

# COPERNICUS EARTH OBSERVATION

## DATA VISUALISATION WORKSHOP SERIES



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EUROPEAN UNION



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## Climate and Weather

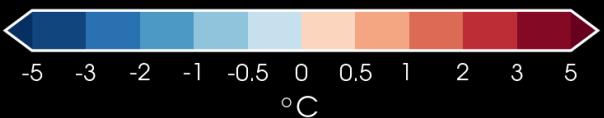
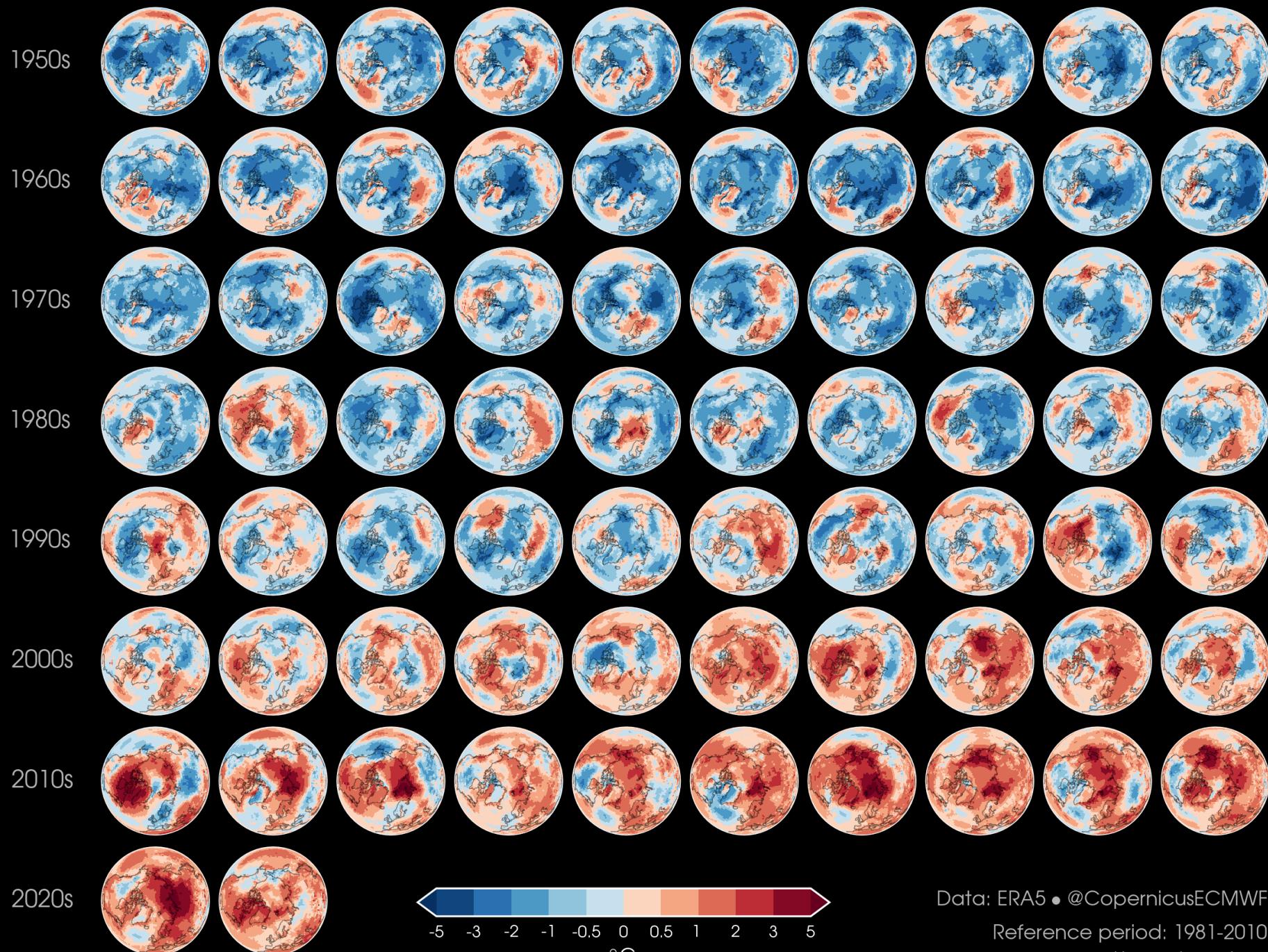
### Communicating climate data – a perspective

Dr Samantha Burgess, Deputy Director - Copernicus Climate Change Service

# Communicating climate change is a challenge

- Intent (Consider your audience)
  - Create compelling narratives (storytelling)
  - Start conversations
  - Collaborate
  - Credit
- 
- Simplify (as much as possible)
  - Test (on as many people as possible)
  - Animate (where it can help tell a story)

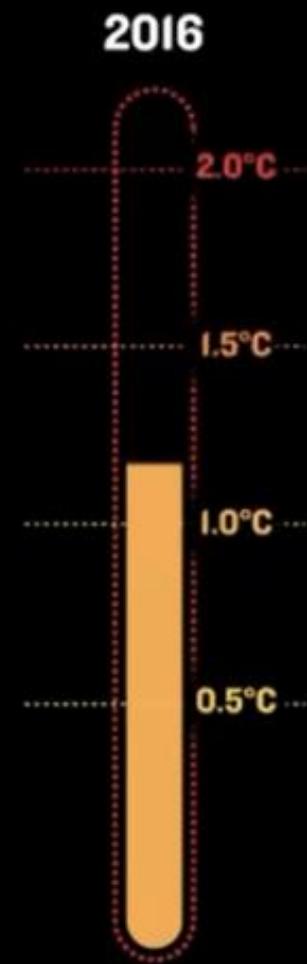
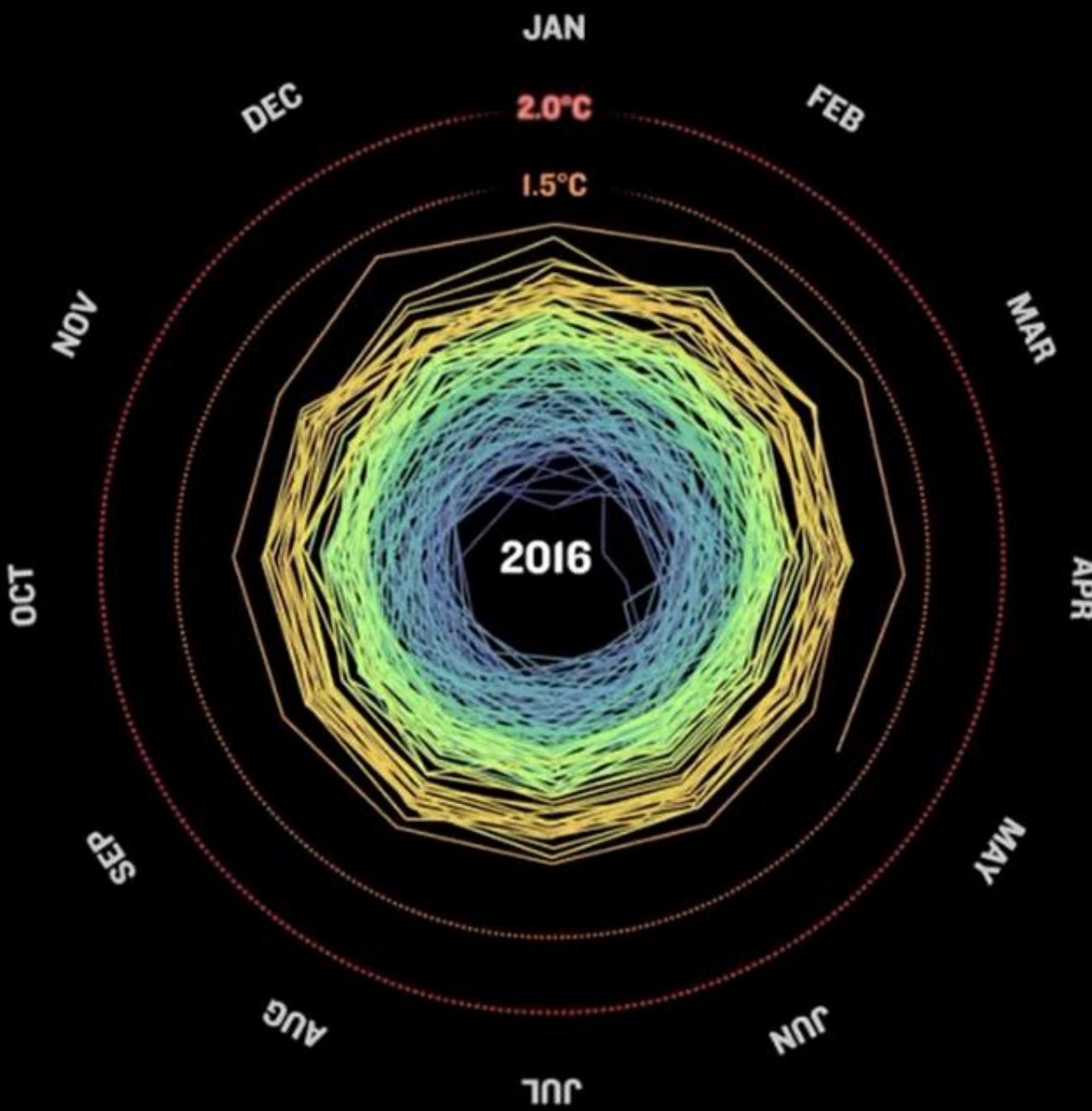


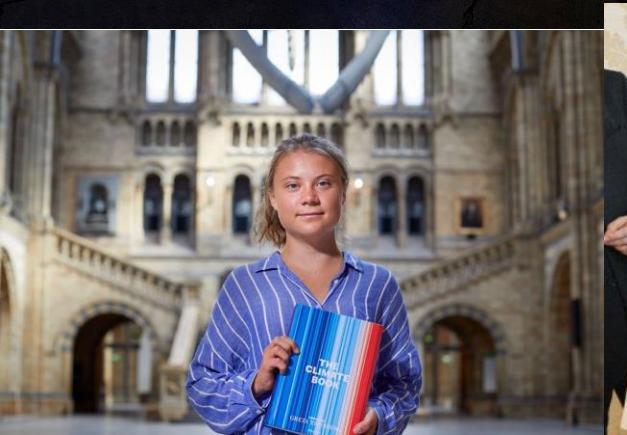


Data: ERA5 • @CopernicusECMWF

Reference period: 1981-2010

Inspired by @Ed\_Hawkins





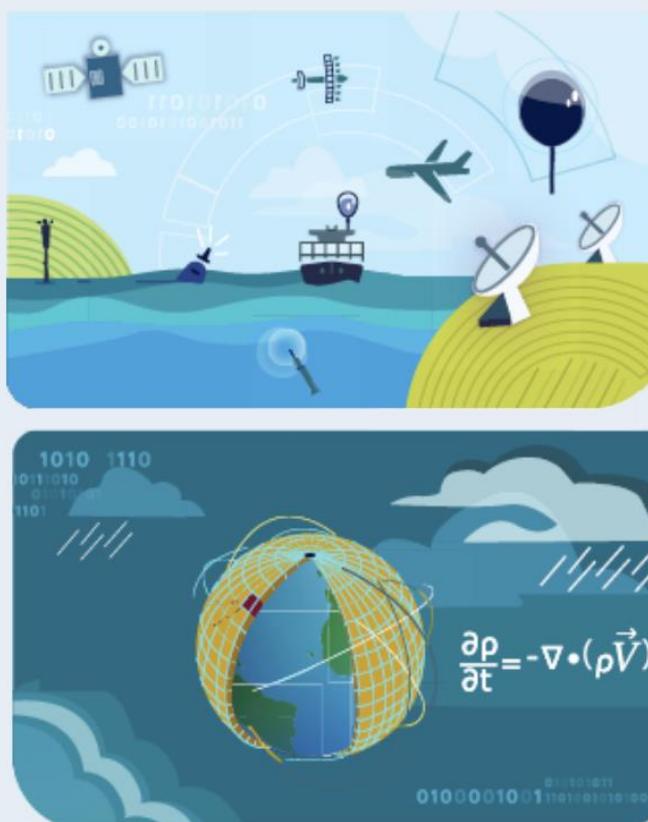


Climate  
Change

# Copernicus Climate Change Service

DATA

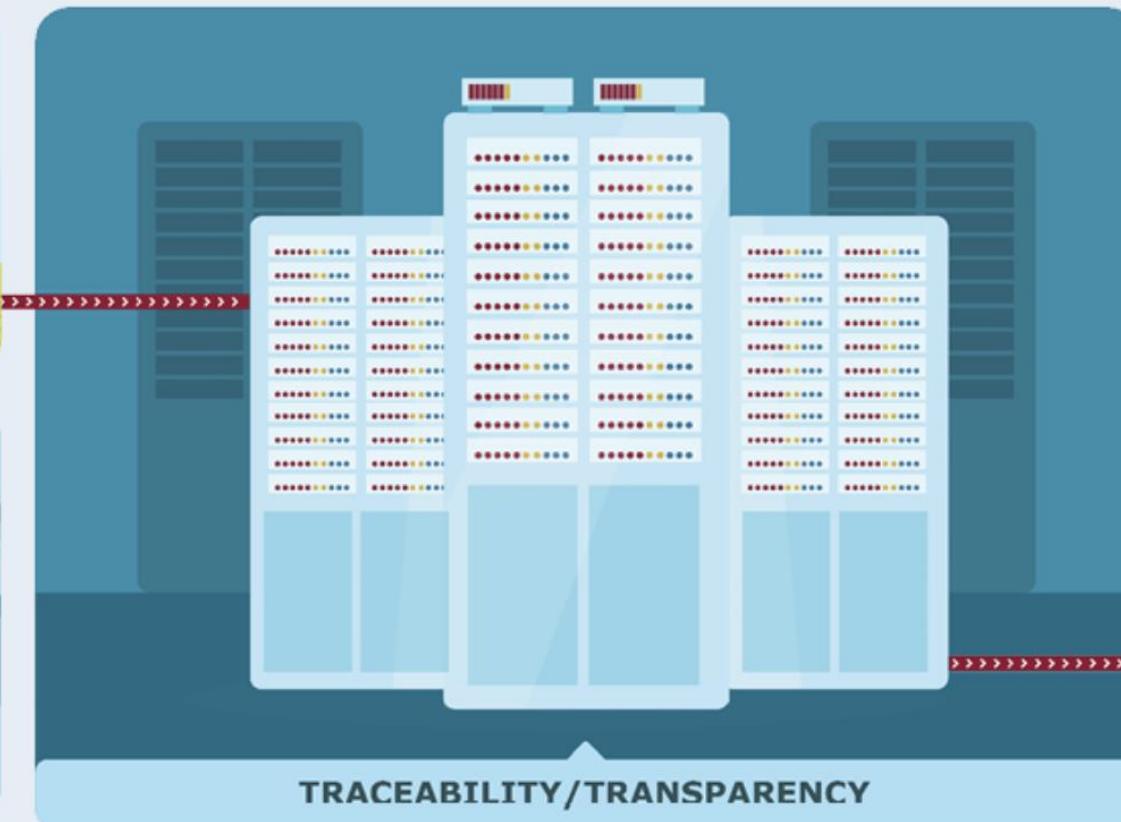
OBSERVATIONS AND MODELS



PETABYTES

CLIMATE DATA STORE

SIMPLIFICATION/STANDARDISATION



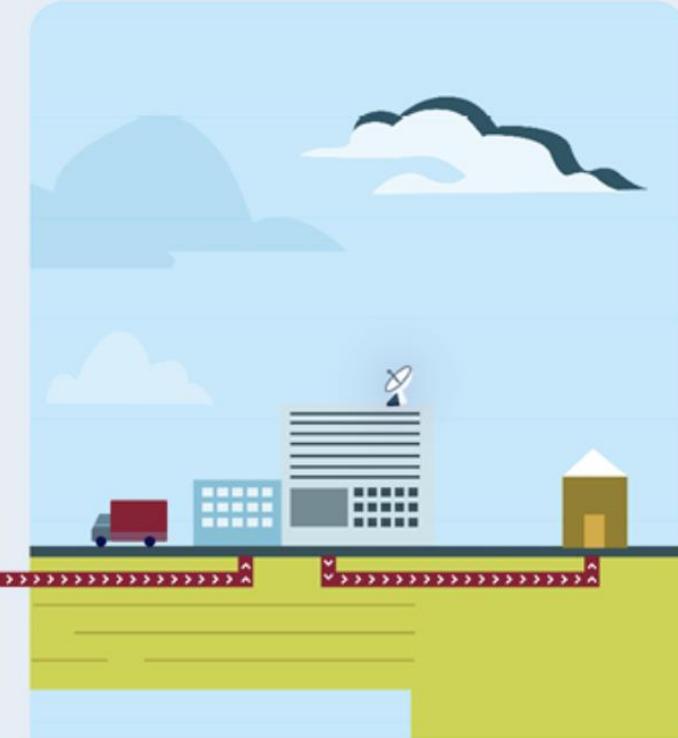
TRACEABILITY/TRANSPARENCY

INFORMATION

LEGISLATORS (EU)

BUSINESSES

CITIZENS



KILOBYTES

## CRYOSPHERE



Available now

- Satellite ECVs
- ECVs from reanalysis
- Ambition

## SURFACE ATMOSPHERE



## SURFACE OCEAN PHYSICS



## SUBSURFACE OCEAN PHYSICS



## OCEAN BIOLOGY / ECOSYSTEMS



## OCEAN BIOGEOCHEMISTRY



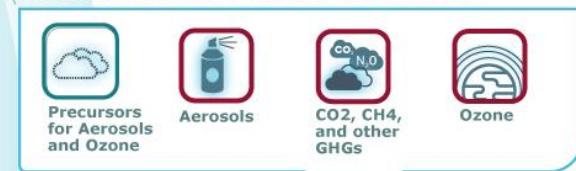
## ICE



## UPPER-AIR ATMOSPHERE



## ATMOSPHERIC COMPOSITION



## HYDROSPHERE



## ANTHROPOSPHERE



## BIOSPHERE



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**ECMWF**



# EUROPEAN STATE OF THE CLIMATE

2022

European State of the Climate Report



# Climate Indicators



Climate Indicators show the long-term evolution of several key variables which are used to assess the global and regional trends of a changing climate. They are updated at least once a year, for the publication of the [European State of the Climate](#).

## Global Temperature

↑ **1.2** °C above pre-industrial level  
[More](#)

## European Temperature

↑ **2.2** °C above pre-industrial level  
[More](#)

## Arctic Temperature

↑ **3** °C above pre-industrial level  
[More](#)

## Carbon Dioxide (CO<sub>2</sub>)

↑ **417** ppm, annual average level  
[More](#)

## Carbon Dioxide (CO<sub>2</sub>) Increase

↑ **2.4** ppm per year, since 2010  
[More](#)

## Methane (CH<sub>4</sub>)

↑ **1894** ppb, annual average level  
[More](#)



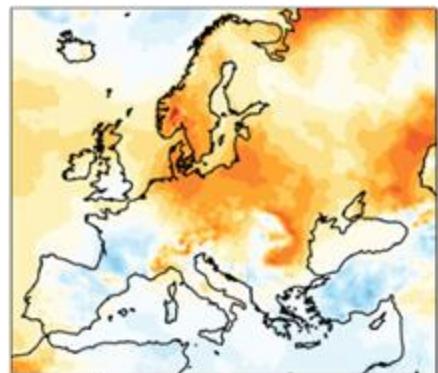
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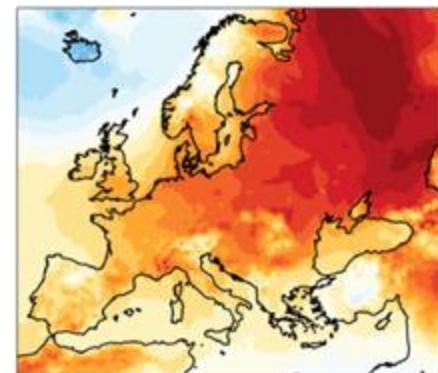
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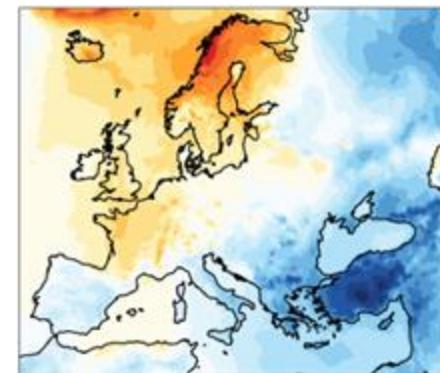
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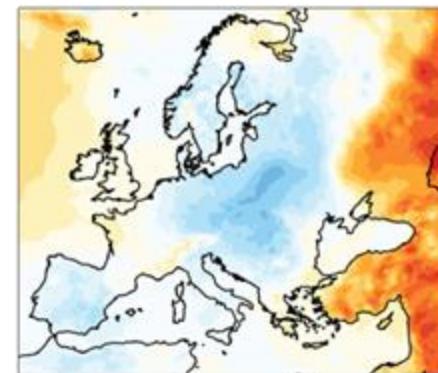
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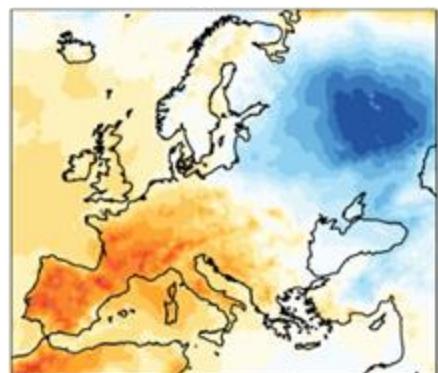
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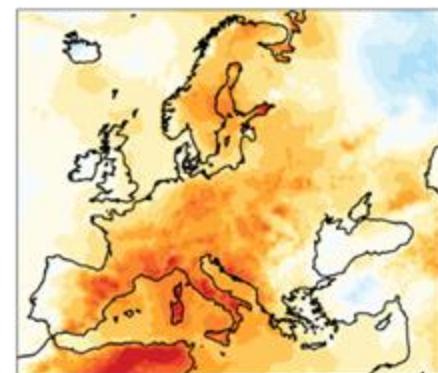
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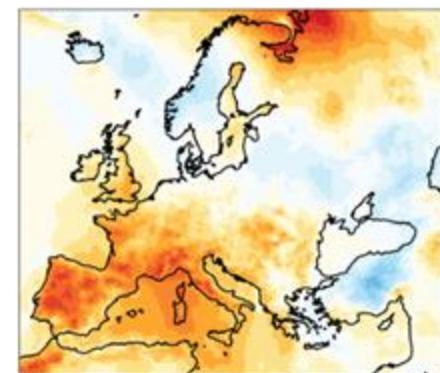
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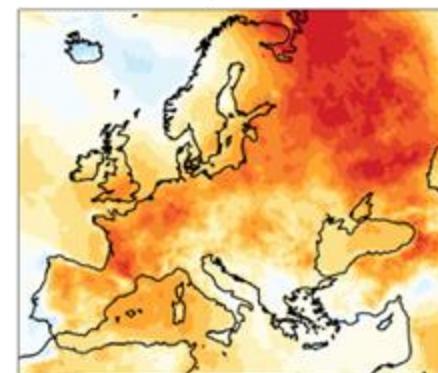
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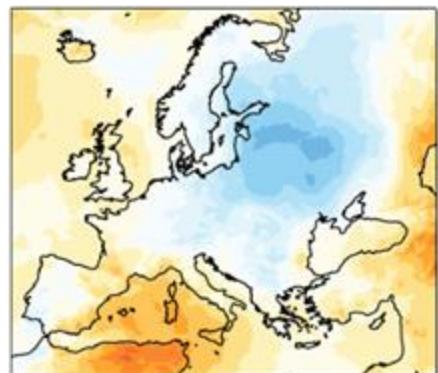
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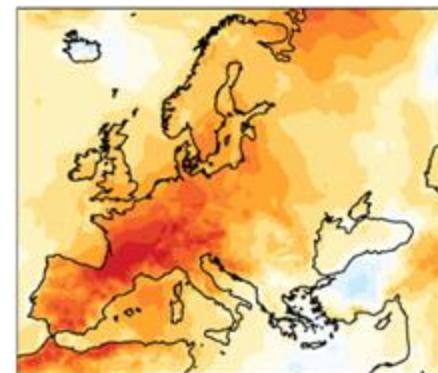
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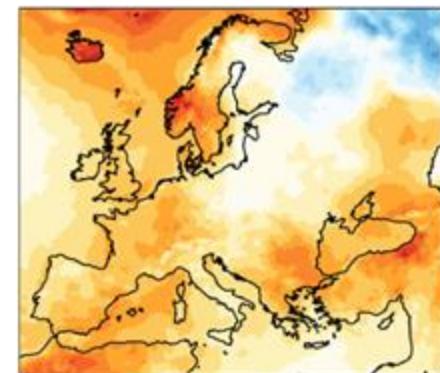
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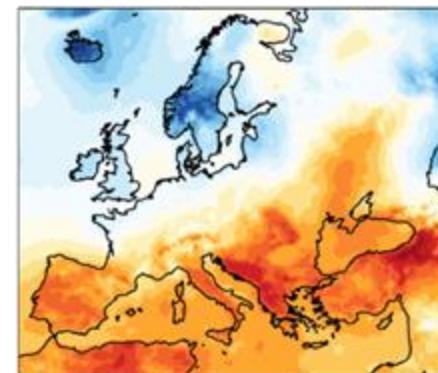
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Nov 2022



Dec 2022

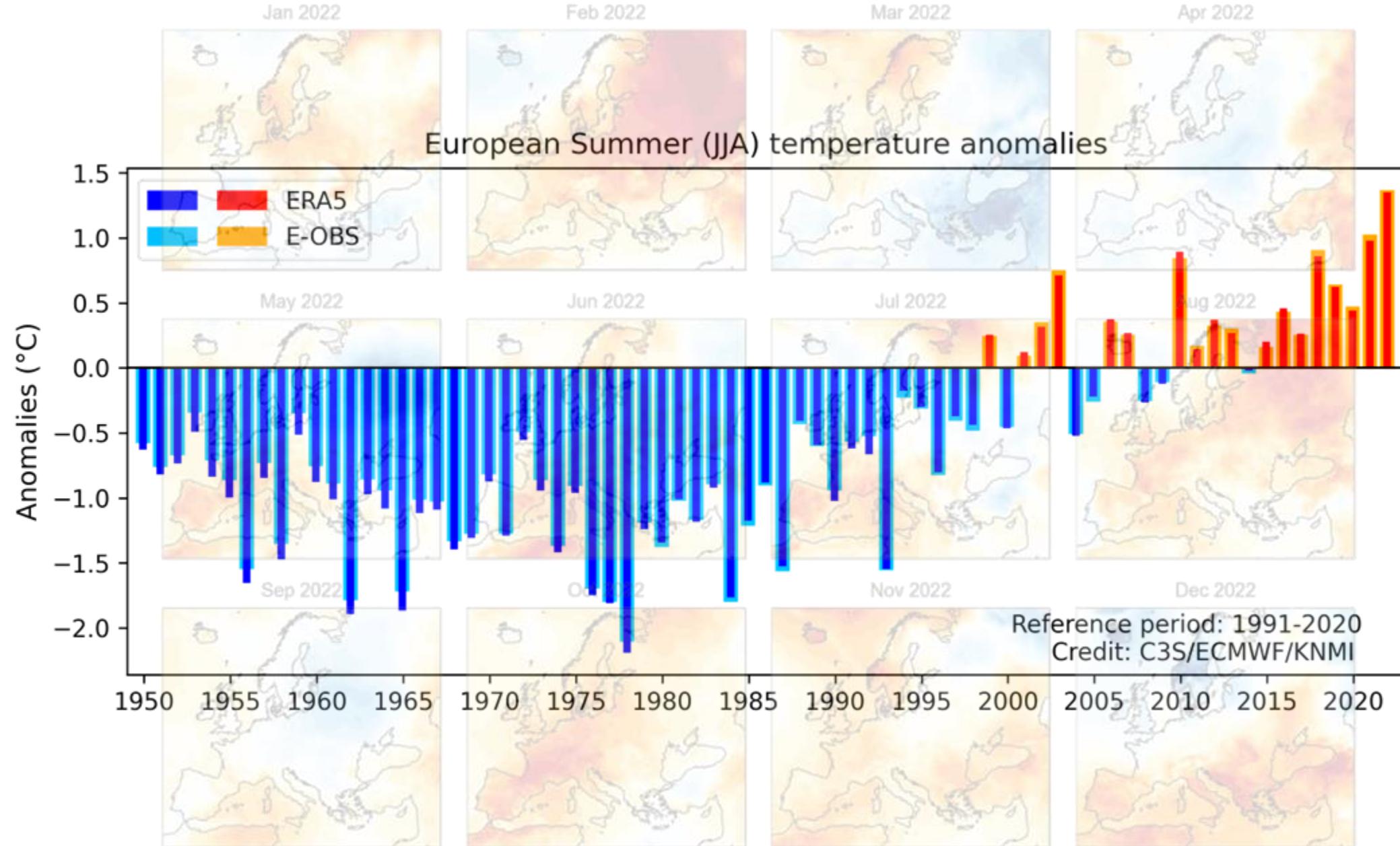


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# EUROPEAN STATE OF THE CLIMATE

## KEY EVENTS 2022

### RECORDS

- > Warmest summer on record
- > Record loss of glacier ice from European Alps
- > Record sunshine duration
- > 2<sup>nd</sup> lowest river flow on record
- > 2<sup>nd</sup> largest wildfire burnt area on record



### KEY EVENTS



#### Drought

Spring through summer across much of Europe



#### Heatwaves

MAY: Southwestern Europe  
SUMMER: Affecting much of Europe  
SEPTEMBER: Greenland



#### Marine Heatwave

MAY ONWARDS: The western Mediterranean Sea



#### Wildfires

JULY, AUGUST: Czechia, France, Portugal, Slovenia, Spain, UK



#### Storms

FEBRUARY: 3 storms in 1 week



#### Heavy Rainfall and Flooding

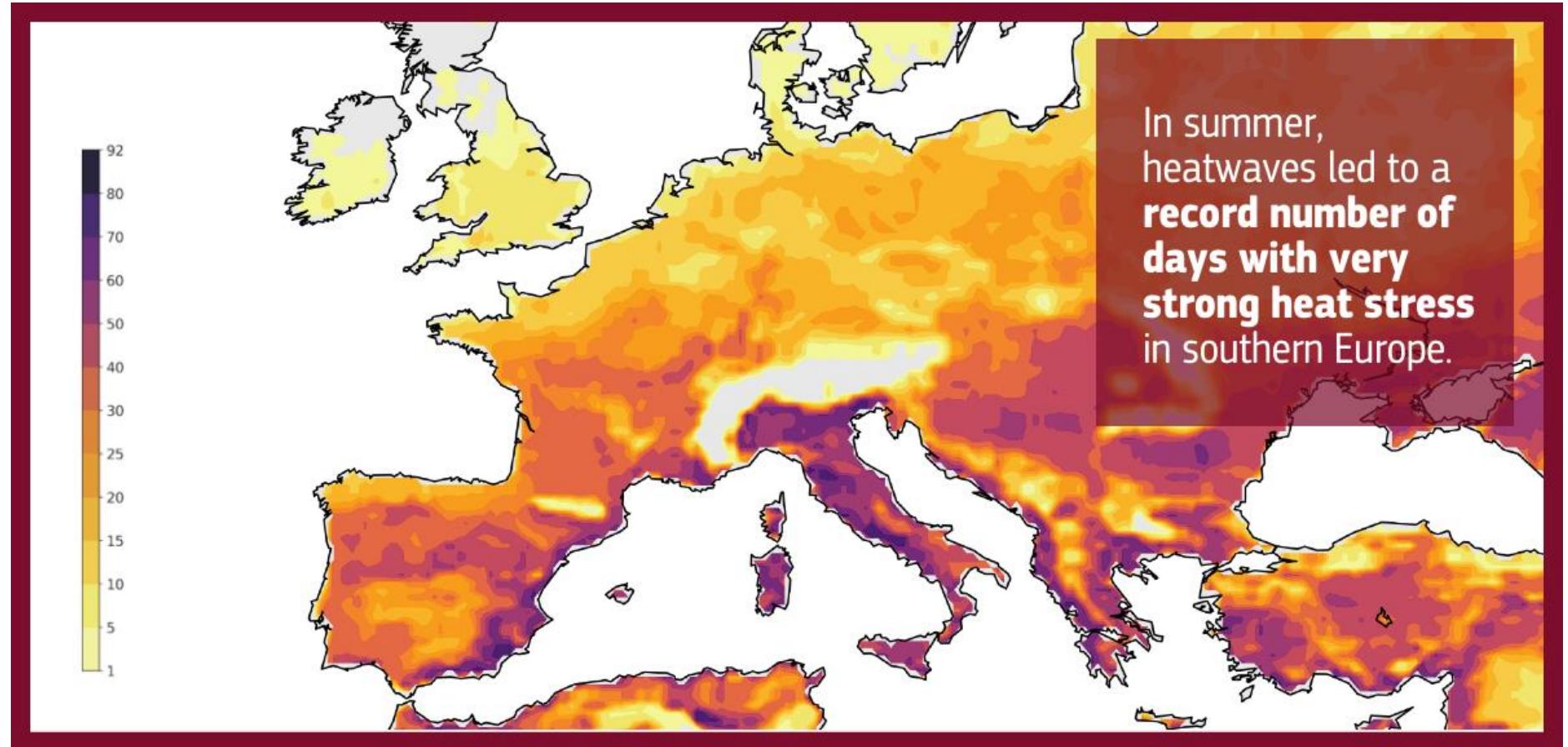
SEPTEMBER: Bulgaria, Croatia, Italy, Portugal, Slovenia, Spain



#### Coldwave

DECEMBER: Northern Europe

## Extreme Heat in 2022



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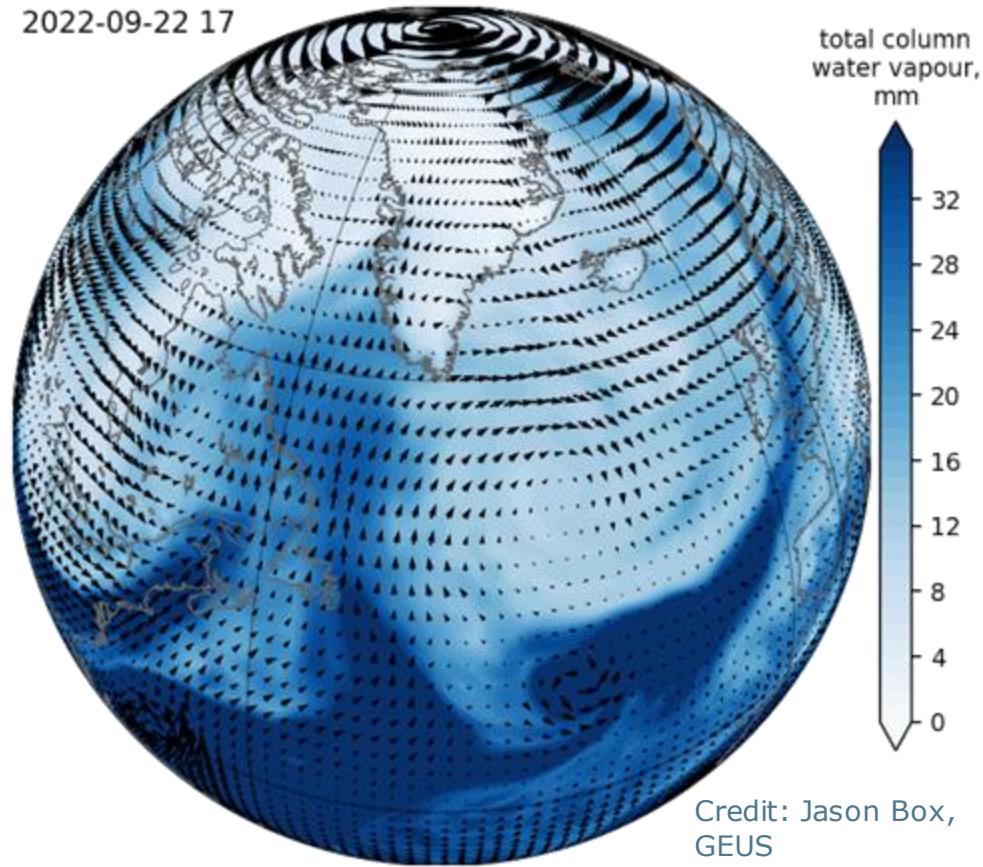


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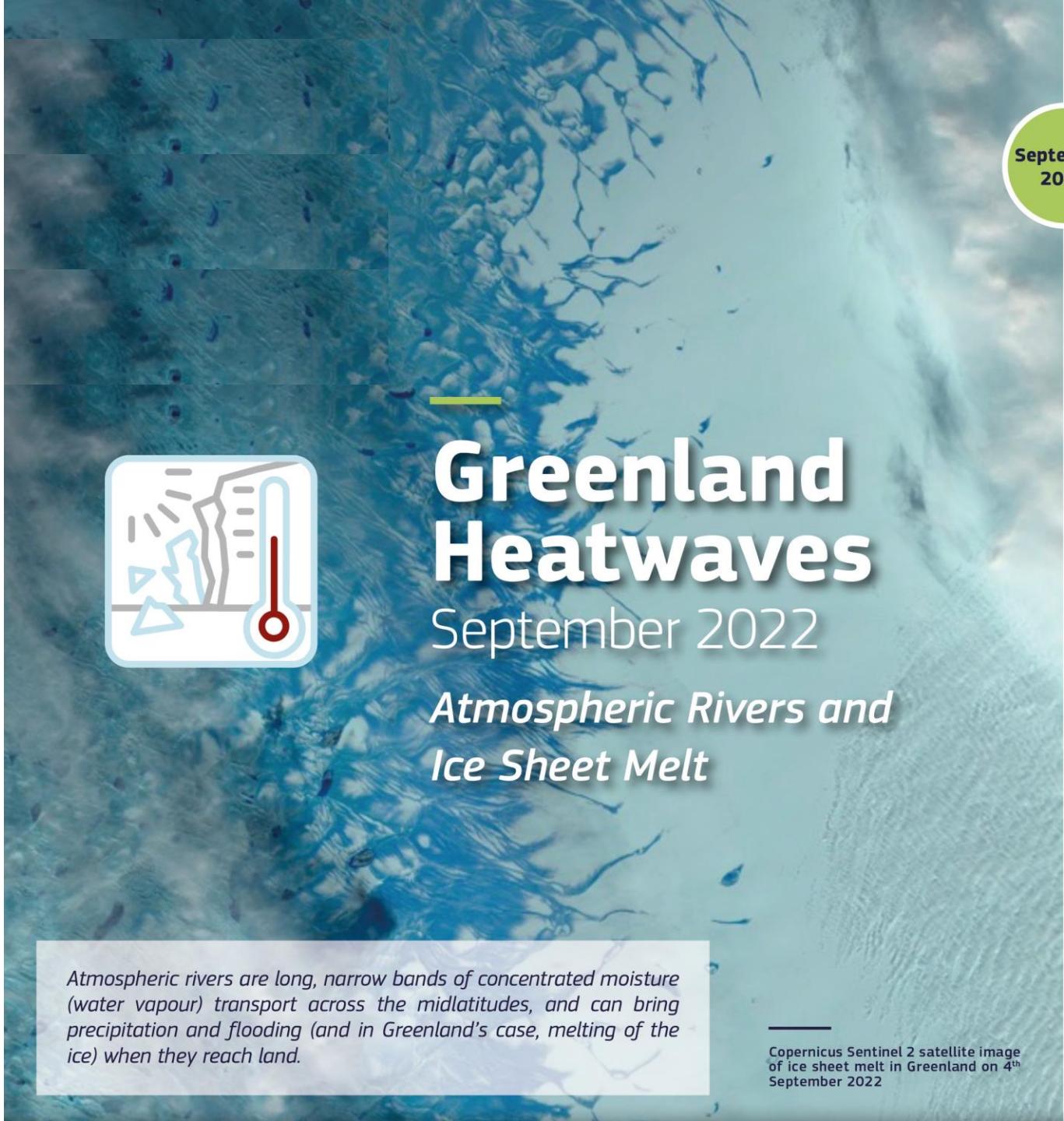




2022-09-22 17



September  
2022



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Copernicus Sentinel 2 satellite image  
of ice sheet melt in Greenland on 4<sup>th</sup>  
September 2022

# LOSS OF ICE SHEET GREENLAND AND ANTARCTICA

more than  
**11 000 km<sup>3</sup>\***  
SINCE THE 1970s



## Ice sheets

Since the 1970s, loss of ice from the Greenland and Antarctic ice sheets has caused sea level to rise by almost 3 cm. The combined rate of ice loss has more than tripled since the 1980s, from 120 km<sup>3</sup> per year in the 1980s, to around 460 km<sup>3</sup> per year in the 2010s.

### Ice sheet loss

#### Greenland

**5850 km<sup>3</sup> ±575**  
between 1972 and 2021



#### Antarctica

**5372 km<sup>3</sup> ±1046**  
between 1979 and 2021

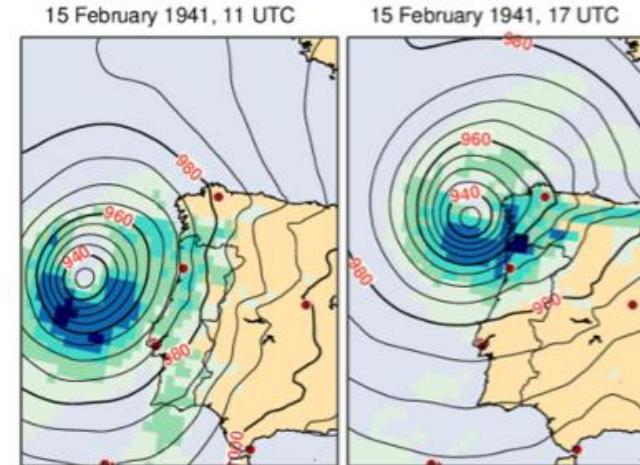
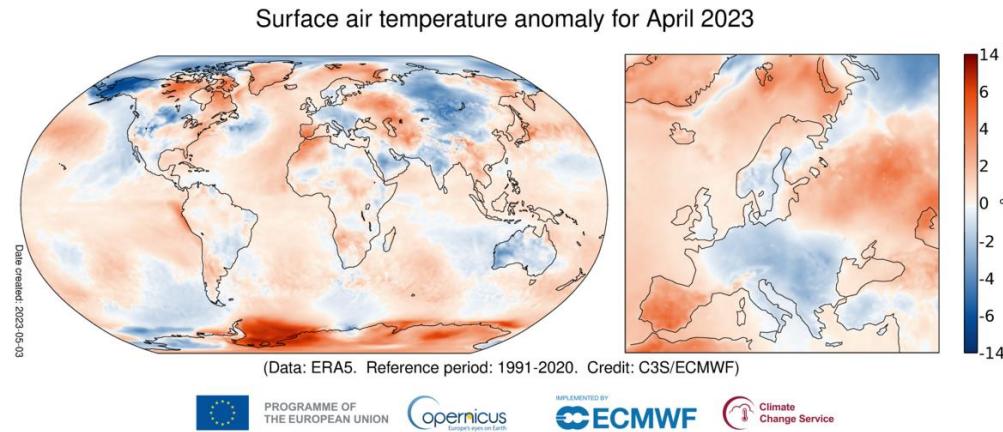


### Satellite data

\*Equivalent to a volume of ice as large as the white circle and with a depth of 1 metre.

# C3S Global reanalysis: ERA5

## ERA5: A full-observing-system global reanalysis for the atmosphere, land and ocean waves



- Most popular dataset in the CDS
- Maps without gaps
- Available from **1940 onwards**
- Near real time

<https://doi.org/10.1002/qj.3803>

## What is reanalysis used for ?

- To obtain an accurate three-dimensional synoptic-scale situation (i.e. the “weather of the day”)
- To compare the current situation with a consistent 30-year climate of the past
- To estimate the variability of the mean state and obtain statistics for the climate-related extremes
- To provide initialization, boundary conditions and drive impact models
- To train ML weather prediction models



Image @NASA | Apollo



Image ECMWF @Philippe Lopez

# Thank you

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[climate.copernicus.eu](http://climate.copernicus.eu)  
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