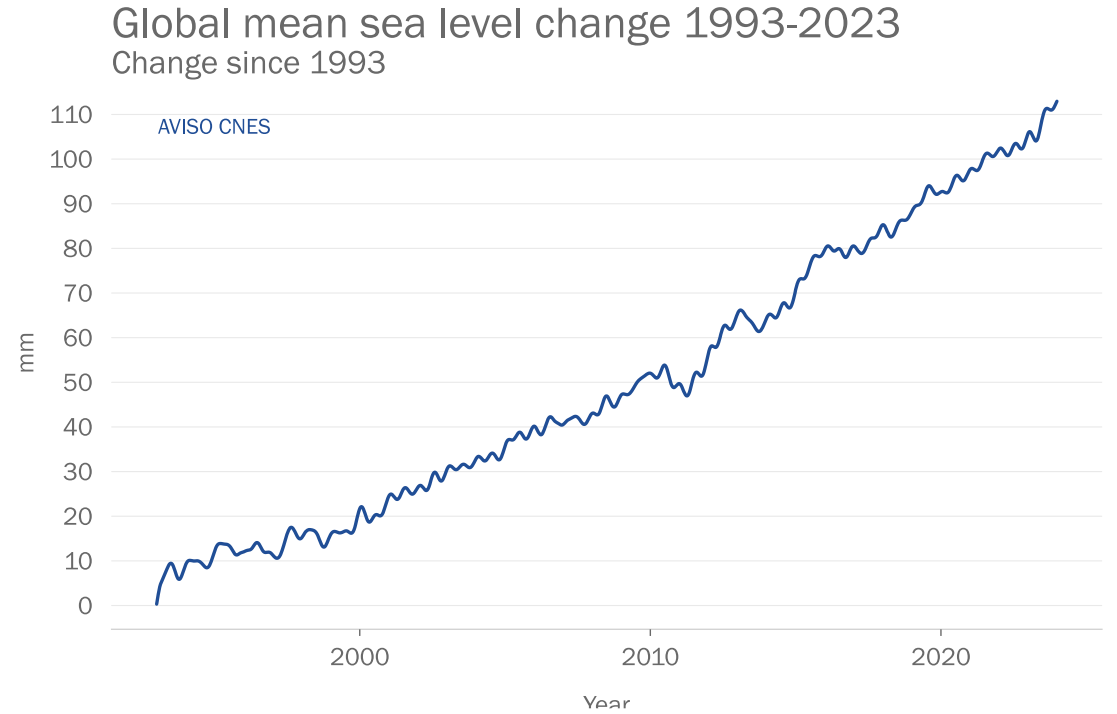
N₂O in 2023
336.9±0.1 ppb
125% of 1750

Ocean heat content 2023, highest on record

Sea level rise is accelerating



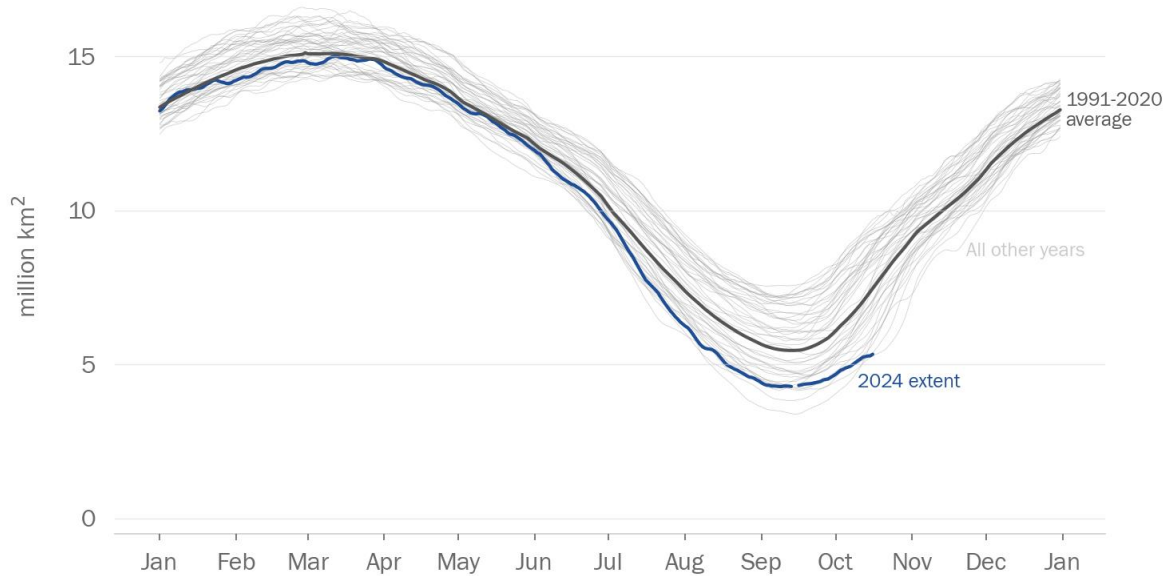
Ocean heat content in 2023 was the highest annual value on record, exceeding the 2022 value by 13 ± 9 ZJ.



Sea level rise is accelerating. Rate increased from $2.13 \text{ mm} \cdot \text{yr}^{-1}$ between 1993 and 2002 to $4.77 \text{ mm} \cdot \text{yr}^{-1}$ between 2014 and 2023.

Arctic and Antarctic sea ice extent in 2024 have both been well below average.

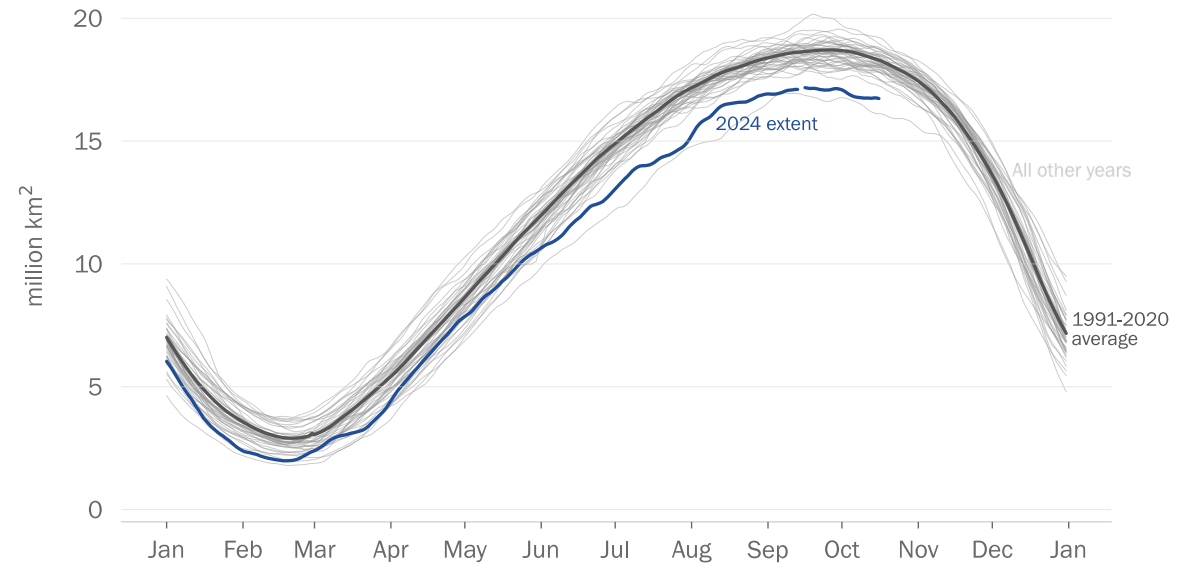
Daily Arctic sea-ice extent through the year 1978-2024



Annual maximum 15.01 million km² on 14 March, slightly below the long-term average (1991-2020) of 15.2 million km².

Annual minimum 4.3 million km² on 11 September, the 7th lowest in the satellite record.

Daily Antarctic sea-ice extent through the year 1978-2024



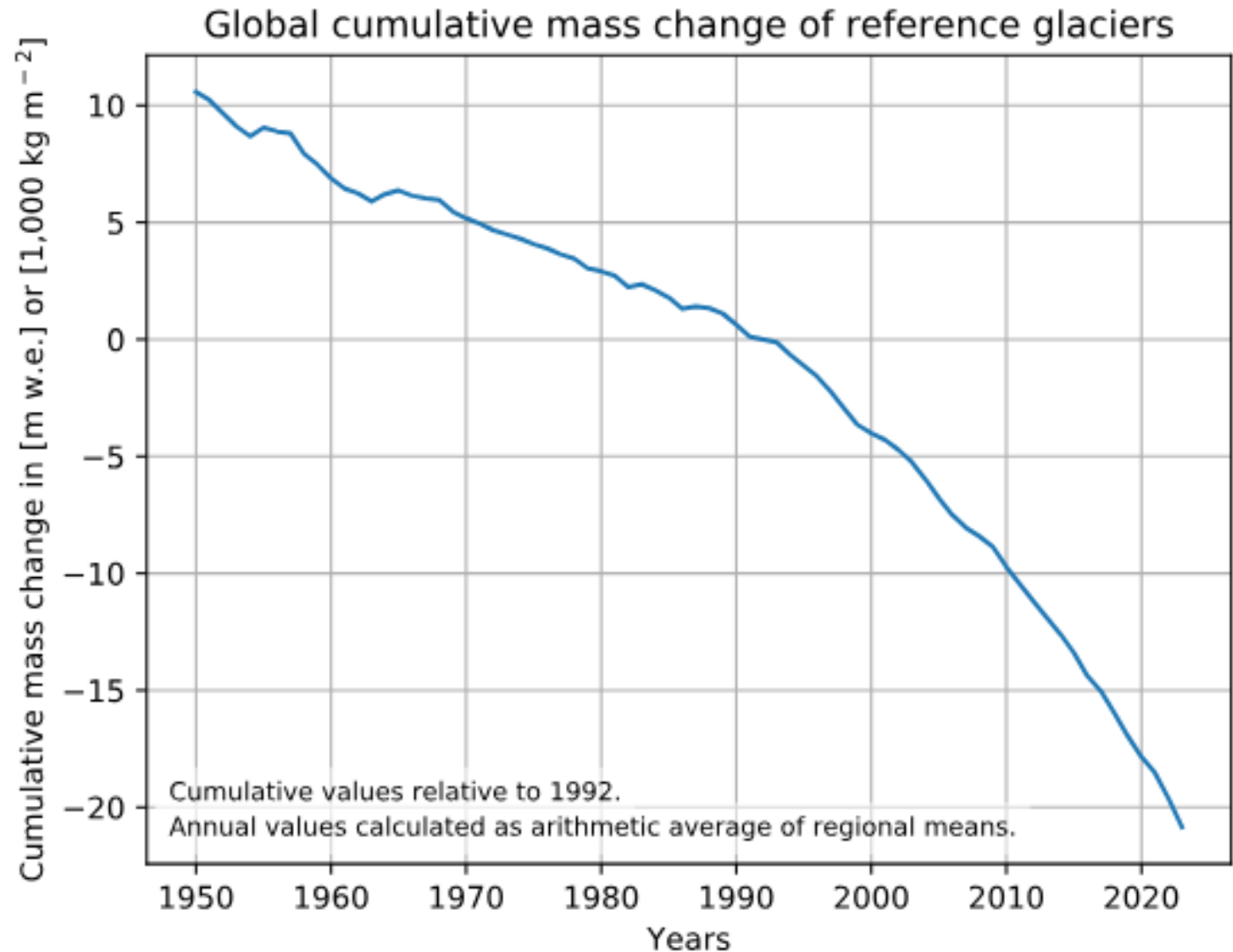
Annual minimum 2.0 million km² on 20 February, the 2nd lowest extent in the satellite record.

Annual maximum 17.2 million km² on 19 September, 2nd lowest annual maximum extent in the satellite record.

Data from National Snow and Ice Data Center

Glacier mass loss is accelerating

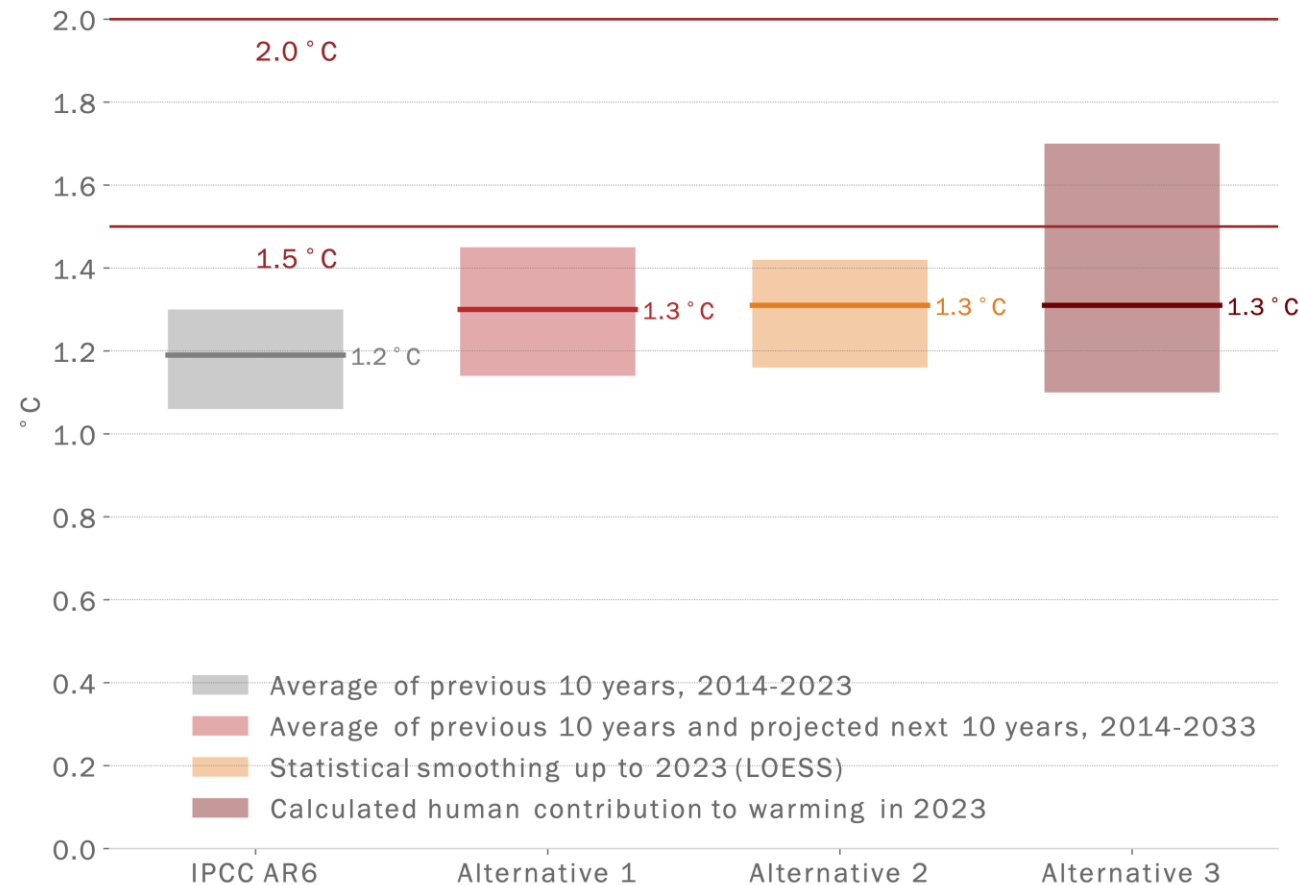
- In 2023, reference glaciers lost 1.2 m water equivalent of ice
- Nominally the largest single year loss on record



Assessing current global warming levels

- Warming levels are considered as an average over multiple years
- Since we do not know the future, in a warming world, observed warming for the last 10 (or 20) years will underestimate current warming
- Several possible approaches to estimate current warming, including:
 - (a) Combine recent observations with short-range model projections
 - (b) Apply statistical fit to recent observations
 - (c) Use models to assess current human contribution to warming

Current global warming is about 1.3 °C,
higher than the average of the last 10 years



Thank you.



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