

Heatwaves, droughts and weather volatility: How climate extremes are reshaping Central European energy markets

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Austrian Energy Day 2026

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- 
- Introduction
 - Look back at summer 2026
 - The El Nino explained...
 - Climate change decadal scale forecasting
 - Climate change impacts on European energy markets

- Degree in Meteorology and Physics, Reading University
- Meteorologist British Antarctic Survey
- Meteorological Equipment Sales, BIRAL
- Meteorologist, TV weather presenter and Technical Sales, The Weather Channel, WSI, The Weather Company
- Solutions Engineer and Climate Risk specialist, IBM
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British Antarctic Survey



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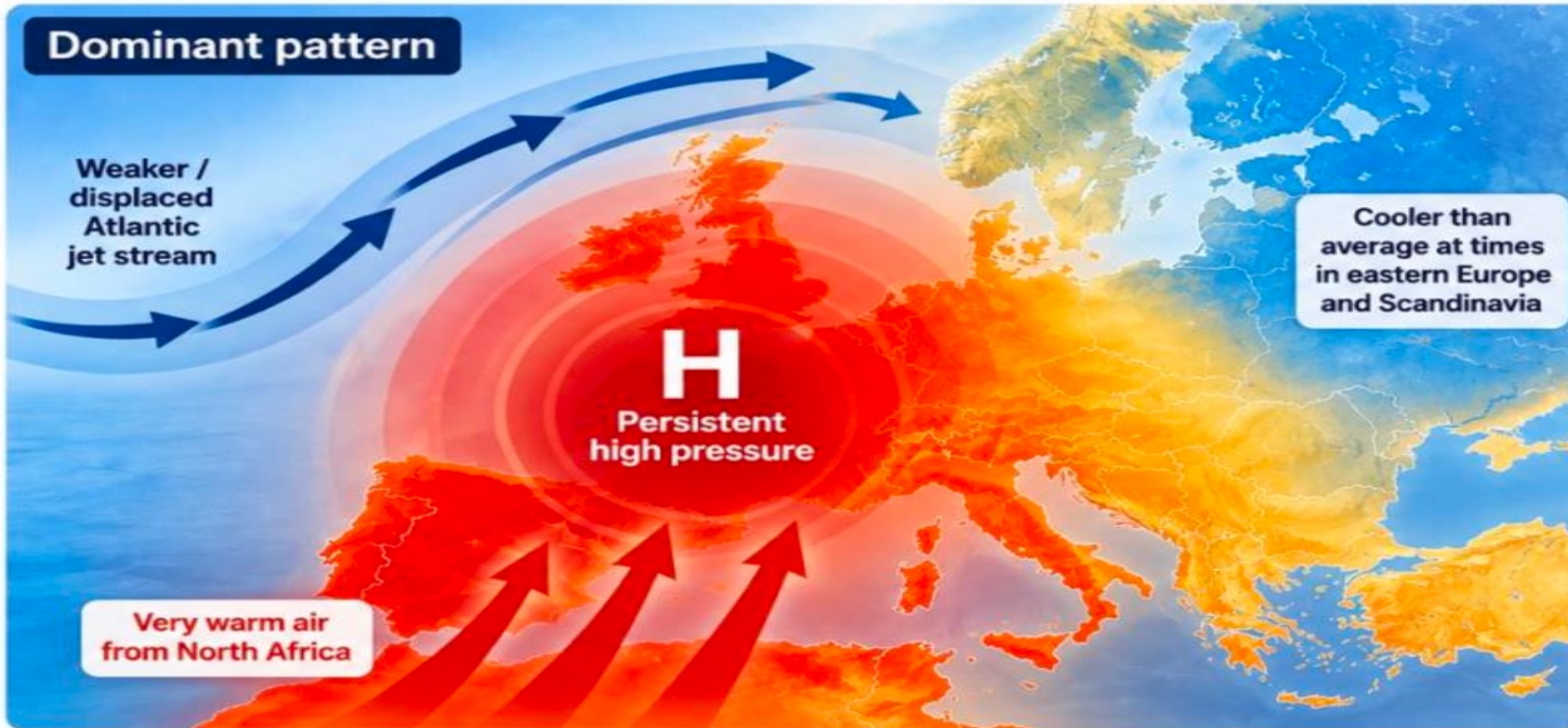
SUMMER 2026 - HEATWAVES AND DROUGHT



Europe's dominant summer weather pattern – Summer 2026

Persistent high pressure, repeated heatwaves and widespread dryness

Dominant pattern



Key features



Persistent high pressure

Recurrent blocking / "heat-dome" conditions slow Atlantic weather systems.



Repeated southerly heat

Hot air drawn north from Iberia and North Africa, bringing multiple heatwaves.



Weaker Atlantic influence

A displaced / weaker jet stream allows high pressure to re-establish after brief interruptions.



Increasing soil dryness

Low rainfall has dried soils, reinforcing heat as more energy heats the surface.



Very warm surrounding seas

Exceptionally warm Atlantic and Mediterranean waters, with widespread marine heatwaves.

Main impacts



Frequent and intense heatwaves

Successive surges of extreme heat across western Europe.



Increased wildfire risk

Hundreds of wildfires across Spain, France, Portugal and other countries.



Worsening drought

Drought conditions have intensified across many regions.



Stress on crops, people and infrastructure

Impacts on agriculture, water supplies, health and transport.

The big picture

Summer 2026 has been shaped by persistent European blocking, reduced Atlantic influence and recurrent surges of southerly heat — making extreme heat easier to develop and sustain, especially in western Europe.



Another clear example of how a warming climate is increasing the frequency and severity of European heat extremes.

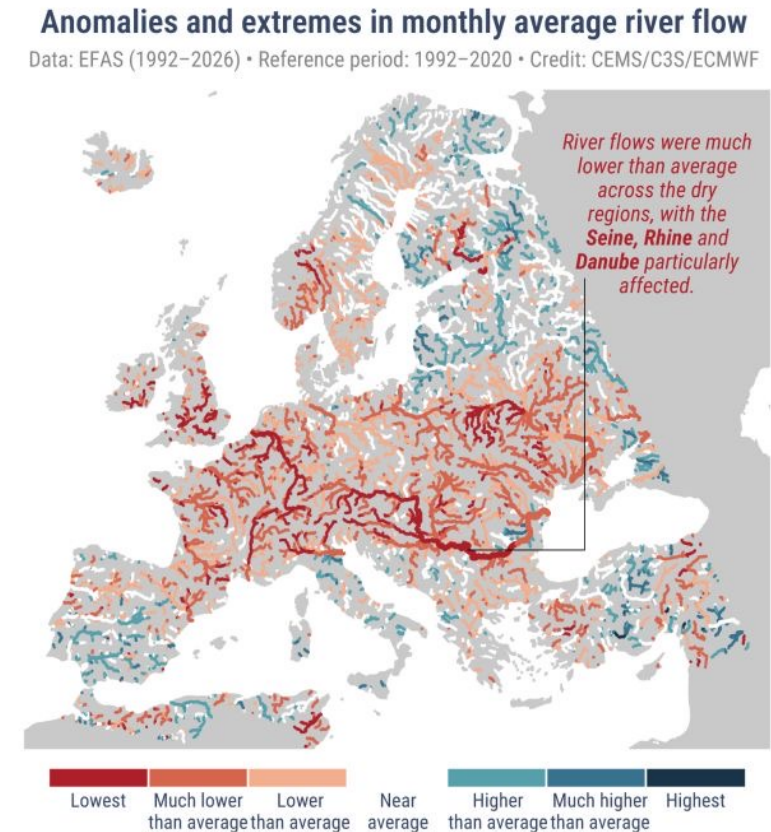
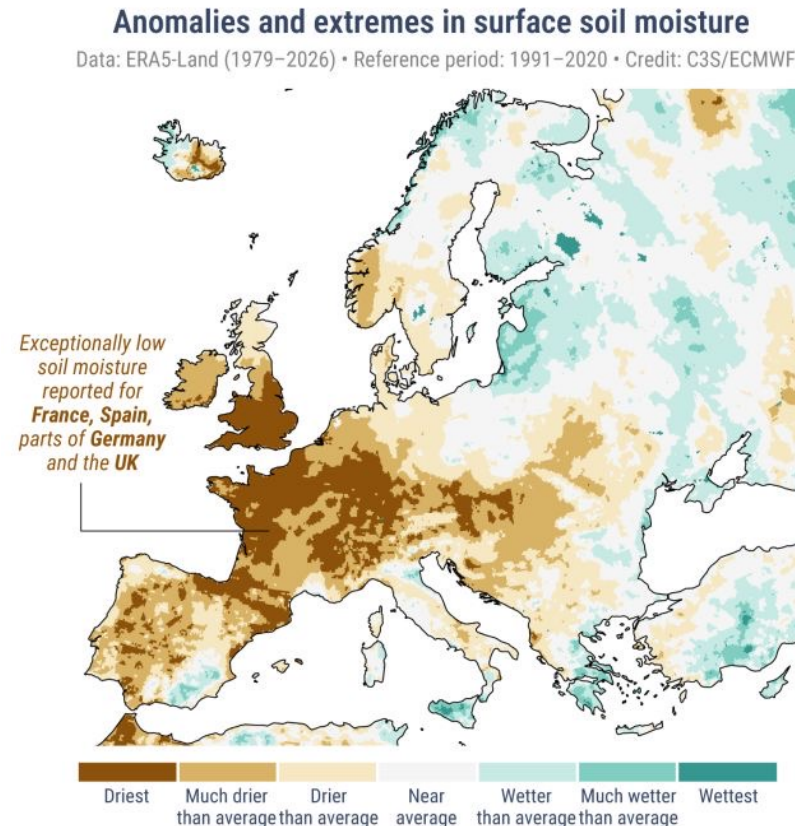
• Droughts

Droughts widely through UK, France, Iberia and Central Europe – not so much far NE and SE of Europe. No rain at all in south UK for 62 days – driest July in 190 years of records

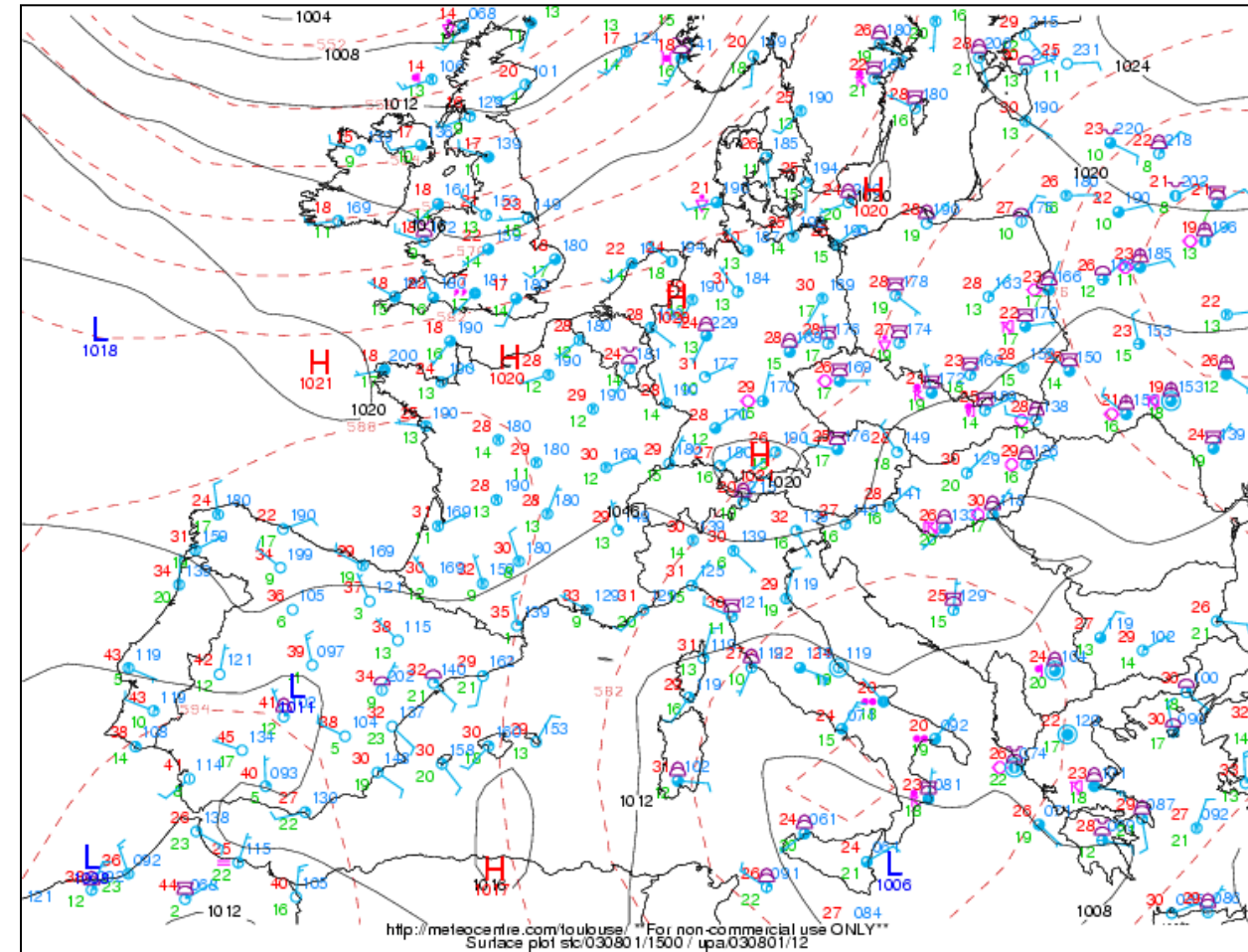
• River Flows

Record low flows reported in Rhine and Danube rivers with huge impacts on Hydro production – 51% of normal for Austria in July. 12.7TWh lower than normal in Central Europe.

Exceptionally dry soils and low river flow across parts of Europe in July 2026



- Heatwaves and droughts in Europe are increasing in frequency and intensity with Climate change.
- Even the 'cool' UK has seen the number of >30°C days treble in the period 2015-2025 vs 1960-1990 – **40** such days in 2026, smashing the previous record
- Vienna experienced a record-breaking summer where the number of Hitzetage exceeding 30°C reached an all-time high of **45 to 48 days**, surpassing the previous record set in 2024
- A 'heat dome' develops under anticyclonic conditions – first over Iberia and then across Northern Europe as in 2003, 2006 and 2022/24/26 heatwaves
- Drier weather in the preceding months is a precursor to highest temperatures – dry ground heats up faster



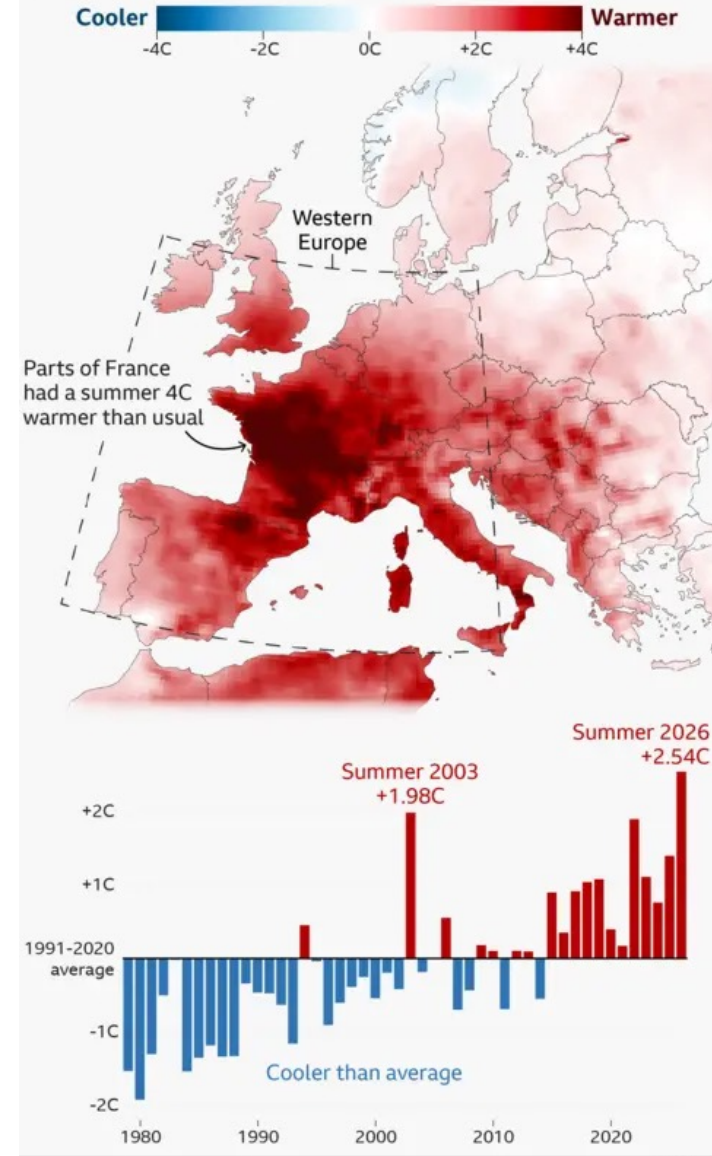
- **Hottest Summer ever...**

According to Copernicus, Many countries $>2^{\circ}\text{C}$ above normal – parts of France $>4^{\circ}\text{C}$ above

- **New normal....?**

...no! Temperatures will likely continue to rise over coming decades – UKMO suggest 2026 will be one of the cooler summers of the next 50 years...

Hottest summer on record in western Europe
Air temperature for June-August 2026, compared with 1991-2020 summer average

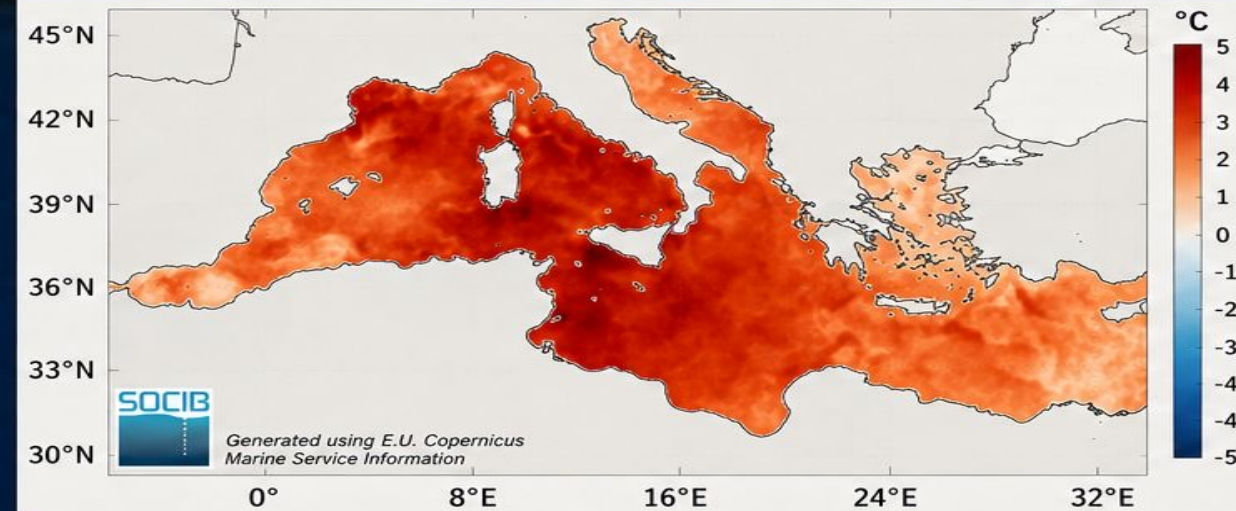


Source: ERA5, C3S/ECMWF

HISTORIC MEDITERRANEAN HEAT HEADING INTO FALL

Exceptionally warm SSTs to provide thermal inertia and fuel fall storms

SEA SURFACE TEMPERATURE ANOMALY (°C) – 2026-08-26



DAILY SEA SURFACE TEMPERATURE IN MEDITERRANEAN SEA (°C)



WHY A WARM MEDITERRANEAN MATTERS INTO FALL



STRONG THERMAL INERTIA

Summer heat stored in the sea persists well into fall, keeping waters unusually warm for longer.



MORE MOISTURE & FUEL

Warmer seas increase evaporation and supply more heat and moisture to the atmosphere.



ENHANCED STORM RISK

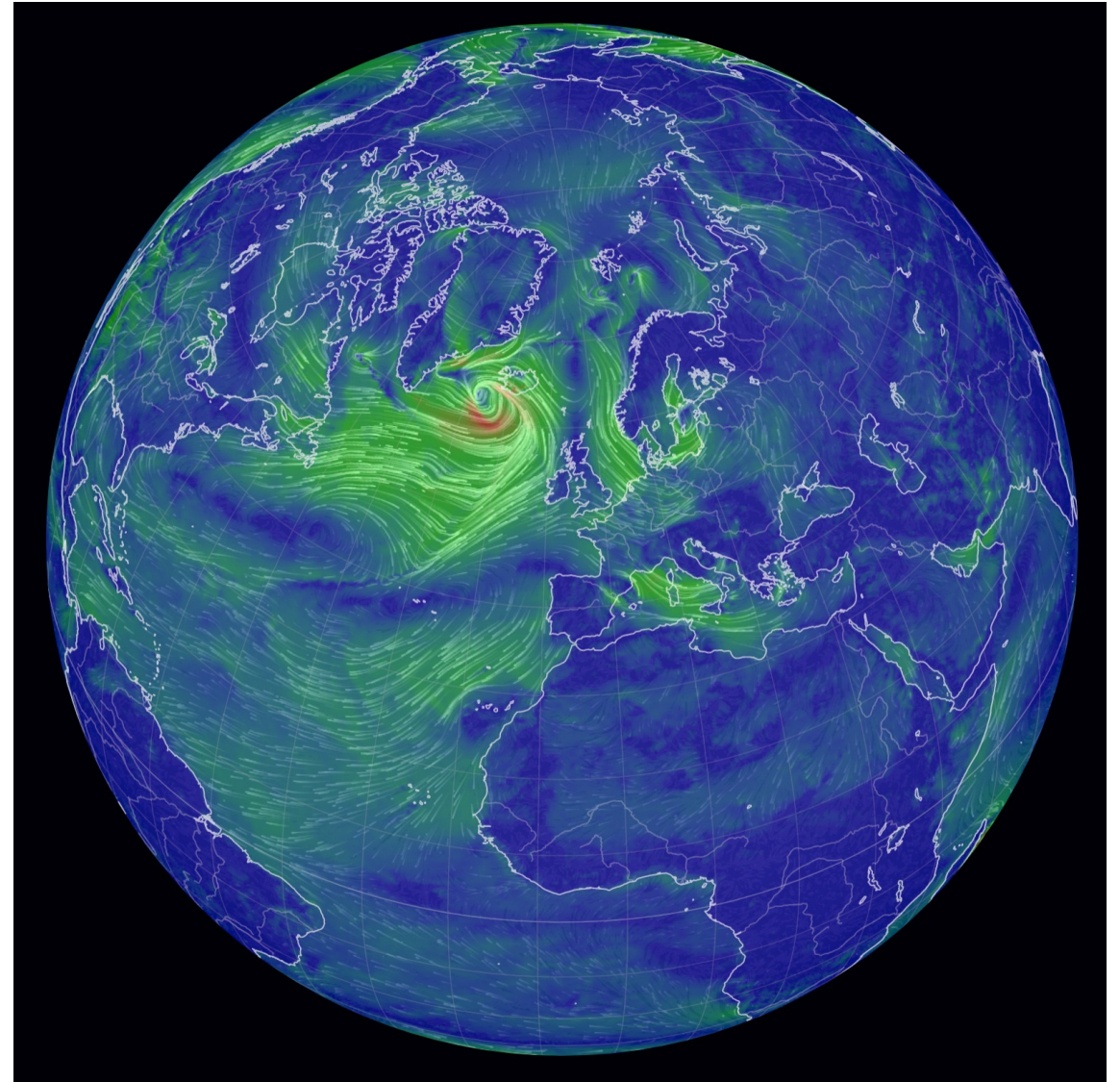
Extra heat and moisture provide more fuel for convection and heavy rainfall when cooler air or troughs arrive.

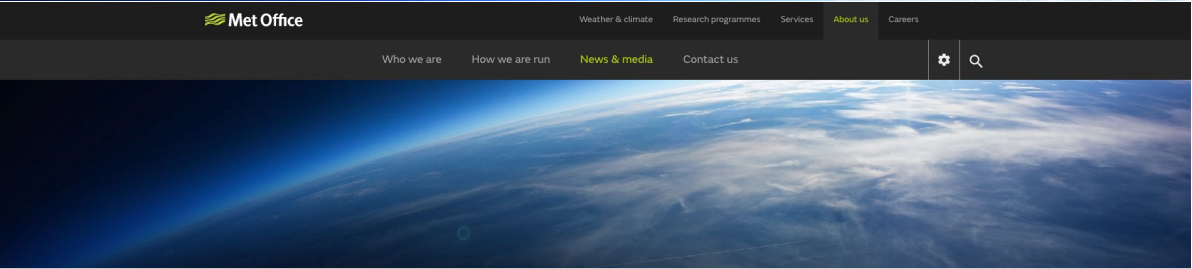


MILDER, HUMID COASTS

Warmer waters help keep coastal areas milder and more humid and delay the broader seasonal cooling.

- El Niño Southern Oscillation (ENSO)
- North Atlantic Oscillation (NAO)
- Arctic Oscillation (AO)
- Pacific North American Oscillation (PNA)
- Eastern Pacific Oscillation
- Atlantic Multidecadal Oscillation (AMO)
- Pacific Decadal Oscillation (PDO)
- Madden-Julian Oscillation (MJO)
- Indian Ocean Dipole (IOD)





Pacific Ocean warming signals the possible return of a strong El Niño

Author: Met Office
15 April 2026

A significant shift is underway in the tropical Pacific, with clear signs that an El Niño event is developing.

El Niño is one of the most important drivers of year-to-year climate variability on Earth, influencing weather patterns across large parts of the globe as well as global temperature. While it occurs far from the UK, its impacts can be felt worldwide.

More by Met Office

[Week ahead: Largely dry and increasingly warm](#)

[Weekly weather quiz: Test your knowledge](#)

[Storm Dave in context: How the storm unfolded](#)

[Weekend weather: Unsettled conditions give way to higher pressure](#)

[Arctic snow blizzards? Mini heatwaves? Weather headline review](#)

[Met Office and AWS are pioneering how AI could shape the future of](#)

CLIMATE

Weather forecasters warn a rare ocean phenomenon is joining the Super El Niño and together they could bring one of the most disruptive winters on record to North America and Europe splitting the continent between dangerous ice storms in the South and record warmth in the North

BY CARLOS ALBERO ROJAS SEP 6, 2026 11:00 AM 7 MIN READ



El Niño southern oscillation

Damian Carrington
Environment editor

Thu 3 Sep 2026 07:00 BST

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'Supersizing before our eyes': UN warns of record El Niño approaching

Event is likely to be largest in at least 1,000 years and will pile extra heat into a world already in a climate crisis

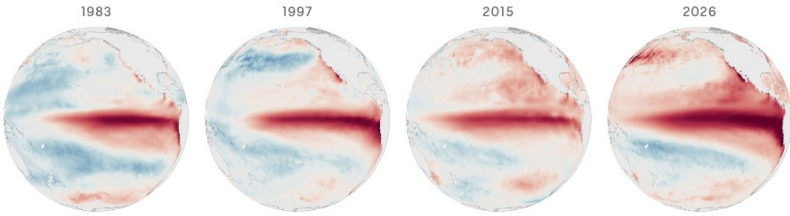


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Why this El Niño is different from all the others

By climate reporter Romy Stephens | Graphics by Alex Lim

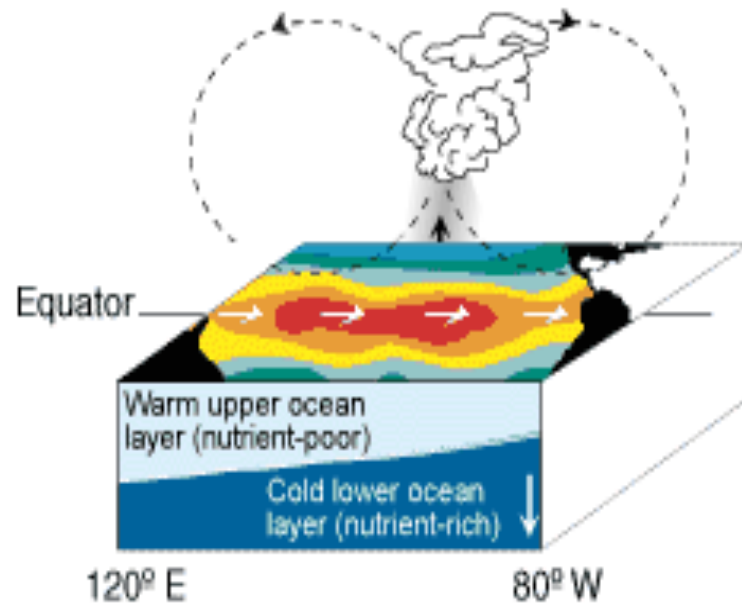
El Niño

Posted Sat at 7:41 pm, updated Sat at 9:45pm

Climate scientists have been closely monitoring what is happening off Australia's east coast over recent months and are increasingly concerned by what they are seeing. Pacific Ocean temperatures, a key driver of El Niño, are rising at an extraordinary pace and starting to enter uncharted territory.

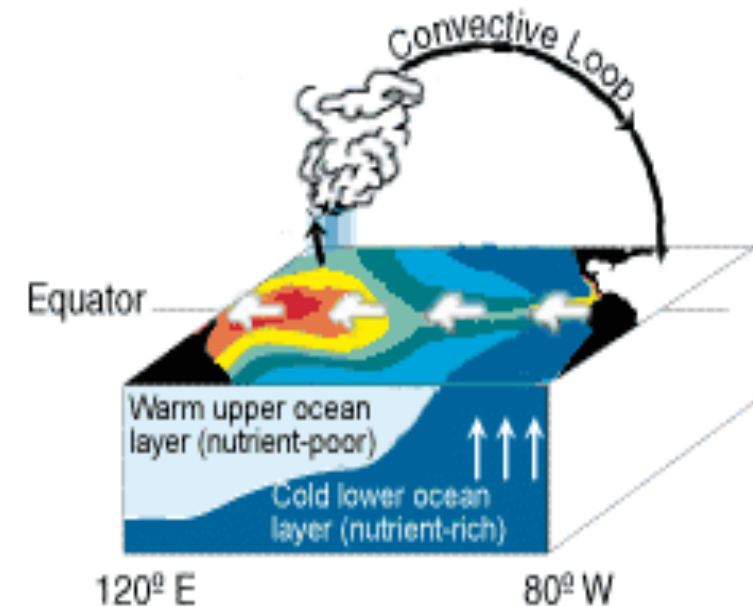
- ENSO is defined as three months or longer of sustained sea surface temperature anomalies of less than -0.5°C or greater than $+0.5^{\circ}\text{C}$ across the east-central tropical Pacific Ocean
- 6 month to 2-year event
- Affects global temperature and precipitation patterns

Positive El Niño Phase



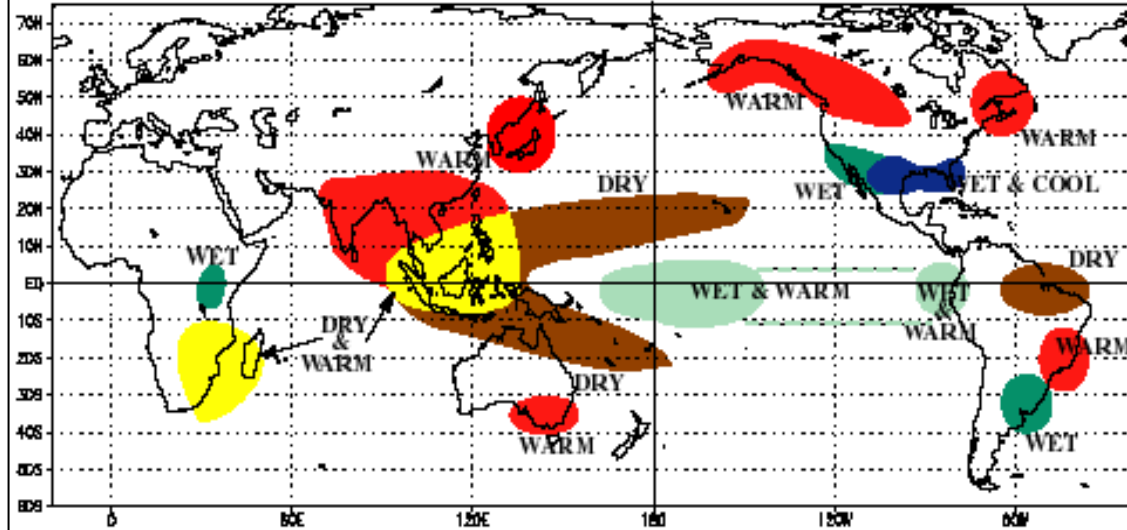
In the El Niño phase, there is a tendency for westerly winds (from the West) to pull warm water from the Western to the Eastern Pacific overriding colder, sub-surface water.

Negative La Niña Phase

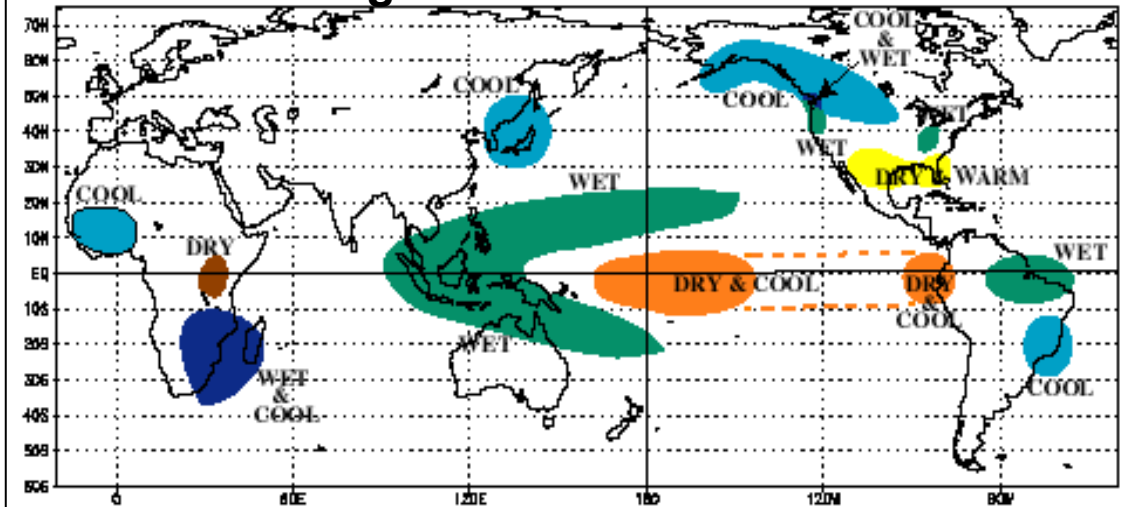


In the La Niña phase, there is a tendency for easterly winds to pull warm water from the Eastern Pacific to the Western Pacific and is then replaced by colder, sub-surface water.

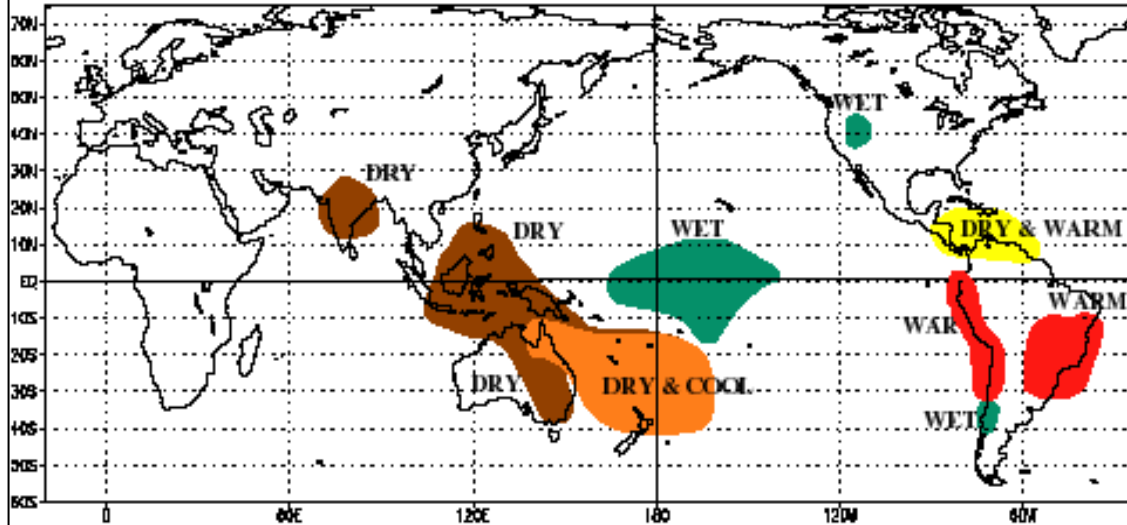
WARM EPISODE RELATIONSHIPS DECEMBER - FEBRUARY
Positive El Niño Phase



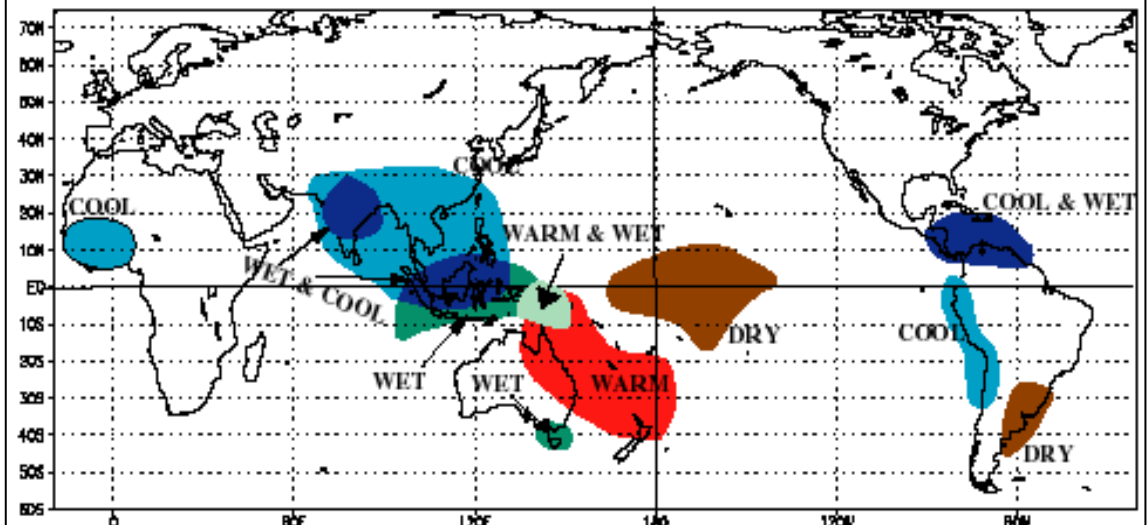
COLD EPISODE RELATIONSHIPS DECEMBER - FEBRUARY
Negative La Niña Phase



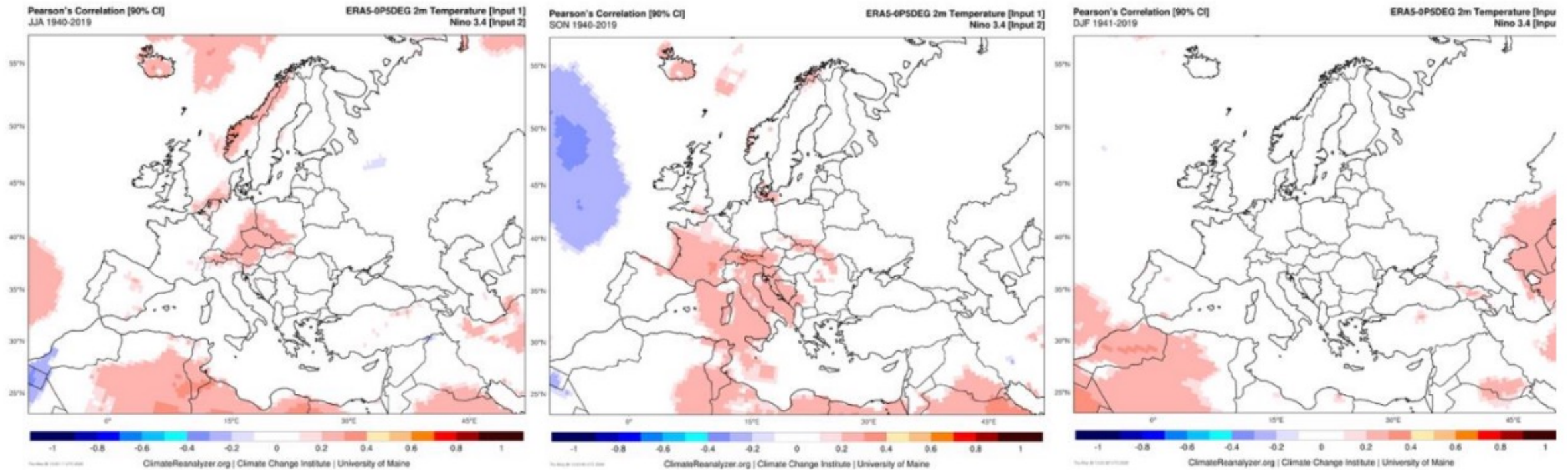
WARM EPISODE RELATIONSHIPS JUNE - AUGUST



COLD EPISODE RELATIONSHIPS JUNE - AUGUST



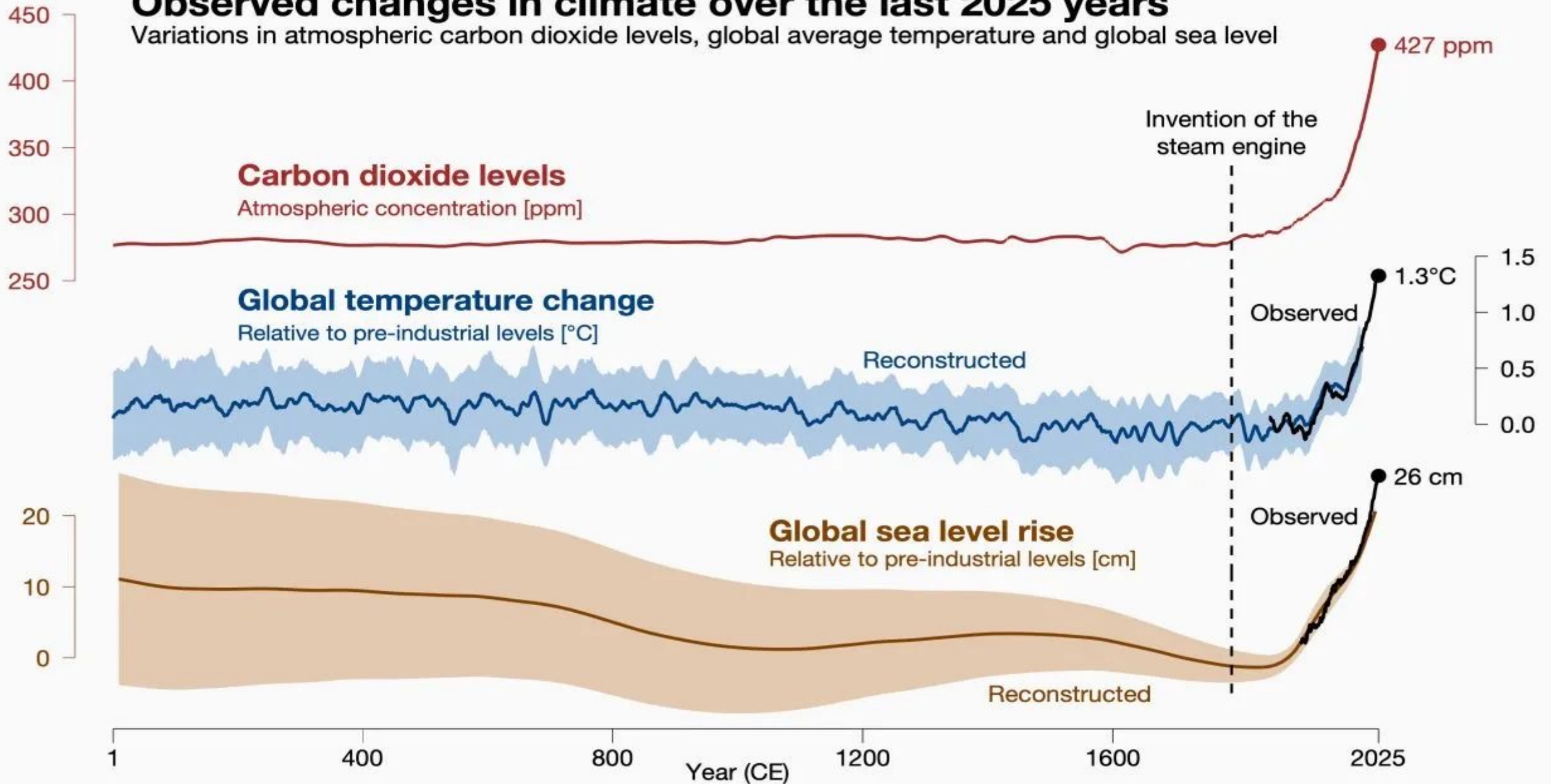
The plots below show the correlation between ENSO and European temperatures for June, July and August (JJA); September, October and November (SON); and December, January and February (DJF). As can be seen, the correlation is extremely weak.





Observed changes in climate over the last 2025 years

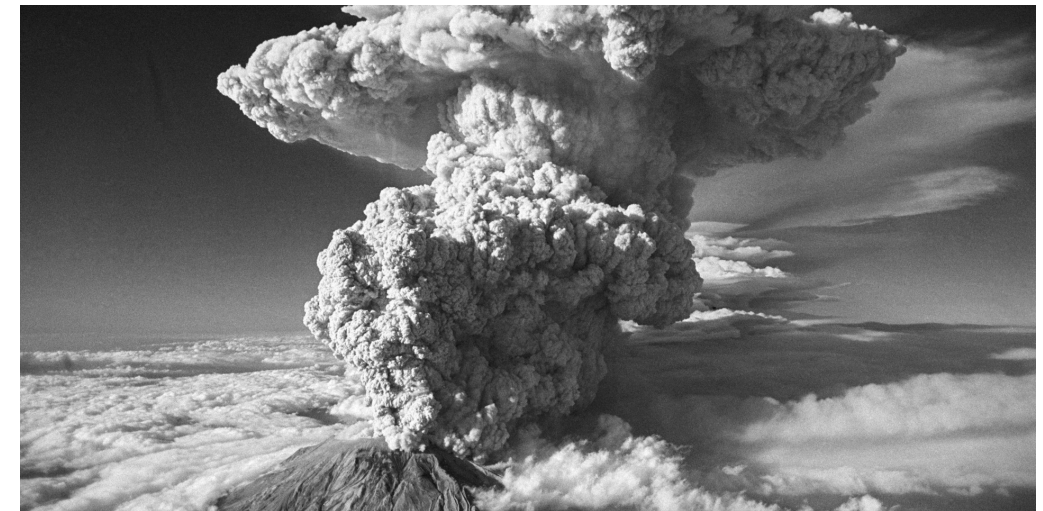
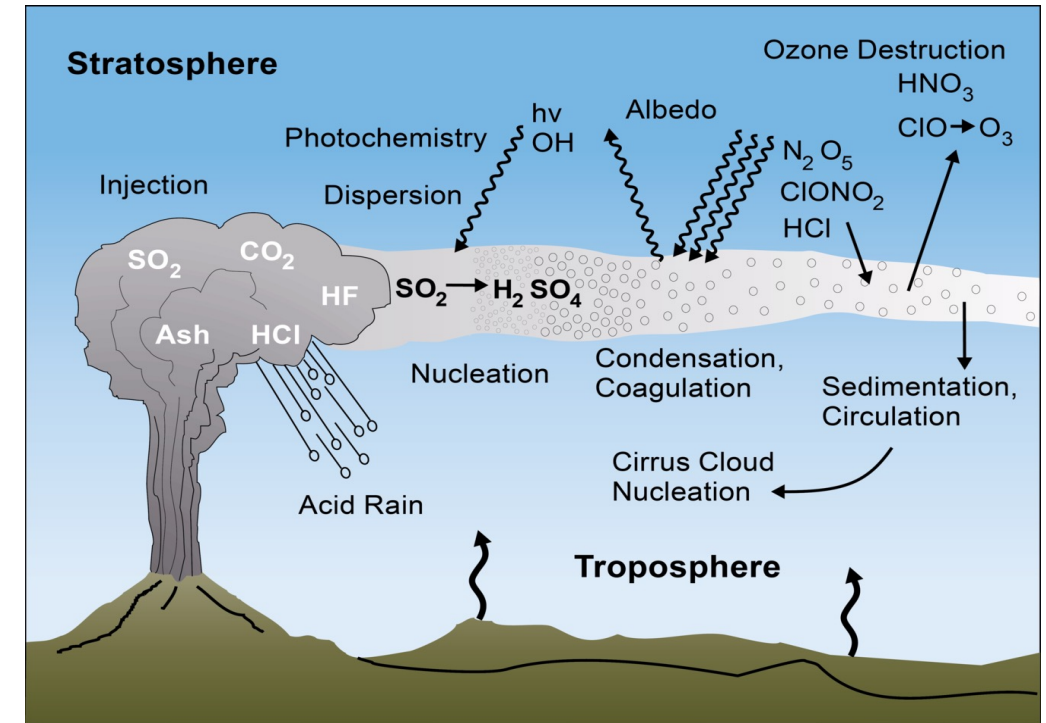
Variations in atmospheric carbon dioxide levels, global average temperature and global sea level



Volcanoes do cause climate change: **but..**

- Global volcanic emissions = $0.26 \pm \text{Gt/y}$
- Anthropogenic CO₂ (2024) = 37-38e Gt/y
- Austria CO₂e emissions (2024) = 0.07 Gt/y
- Mt St Helens (1980) = 0.01Gt = $\pm 0\text{C}$
- Mt Pinatubo (1991) = 0.05 Gt = -0.5C
- Laki (1783-4) = 120 Mt SO₂ = >-1.0C
- Hunga Tonga–Hunga Ha‘apai (2022) = $\pm 0\text{C}$

Impacts are **MUCH** more short term....



	Weather Forecasts	Climate Hazard Risk Data
Purpose and Timeframe	Focuses on short-term predictions, typically up to 14 days.	Annual projections, often spanning decades. Use for adaptation to climate-related risks.
Scope	- Concentrates on atmospheric conditions, including temperature, precipitation, wind speed, and humidity. - Primarily serves the goal of predicting daily or weekly weather conditions.	Looks at climate-related hazards, such as hurricanes, droughts, floods, and wildfires. - The changing likelihood and severity of these hazards over many years
Data and Inputs	- Uses real-time data, like satellite imagery, and computer models. - Requires frequent updates to reflect changing weather conditions.	This data is based on climatology, not real time observations. Hence it doesn't change often.
Uncertainty	- Acknowledges short-term uncertainties due to the inherent complexity of the atmosphere. - Forecasts become less accurate as the timeframe extends beyond a few days.	- Focuses on the probabilistic nature of long-term climate change and associated hazards. - Provides valuable insights into trends and potential impacts

Daily Surface Air Temperature

Area Selection

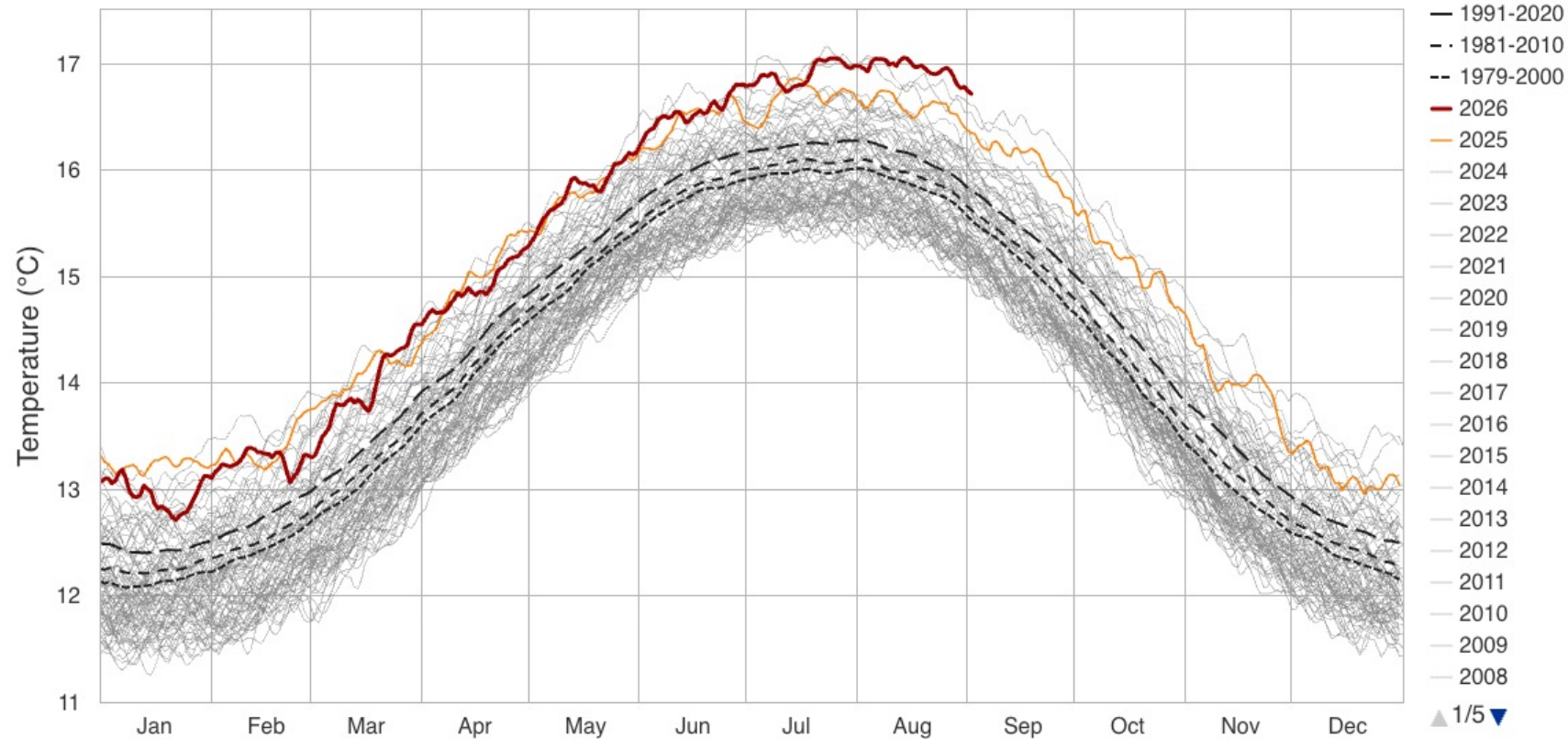
World

This page shows daily temperature estimates from ECMWF Reanalysis v5 (ERA5). The latest data values update with a 6-day lag from the current date. [See details below.](#)

Daily Surface Air Temperature, World (90°S–90°N, 0–360°E)

Export Chart

Dataset: ECMWF Reanalysis v5 (ERA5) downloaded from C3S | Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine



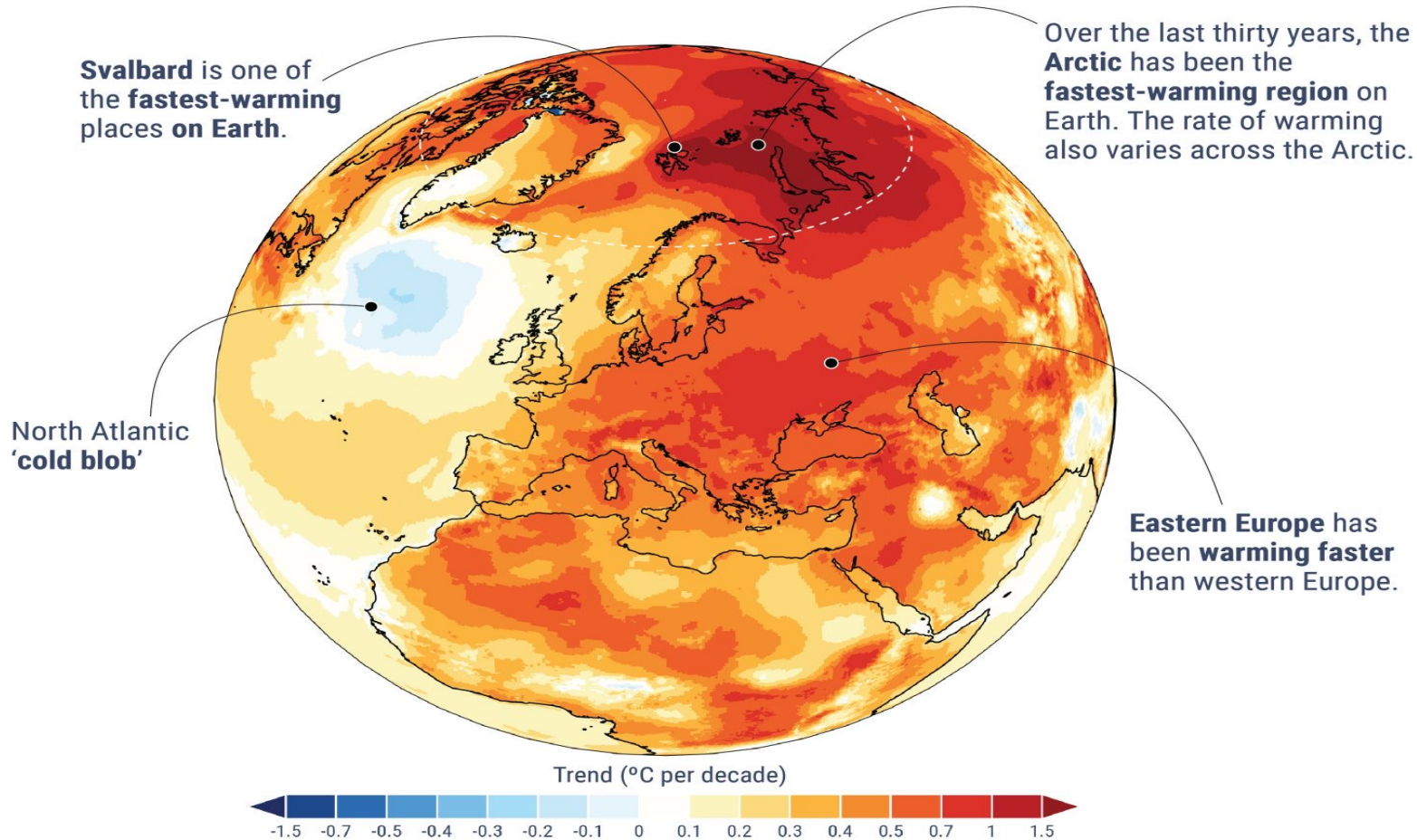
The fastest warming is all in the 21st Century

2024/25 exceeded the limit of 1.5C

The current El Nino is/will likely add 0.2-0.4C on top of background warming

The rate of warming varies across Europe

Linear trend in annual surface air temperature for 1996–2025

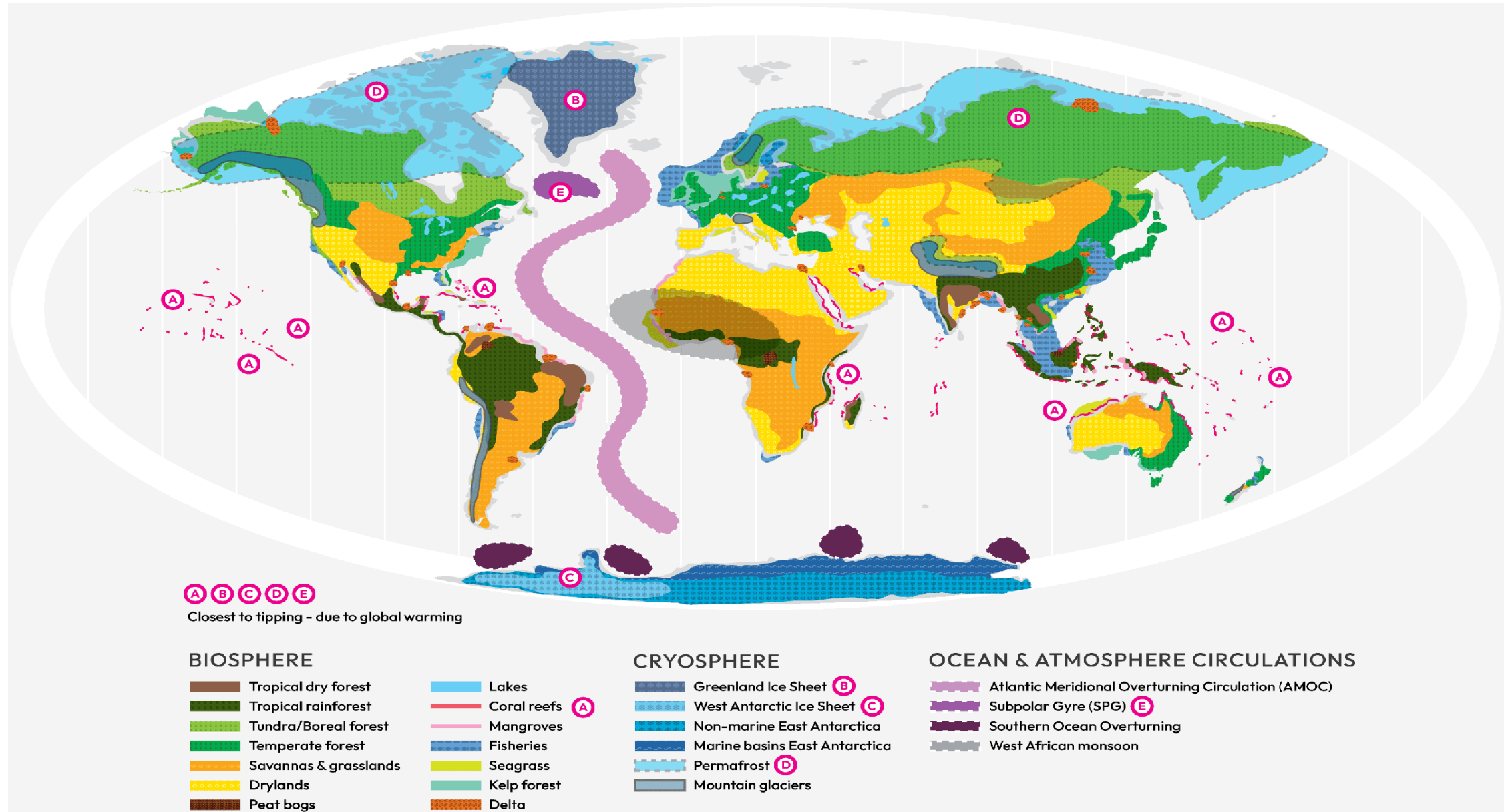


Greatest warming in east and southeast of Europe

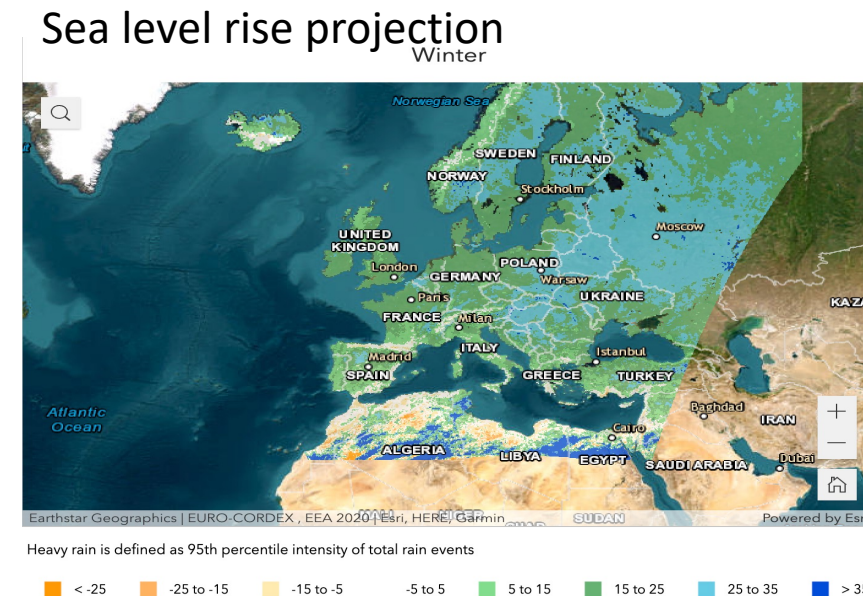
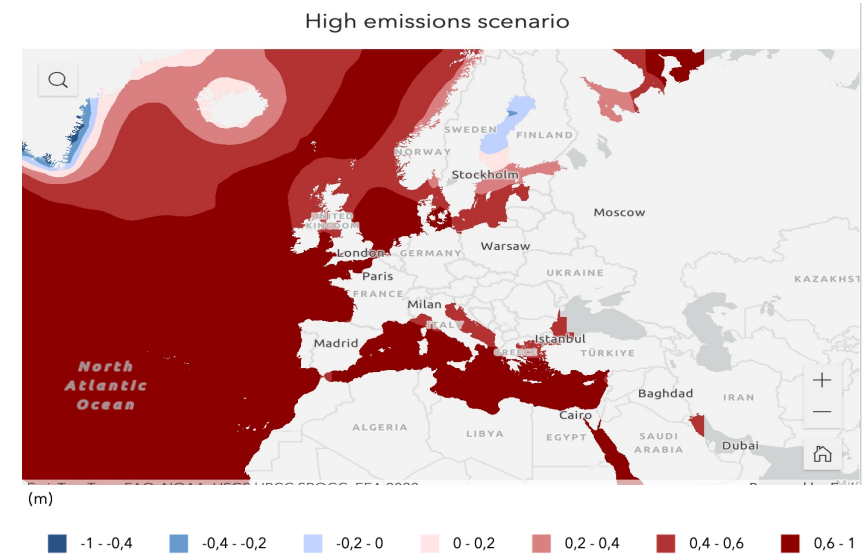
Alpine regions amongst the fastest warming

Note the persistent cold blob in The Atlantic

Data: ERA5 • Credit: C3S/ECMWF



- Sea level rise affects coastal based energy assets eg. Nat gas terminals
- Increased winter heavy rain impacts near river assets, and longer/more frequent droughts with possible implications for hydro generation on European rivers
- More storms impact renewable energy generation making it less reliable
- Summer heatwaves would substantially increasing cooling energy demand (doubling in southern Europe)
- Winter heating demand projected to decrease by as much as 27% under high emission scenarios
- But...AMOC 'collapse' would result in severe winters and even wilder swings from drought to high precipitation events – possible winter sea ice in The North Sea....!



Increase in heavy rainfall events

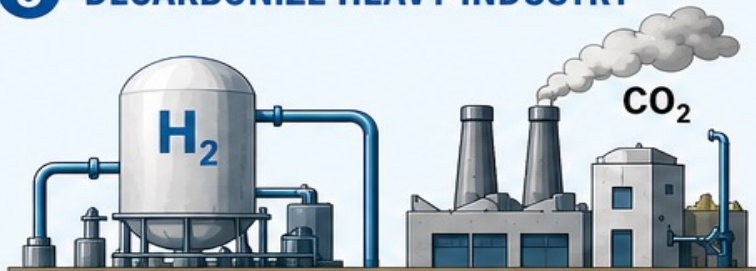
- **Emissions source** – N_2O is 300x more potent than CO_2 as a greenhouse gas
- **Production/use** - One third of emissions from production and two thirds from application
- **Climate change driven demand** – warmer and wetter conditions = runoff = more required
- **Land use shifts** – crops no longer capable of being grown in the environment eg. Olive trees replacing vines, even desertification
- **Degradation of soil** – overuse = fertility loss = higher application to maintain productivity
- **Environmental damage** – excess may get into waterways damaging ecosystems



1 TRANSFORM THE ENERGY SYSTEM (CORE LEVER)



3 DECARBONIZE HEAVY INDUSTRY



5 CUT NON-CO2 EMISSIONS



8 BEHAVIORAL & DEMAND-SIDE CHANGES



THE GLOBAL ACTION PLAN TO LIMIT WARMING TO <2°C

A SYSTEMS TRANSFORMATION
FOR A NET-ZERO FUTURE



6 SCALE CARBON REMOVAL



2 ELECTRIFY & IMPROVE EFFICIENCY



4 TRANSFORM LAND USE & AGRICULTURE



7 POLICY, FINANCE & GLOBAL COORDINATION



KEY CONSTRAINT: CARBON BUDGET



Remaining budget for 2°C
900–1,200 GtCO₂
At ~40 GtCO₂/year
<30 YEARS
remaining without rapid cuts



THE BOTTOM LINE

Limiting warming below 2°C requires immediate, coordinated global transformation across energy, industry, land systems, and policy—driven by deep emissions cuts this decade and net-zero by mid-century.



Europe ▾

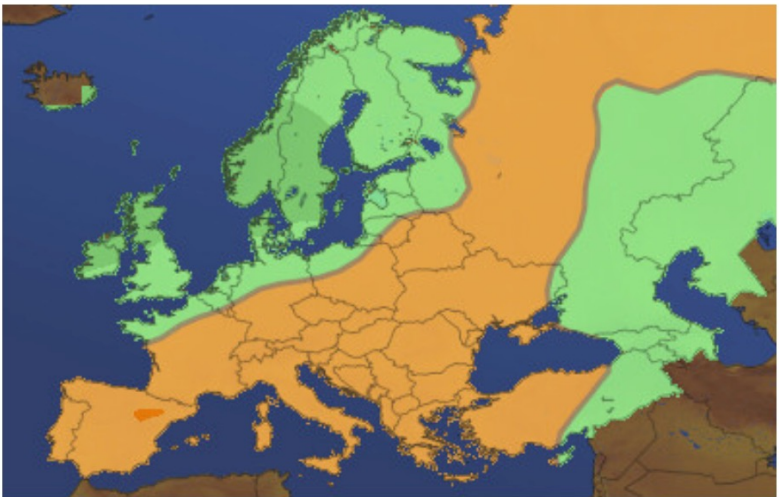
Forecast: AG2 ▾

Model Forecast Comparison

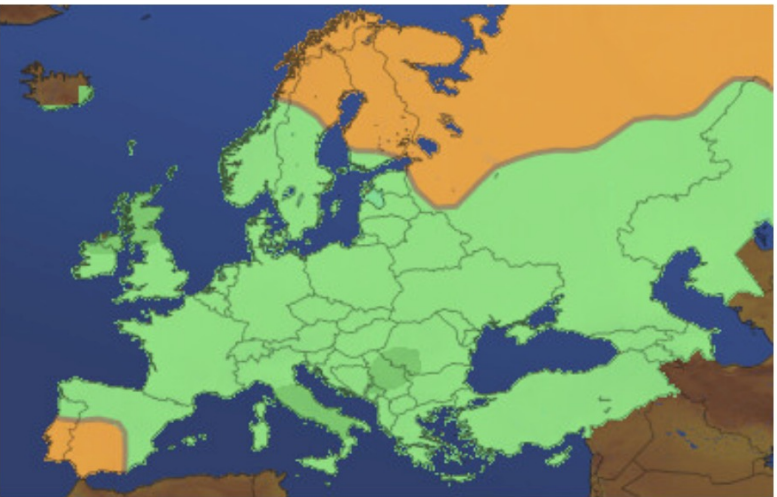
Verification

Temperature Precipitation

Next full forecast: September 16
Next late-month update: September 30



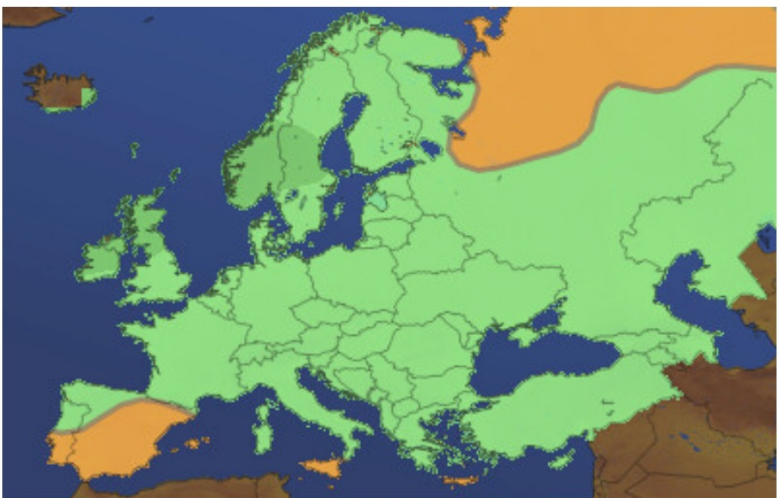
AG2 Month 1 Precip (% Normal)
80 85 90 95 100 105 110 115 120
Drier than normal Wetter than normal
Sep 2026
Updated 09:45 UTC 27-Aug-2026



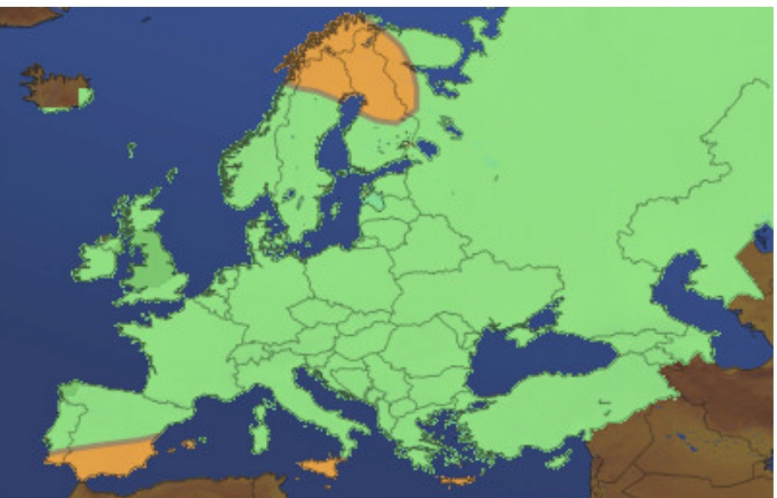
AG2 Month 2 Precip (% Normal)
80 85 90 95 100 105 110 115 120
Drier than normal Wetter than normal
Oct 2026
Updated 09:45 UTC 27-Aug-2026



AG2 Month 3 Precip (% Normal)
80 85 90 95 100 105 110 115 120
Drier than normal Wetter than normal
Nov 2026
Updated 09:45 UTC 27-Aug-2026



AG2 Mon 4: 2 Precip (% Normal)
80 85 90 95 100 105 110 115 120
Drier than normal Wetter than normal



AG2 Mon 5: 4 Precip (% Normal)
80 85 90 95 100 105 110 115 120
Drier than normal Wetter than normal

Thank you for listening...

Any questions?

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