

State of the Climate

Key dataset overview

John Kennedy

Astana Workshop 23rd-26th June 2025

Key indicators

- Global and regional mean temperature
- Precipitation
- Carbon dioxide, methane and nitrous oxide
- Ocean heat content
- Ocean acidification
- Global mean sea level
- Glaciers
- Sea ice extent

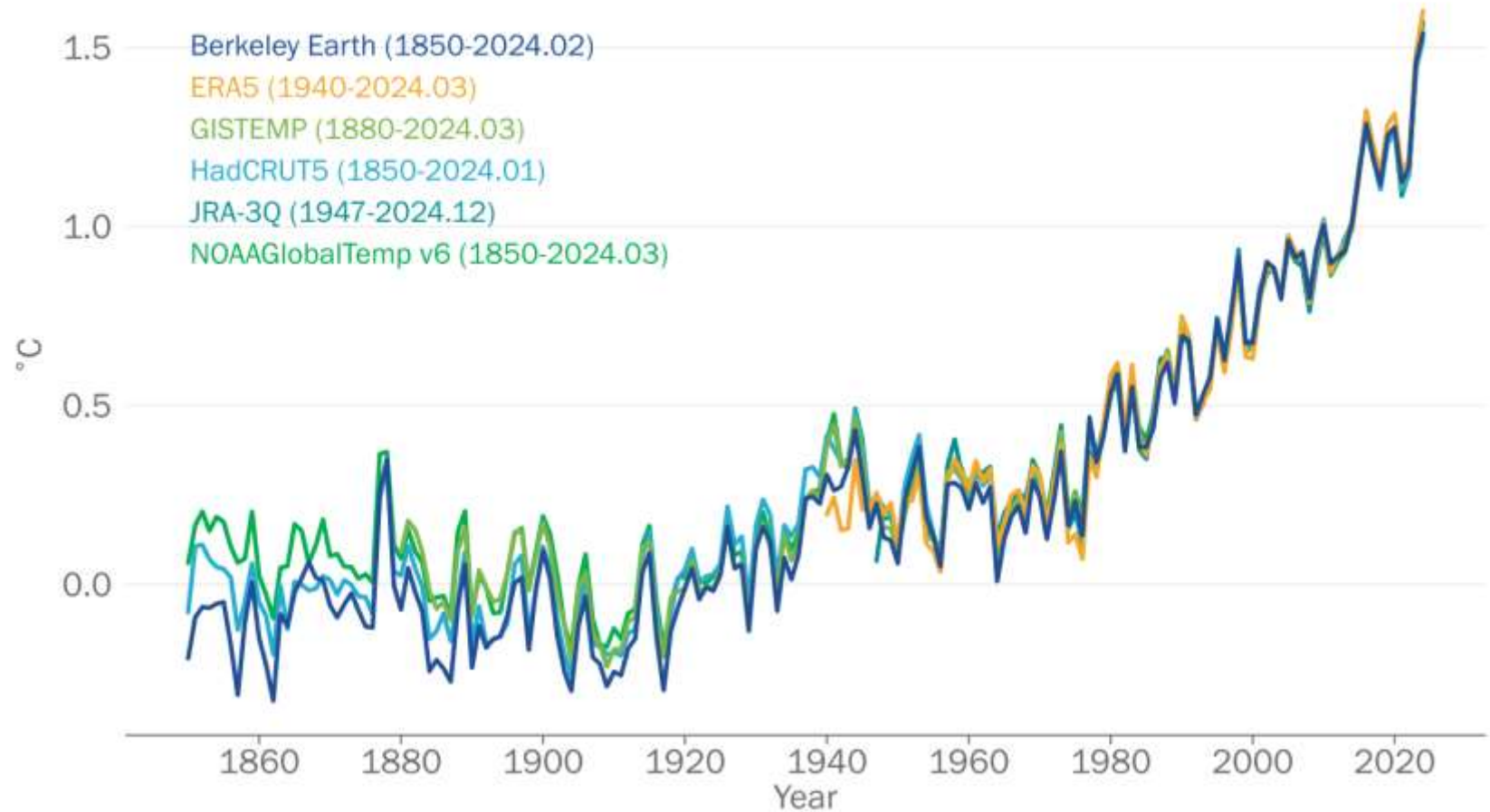
Global and regional temperature

Six datasets currently used directly in global and regional temperature assessment

Only 3 start in 1850 but need an 1850-1900 baseline for Paris Agreement

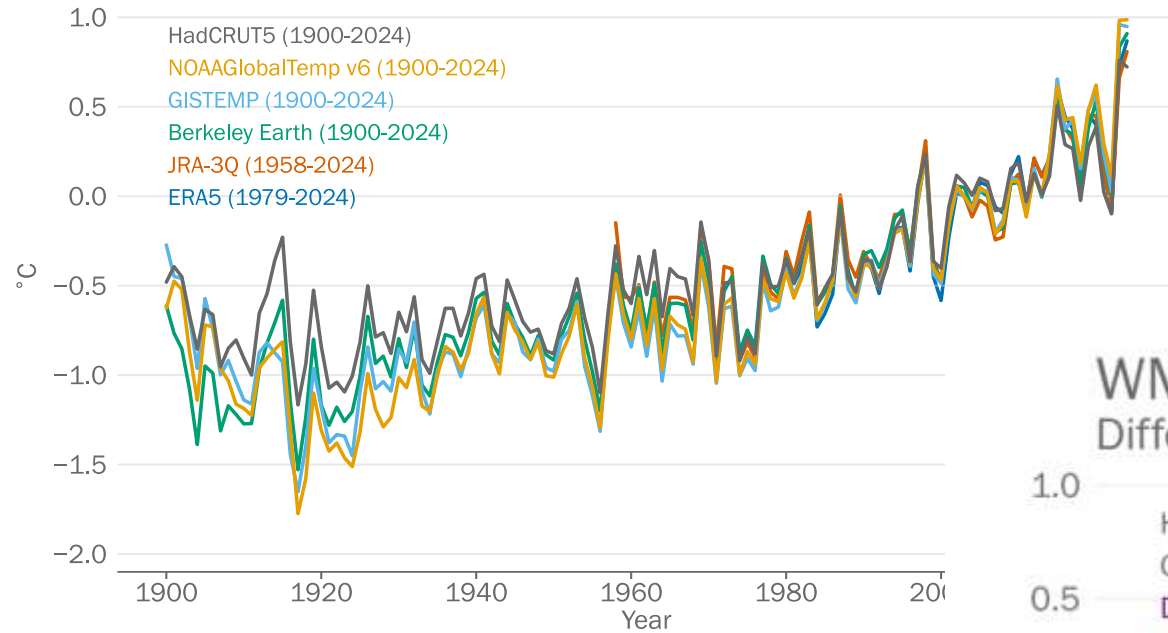
Split the period

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



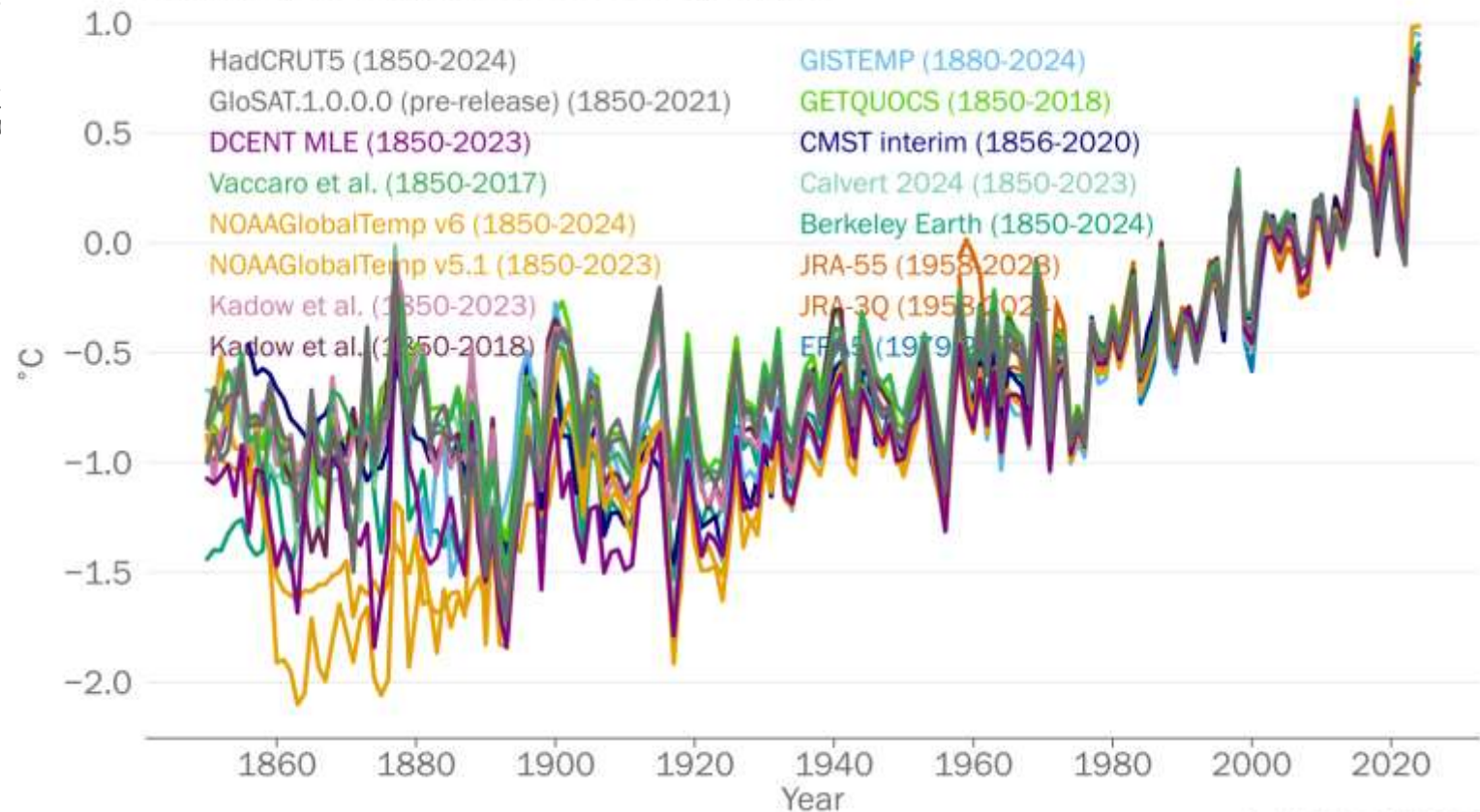
WMO RA III South America annual land temperature

Difference from 1991-2020 average



WMO RA III South America annual temperature 1850-

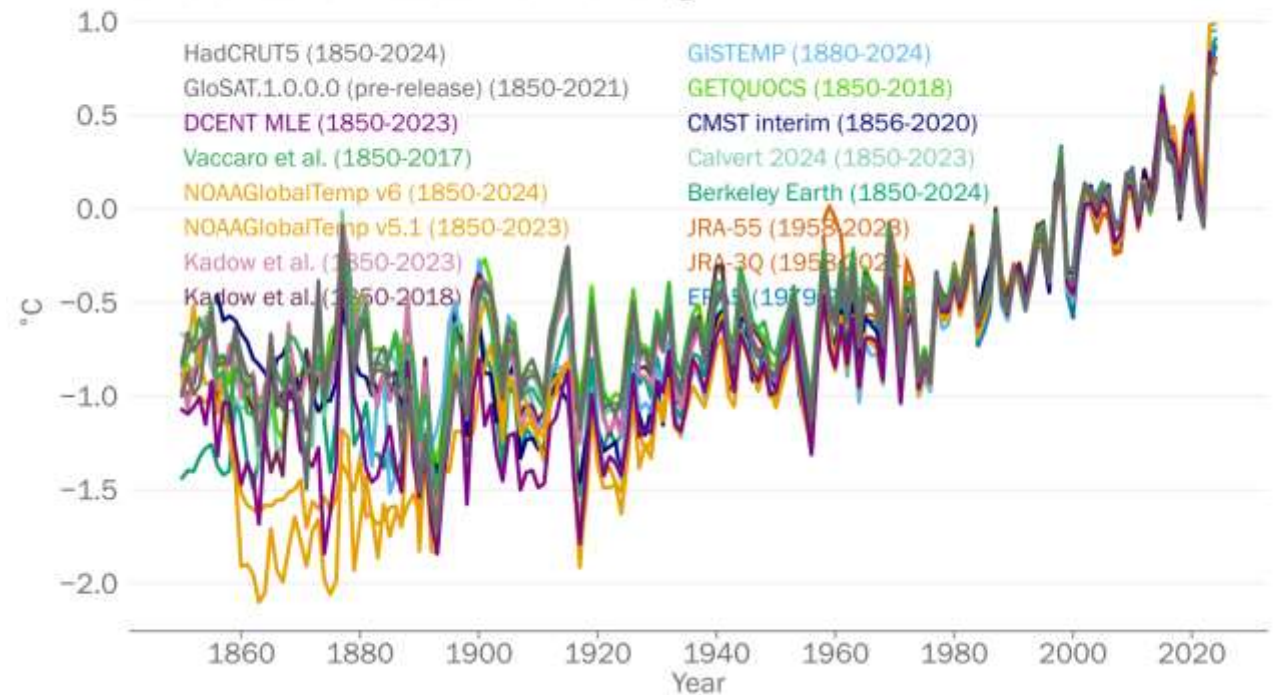
Difference from 1991-2020 average



Criteria

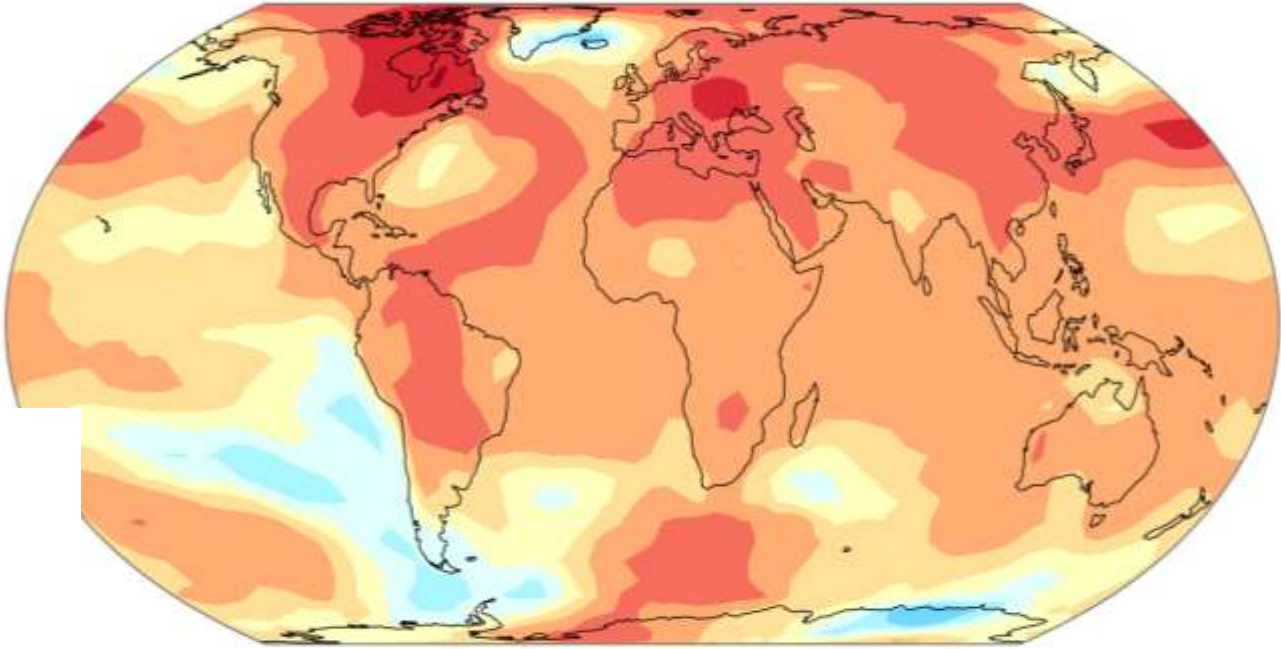
- freely available
- peer reviewed paper. (Updates or partial replacement of source data, and minor changes)
- accounts for known and documented major sources of bias and error
- Infilled to avoid spatial bias.
- Data should run from 1850 to 2010. OR from 1981 to the last full year with annual update by the end of the following January.
- [complex uncertainty requirement]
- For inclusion in the modern period, the data product should have been regularly updated for a fixed period of time or have demonstrable institutional backing so that annual data updates are available in January.

WMO RA III South America annual temperature 1850-2024
Difference from 1991-2020 average

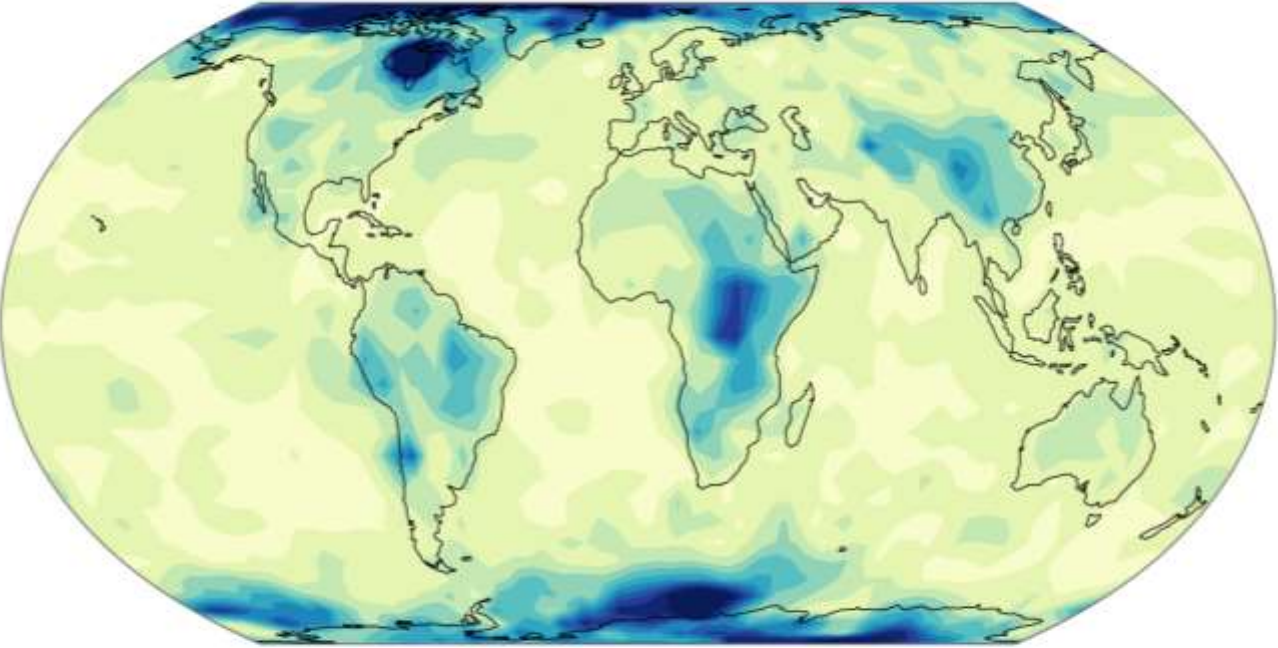


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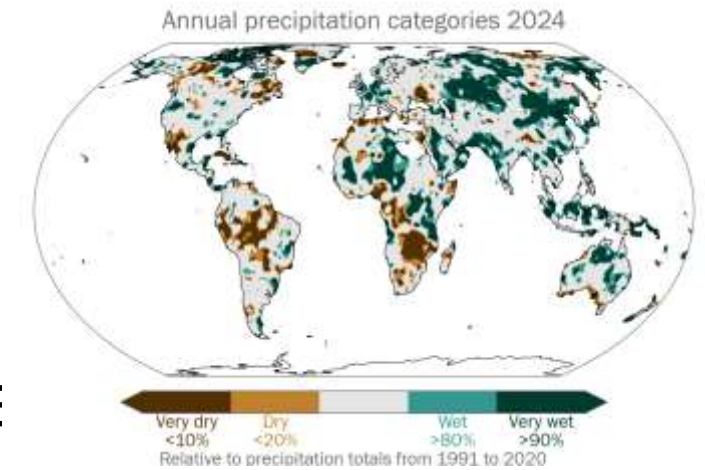
Annual Temperature Anomalies 2024



Annual Temperature Anomalies Uncertainty 2024



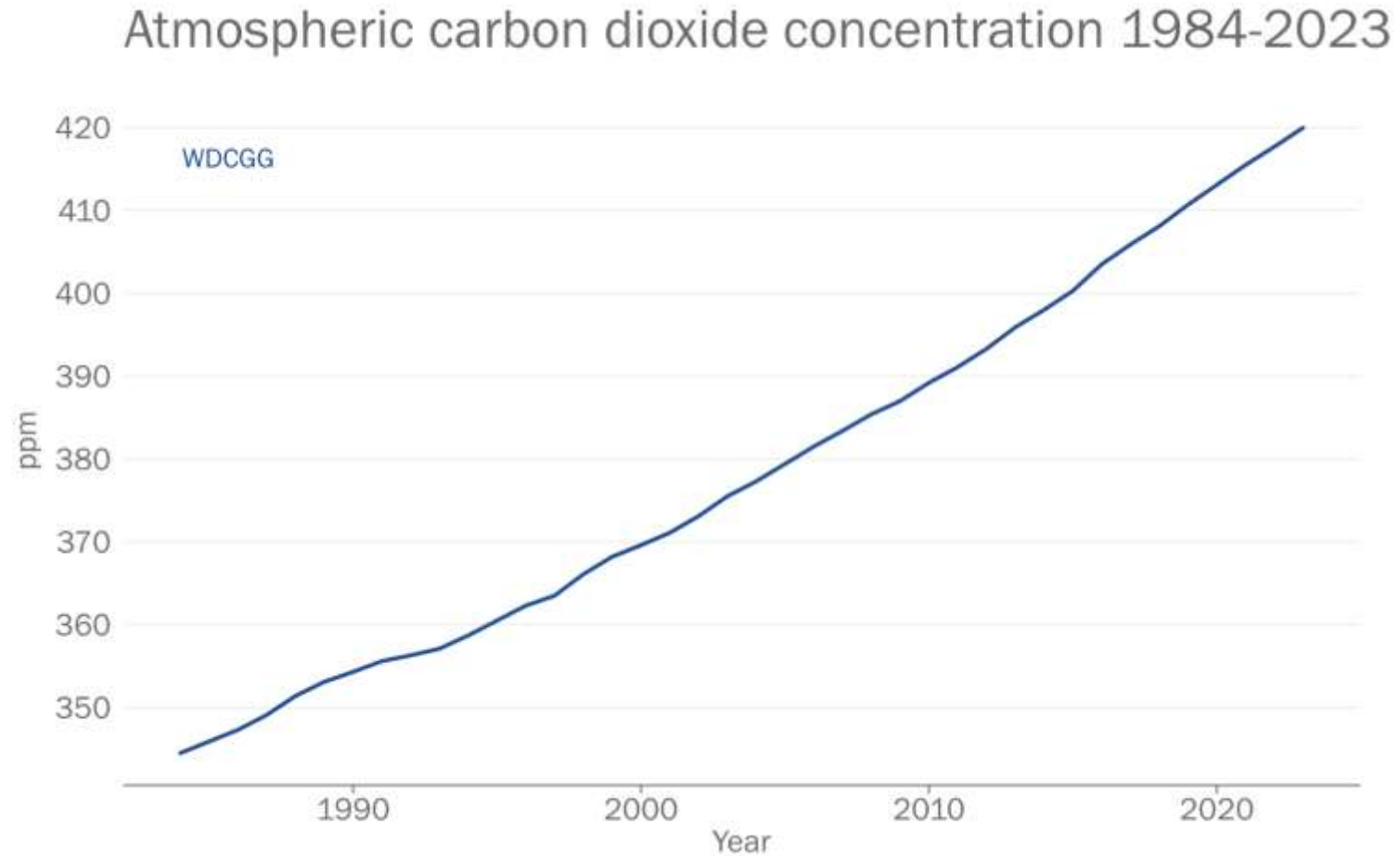
Precipitation



- The following Global Precipitation Climatology Center datasets were used in the analysis:
- First Guess Monthly,
https://doi.org/10.5676/DWD_GPCC/FG_M_100
- Monitoring Product (Version 2022), https://doi.org/10.5676/DWD_GPCC/MP_M_V2022_100
- Full Data Monthly (Version 2022),
https://doi.org/10.5676/DWD_GPCC/FD_M_V2022_100
- Precipitation Climatology (Version 2022),
https://doi.org/10.5676/DWD_GPCC/CLIM_M_V2022_100

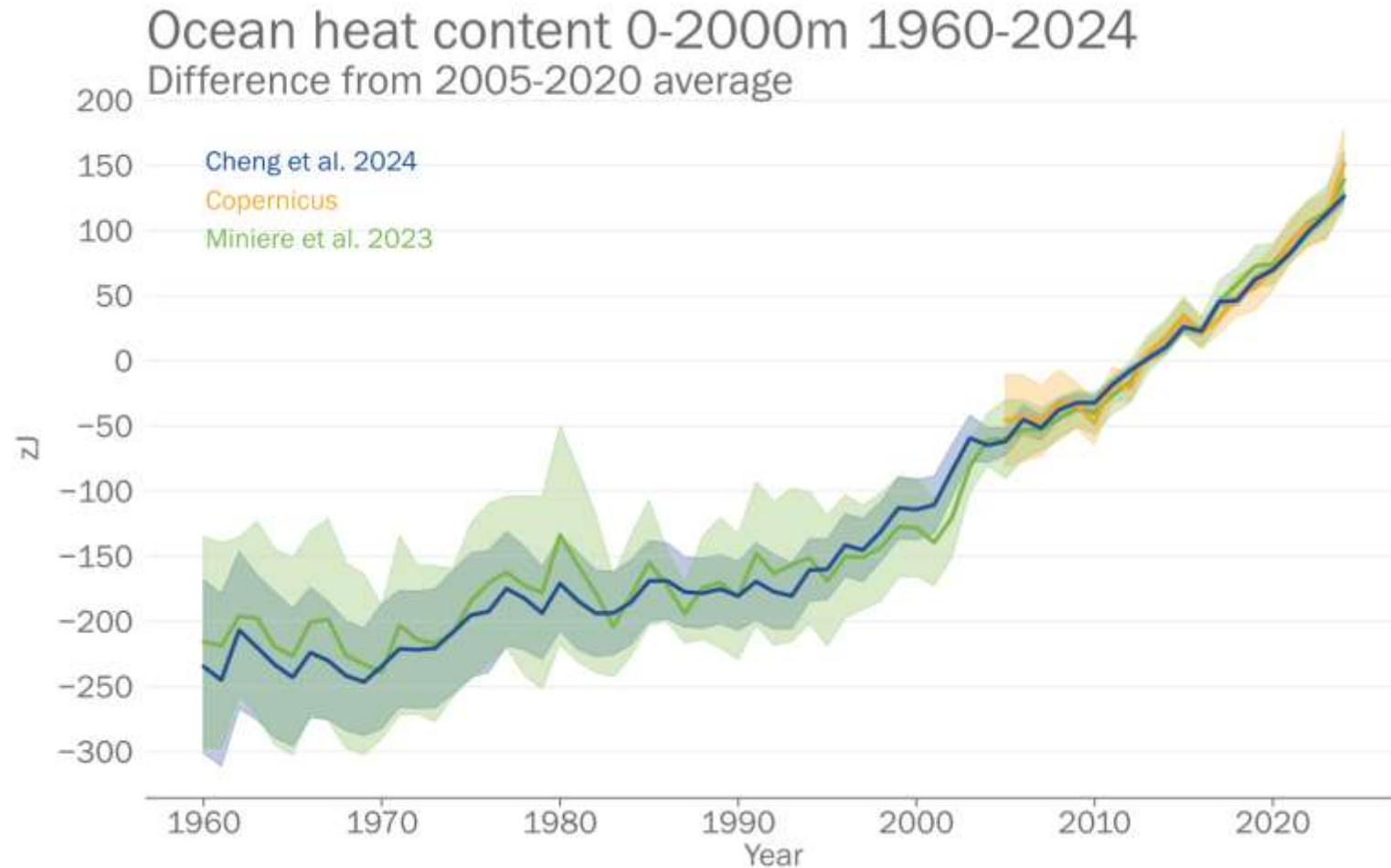
Carbon Dioxide (and other GHG)

- WDCGG operated by JMA,
<https://gaw.kishou.go.jp/>
- WMO Greenhouse Gas Bulletin – No. 20: The State of Greenhouse Gases in the Atmosphere Based on Global Observations through 2023. Geneva, 2024.



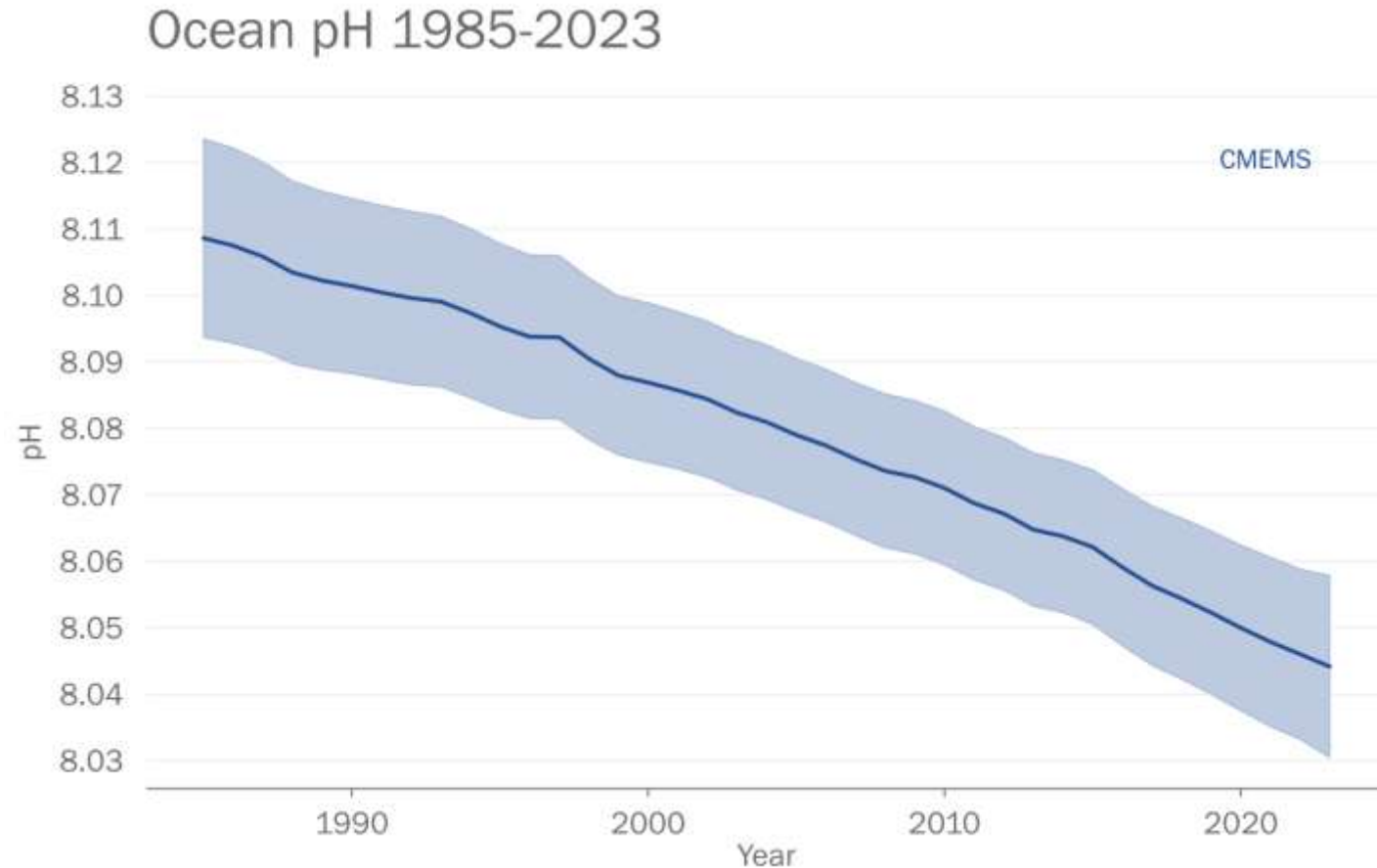
Ocean heat content

- In previous years used a “GCOS” dataset which aggregated ~16 datasets
- Minière replaces this and is based on 10 datasets (IAP, EN4, NOAA, JAMSTEC, ISAS, GDCSM, CSIO, SCRIPPS, IPRC, +1)
- Cheng et al. and Copernicus datasets are single datasets.



Ocean acidulation

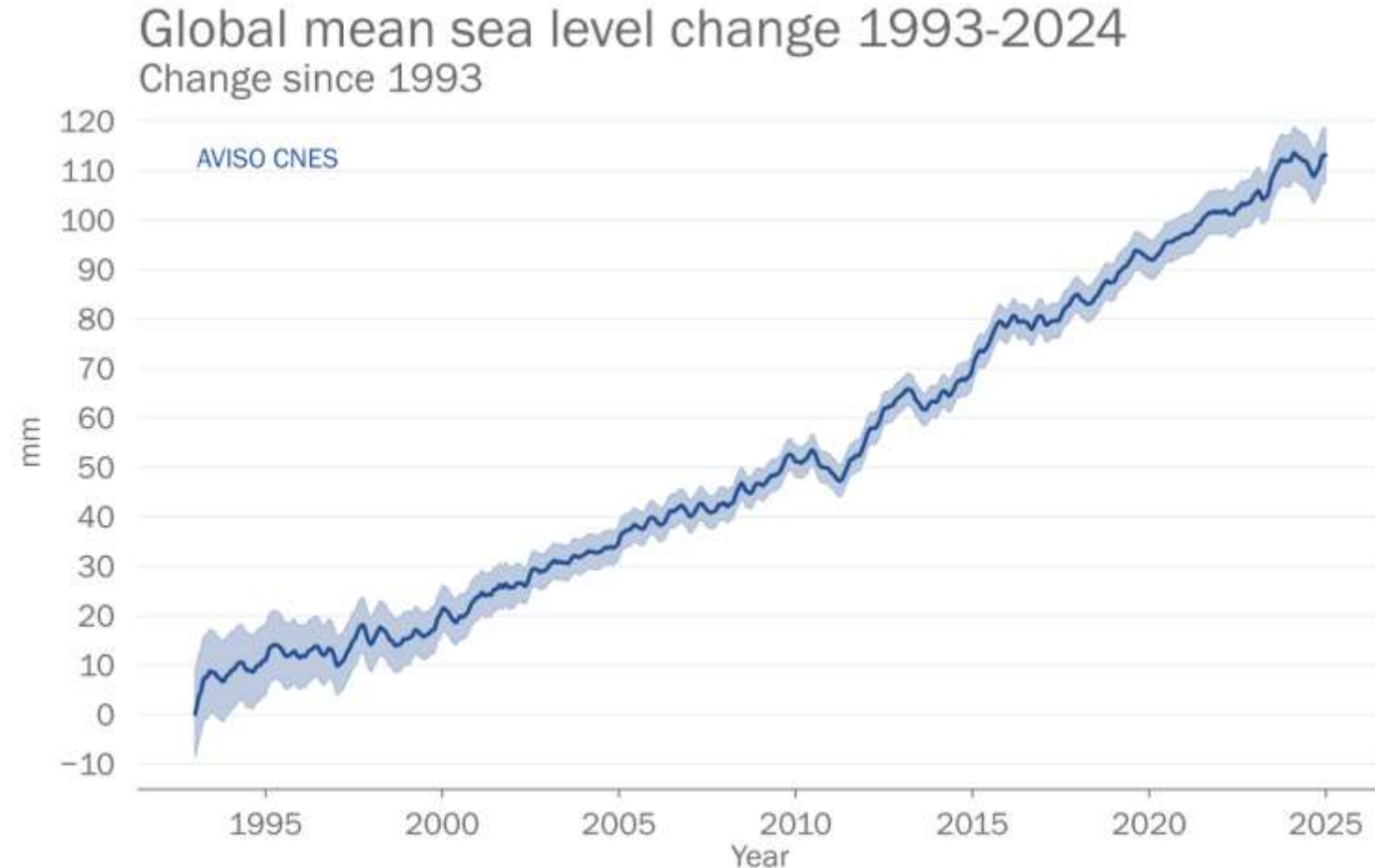
- This indicator is produced by the Copernicus Marine Service.
- Data
- <https://doi.org/10.48670/moi-00224>
- Papers
- <https://doi.org/10.5194/bg-19-1087-2022>
- <https://doi.org/10.1080/1755876X.2020.1785097>



1+ years in arrears due to unavailability of upstream data

Global mean sea level

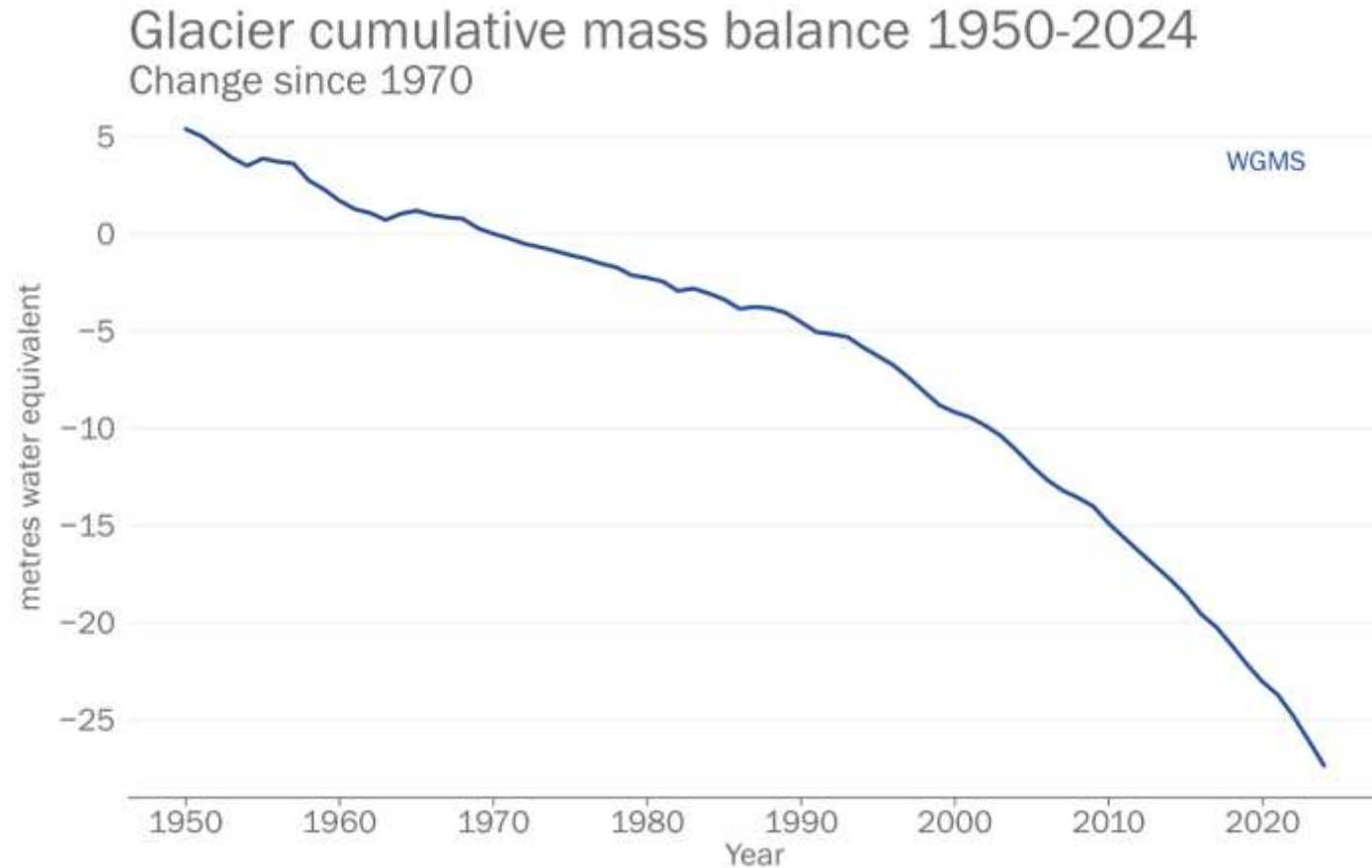
- GMSL from CNES/Aviso+,
- [Data access](#)
- Various corrections applied to the data



Alternative datasets exist e.g. NASA, tide gauge data

Glaciers

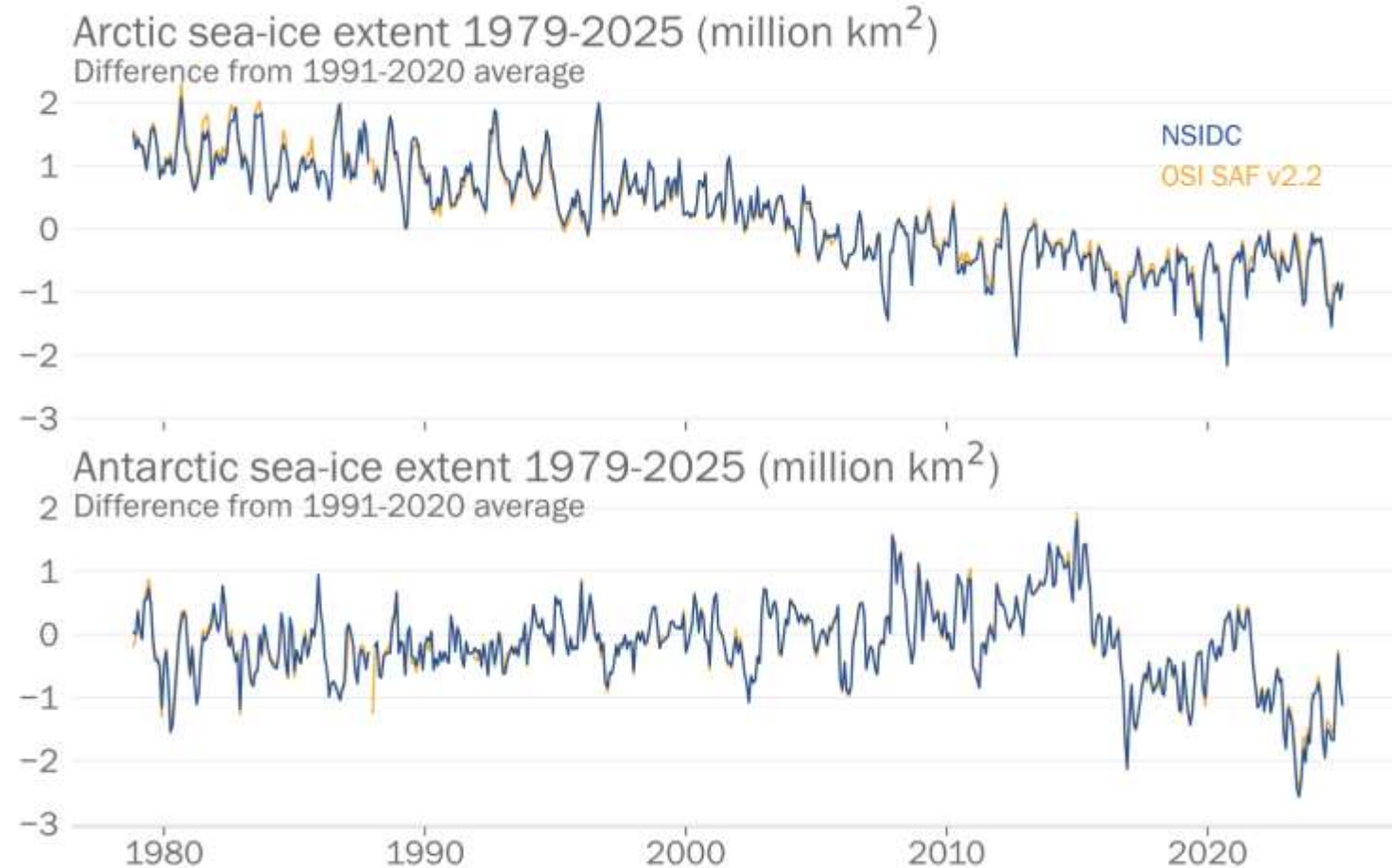
- WGMS
- <https://wgms.ch/global-glacier-state/>
- Data
- http://wgms.ch/data/faq/m_b_ref.csv
- Note that data link is not even https. Some browsers and computer security software treats this as suspicious and blocks access.



Alternative datasets exist

Sea ice extent

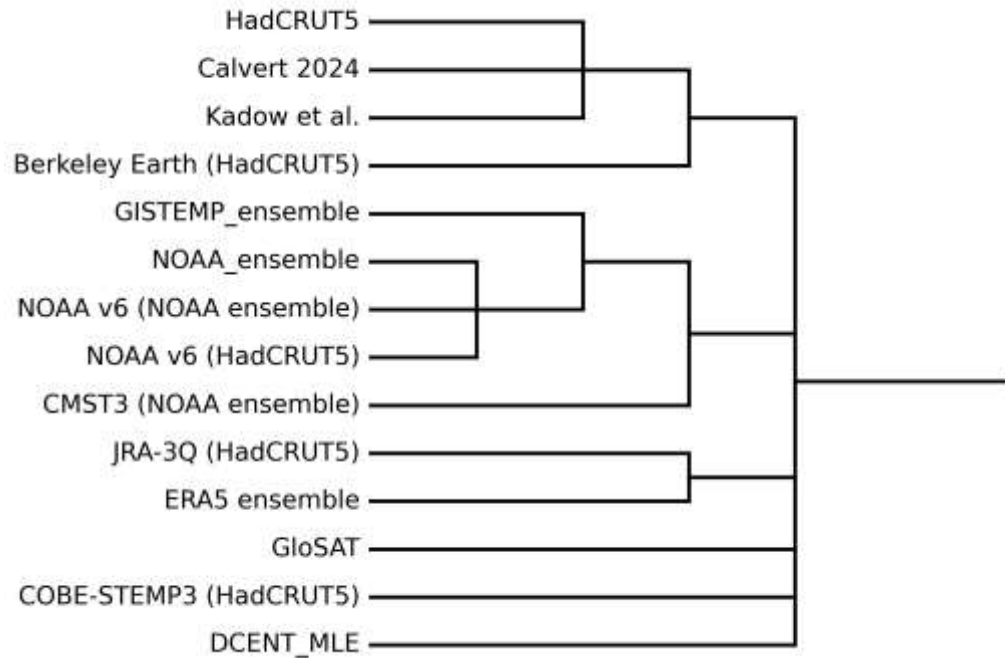
- Use NSIDC as a principal dataset and OSI-SAF for corroboration
- Actual sea ice extent is quite different between datasets, but anomalies are very similar.
- <https://nsidc.org/data/g02135/versions/3>
- <https://osisaf-hl.met.no/v2p2-sea-ice-index>



Alternative datasets exist

Thank you!
Спасибо

How to combine estimates of global temperature?



(a) Annual global mean temperatures, 1850-1900 baseline

