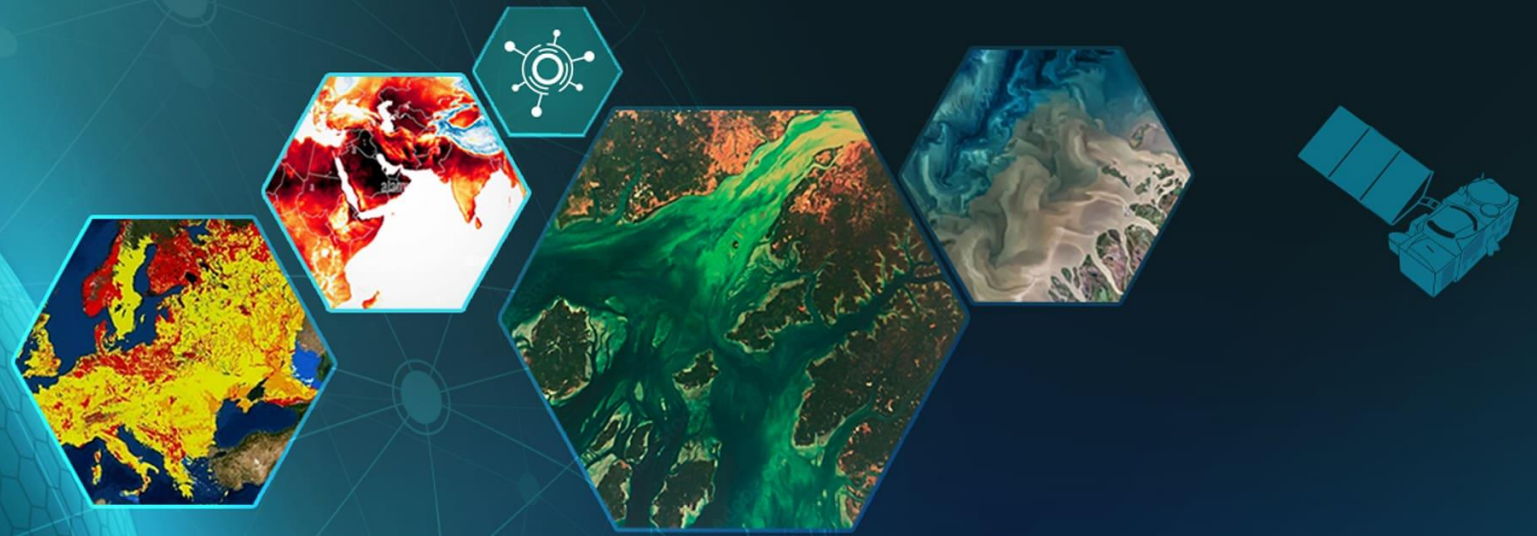


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Climate Extremes: Heatwaves, Changes in Ice, Drought, Floods

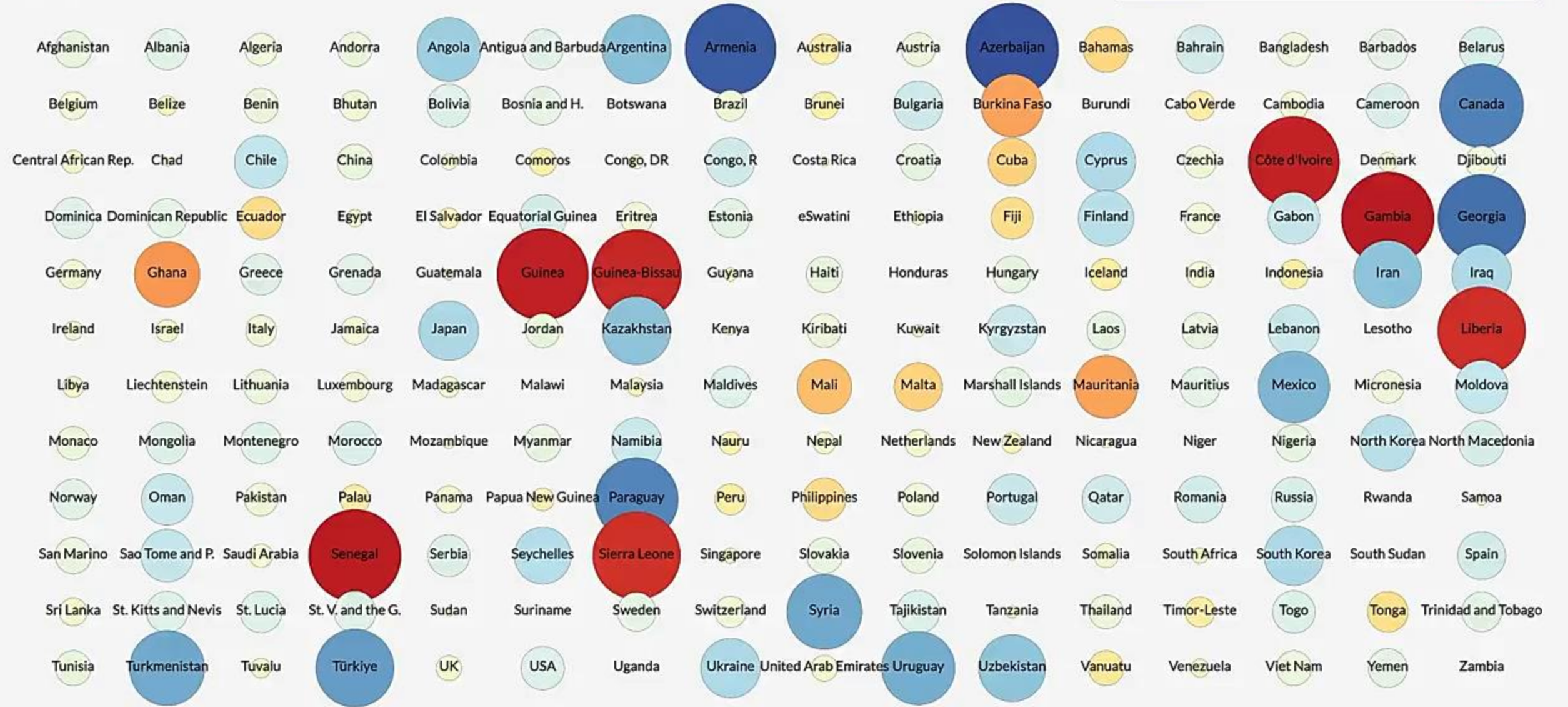
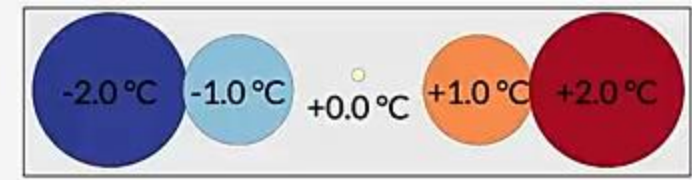
Air Temperature Anomalies in Arctic Regions

Antti Lipponen, Finnish Meteorological Institute

Temperature Change by Country

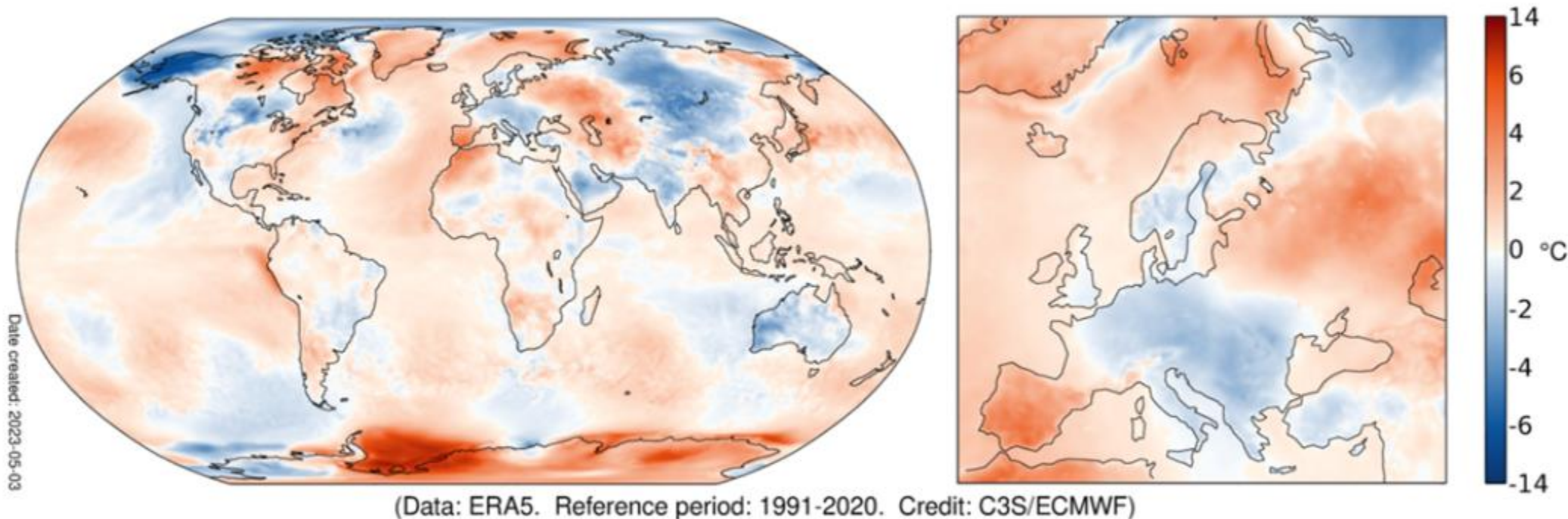
Years 1880 – 2022

1880



Data Source:
NASA GISS, GISTEMP Land-Ocean Temperature Index, ERSSTv5, 1200km smoothing
<https://data.giss.nasa.gov/gistemp/>
Average of monthly temperature anomalies. GISTEMP base period 1951–1980.

Surface air temperature anomaly for April 2023



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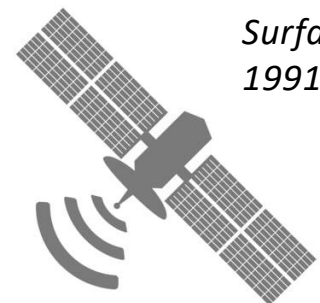
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Surface air temperature anomaly for April 2023 relative to the April average for the period 1991-2020. Data source: ERA5. Credit: Copernicus Climate Change Service/ECMWF.

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*“As an arctic country, Finland is particularly concerned about the fast-warming Arctic region. Everyone else should be concerned too: **if we lose the Arctic, we lose the globe.** In the Arctic, reducing black carbon and methane emissions is essential.”*

Sauli Niinistö, president of Finland

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communications earth & environment

ARTICLE

<https://doi.org/10.1038/s43247-022-00498-3>

OPEN

The Arctic has warmed nearly four times faster than the globe since 1979

Mika Rantanen ^{1✉}, Alexey Yu. Karpechko¹, Antti Lipponen ², Kalle Nordling^{1,3}, Otto Hyvärinen¹,
Kimmo Ruosteenoja¹, Timo Vihma ¹ & Ari Laaksonen^{1,4}

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What would I need for a map of Arctic?

- Good data source, preferably near-real-time, open data!
- Easy, repeatable workflow for monthly updates

A temperature map of the Arctic + time series graphic



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```
ARCTIC anomalies - ERA5 T... Console History Your queue Runtime profile <
Layout Copy Save Run
1 import cdstoolbox as ct
2
3 month = 4
4 year = 2023
5
6 @ct.application(title='ERA5 2m temperature anomalies')
7 @ct.output.download()
8 def application():
9     variable = '2m_temperature'
10    data = ct.catalogue.retrieve(
11        'reanalysis-era5-single-levels-monthly-means',
12        {
13            'product_type': 'monthly_averaged_reanalysis',
14            'variable': variable,
15            'year': ['{:d}'.format(ii) for ii in range(1940, year + 1)],
16            'month': ['{:02d}'.format(month)],
17            'time': '00:00',
18        }
19    )
20    data_month_anomalies = ct.climate.anomaly(
21        data,
22        interval=['1951', '1980']
23    )
24    return data_month_anomalies
```

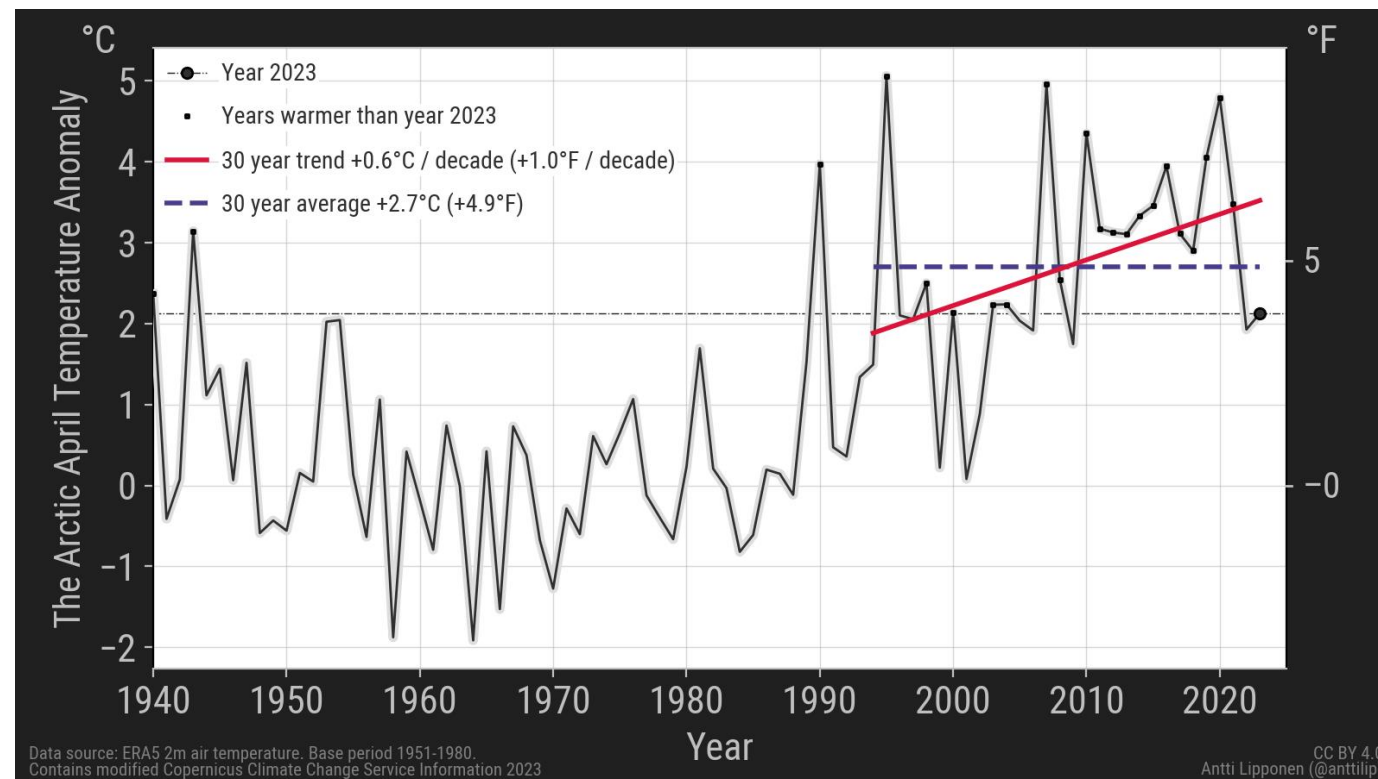
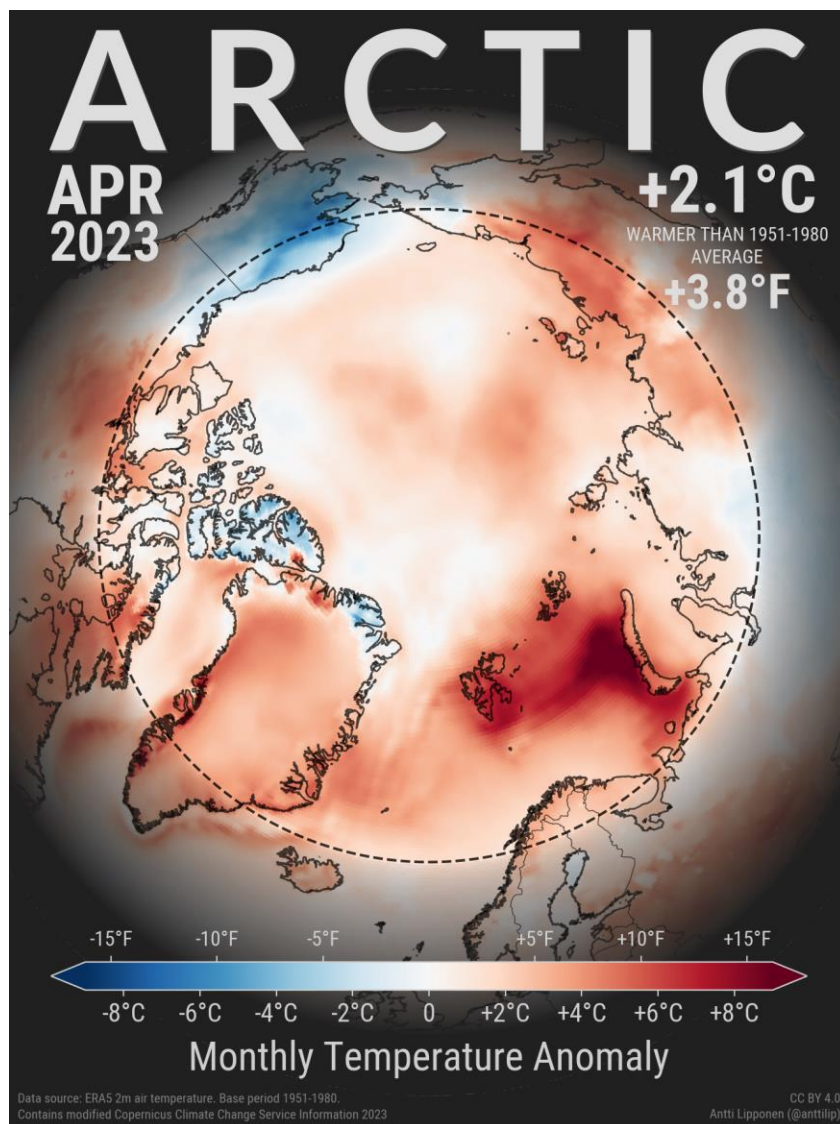
ERA5 data

Copernicus Climate Data
Store Toolbox

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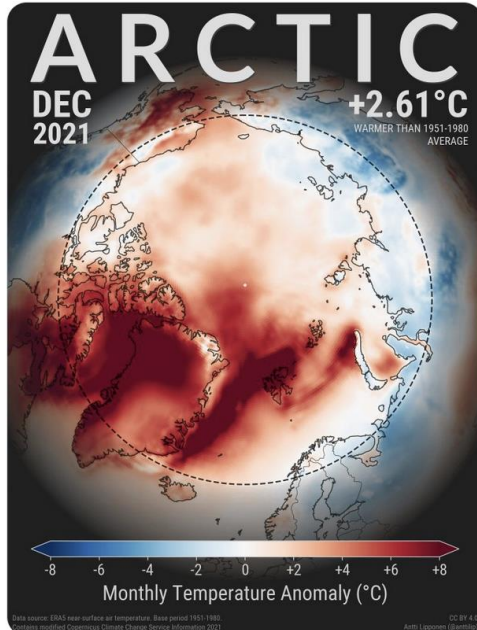


Antti Lipponen @anttilip · Jan 6, 2022

In December 2021, the #Arctic was +2.61°C warmer than the average December of 1951-1980.

Data source: Copernicus Climate Change Service @CopernicusECMWF

#climate #climatechange



73 880 1,477

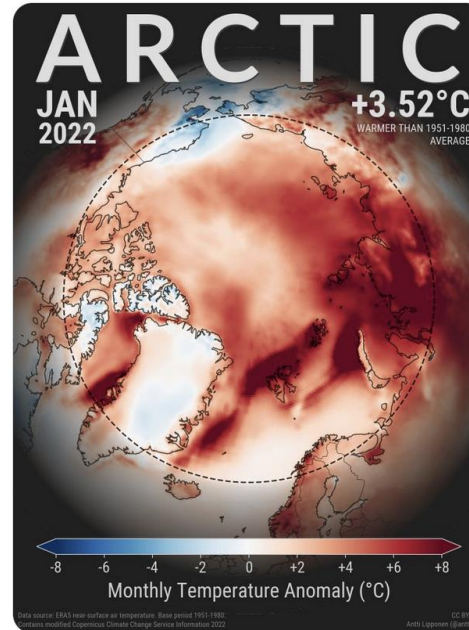


Antti Lipponen @anttilip · Feb 6, 2022

In January 2022, the #Arctic was +3.52°C warmer than the average January of 1951-1980.

Data source: Copernicus Climate Change Service @CopernicusECMWF

#climate #climatechange



106 1,519 2,336

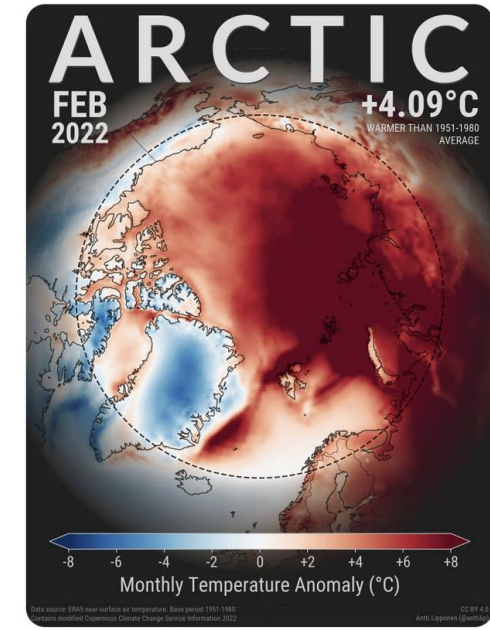


Antti Lipponen @anttilip · Mar 6, 2022

In February 2022, the #Arctic was +4.09°C warmer than the average February of 1951-1980.

Data source: Copernicus Climate Change Service @CopernicusECMWF

#climate #climatechange



48 1,254 1,552

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What I like about Copernicus data

- Easy data access (especially climate & atmosphere data store + online toolbox), this has improved a lot over the last years! **Thank you!**
- Open data
- Trustworthy, widely used
- Wide variety of variables available
- Available when needed! (only a short delay)



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Thank you for your attention!

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@anttilip



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