

Earth Sciences
Department



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación

Forecast Briefing

April 2026

Marta Brotons, Pep Cos, Aleksander Lacima and Paloma Trascasa

Earth Sciences department

Barcelona Supercomputing Center (BSC)

Tuesday 28th April 2026

Outline

- I. Recent state of the climate
- II. Subseasonal forecasts
- III. Seasonal forecasts
- IV. Discussion

I. Recent state of the climate

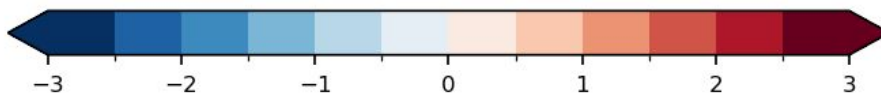
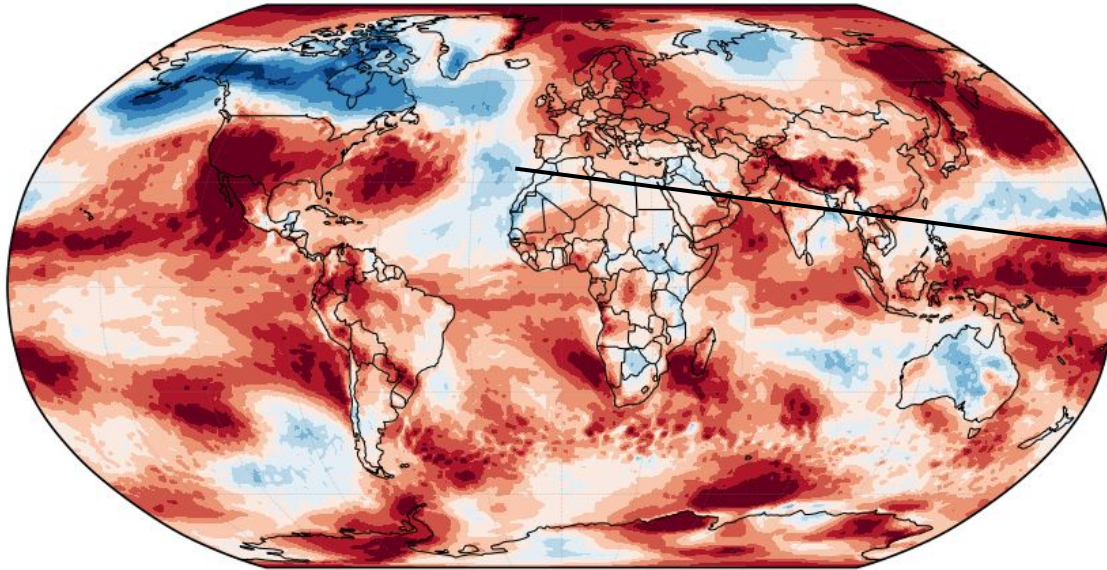
I. Recent state of the climate

Temperature



1.48°C above March 1850-1900 (ERA5)

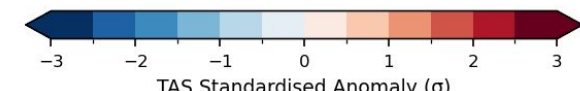
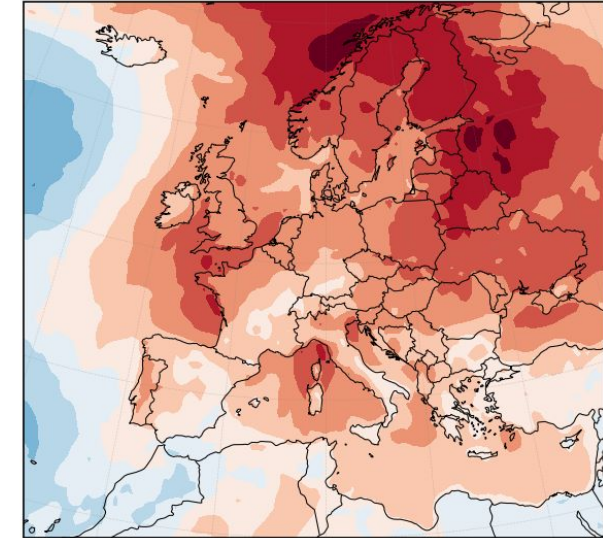
TAS Standardised Anomaly — March 2026
Ref: 1991-2020



TAS Standardised Anomaly (σ)

Data source: ERA5

TAS Standardised Anomaly — March 2026
Ref: 1991-2020



TAS Standardised Anomaly (σ)

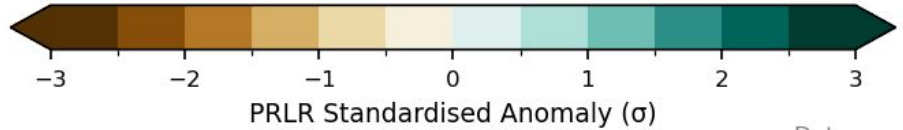
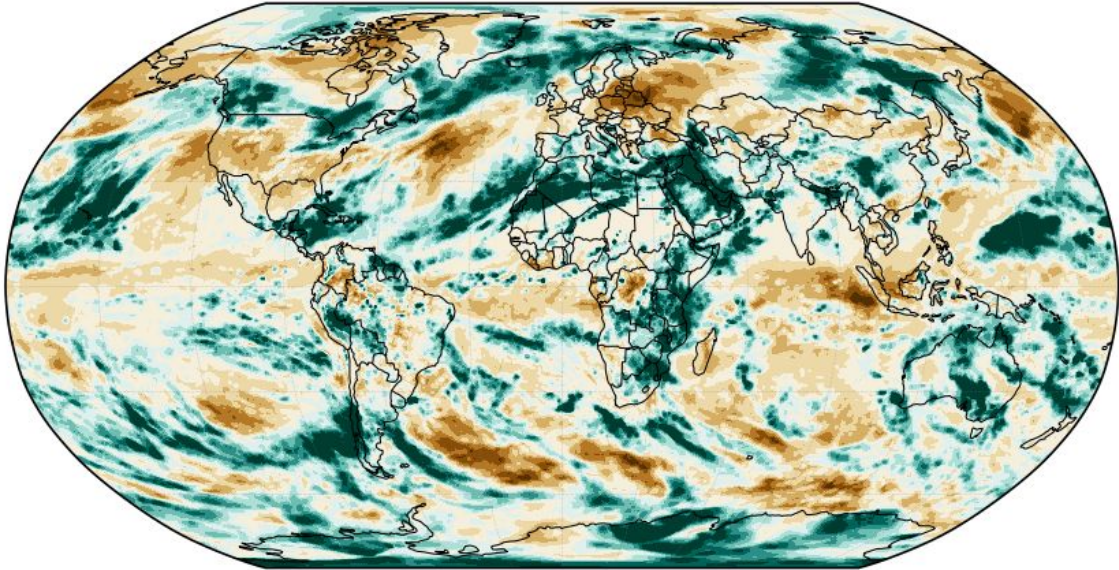
Data source: ERA5

- 2nd warmest on record in Europe (after 2025). Overall warm anomalies, especially over NW Russia, N Fennoscandia.
- Heatwave over W USA, and usually cold conditions across Alaska, Canada, S Greenland and NW Siberia.

I. Recent state of the climate

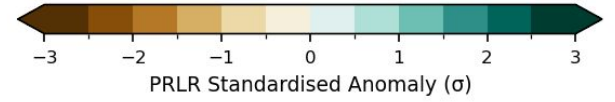
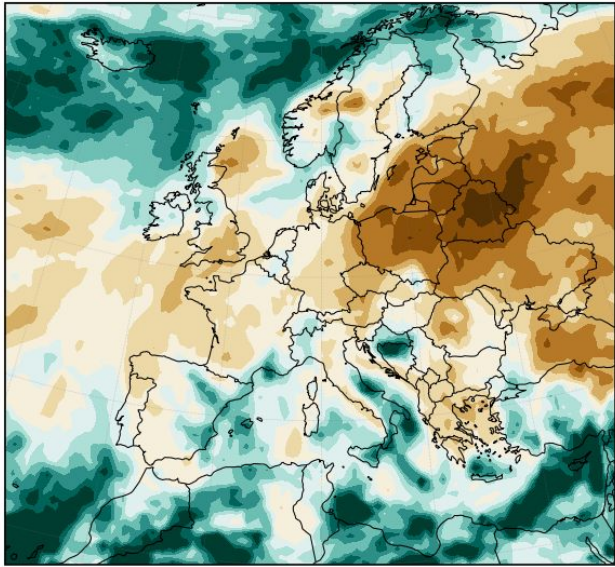
Precipitation

PRLR Standardised Anomaly — March 2026
Ref: 1991-2020



Data source: ERA5

PRLR Standardised Anomaly — March 2026
Ref: 1991-2020



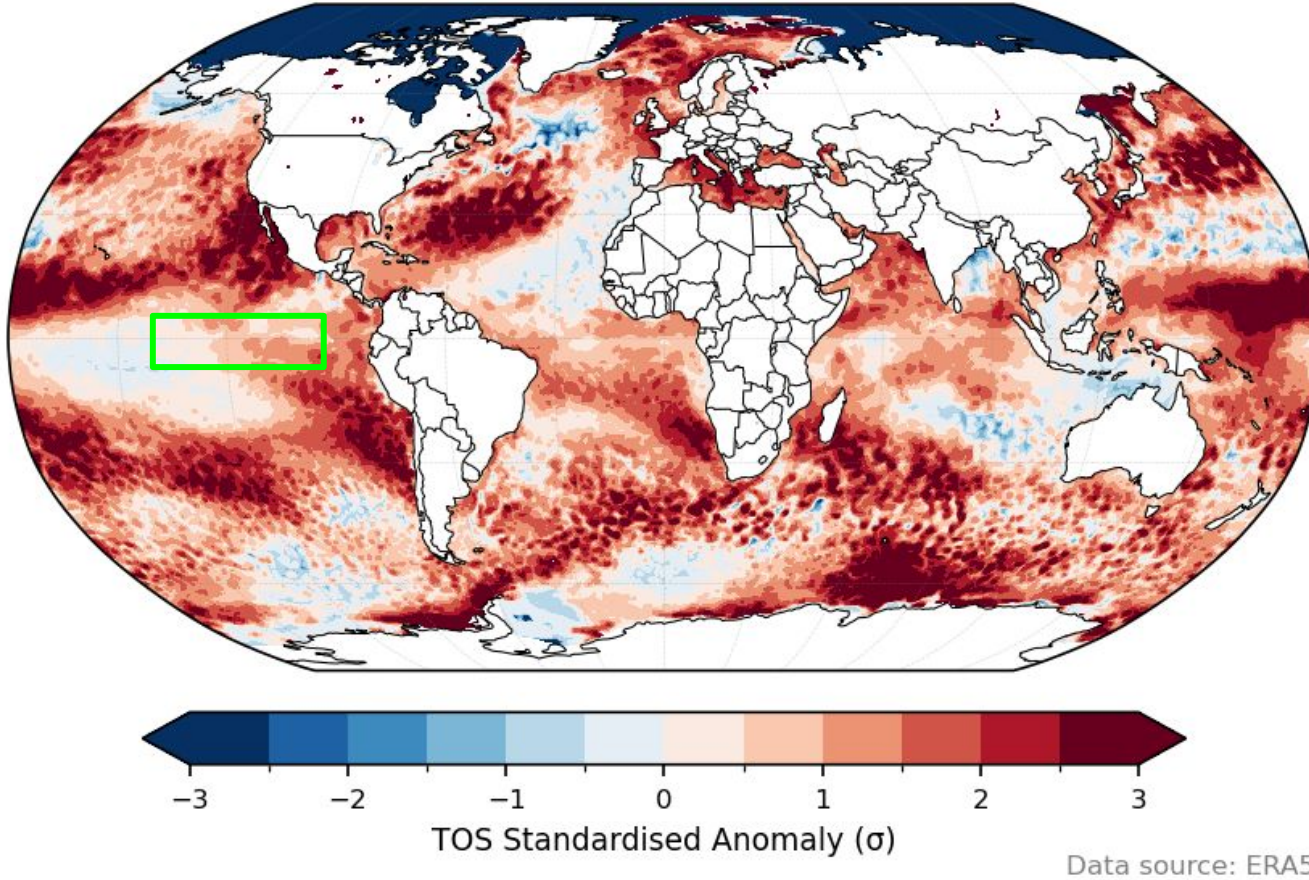
Data source: ERA5

- Wetter than average conditions in large parts of Australia, S Chile, Middle East, N, E, S Africa
- Dry conditions over most of Europe, except for N UK, Scandinavia, Eastern Spain, Italy and Sicily

I. Recent state of the climate

Sea surface temperature (SST)

TOS Standardised Anomaly — March 2026
Ref: 1991-2020

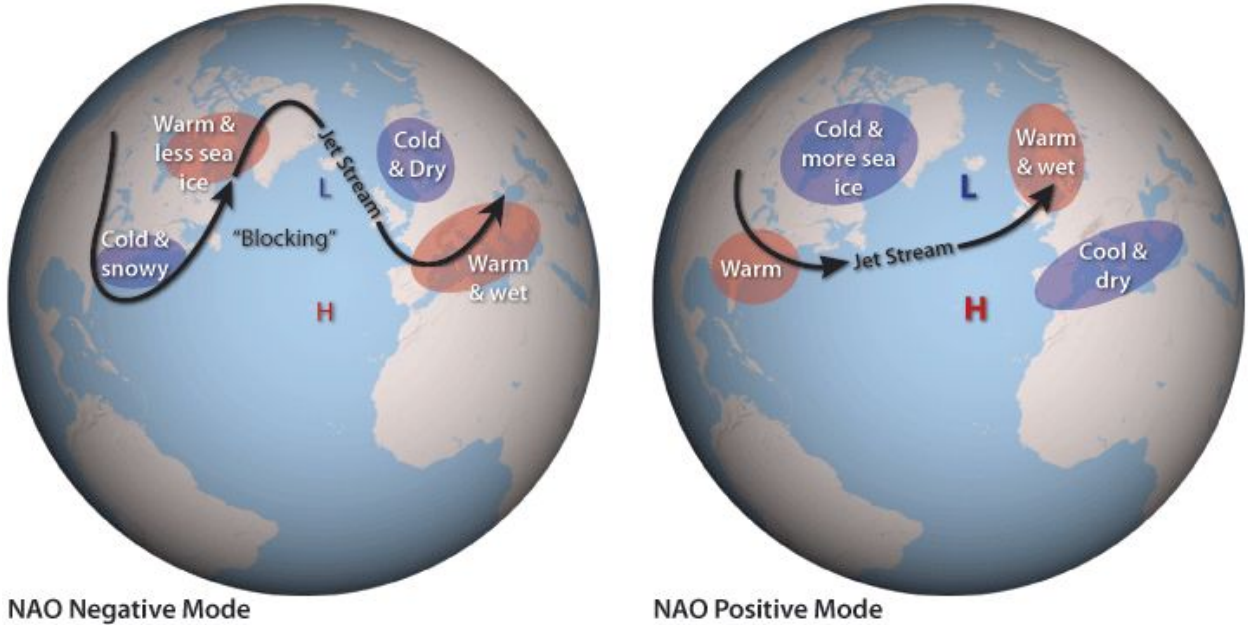


- 60°S-60°N: 20.97°C, 2nd highest on record (since 2024).
- **ENSO-neutral** conditions (0°C SST anomaly in the Niño3.4 region, RONI: JMF: **-0.7°C**) transition to El Niño expected soon.
- SSTs over NW Atlantic keep way above normal.

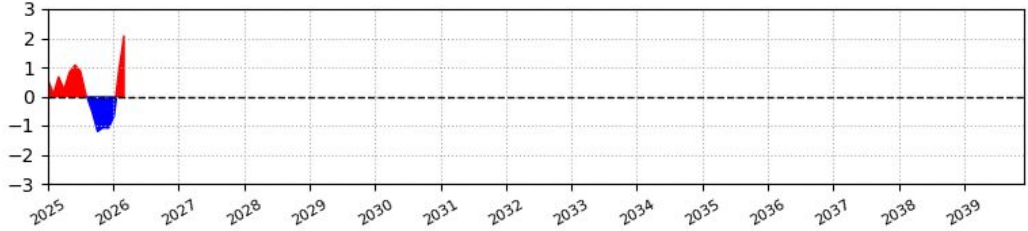
I. Recent state of the climate

North Atlantic Oscillation (NAO)

➤ The **North Atlantic Oscillation (NAO)** is the leading mode of large-scale atmospheric variability in the North Atlantic basin.



North Atlantic Oscillation (NAO)
Standardized 3-month Running Mean Index (through MAR 2026)

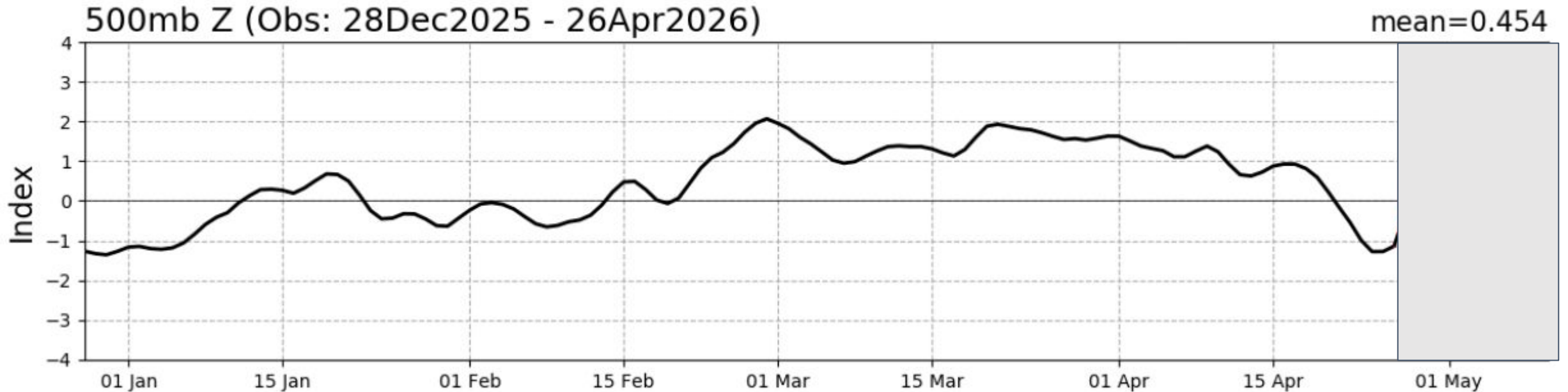


I. Recent state of the climate

North Atlantic Oscillation (NAO)

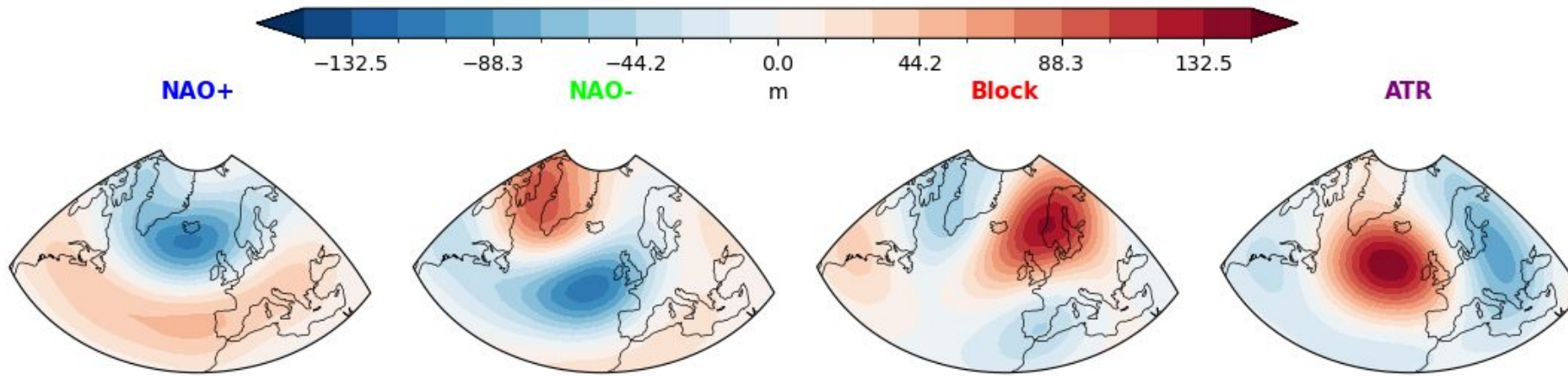
- Positive NAO from mid-February and throughout March.

NAO Index: Observed & GEFS Forecasts



I. Recent state of the climate

European weather regimes



- Geopotential height anomaly composites at 500 hPa.
- 1980 - 2008 ONDJFMA (k-means clustering).

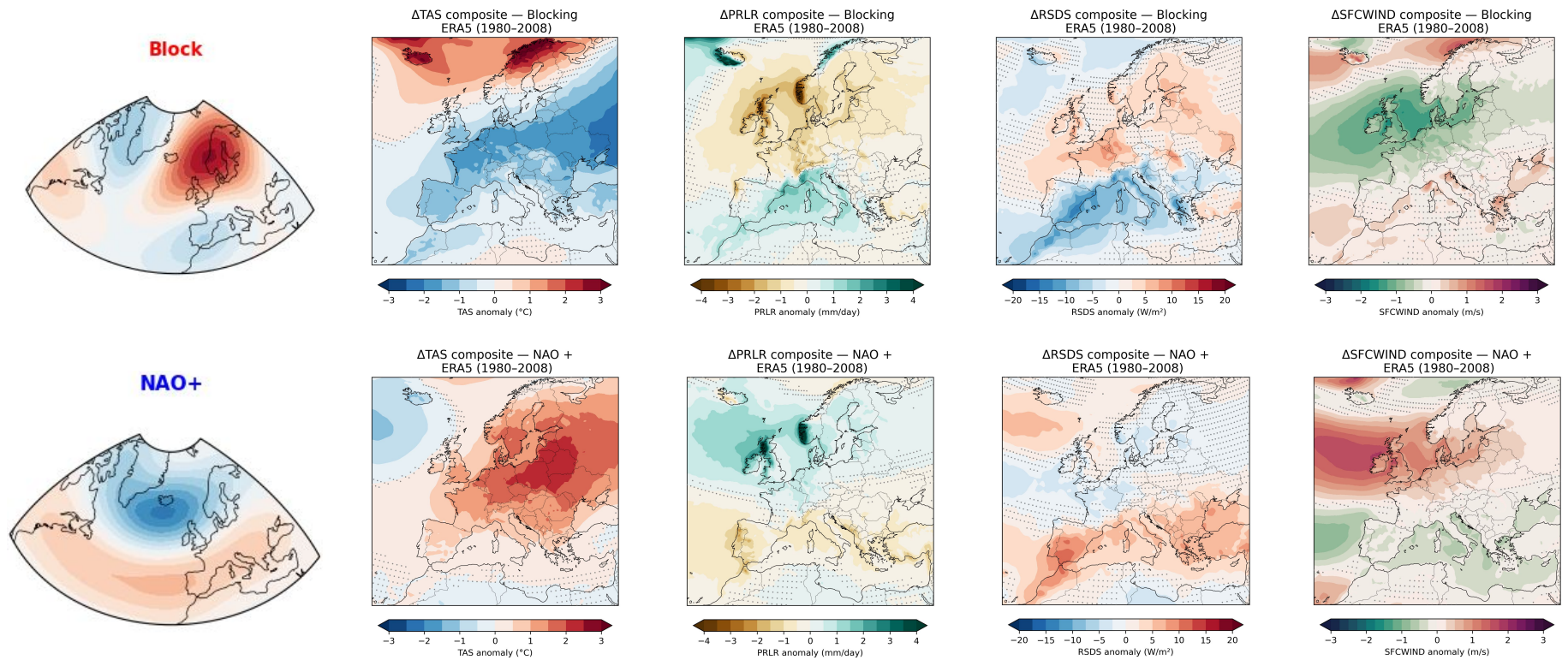
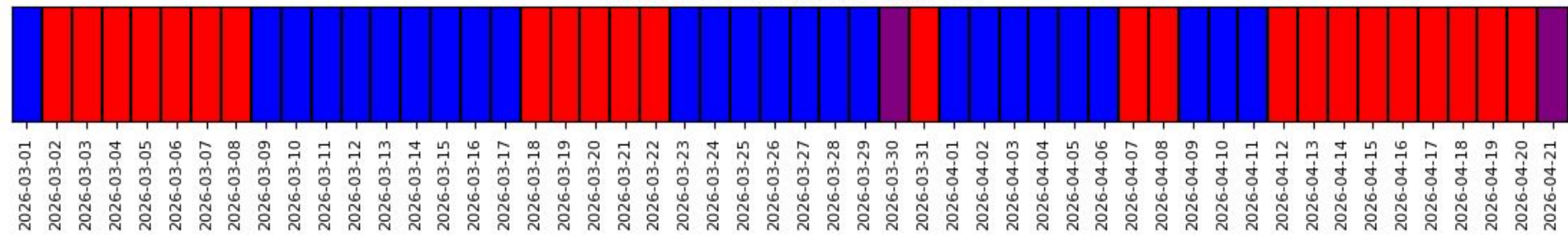
- **Blocking:** Cold and dry anomalies in Northern Europe, wet anomalies in Southwestern Europe. Onset through anticyclonic wave breaking over Europe in the upper troposphere (Michel et al., 2012).
- **NAO+:** Westerly winds predominate bringing mild, wet and stormy winter conditions to northern Europe and eastern USA while southern Europe is more likely to see cold, dry winter conditions.
- **NAO-:** Spells of easterly winds bring cold dry and calm winters with fewer and weaker storms to northern Europe and eastern USA.
- **ATR:** Northern Europe: Drier and slightly milder due to being under the influence of ridging on the upstream side. Southern Europe: Can be wetter (particularly Iberia and Western Mediterranean) due to enhanced storm tracks directed southward. Eastern Mediterranean may be less affected.

I. Recent state of the climate

European weather regimes

ATR
Block
NAO+
NAO-

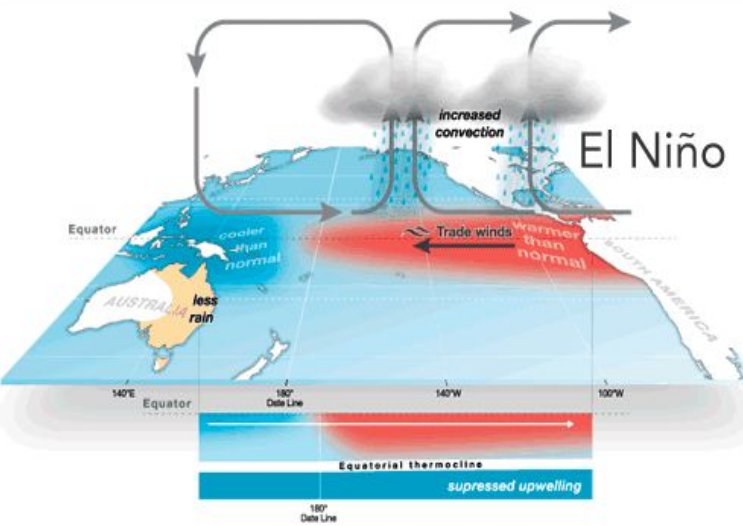
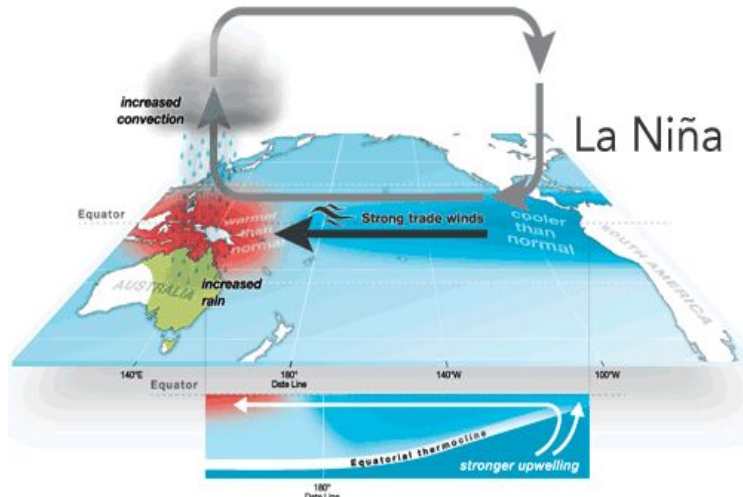
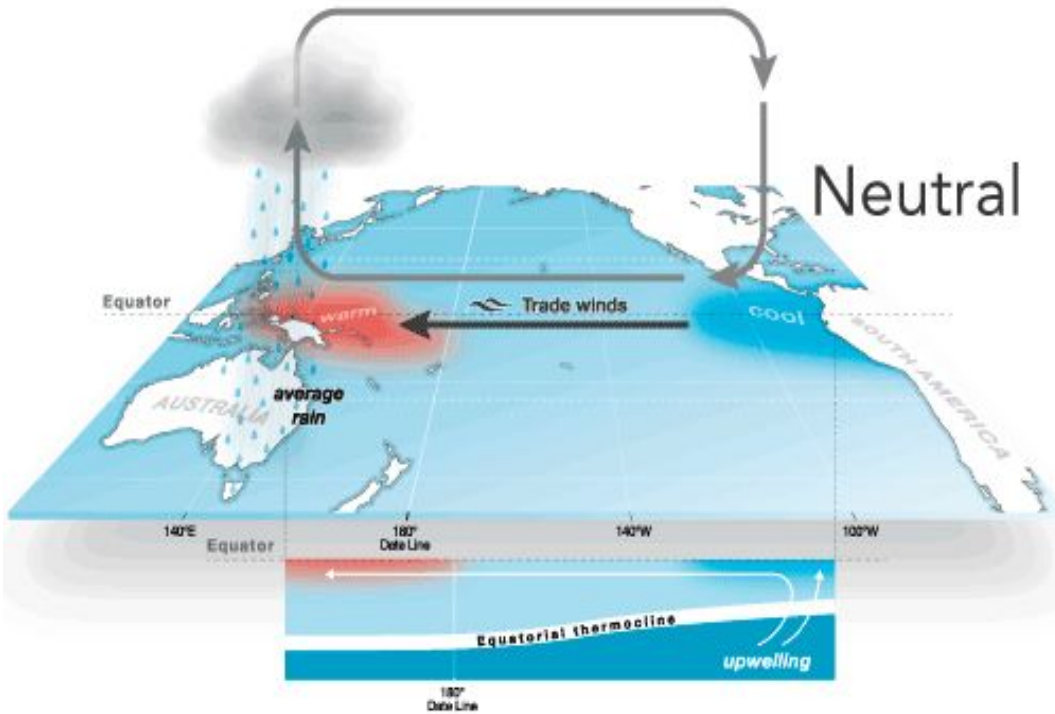
Timeline of Circulation Patterns



I. Recent state of the climate

El Niño-Southern Oscillation (ENSO)

➤ ENSO is the leading mode of natural variability at seasonal to interannual (S2I) time scales and is considered as an internally occurring coupled ocean-atmosphere phenomenon.

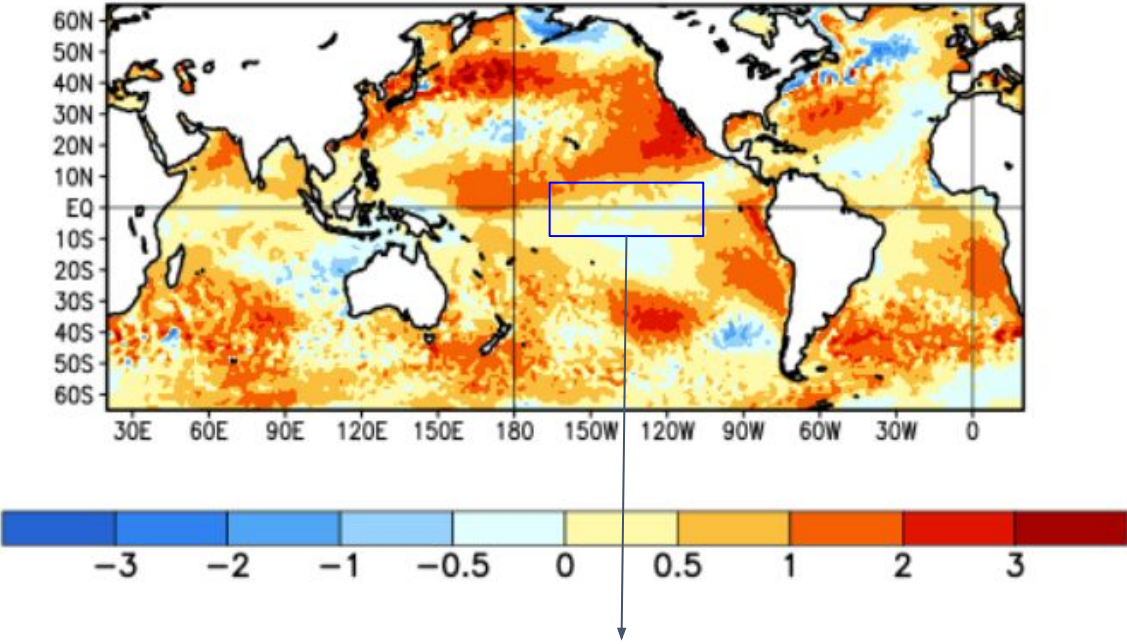


I. Recent state of the climate

El Niño-Southern Oscillation (ENSO)

SST anomalies

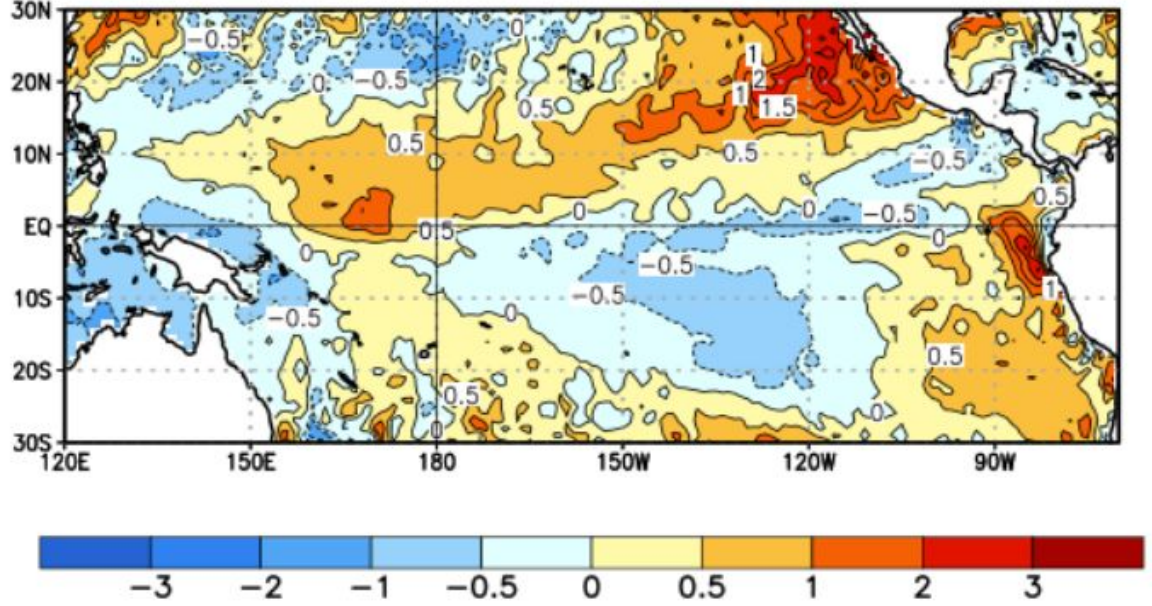
Average SST Anomalies
22 MAR 2026 – 18 APR 2026



Niño3.4 SST anomalies in JFM: **-0.2°C**

Relative SST anomalies

Average Relative SST Anomalies
22 MAR 2026 – 18 APR 2026

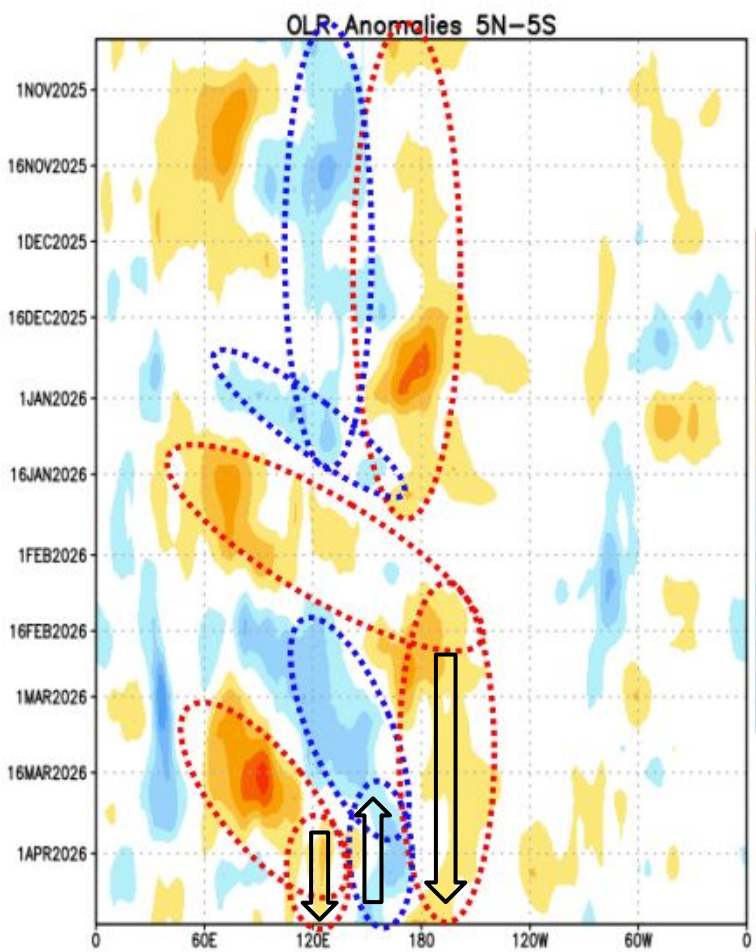


Niño3.4 RSST anomalies in JFM: **-0.7°C**

I. Recent state of the climate

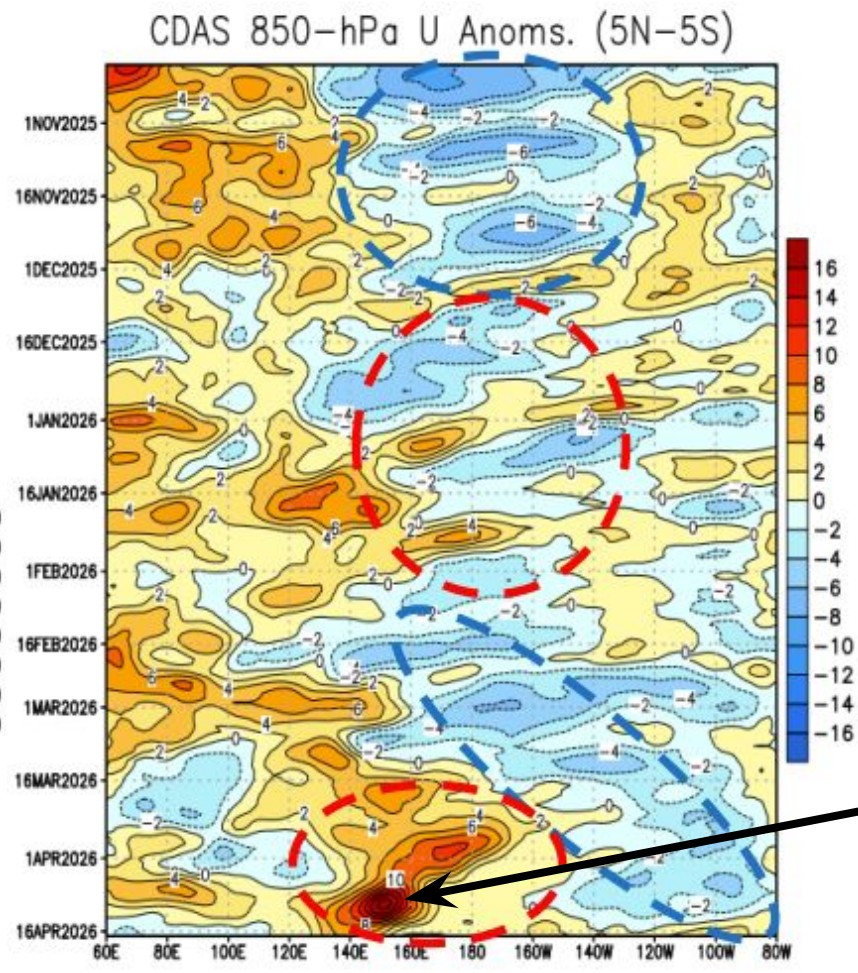
El Niño-Southern Oscillation (ENSO) - The atmosphere

Past
Present



AUS PERU

Blue = easterly wind anomalies
Red = westerly wind anomalies



AUS PERU

Blue = negative OLR, enhanced convection/rainfall.
Red = positive OLR anomalies, subsidence, suppressed rainfall

- Strong subsidence in the Central Pacific (still La Niña - like anomalies), some subsidence starts to appear over the Maritime continent.
- Westerly wind anomalies are spanning eastwards.
- **Westerly wind burst (WWB) associated with 3 Pacific tropical cyclones- SPOILER: El Niño is coming!**

I. Recent state of the climate

El Niño-Southern Oscillation (ENSO) - Westerly wind bursts (WWBs)

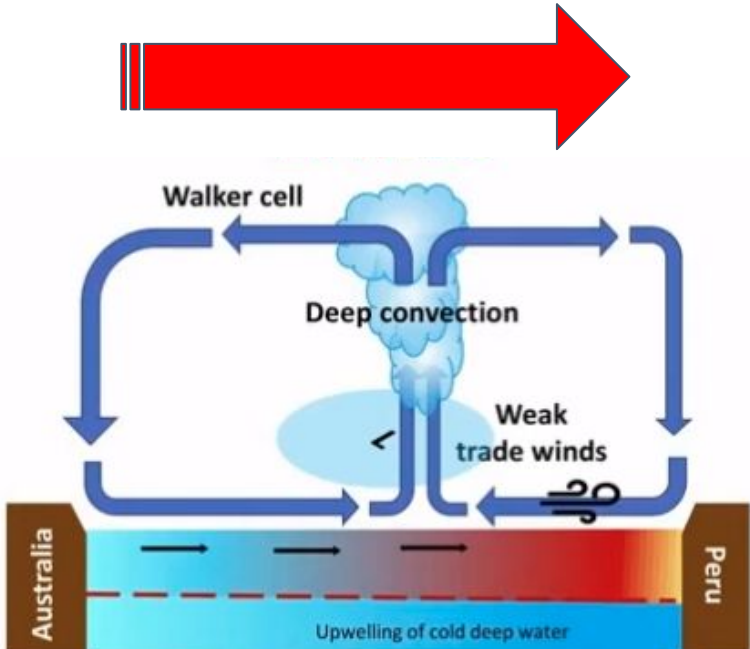
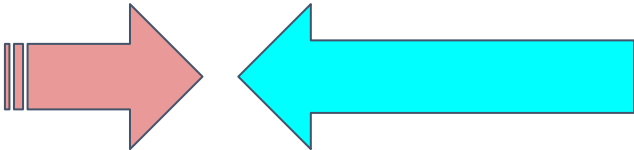
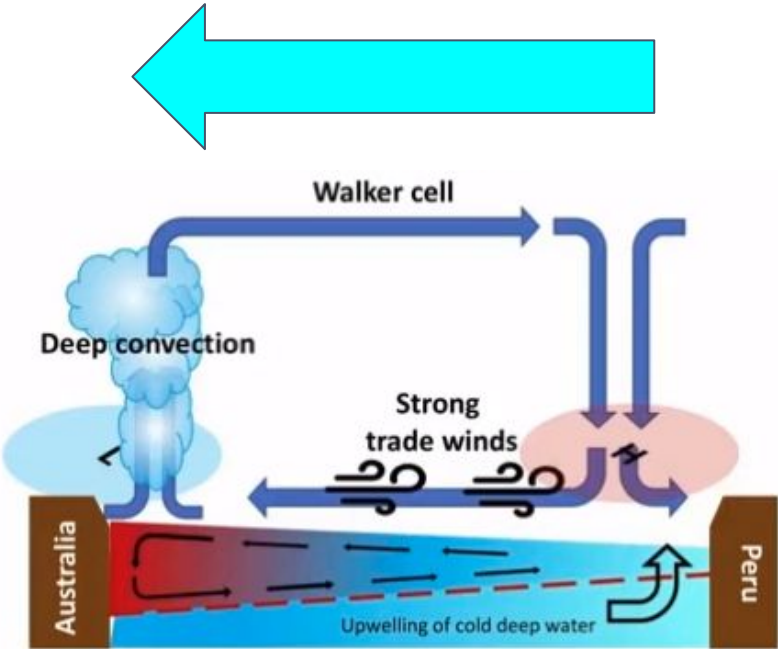
La Niña

Strong easterlies (westward, from the east)

WWBs: Strong “pulses” of westerly (eastward) wind in the western Pacific that can lead to the onset of El Niño

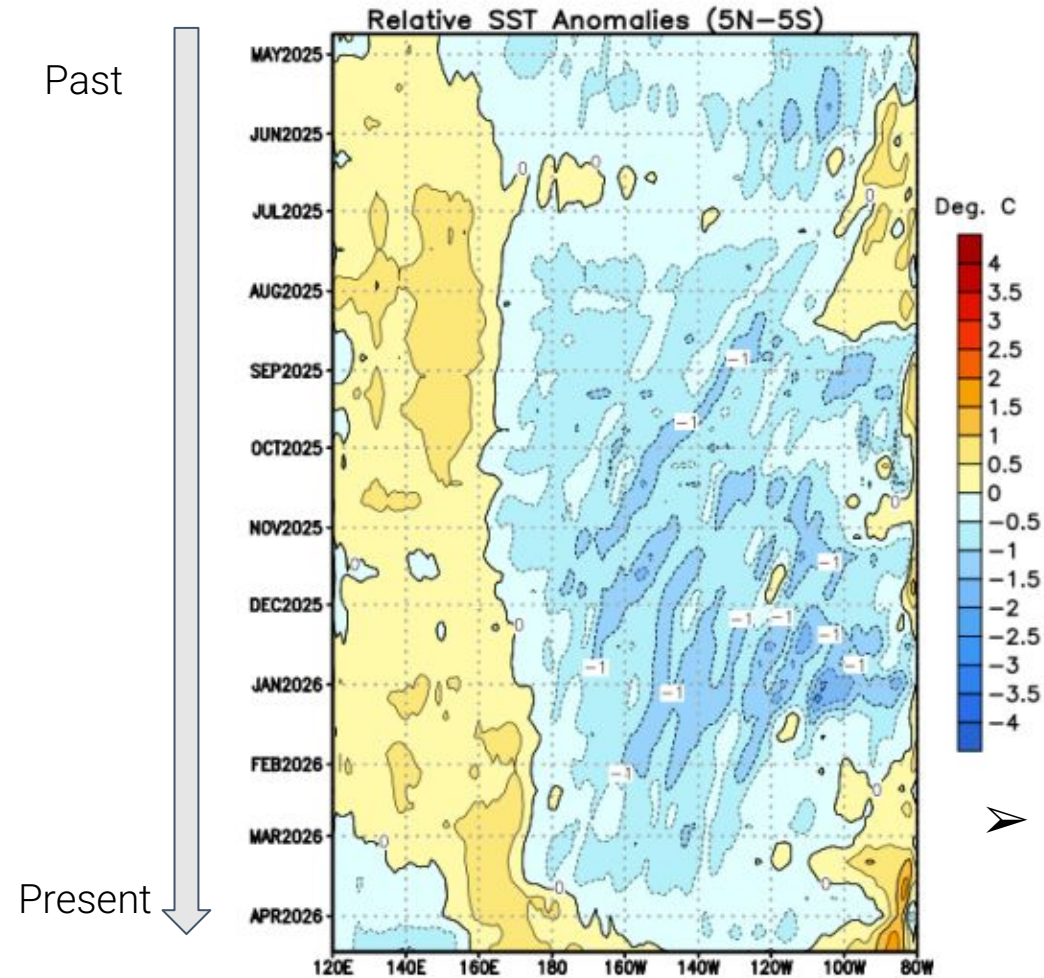
El Niño

Westerlies (eastward, from the west)

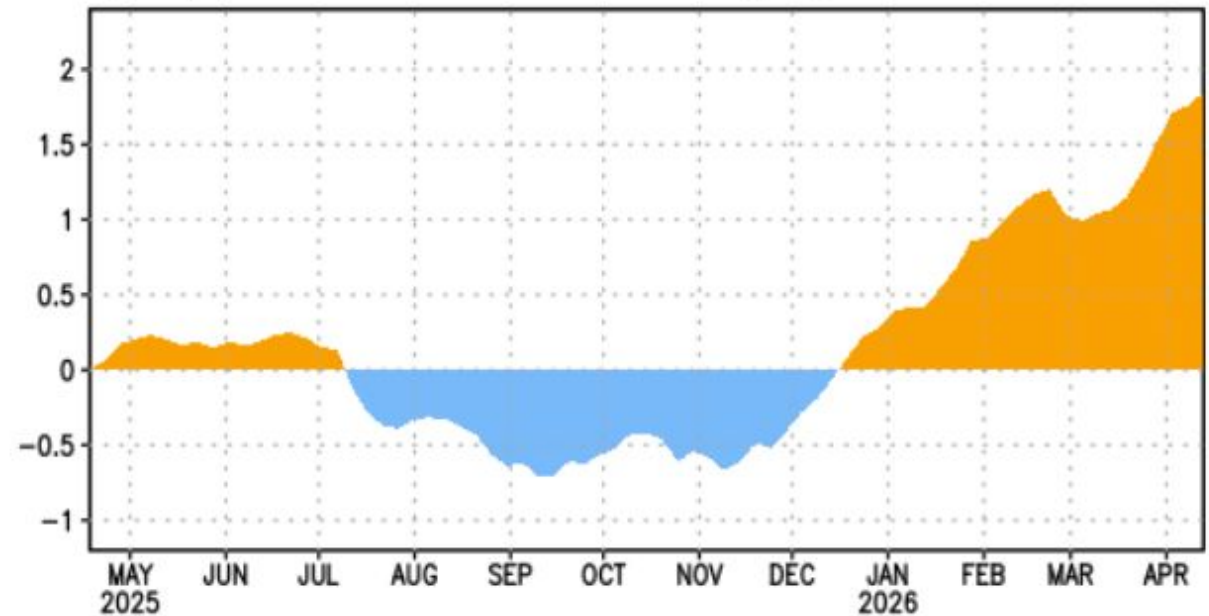


I. Recent state of the climate

El Niño-Southern Oscillation (ENSO) - The ocean



EQ. Upper-Ocean Heat Anoms. (deg C) for 180-100W



- The Eastern Pacific upper ocean has been warming since mid-December. It remained steady in March to quickly rocket in April
- **ENSO precursor** (most of the times).

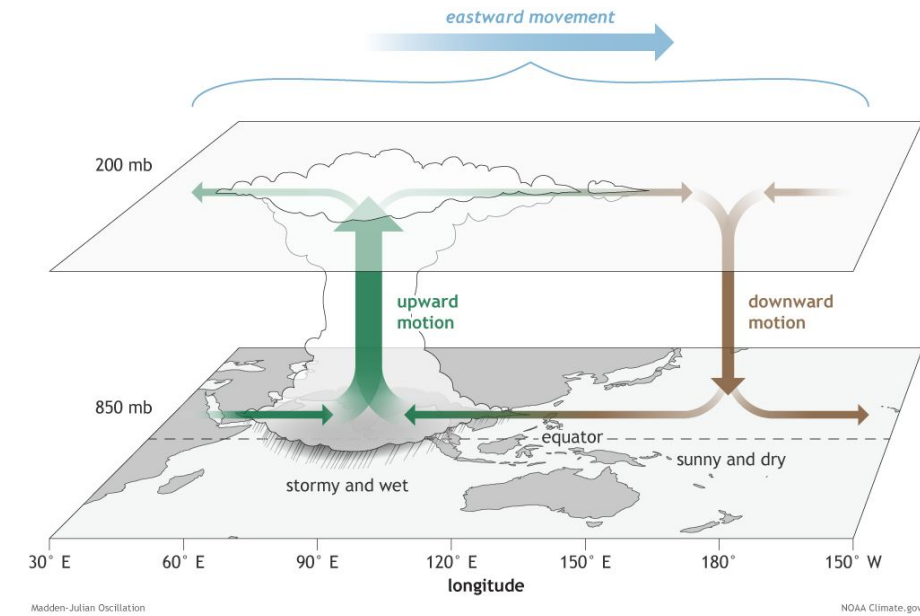
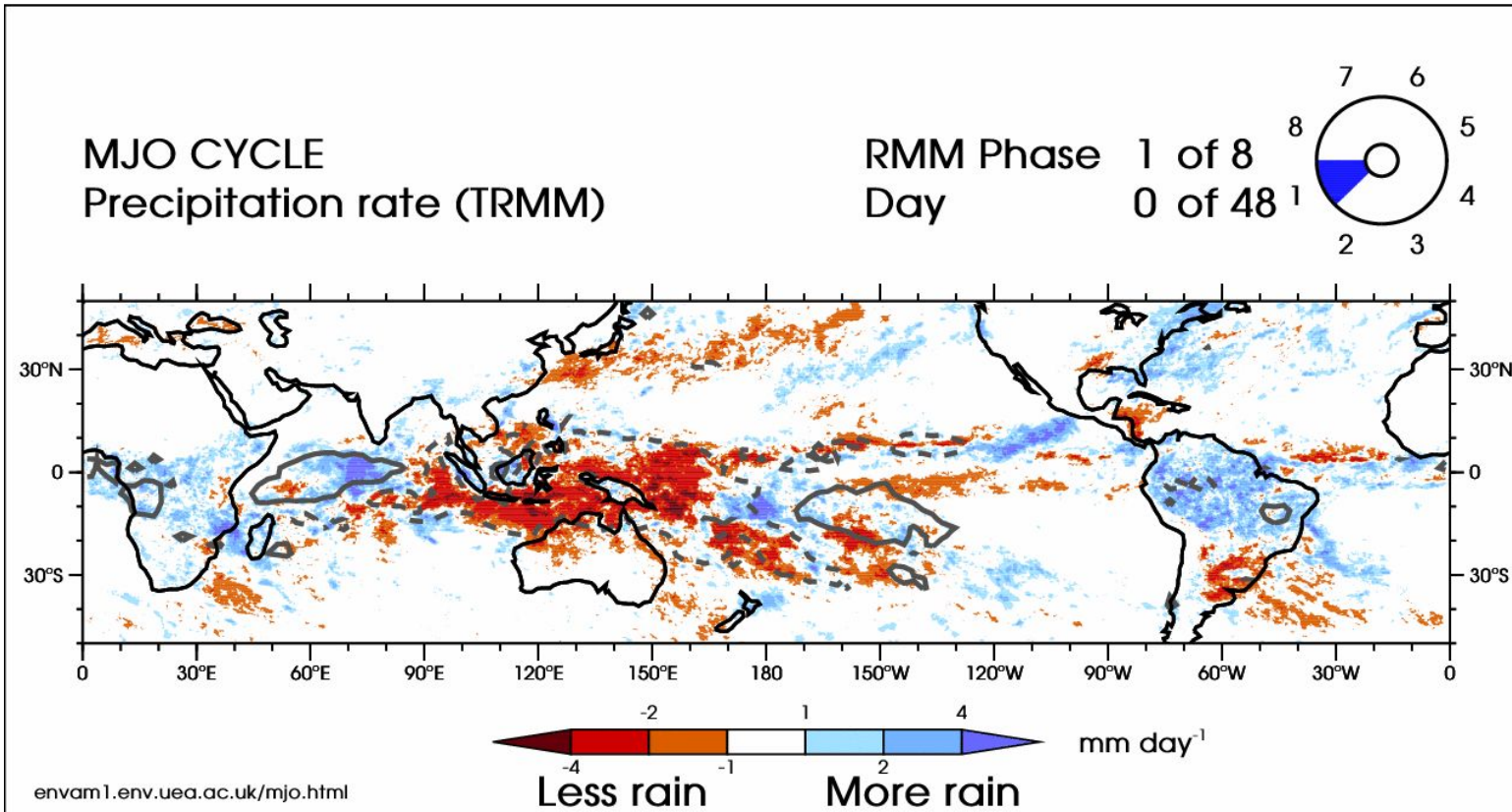
I. Recent state of the climate

II. Subseasonal forecasts

II. Subseasonal forecasts

Madden-Julian Oscillation (MJO)

- The MJO is the leading mode of tropical subseasonal variability with a 20–90 days time scale. It is an important source of regional climate variability and predictability across the globe at subseasonal time scales.

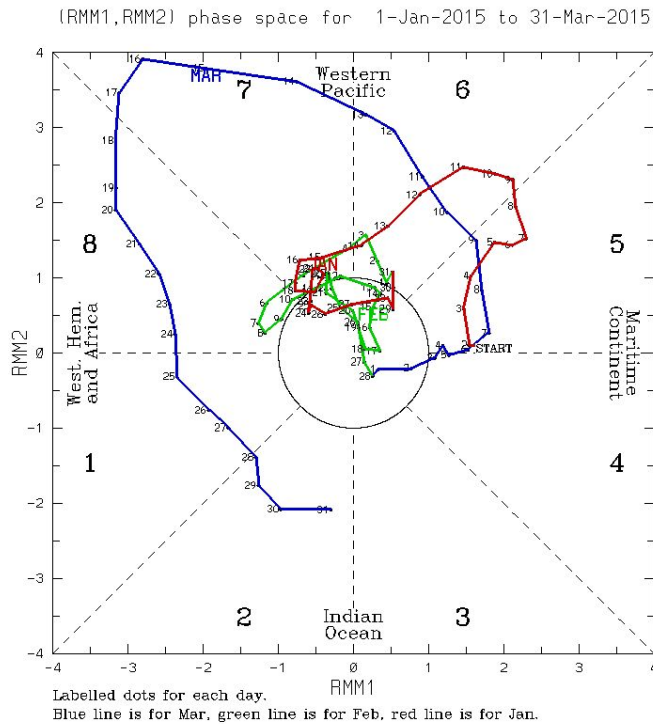


II. Subseasonal forecasts

Is a Super El Niño coming?

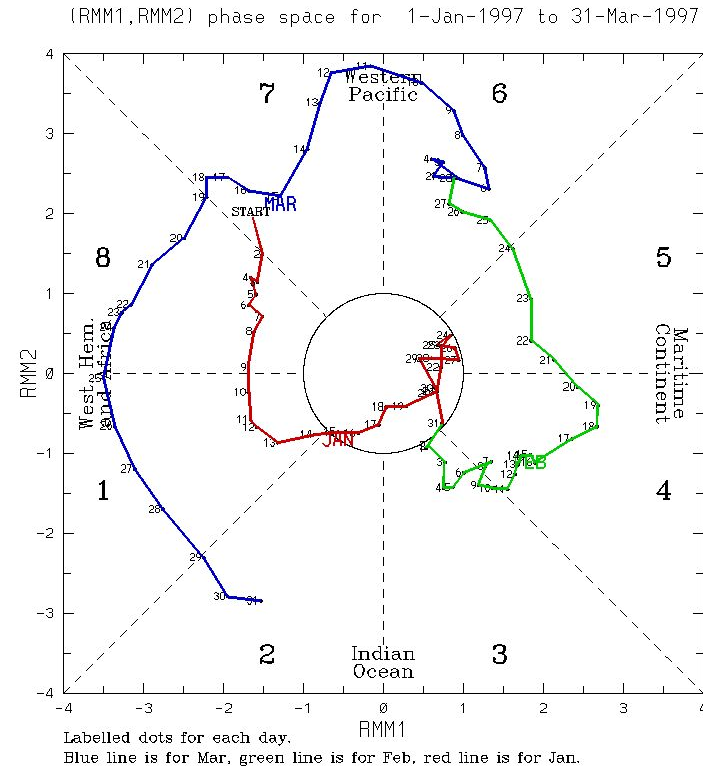
- MJO 97/98, 15/16 very strong in phase 7 and 8 in March (prior to the development of El Niño).

15/16

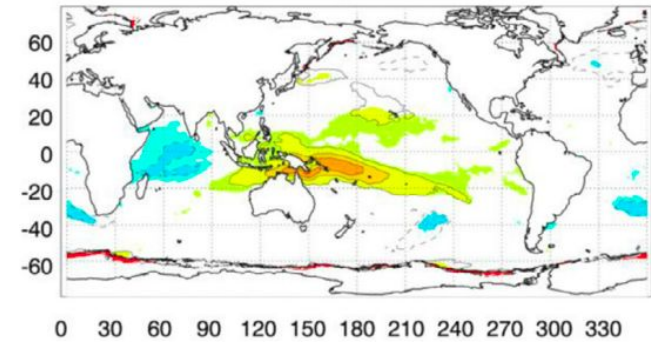


(C) Copyright Commonwealth of Australia Bureau of Meteorology

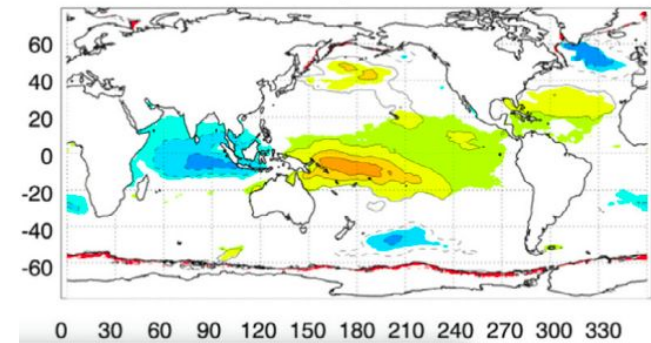
97/98



MJO phase 7



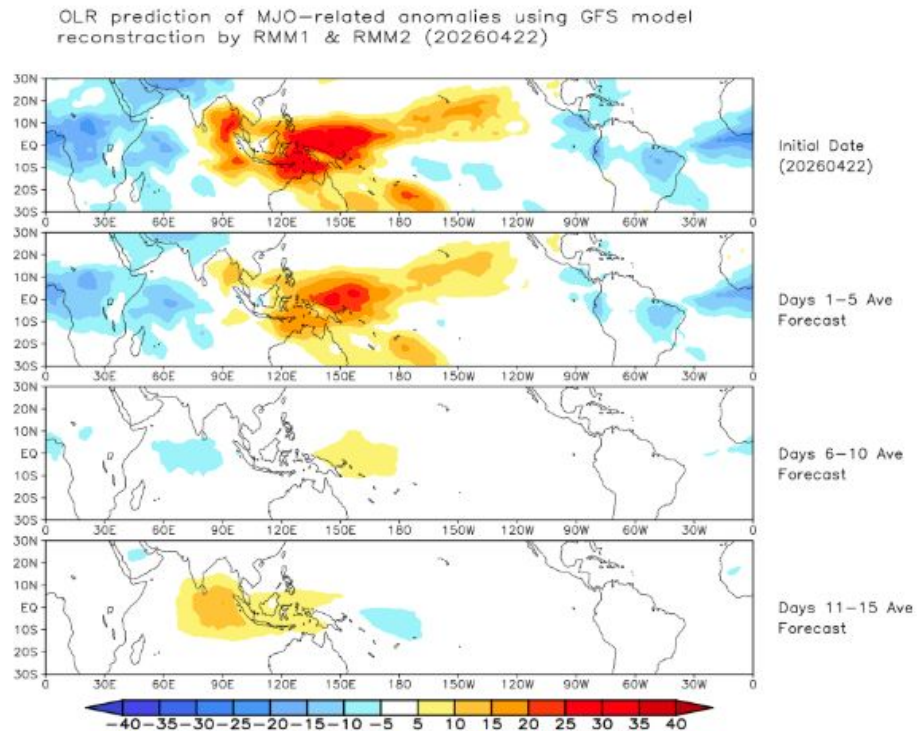
MJO phase 8



II. Subseasonal forecasts

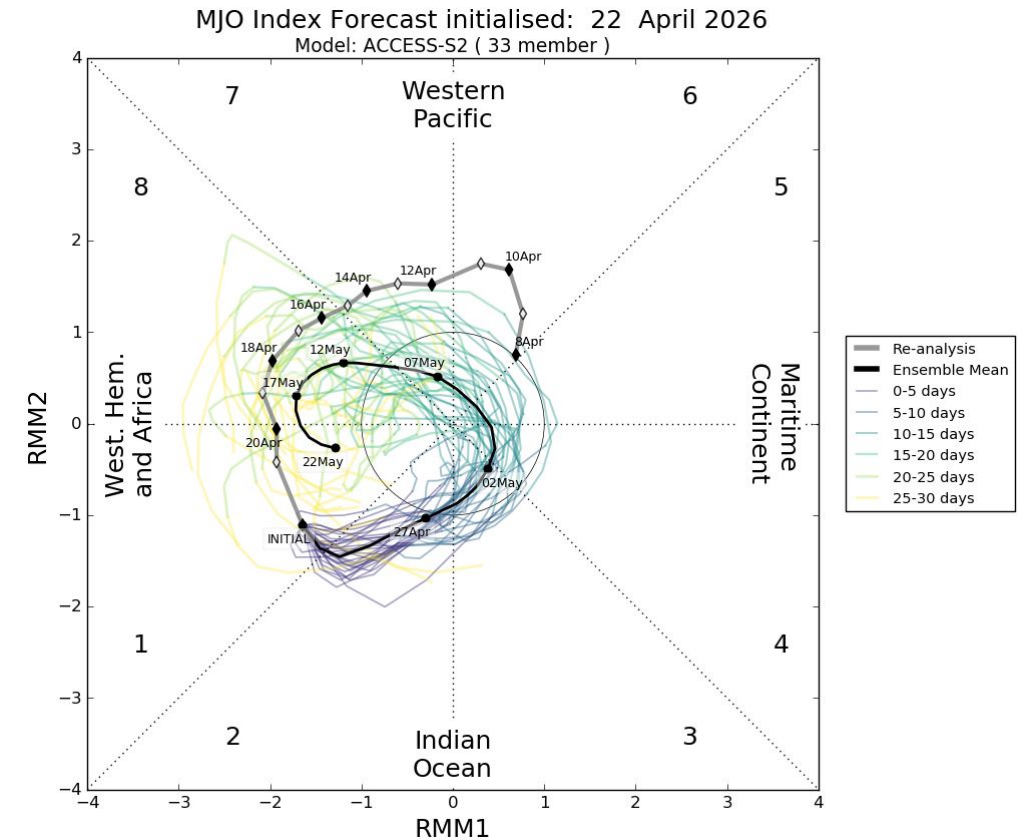
MJO forecasts

- OLR anomalies [W/m²] (ensemble mean GEFS)



Low OLR (enhanced convection) / High OLR (suppressed convection)

- Evolution of last days of observations + ensemble forecast



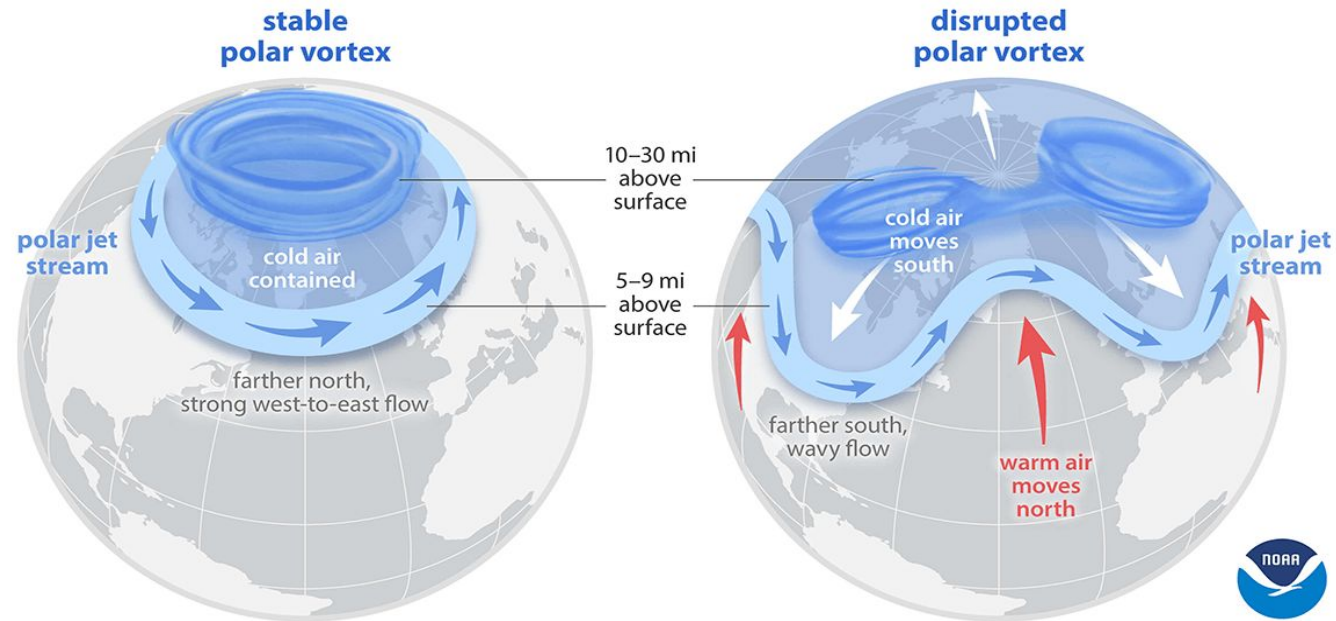
- MJO has remained active during most of April through phase 6, 7, and 8, which contributed to the WWBs observed in the Western Pacific.

Understanding the polar vortex

The Arctic polar vortex is a strong band of winds in the stratosphere, surrounding the North Pole 10–30 miles above the surface.

The polar vortex is far above and typically does not interact with the polar jet stream, the flow of winds in the troposphere 5–9 miles above the surface. But when the polar vortex is especially strong and stable, the jet stream stays farther north and has fewer “kinks.” This keeps cold air contained over the Arctic and the mid-latitudes warmer than usual.

Every other year or so, the Arctic polar vortex dramatically weakens. The vortex can be pushed off the pole or split into two. Sometimes the polar jet stream mirrors this stratospheric upheaval, becoming weaker or wavy. At the surface, cold air is pushed southward to the mid-latitudes, and warm air is drawn up into the Arctic.

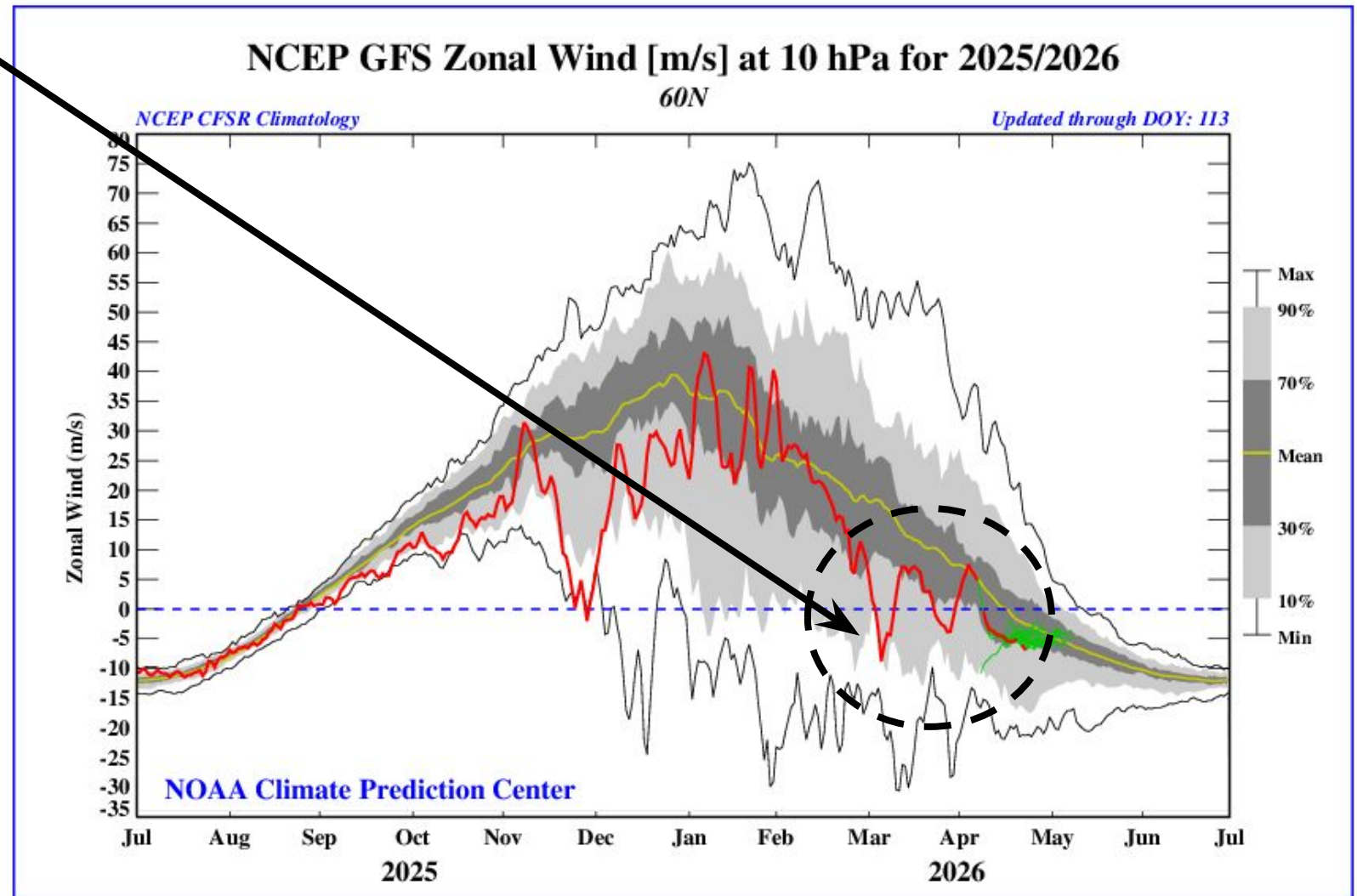


NOAA Climate.gov
2021

II. Subseasonal forecasts

Stratospheric polar vortex

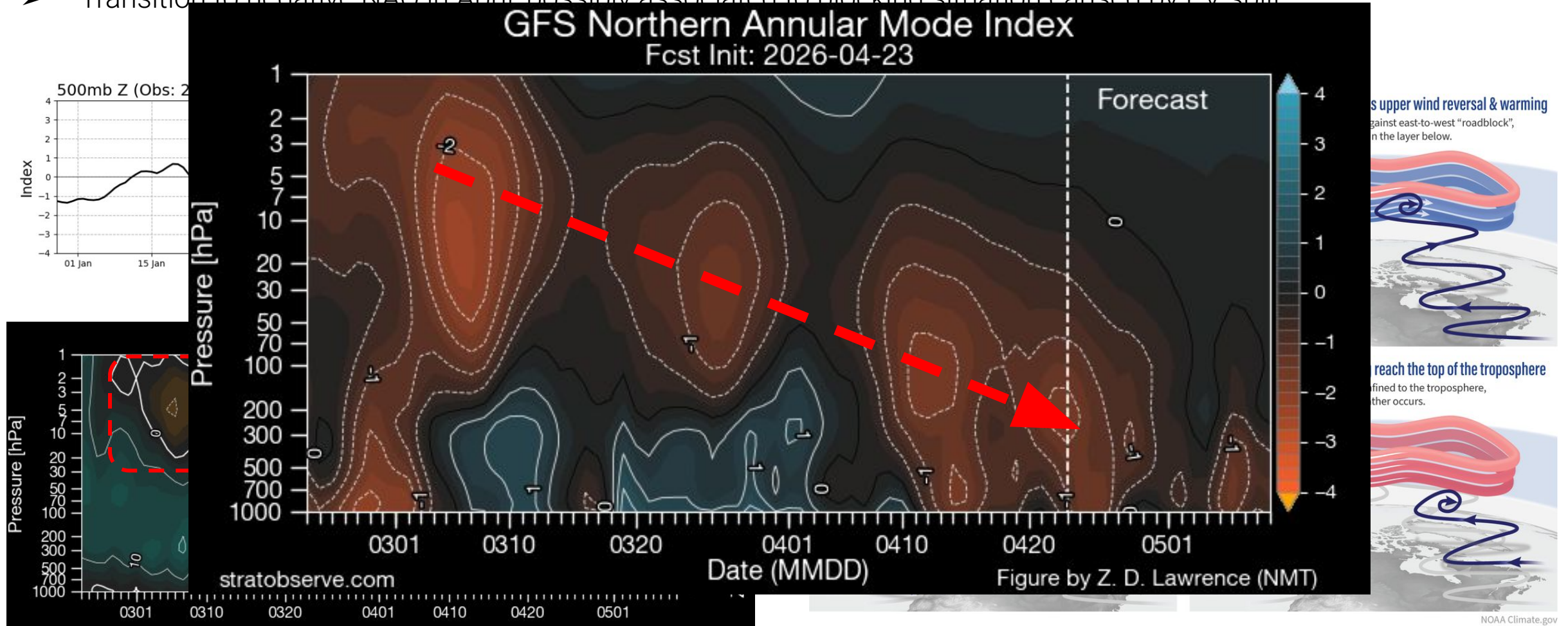
- Two SSWs occurred in early and late March, in the form of a polar vortex split (PV split).
- Final warming has occurred.
- If both PV splits occur within less than 20 days then they are considered part of the final warming event.



II. Subseasonal forecasts

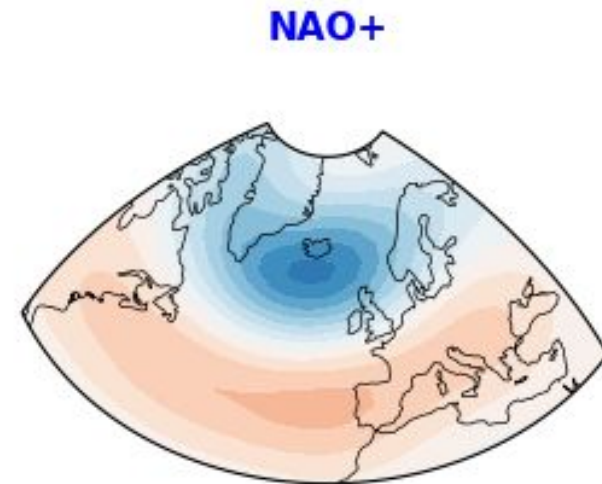
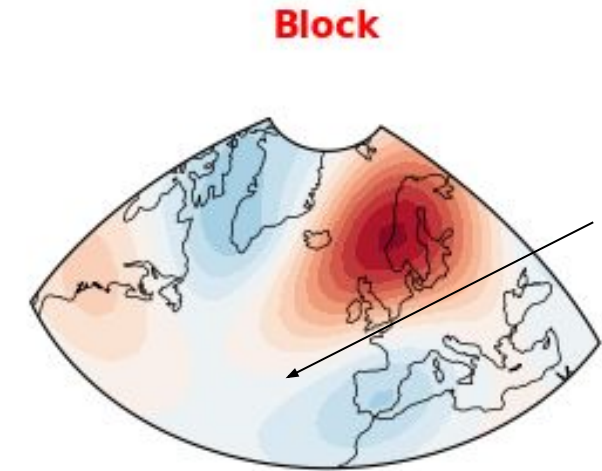
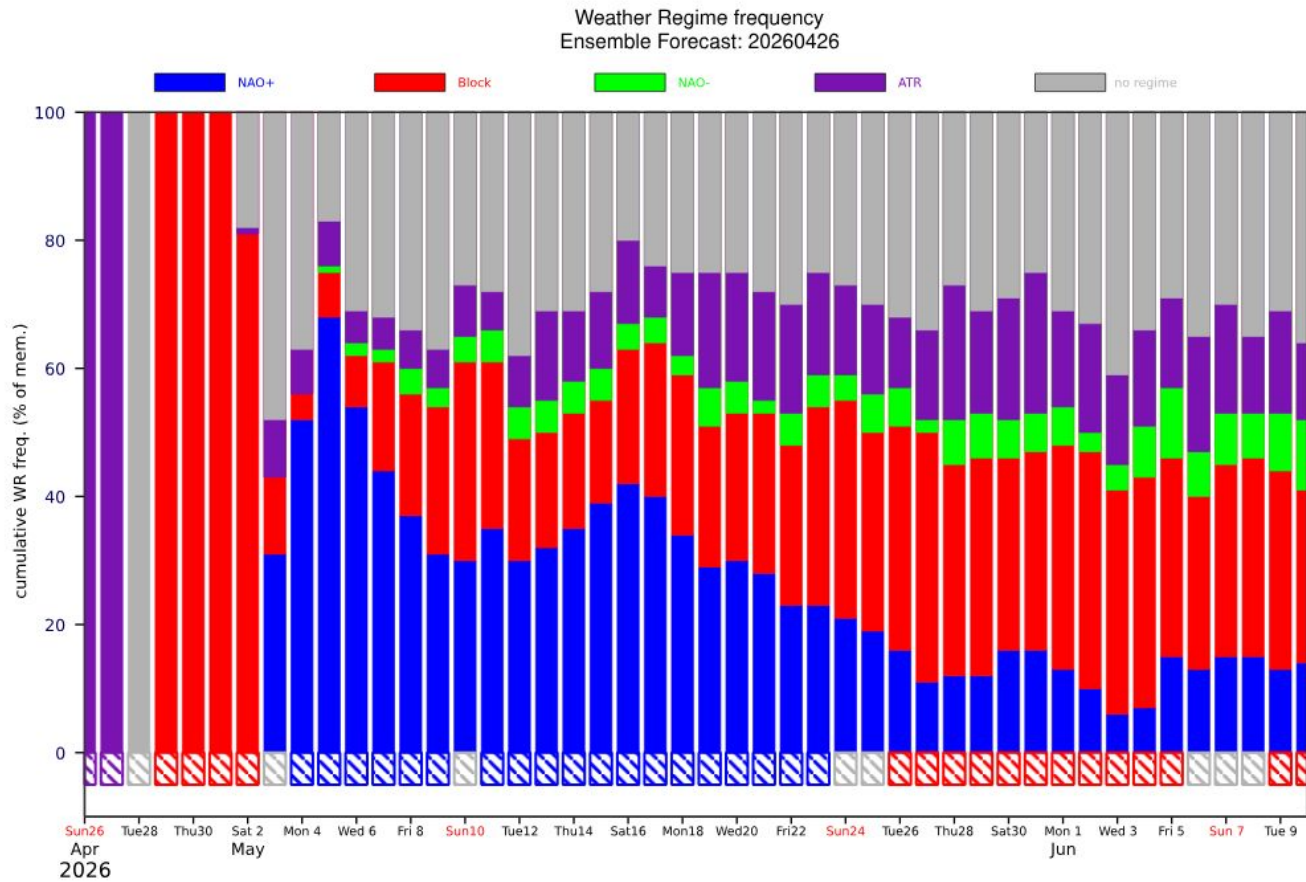
NAO / PV forecast

- Transition to negative NAO in April possibly associated to blocking situation caused by PV split



II. Subseasonal forecasts

Weather regimes



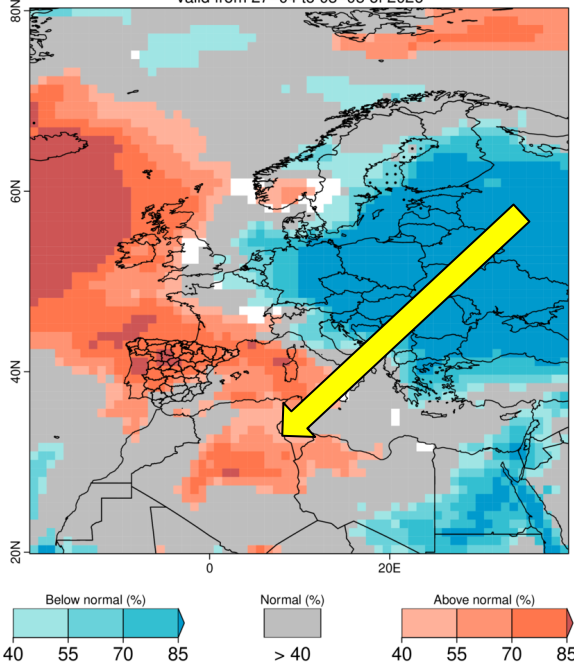
➤ ECMWF more in favour of Scandinavian Blocking.

II. Subseasonal forecasts

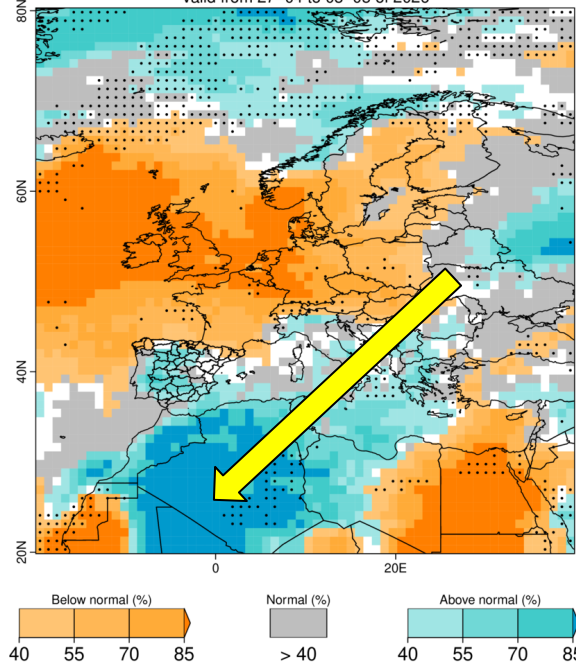
Valid on 27 Apr - 3 May [Init. 23 Apr]

Hindcast period: 1999 - 2016

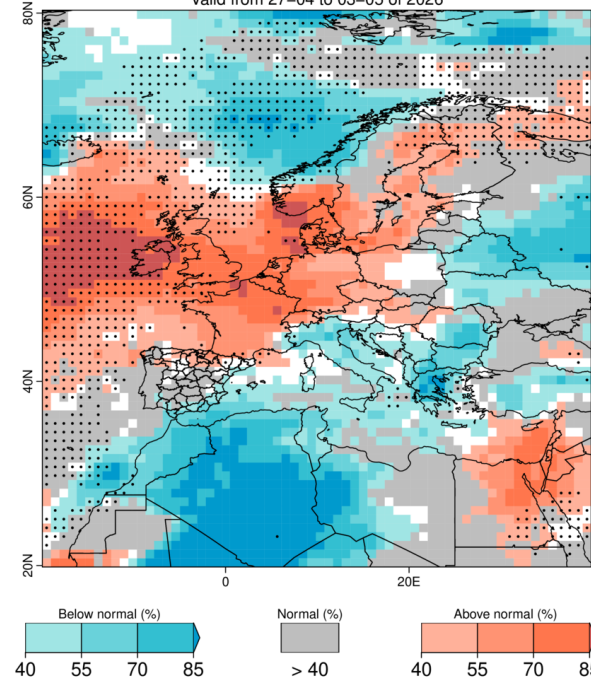
NCEP CFSv2 / 2 Metre Temperature
Most Likely Tercile / Issued on 23-04-2026
Valid from 27-04 to 03-05 of 2026



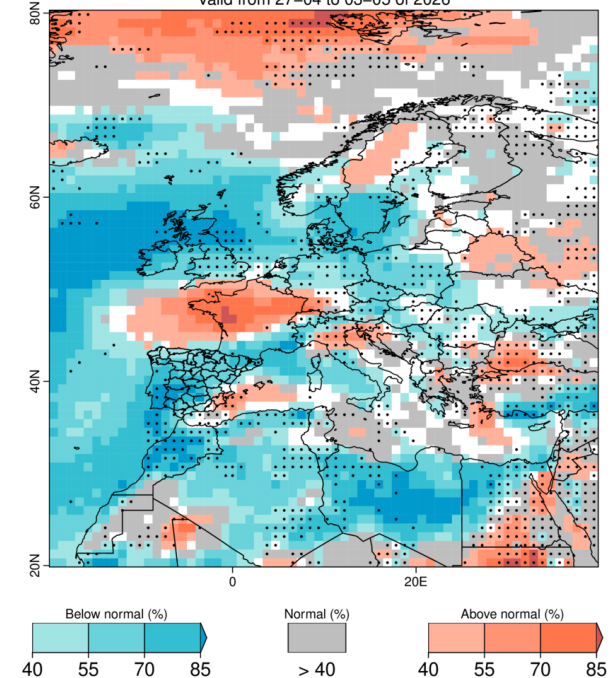
NCEP CFSv2 / Total Precipitation
Most Likely Tercile / Issued on 23-04-2026
Valid from 27-04 to 03-05 of 2026



NCEP CFSv2 / Surface Solar Radiation Downwards
Most Likely Tercile / Issued on 23-04-2026
Valid from 27-04 to 03-05 of 2026



NCEP CFSv2 / 10 Meter Windspeed
Most Likely Tercile / Issued on 23-04-2026
Valid from 27-04 to 03-05 of 2026



Temperature



Precipitation



Solar radiation



Surface wind

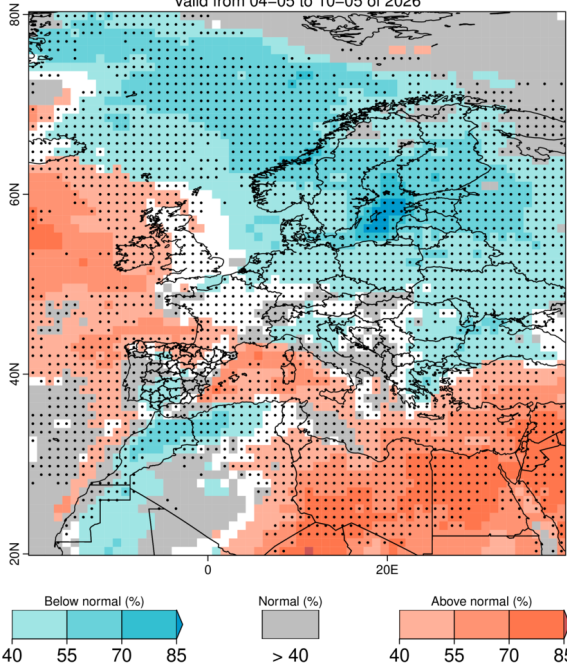
Consistent with NAO+

II. Subseasonal forecasts

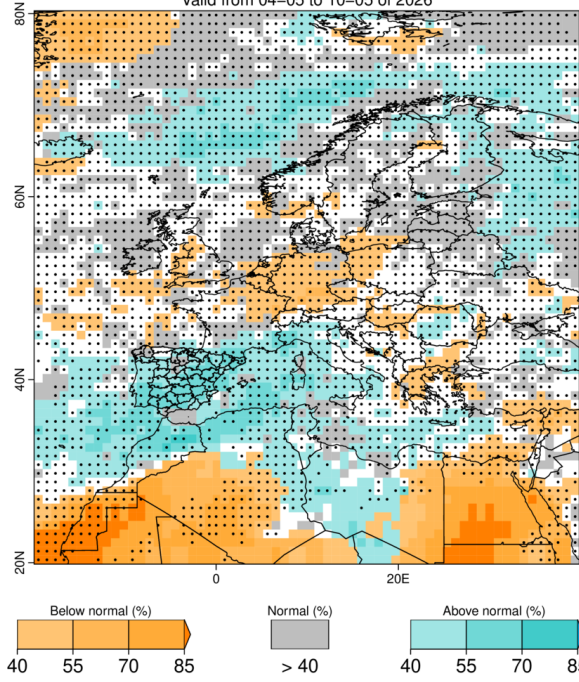
Valid on 4 - 10 May [Init. 23 Apr]

Hindcast period: 1999 - 2016

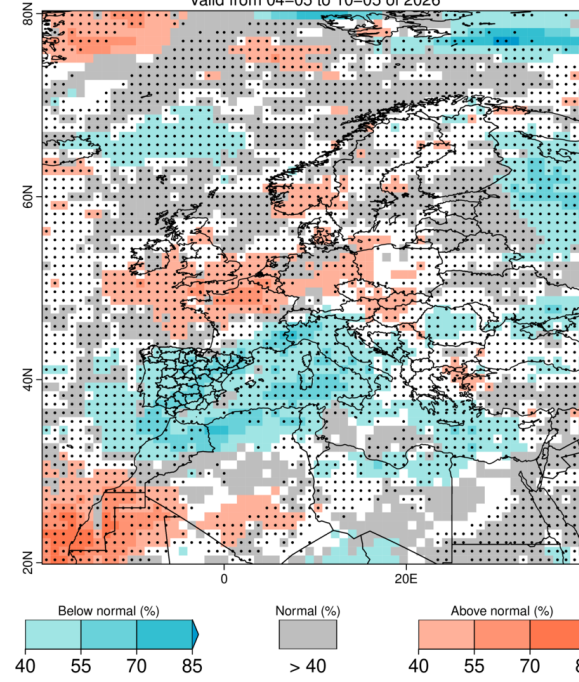
NCEP CFSv2 / 2 Metre Temperature
Most Likely Tercile / Issued on 23-04-2026
Valid from 04-05 to 10-05 of 2026



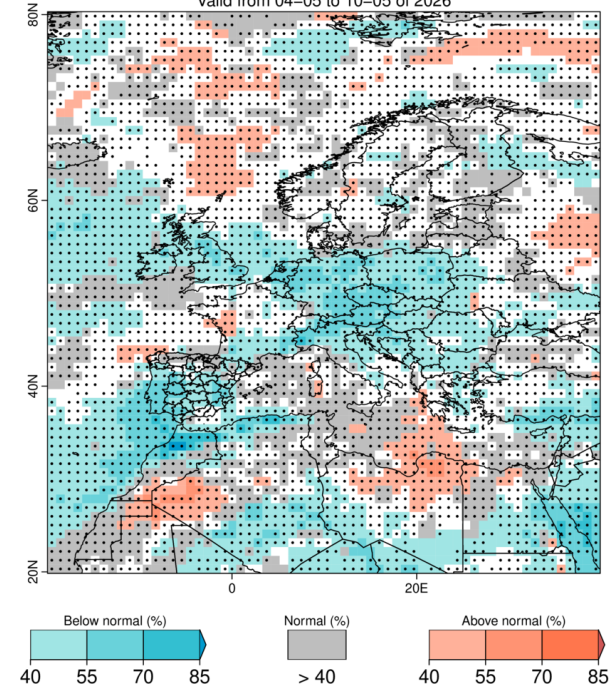
NCEP CFSv2 / Total Precipitation
Most Likely Tercile / Issued on 23-04-2026
Valid from 04-05 to 10-05 of 2026



NCEP CFSv2 / Surface Solar Radiation Downwards
Most Likely Tercile / Issued on 23-04-2026
Valid from 04-05 to 10-05 of 2026



NCEP CFSv2 / 10 Meter Windspeed
Most Likely Tercile / Issued on 23-04-2026
Valid from 04-05 to 10-05 of 2026



Temperature



Precipitation

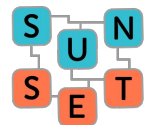


Solar radiation



Surface wind

Mixed NAO-/Block signals + trends?

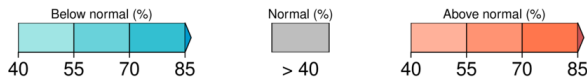
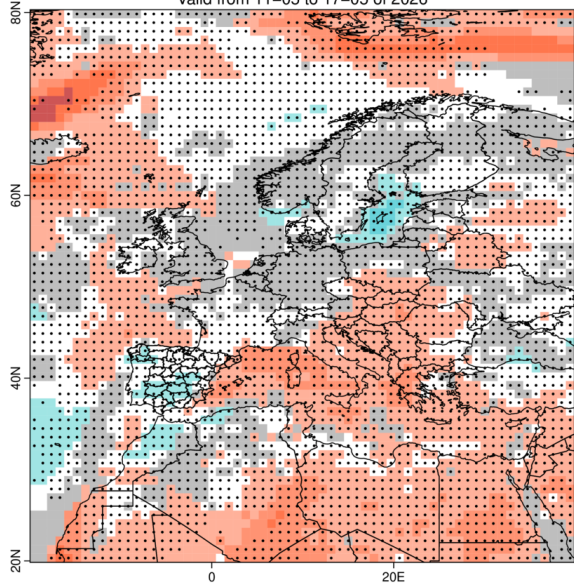


II. Subseasonal forecasts

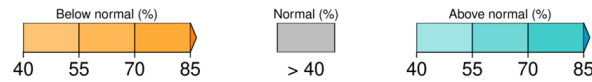
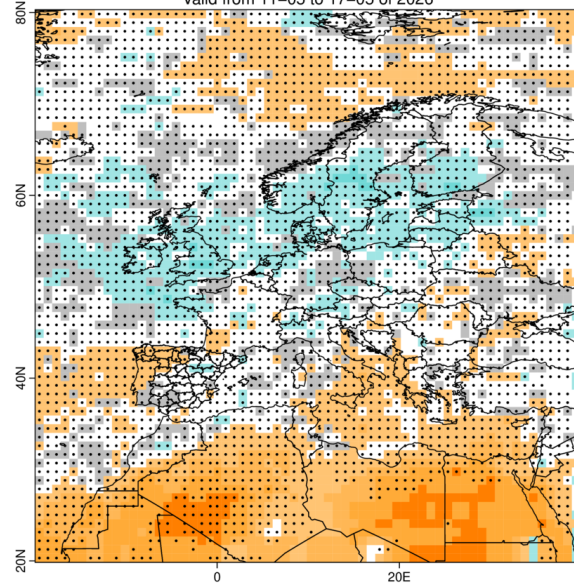
Valid on 11 - 17 May [Init. 23 Apr]

Hindcast period: 1999 - 2016

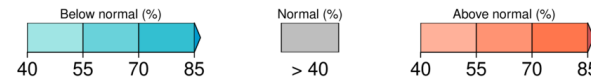
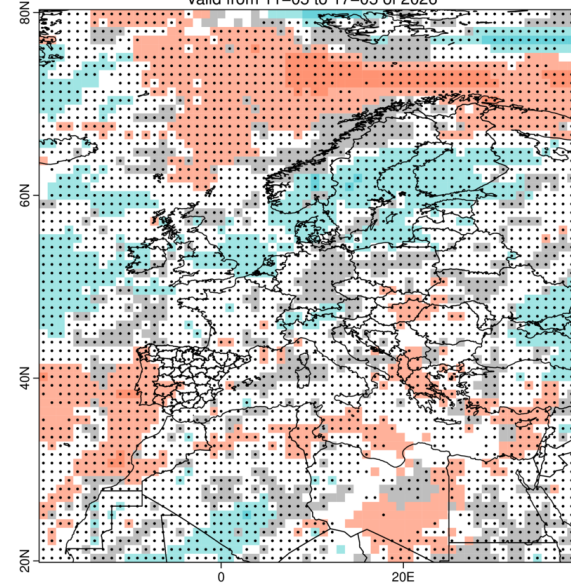
NCEP CFSv2 / 2 Metre Temperature
Most Likely Tercile / Issued on 23-04-2026
Valid from 11-05 to 17-05 of 2026



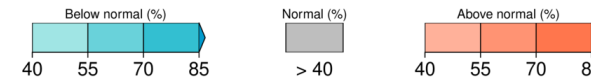
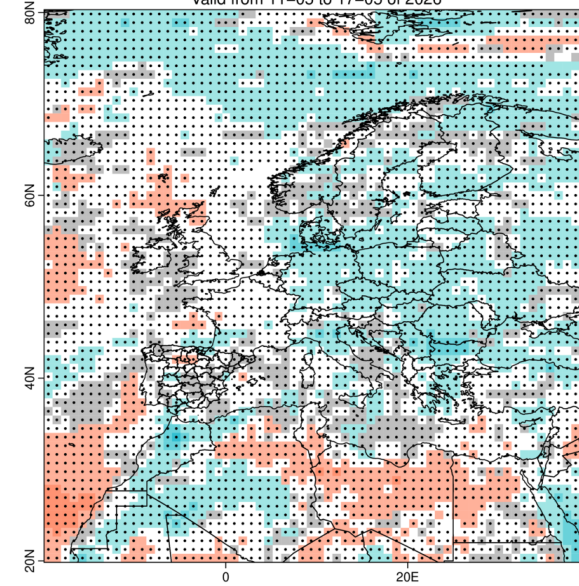
NCEP CFSv2 / Total Precipitation
Most Likely Tercile / Issued on 23-04-2026
Valid from 11-05 to 17-05 of 2026



NCEP CFSv2 / Surface Solar Radiation Downwards
Most Likely Tercile / Issued on 23-04-2026
Valid from 11-05 to 17-05 of 2026



NCEP CFSv2 / 10 Meter Windspeed
Most Likely Tercile / Issued on 23-04-2026
Valid from 11-05 to 17-05 of 2026



Temperature



Precipitation

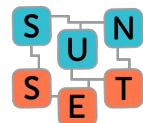


Solar radiation



Surface wind

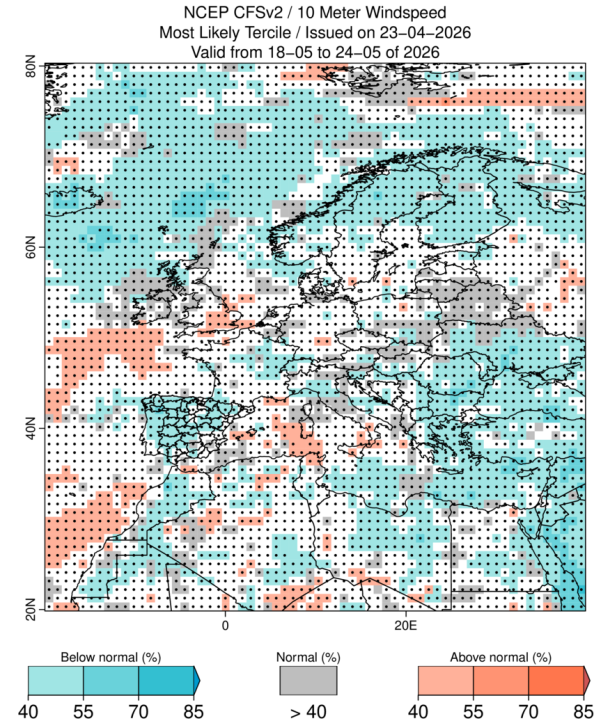
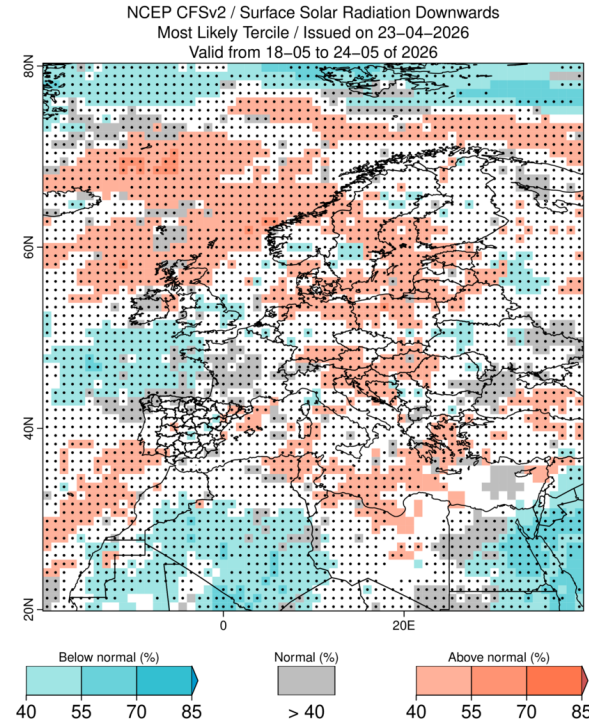
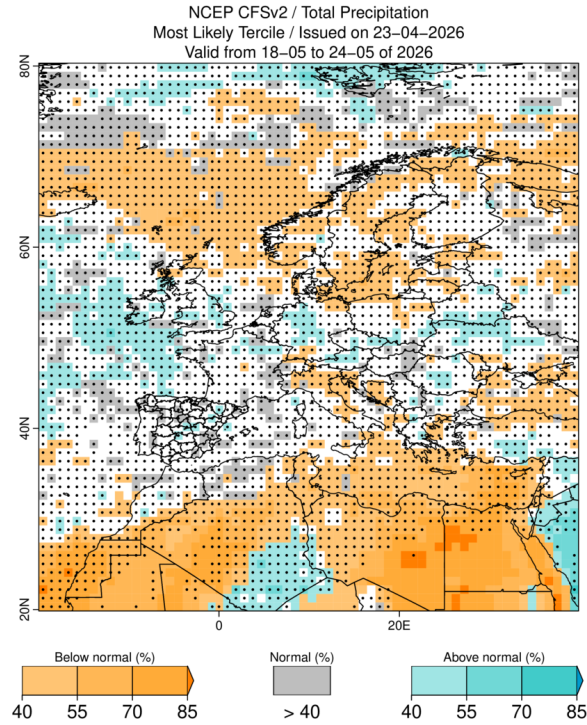
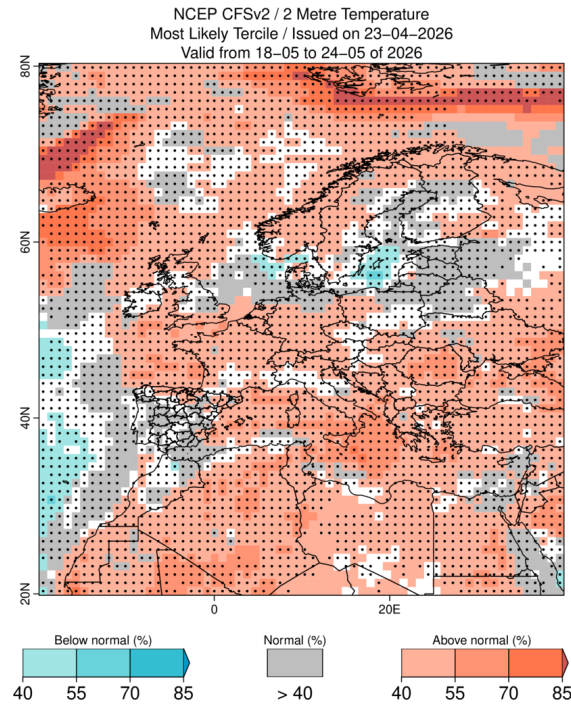
Mixed NAO-/Block signals + trends?



II. Subseasonal forecasts

Valid on 18 - 24 May [Init. 23 Apr]

Hindcast period: 1999 - 2016



Temperature



Precipitation



Solar radiation



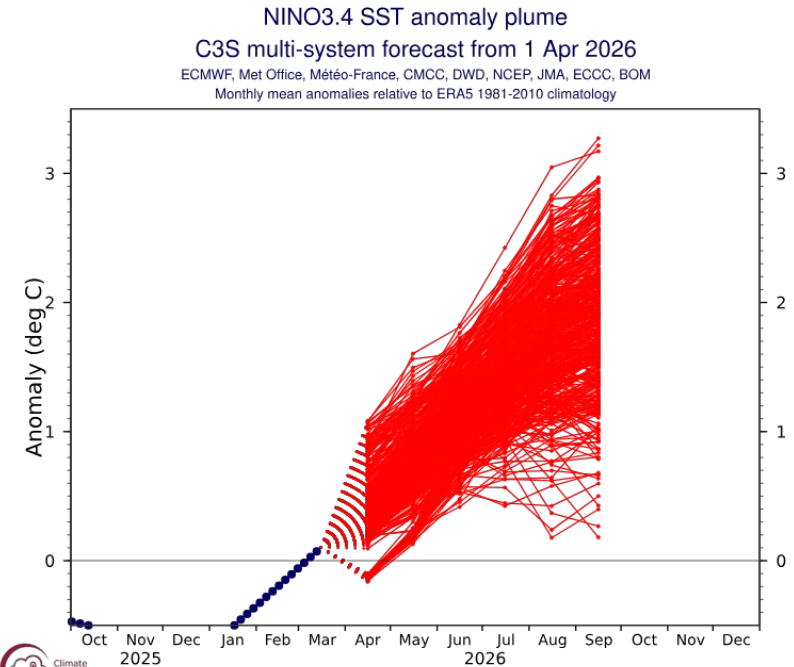
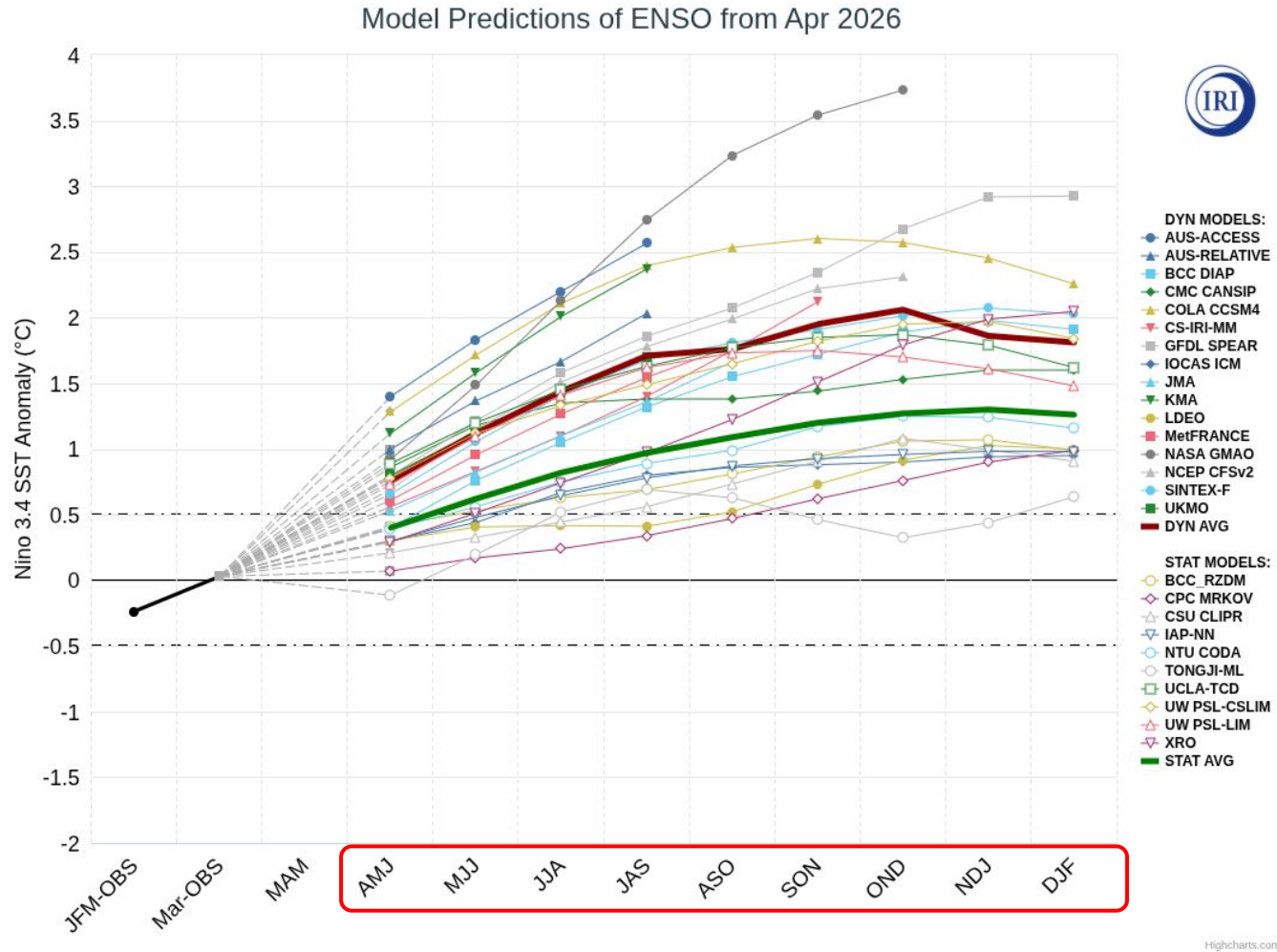
Surface wind

- I. Recent state of the climate
- II. Subseasonal forecasts
- III. Seasonal forecasts

III. Seasonal forecasts

ENSO forecasts

- Transition towards **El Niño** conditions as early as in April-May-June (AMJ).
- The statistical models predict ENSO-neutral conditions until MJJ.
- Watch out, the amplitude of ENSO (SST anomalies) is quite sensitive to the reference period. Here IRI's using 1991-2020.

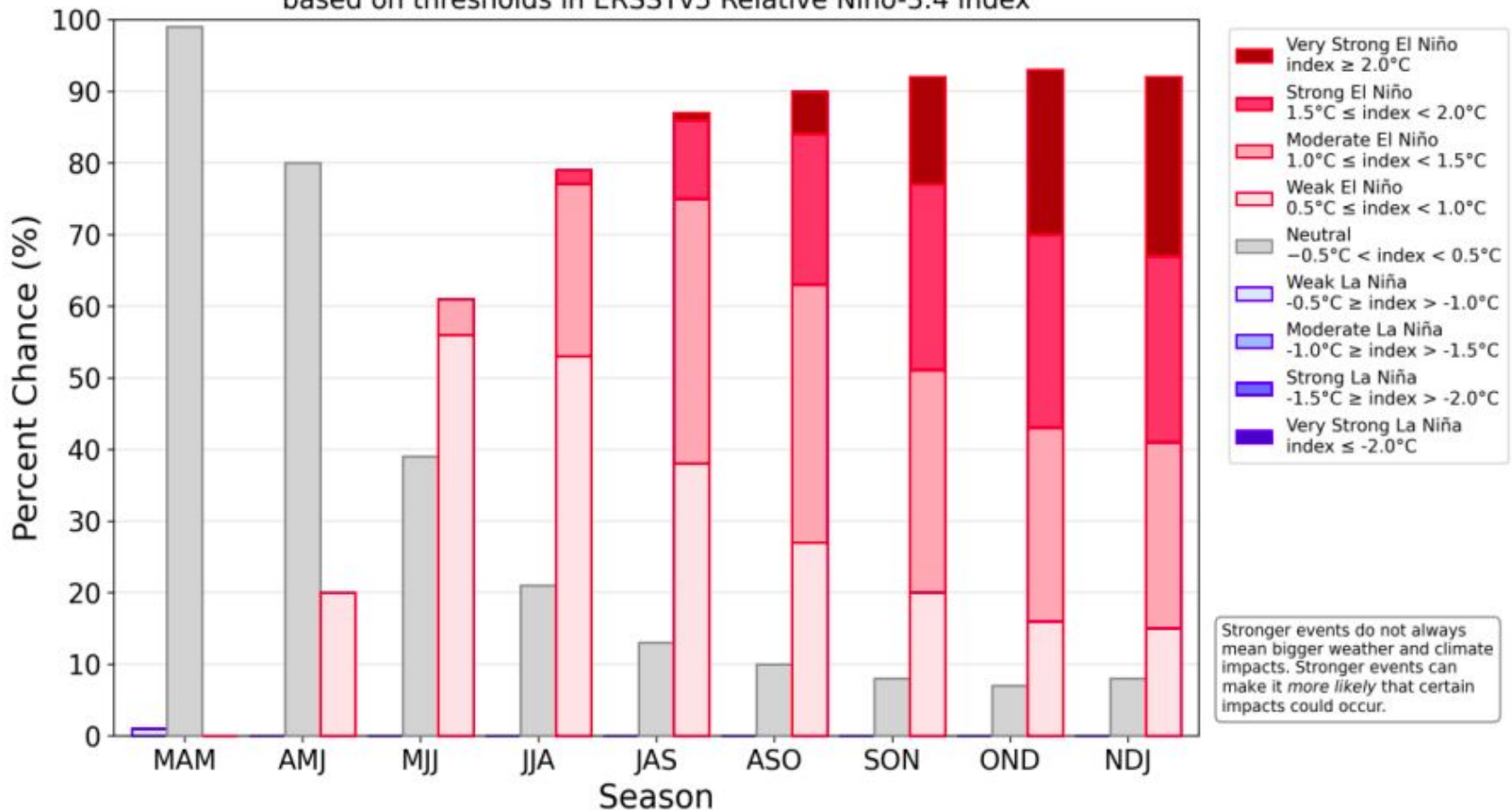


III. Seasonal forecasts

ENSO forecasts

NOAA CPC ENSO Strength Probabilities (issued April 2026)

based on thresholds in ERSSTv5 Relative Niño-3.4 index

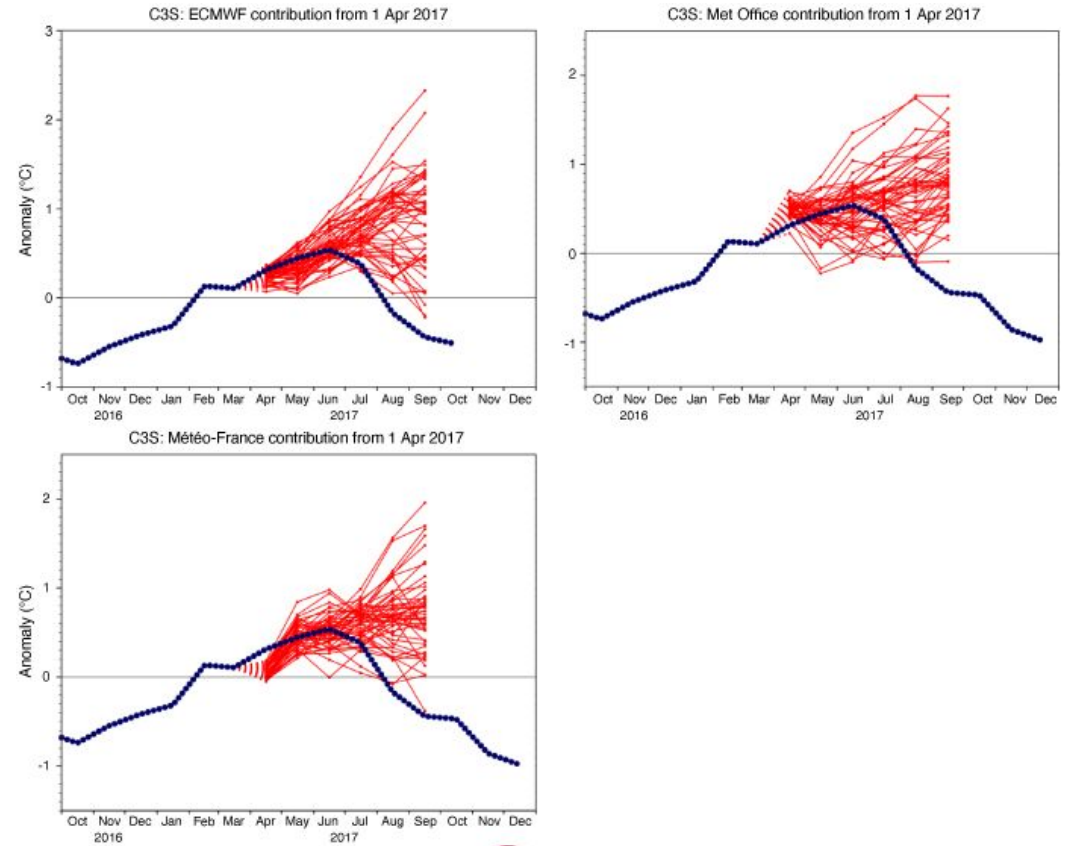
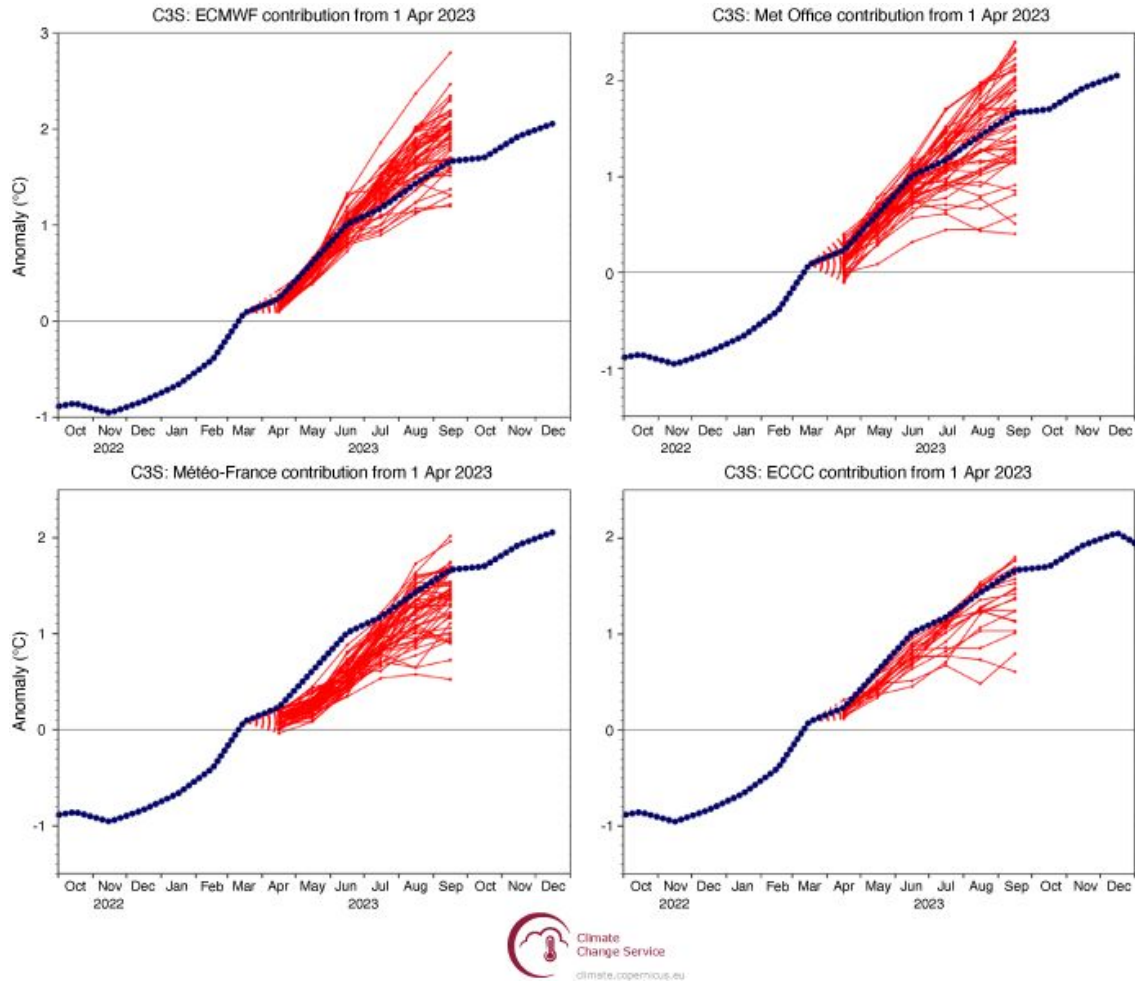


- Almost equal probabilities of having a moderate, strong or very strong El Niño by NDJ.
- Reduced probability of having a weak El Niño.

III. Seasonal forecasts

ENSO forecasts: A note of caution

➤ Although the signal seems strong, there is still a lot of spread in the multi-system ensemble. Moreover, we are still in the middle of the **springtime predictability barrier** (SPB).

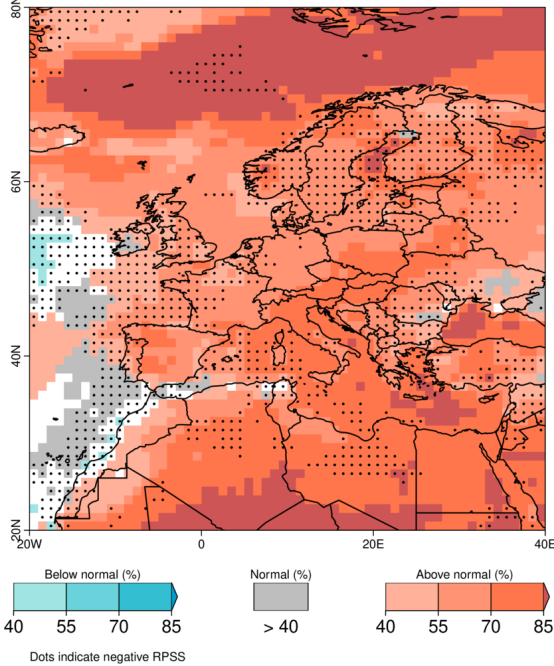


III. Seasonal forecasts

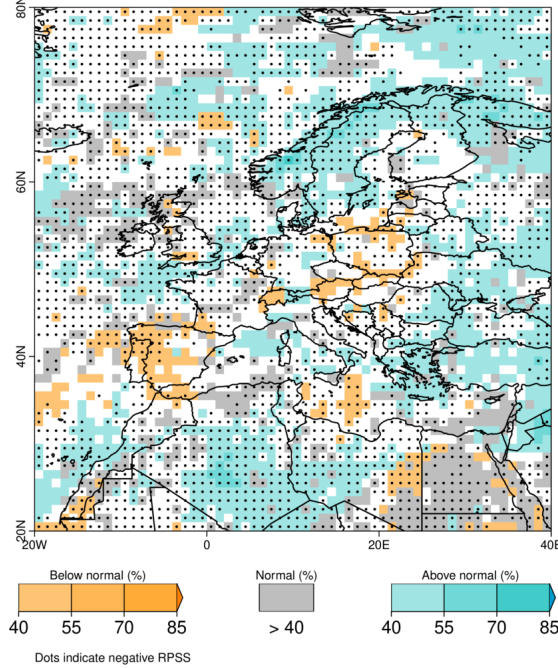
MJJ 2026 (Forecast times 2-4)

Hindcast period: 1993 - 2016

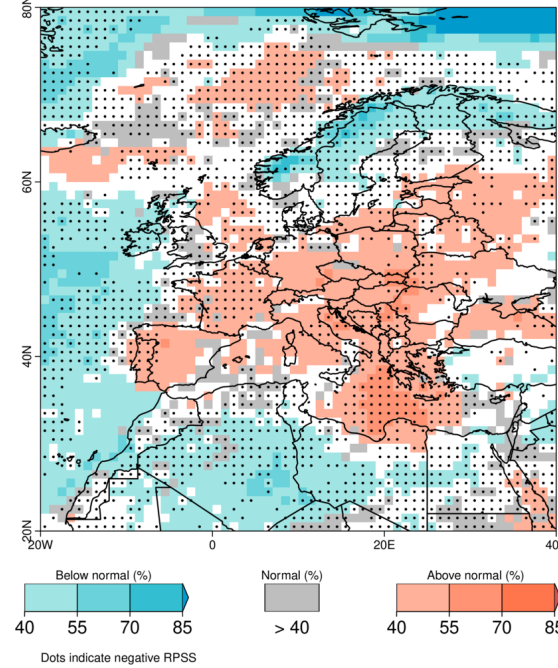
ECMWF SEAS5 (v5.1) / 2 Metre Temperature
Most Likely Tercile / May to July 2026 / Start date: 01-04-2026



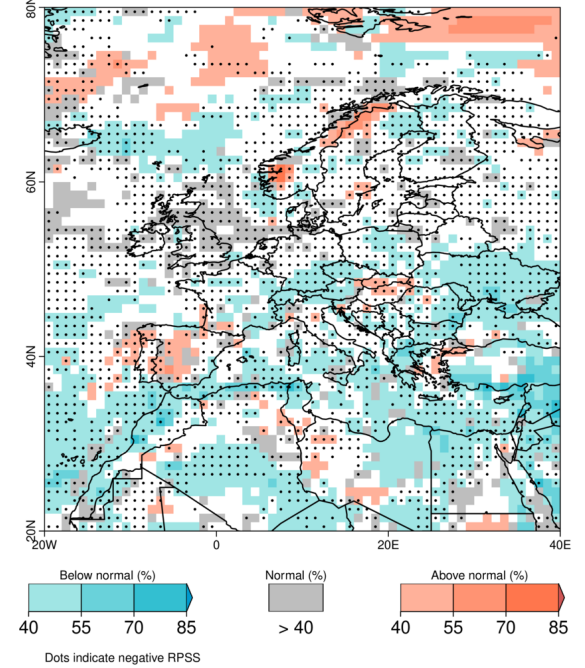
ECMWF SEAS5 (v5.1) / Total Precipitation
Most Likely Tercile / May to July 2026 / Start date: 01-04-2026



ECMWF SEAS5 (v5.1) / Surface Solar Radiation Downwards
Most Likely Tercile / May to July 2026 / Start date: 01-04-2026



ECMWF SEAS5 (v5.1) / Near-Surface Wind Speed
Most Likely Tercile / May to July 2026 / Start date: 01-04-2026



Temperature



Precipitation



Solar radiation



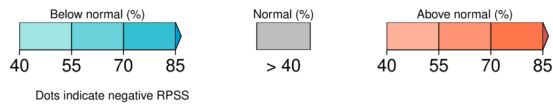
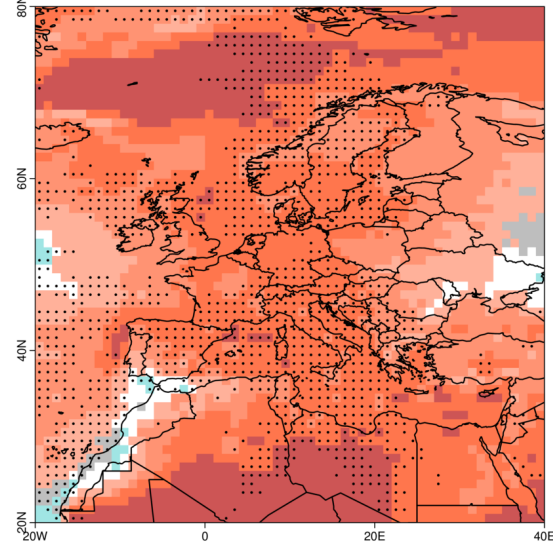
Surface wind

III. Seasonal forecasts

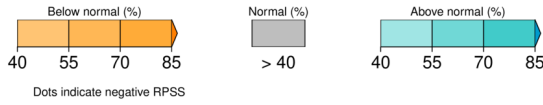
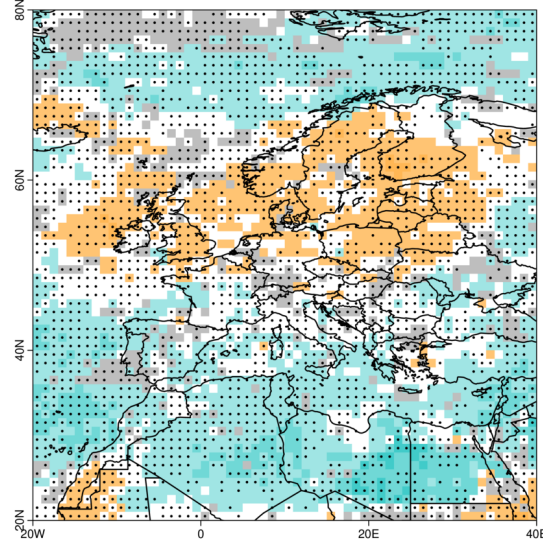
AS 2026 (Forecast times 5-6)

Hindcast period: 1993 - 2016

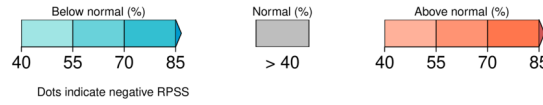
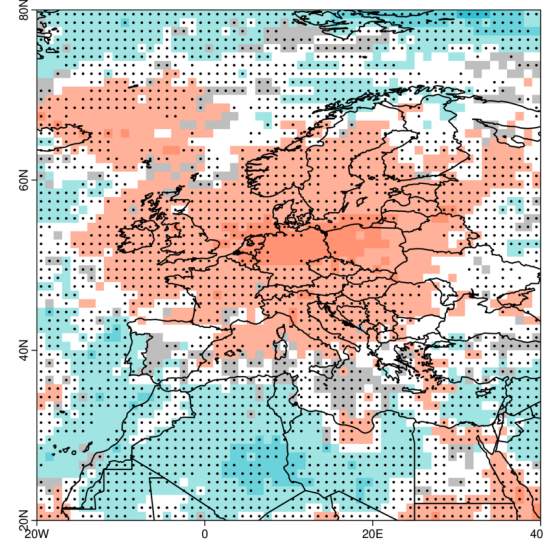
ECMWF SEAS5 (v5.1) / 2 Metre Temperature
Most Likely Tercile / August to September 2026 / Start date: 01-04-2026



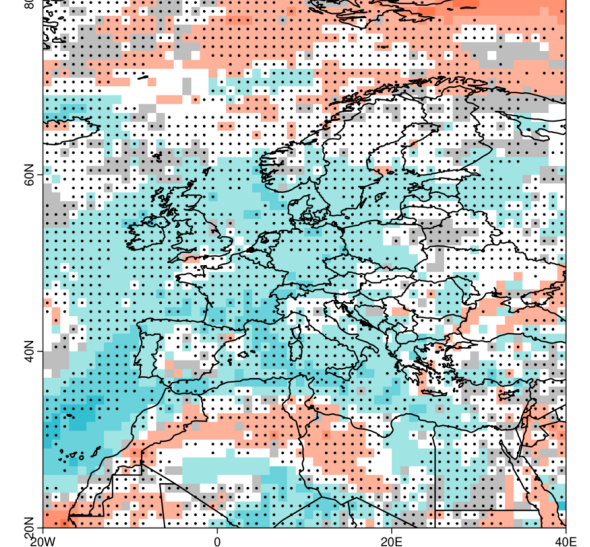
ECMWF SEAS5 (v5.1) / Total Precipitation
Most Likely Tercile / August to September 2026 / Start date: 01-04-2026



ECMWF SEAS5 (v5.1) / Surface Solar Radiation Downwards
Most Likely Tercile / August to September 2026 / Start date: 01-04-2026



ECMWF SEAS5 (v5.1) / Near-Surface Wind Speed
Most Likely Tercile / August to September 2026 / Start date: 01-04-2026



Temperature



Precipitation

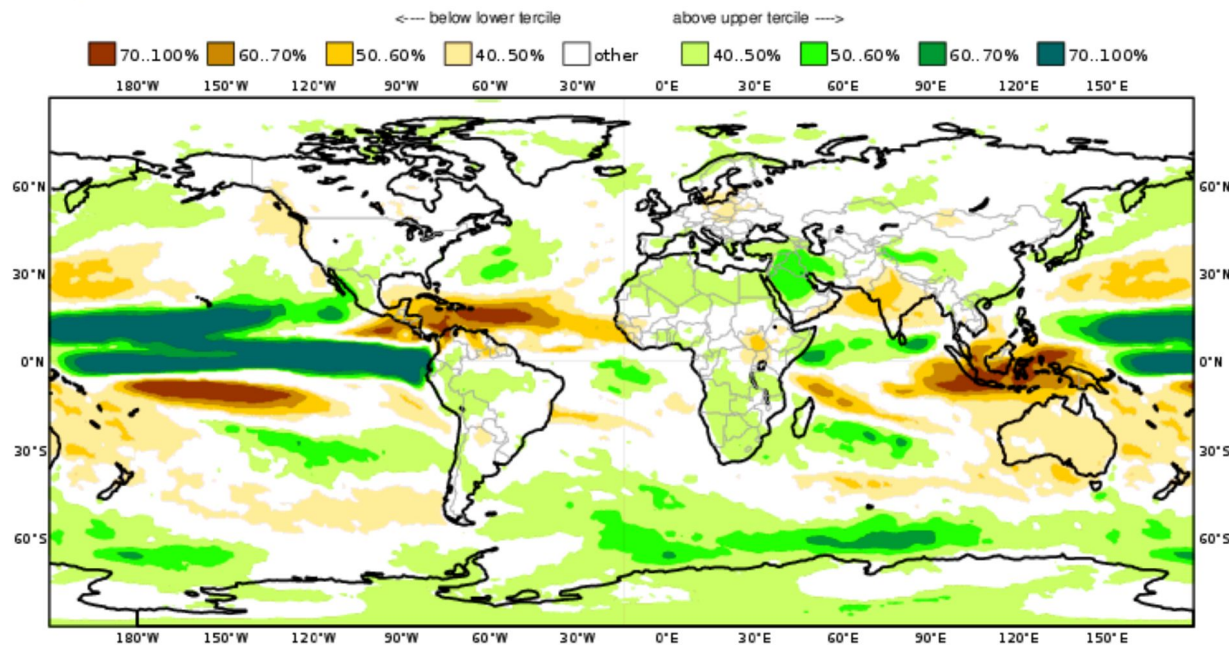


Solar radiation



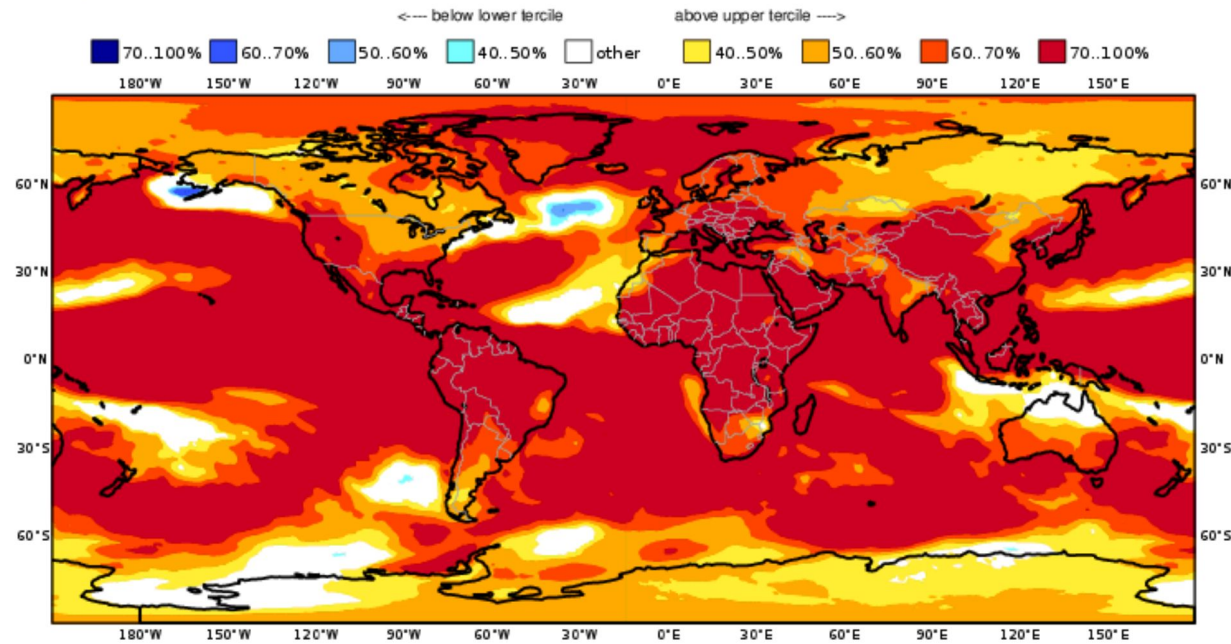
Surface wind

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC/BOM
Prob(most likely category of precipitation) MJJ 2026
Nominal forecast start: 01/04/26
Unweighted mean



- **Positive** Most of South America (except NE), Most of Africa, Mexico, Southern Europe, Fennoscandia, Arabic Peninsula
- **Negative** Indonesia, Australia, Central America...

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC/BOM
Prob(most likely category of 2m temperature) MJJ 2026
Nominal forecast start: 01/04/26
Unweighted mean



- Typical global warming signal.
- Parts of North Atlantic and NE Pacific with cooler anomalies.

Earth Sciences
Department



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación

Forecast Briefing

April 2026

Marta Brotons, Pep Cos, Aleksander Lacima and Paloma Trascasa

Earth Sciences department

Barcelona Supercomputing Center (BSC)

Tuesday 28th April 2026