Météo-France Seasonal Forecast Bulletin

JUNE- JULY - AUGUST 2024

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General synthesis : JJA 2024

The "El Niño" phase came to an end at the beginning of this quarter.

A) Oceanic forecast :

- ENSO : Neutral conditions.

- IOD : Positive phase.

- Equatorial and north tropical Atlantic, Northeastern Atlantic : Strong positive anomaly.

B) Drivers :

Positive phase of IOD and warm anomaly over the North Atlantic.

C) Atmospheric circulation :

Atmospheric response is now convergent between the different models. It is consistent with the positive phase of the IOD around the Indian Ocean.
The models agree on subsidences in the Pacific basin.
They also agree on the patterns of stream functions, with two dipoles and still an anticyclonic curvature stretching as far as the Mediterranean basin, more or less remarquable depending on the model.
EA+, NAO+ and PNA- modes are predominant, .

D) Most likely conditions :

Temperatures : The warmer-than-normal scenario is favored across Europe.

Precipitations : Drye-than-normal is favored across southwestern Europ.

Next bulletin : scheduled on Juin 18th

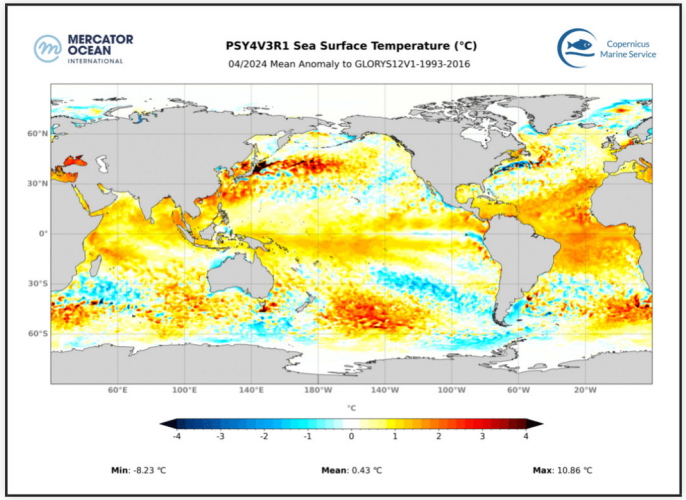
Oceanic analysis of April 2024 : SST anomalies

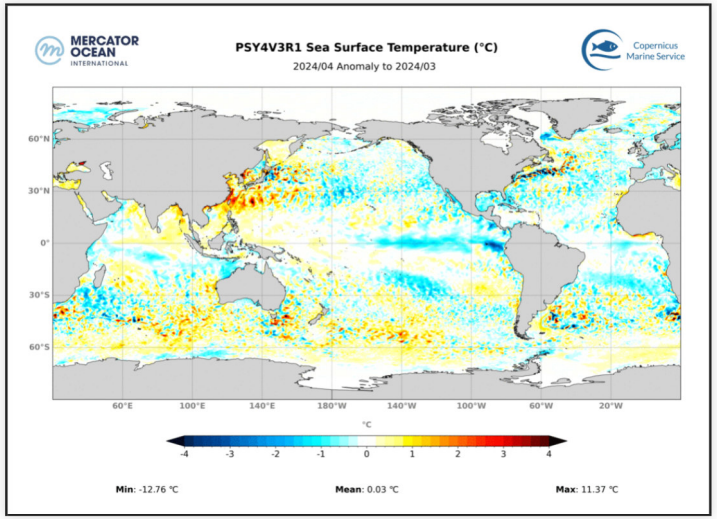
Current ENSO situation : positive phase

In the Pacific Ocean : In the equatorial basin, the positive anomaly is still visible, but it is becoming weaker and weaker. In the Northern Hemisphere, the PDO- pattern is also visible, but attenuated.

In the Indian Ocean : Overall, the SST remains above normal, but the difference from normal is decreasing except concerning the southwest of Australia.

In the Atlantic Ocean : Warm anomalies remain marked over the intertropical zone and the eastern North Atlantic basin, although they are fading over the latter.

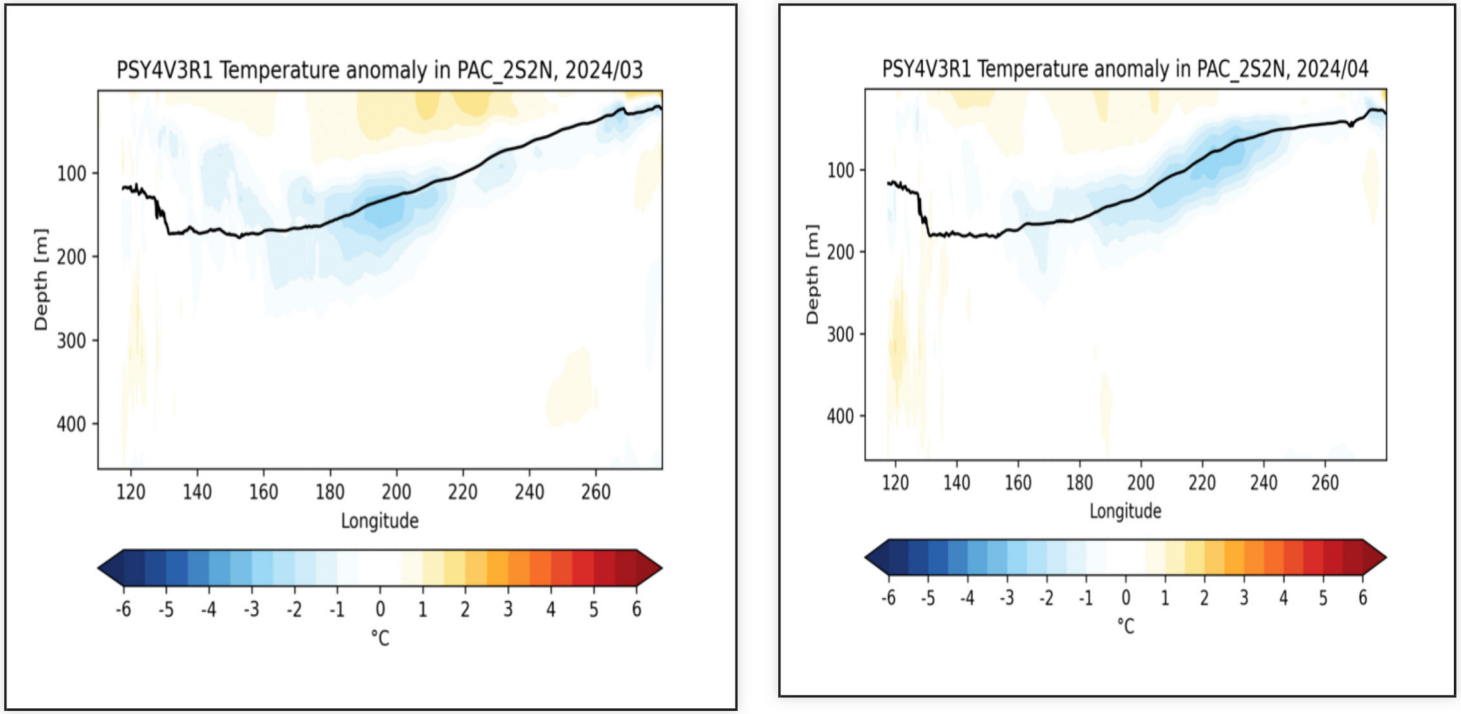




SST Anomalies and trend with the previous month (c) Mercator-Ocean

Oceanic analysis of April 2024 : Pacific vertical section

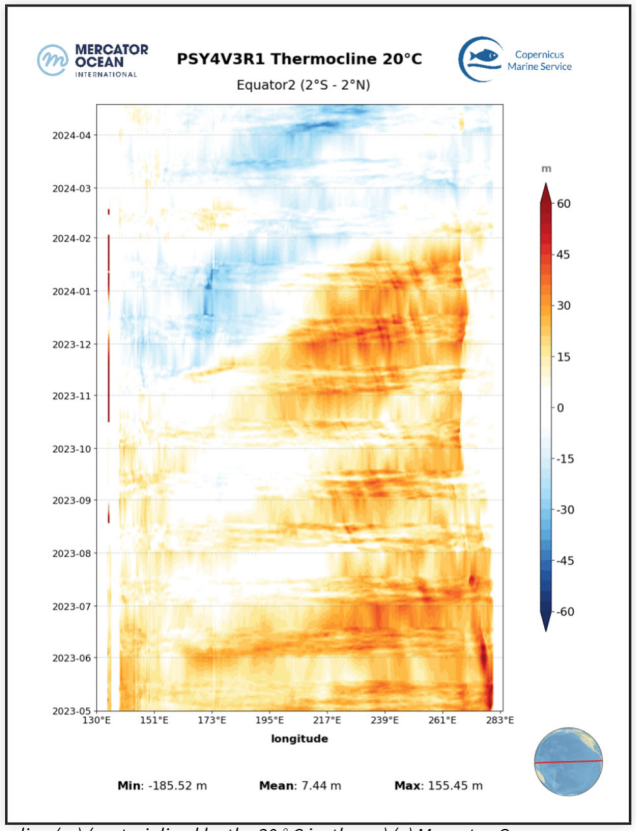
In the subsurface, the warm anomaly has almost completely disappeared.



Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

Oceanic analysis of April 2024 : Hovmüller diagram of the 20°C isotherm

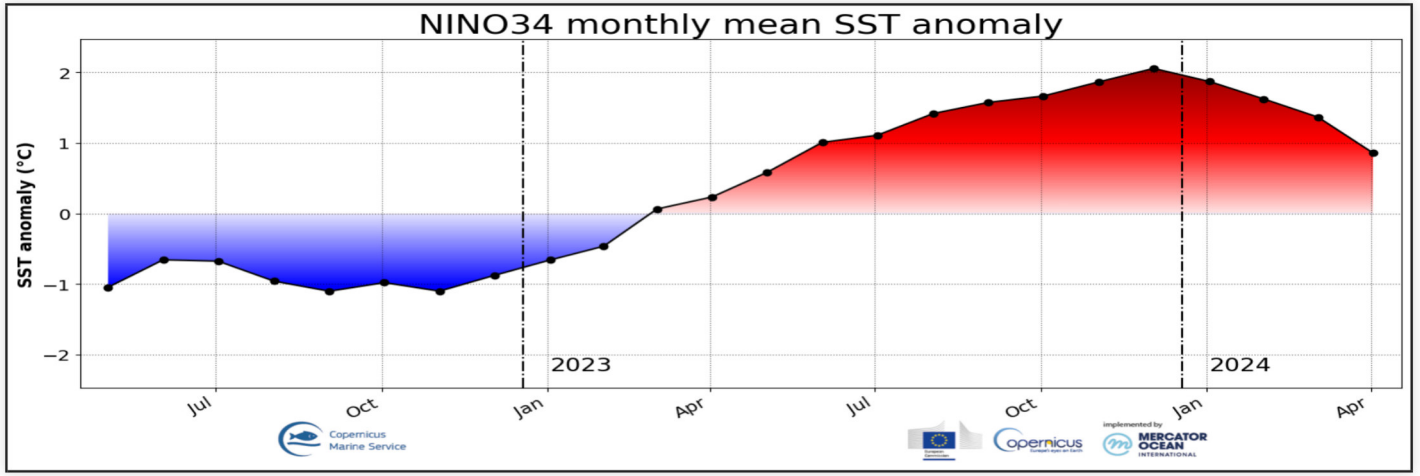
Same remark as before.



Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 ° C isotherm) (c) Mercator-Ocean

Oceanic analysis of April 2024 : Pacific Ocean - Nino3.4 index history

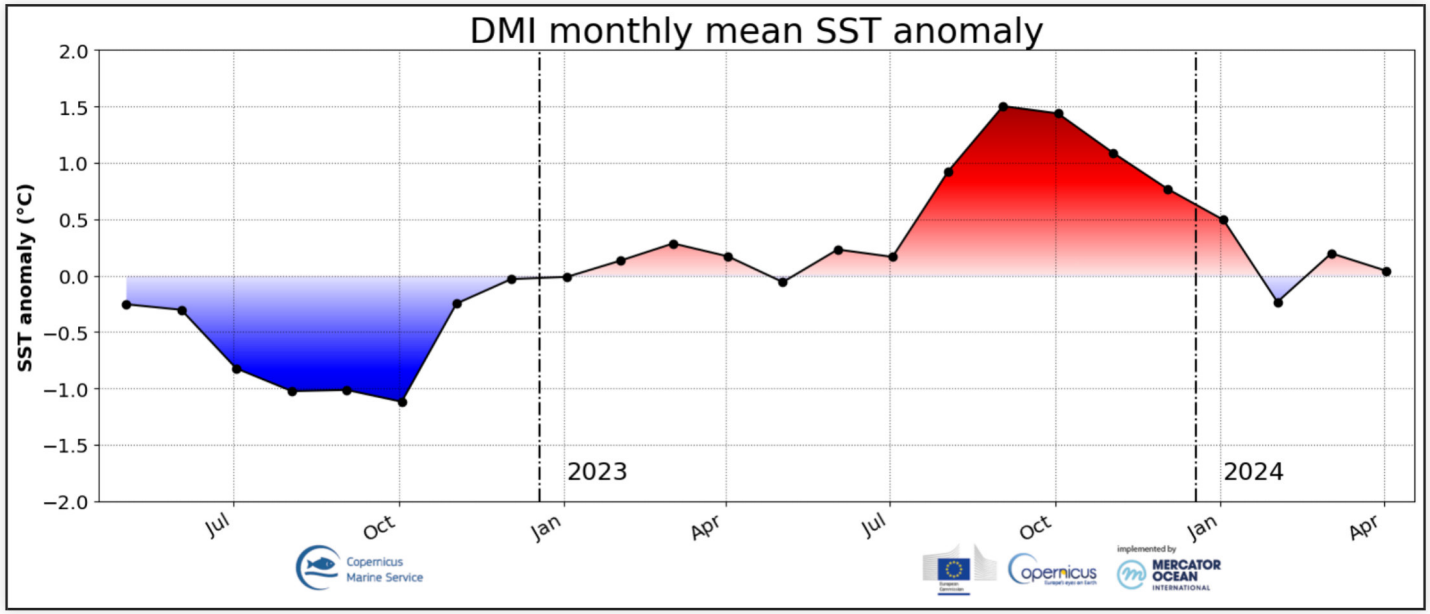
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : close to +0.8 °C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

Oceanic analysis of April 2024 : Indien Ocean - DMI index history

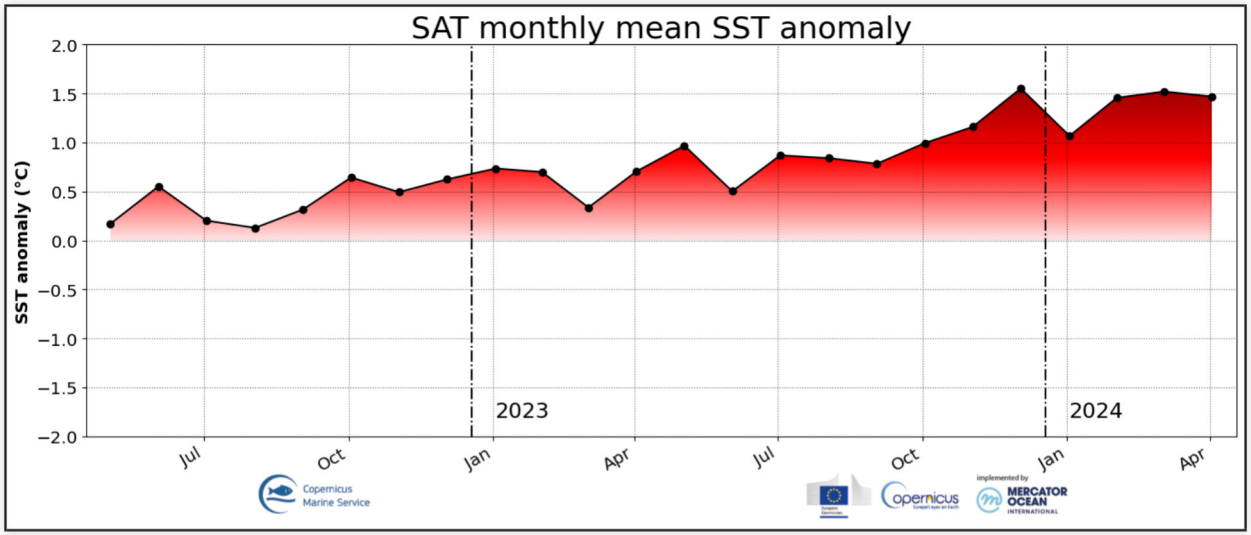
DMI Index issued from Mercator Ocean PSYV4R2 analysis : close to +0°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/iod1.png)

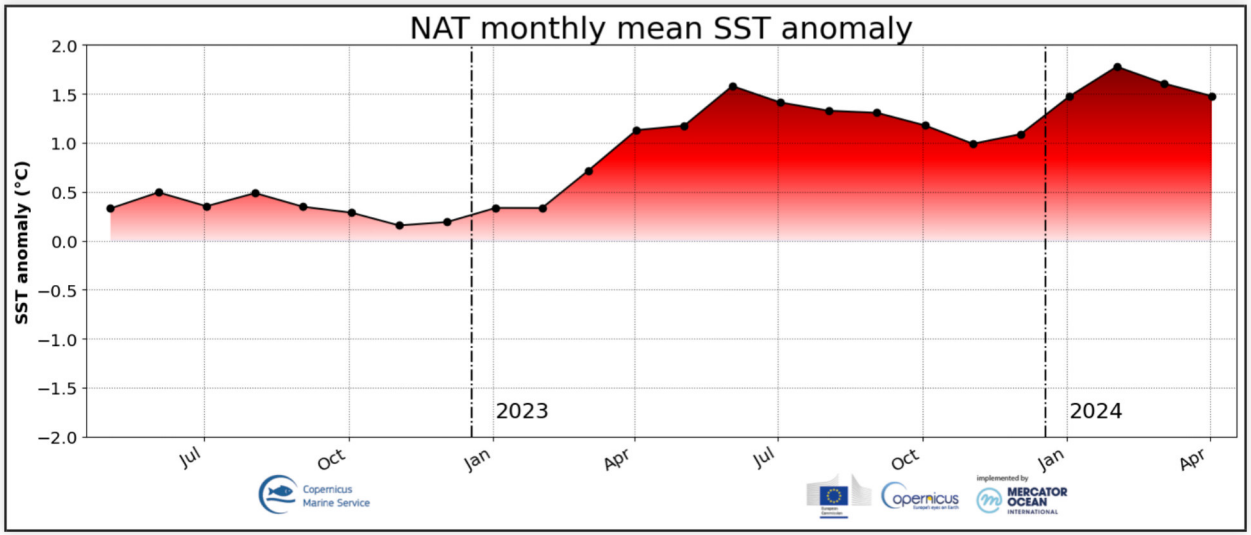


Evolution of SST in the DMI box (c) Mercator Ocean

Oceanic analysis of April 2024 : Atlantic Ocean : SAT and NAT index

Warm anomalies remain remarkably high, both in the equatorial zone and in the northern intertropical zone.





Evolution of SST in the SAT and NAT box (c) Mercator-Ocean

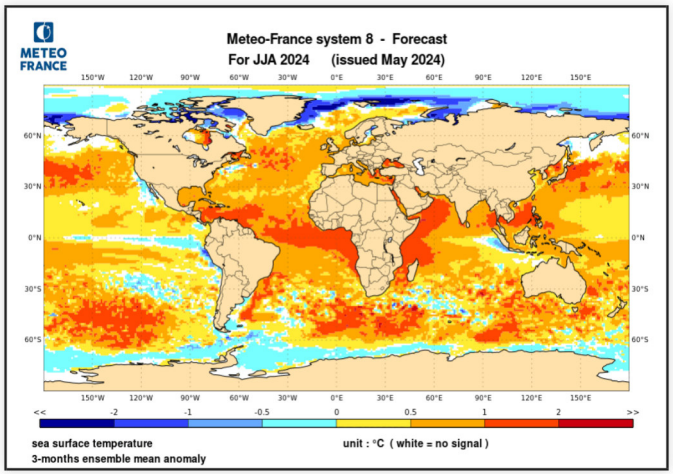
Oceanic forecast : SST anomaly

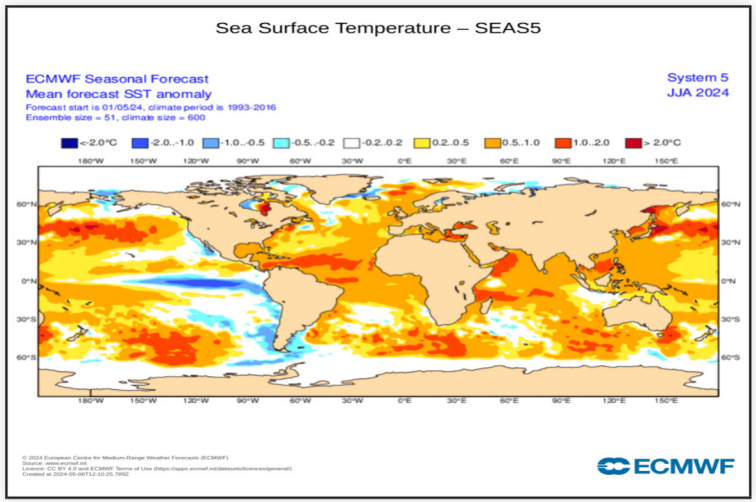
The two models offer very similar patterns.

In the Pacific Ocean : Over the extreme eastern equatorial zone, a cold anomaly appears for both models, more marked with ECMWF. In the Northern Hemisphere, the PDO- structure is attenuated but still present.

In the Indian Ocean : The warm anomaly over the western part of the basin persists, while a relative cold anomaly is taking shape along the Indonesian coast.

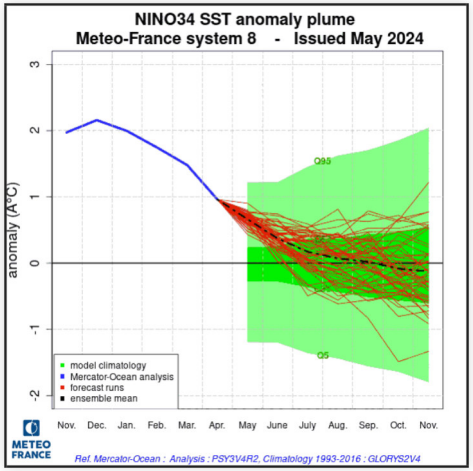
In the Atlantic Ocean : A strong warm anomaly persists over the intertropical zone. The North Atlantic basin remains warmer than normal. Finally, a marked warm anomaly over the eastern Mediterranean basin is forecast by both models. ECMWF also shows a light cold anomaly in the south of Greenland.

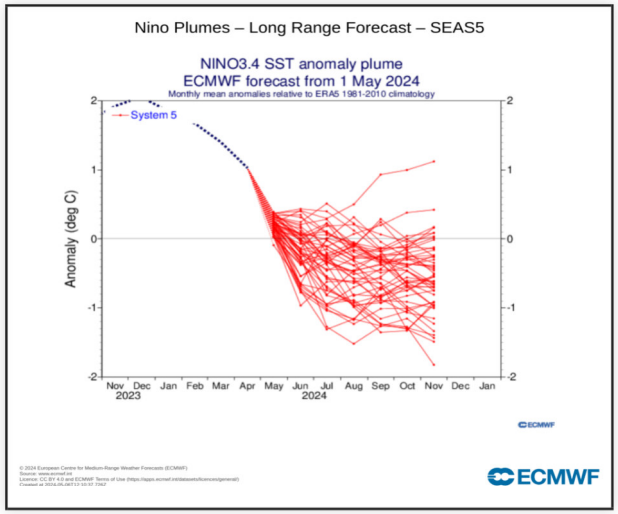




Oceanic forecast : NINO3.4 Plume diagrams

MF8 is forecasting a return to neutral conditions by the end of next quarter while ECMWF forecast if for the beginning, and then becoming negative.

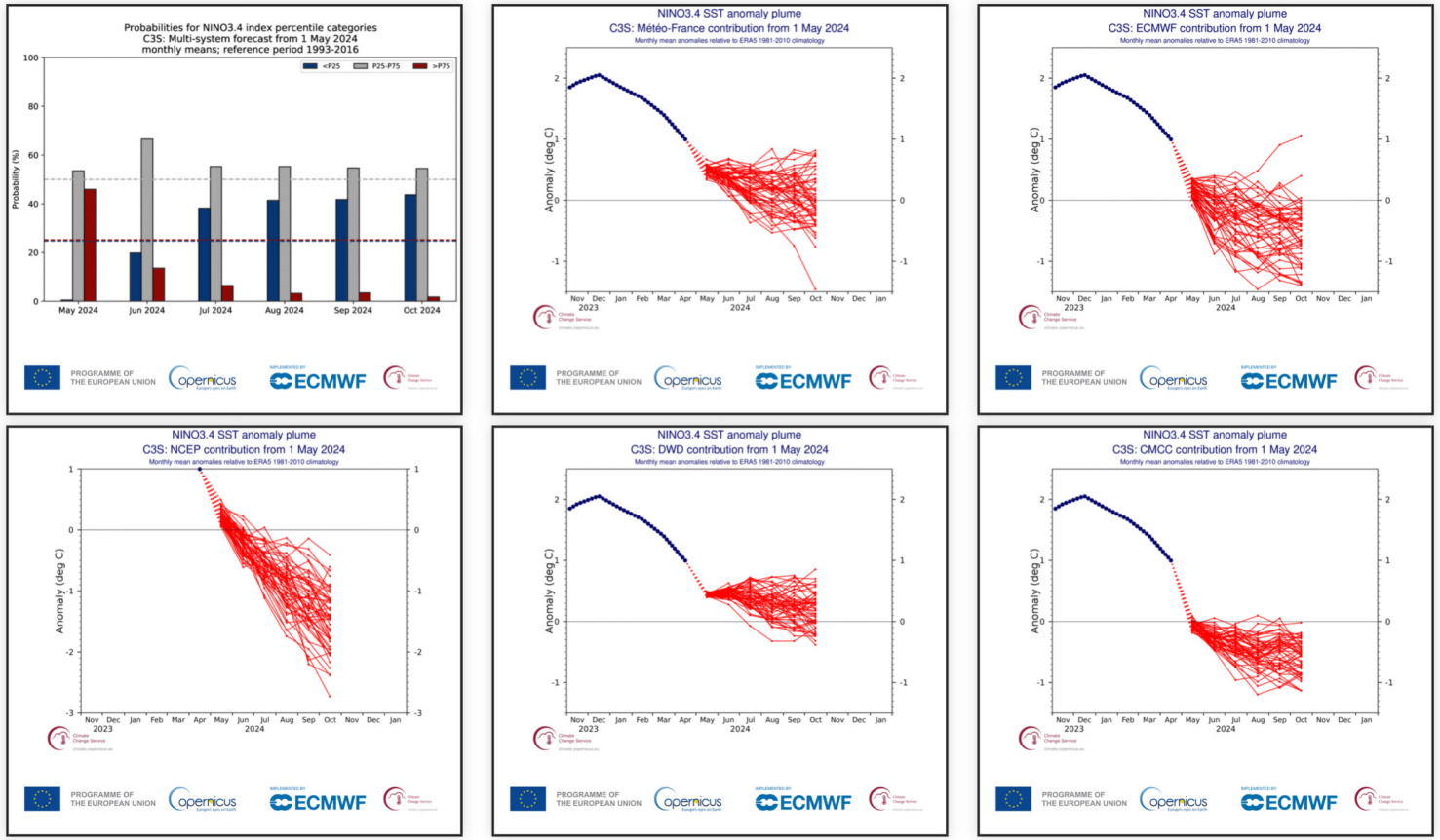




Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

All models forecast a rapid decline in the Nino3.4 index and a return to neutral values during the quarter, except DWD and MF8. Beyond that, however, there are major discrepancies. MF8 and ECMWF remain close to neutral.

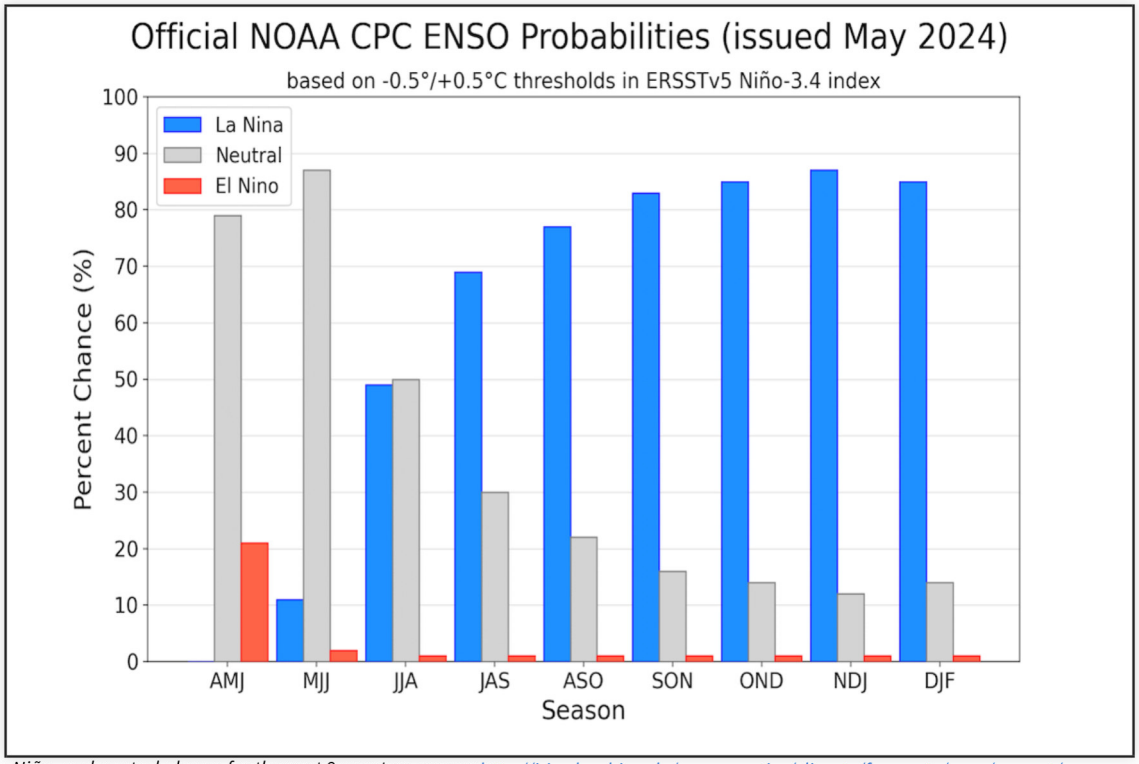
The most likely phase for the next three months : Return to neutral phase



C3S multi-system probabilty forecast (top left figure) and C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

Oceanic forecast : Synthesis from IRI

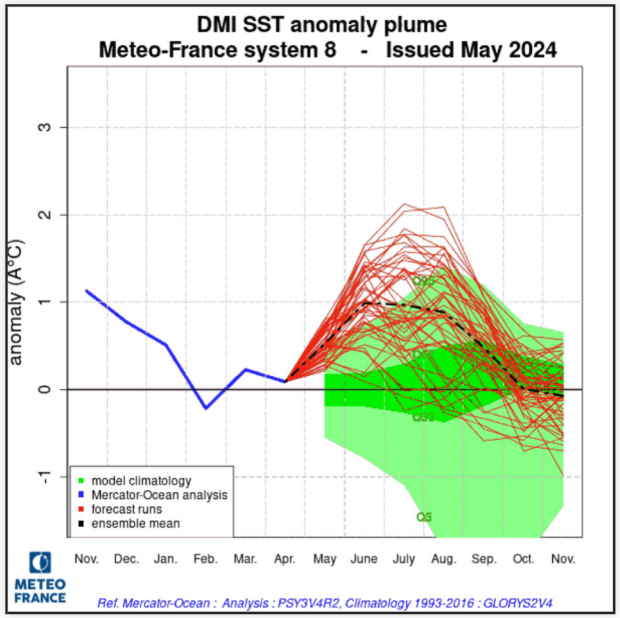
IRI forecast : about 50% probability of neural or La Nina conditions for JJA.

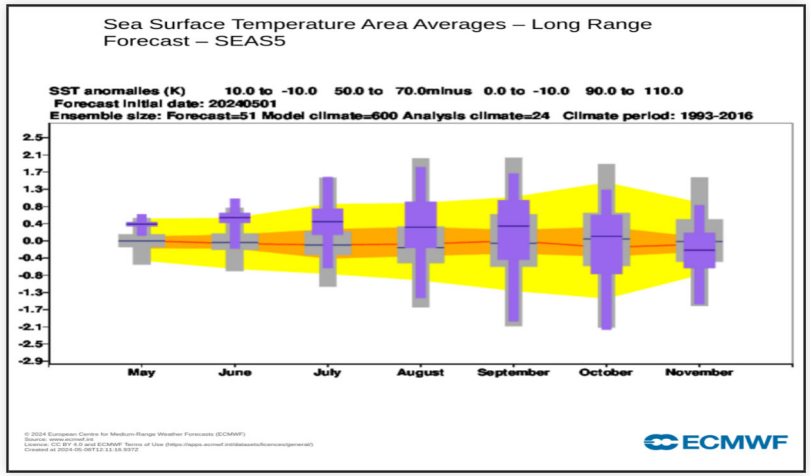


Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Oceanic forecast : Indian ocean - DMI evolution

For both models, the DMI index is expected to rise again over the next quarter, indicating a positive IOD phase. The spread remains wide. Positive phase is expected to happen a bit earlier than climatology.

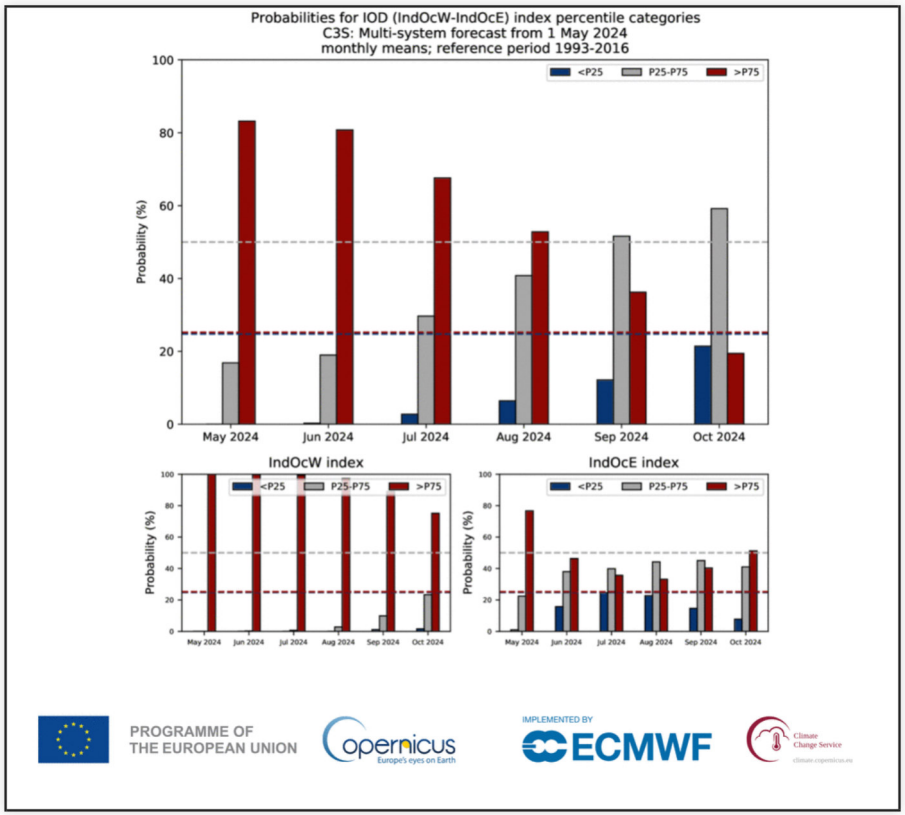




DMI index : analysis, forecasts and model climatology with MF-S8 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

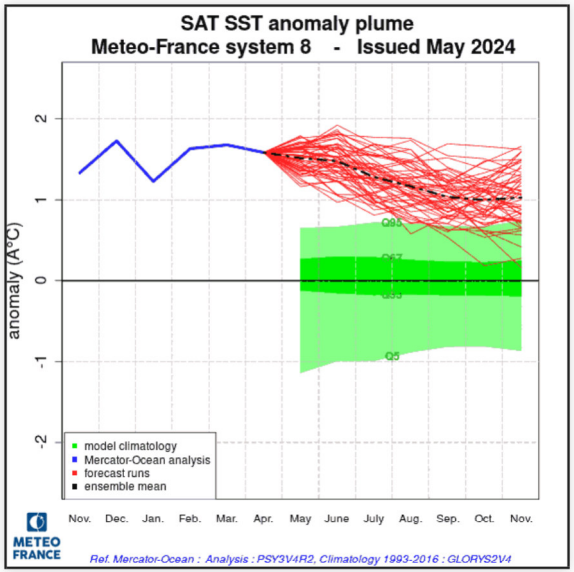
Expected Phase for the next three months : positive phase

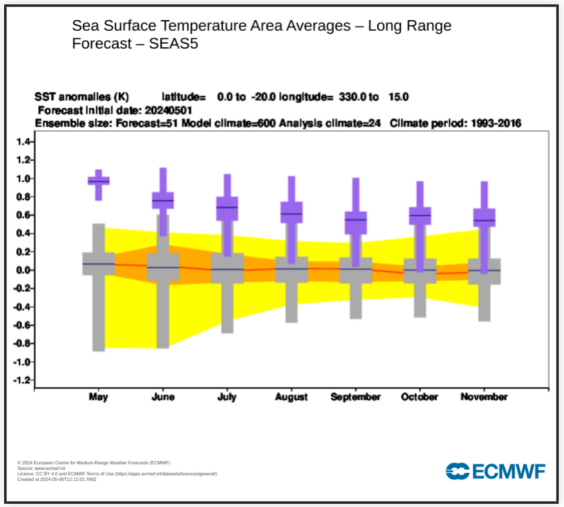


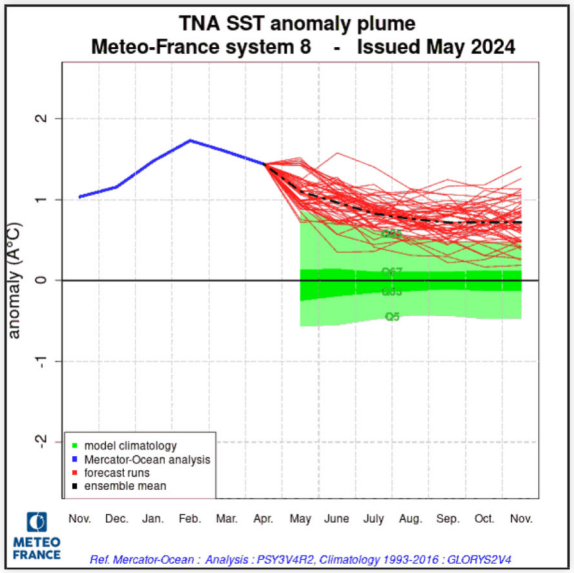
C3S multi-system probabilty forecast for IOD , west box and east box Index

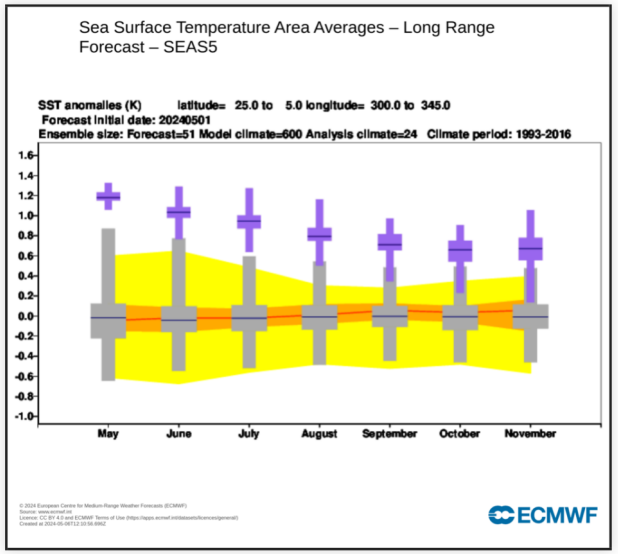
Oceanic forecast : Atlantic Ocean - SAT and TNA evolution

Although the trend is downwards, both models maintain a very marked warm anomaly for the months ahead.







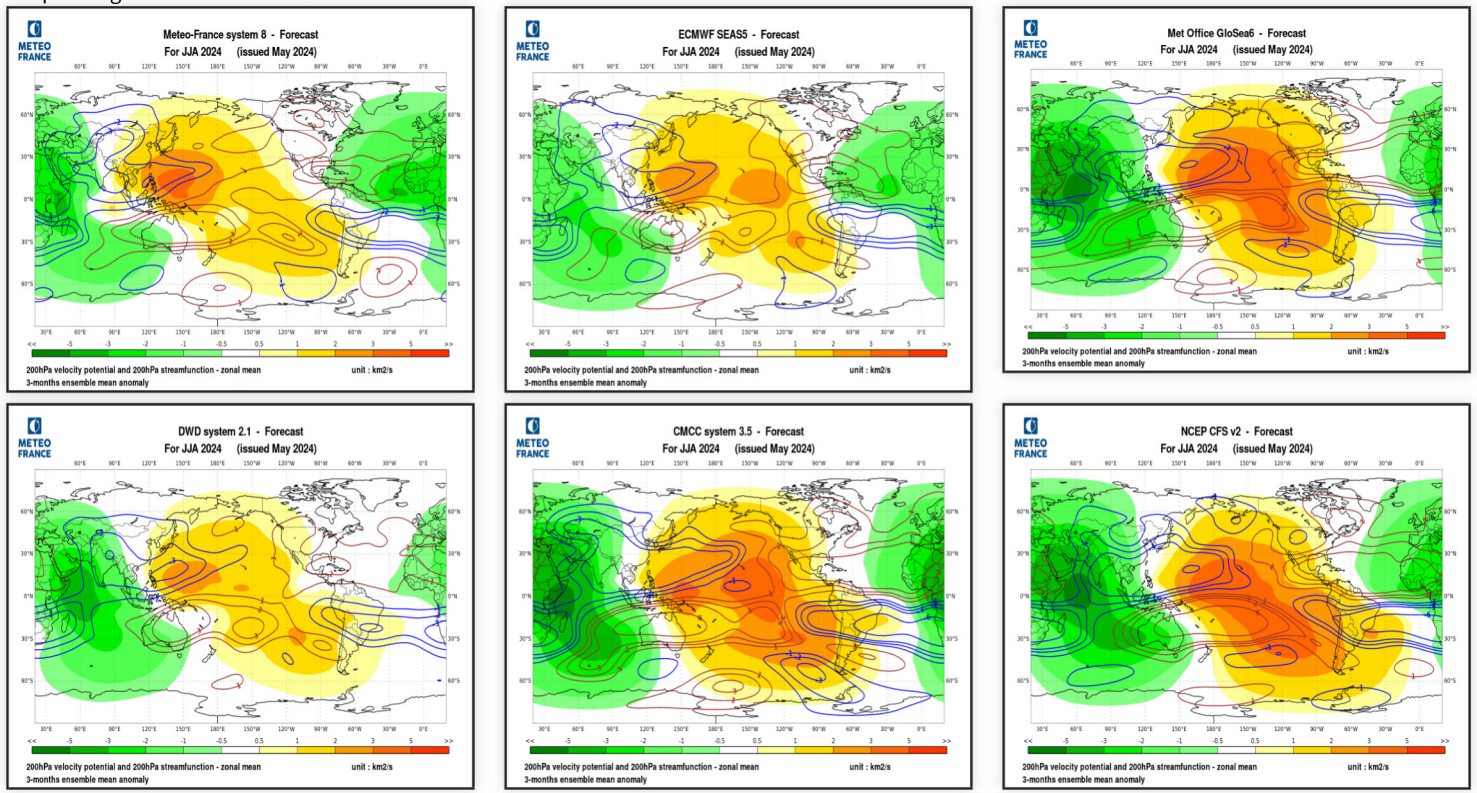


Anomaly on the SAT and TNA box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : All the models are in agreement this month, although ECMWF, MF8 and DWD are more moderate. They all agree in forecasting a large zone of subsidences over the Pacific Ocean. Lifts extend from the western Indian Ocean (linked to the positive phase of the IOD) to Africa, Europe and Atlanic ocean.

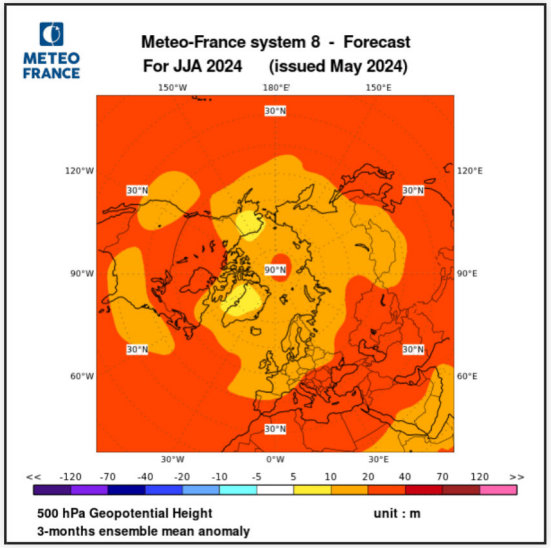
Streamfunctions : The models are also very well matched. Two dipoles are visible. The first is over the Maritime Continent, with a cyclonic circulation extending as far as the Near East. The second is centered on the Atlantic. A weak anticyclonic curvature signal stretches as far as the Mediterranean, depending on the model. No teleconnections.

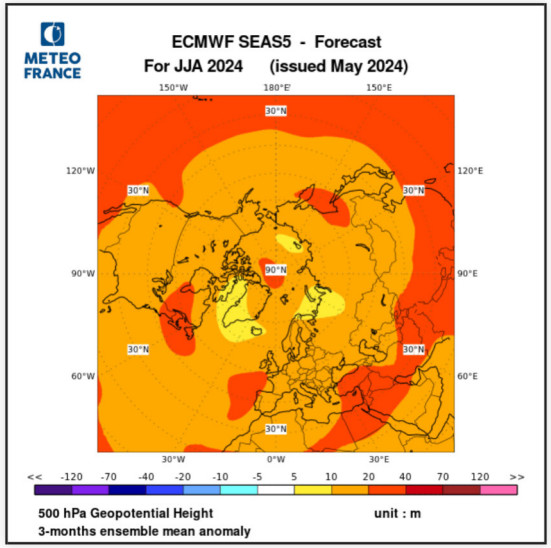


MF8,SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Signals are weak. It is difficult to locate extremes and to find convergences between the two models. This is particularly true over the bay of Biscay, where the two models contrast: a relative minimum for ECMWF and a positive anomaly for MF8. Both show a weakness aver Grenland.

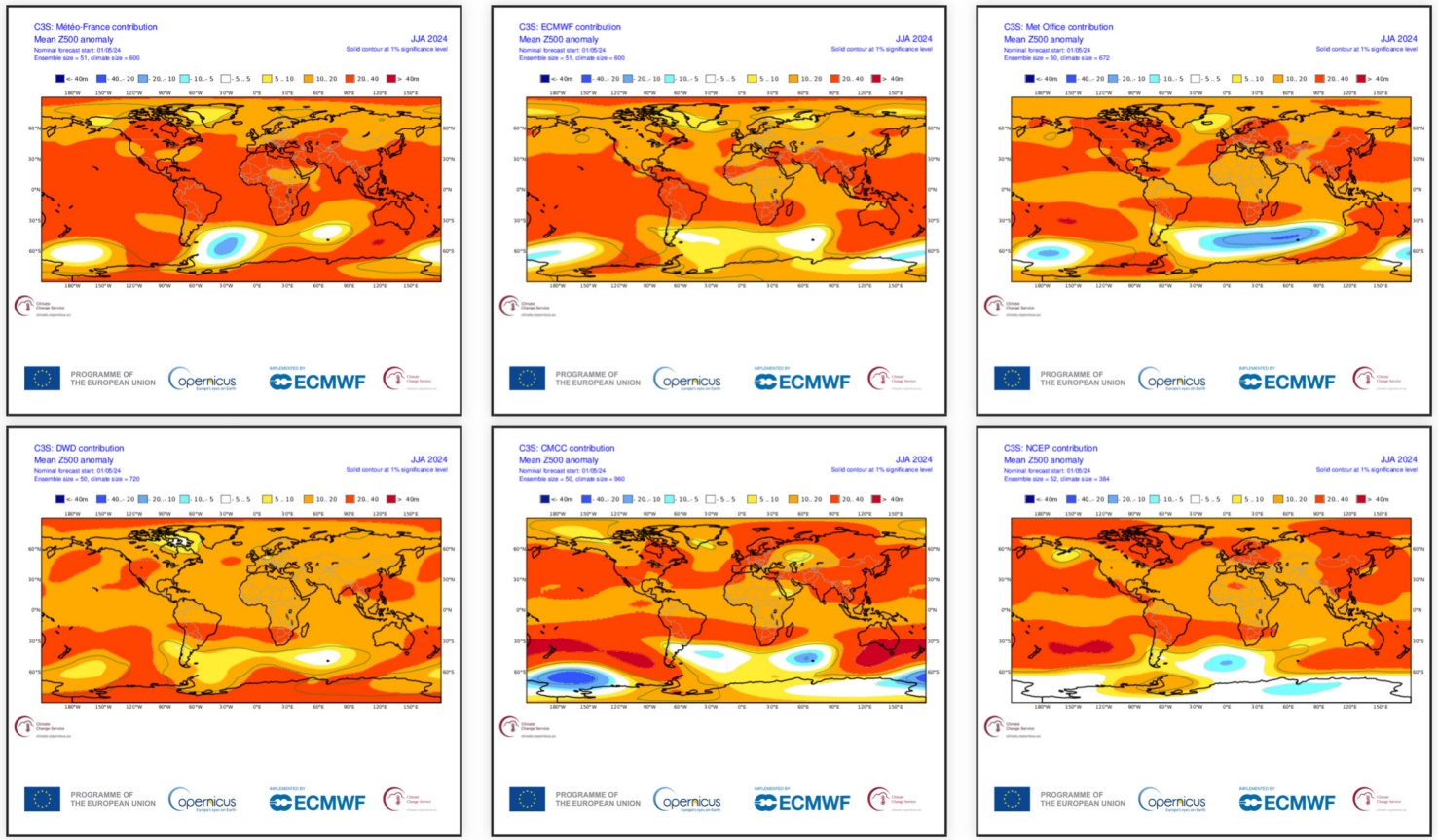




polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

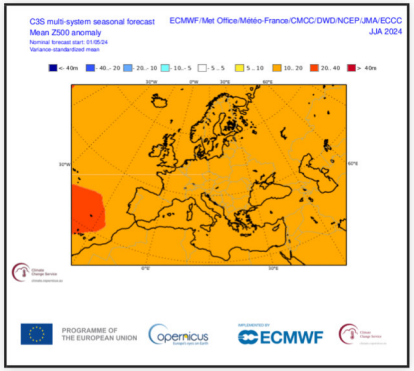
In the southern hemisphere the negative anomaly stretching from southern Argentina to the southern Indian Ocean shows a goodaccordance betxeen models.
In the Northern Hemisphere the signals are weak and lack consensus, whether over America, Europe or Asia, except a weak anomaly over Greenland/Iceland.

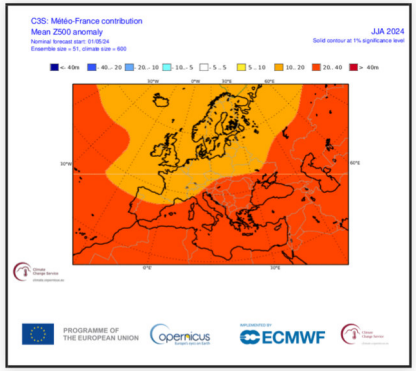


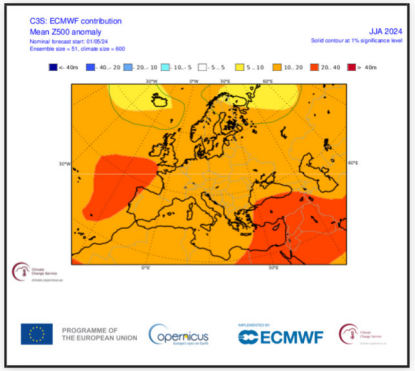
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

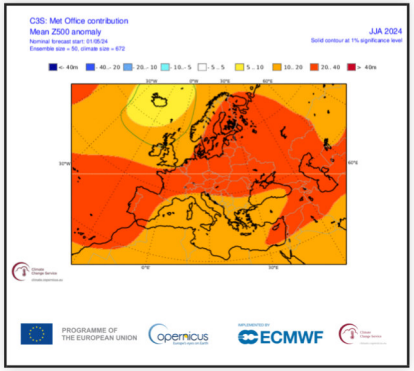
Atmospheric circulation forecasts : Z500 anomalies in C3S models

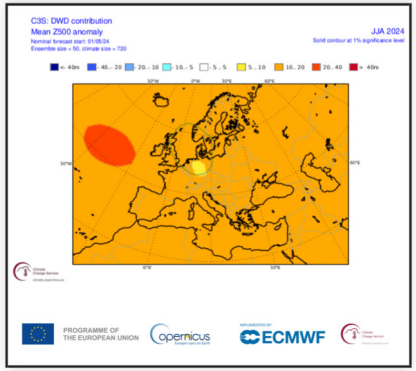
Zooming in on the European continent confirms the lack of convergence between models, whether in Europe or around the Mediterranean Basin.

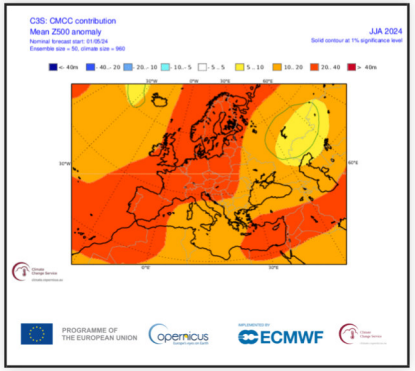


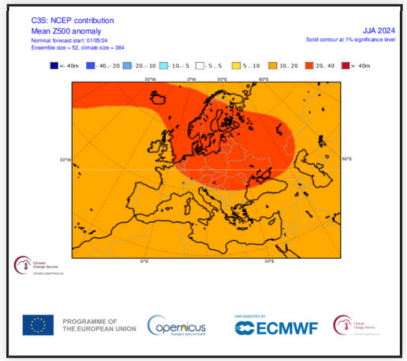


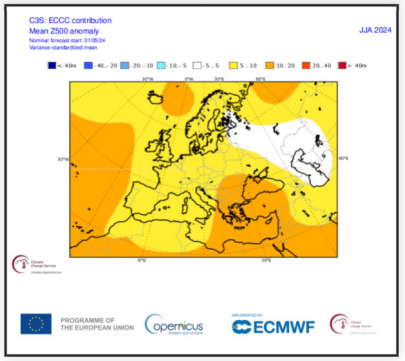


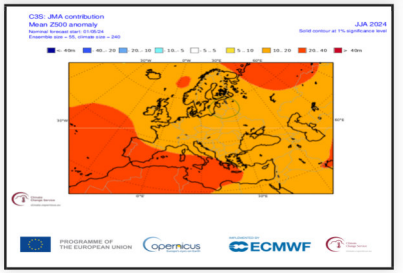








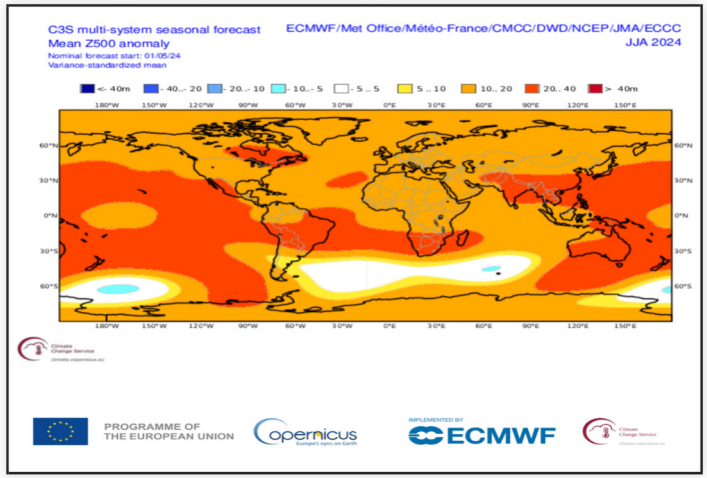




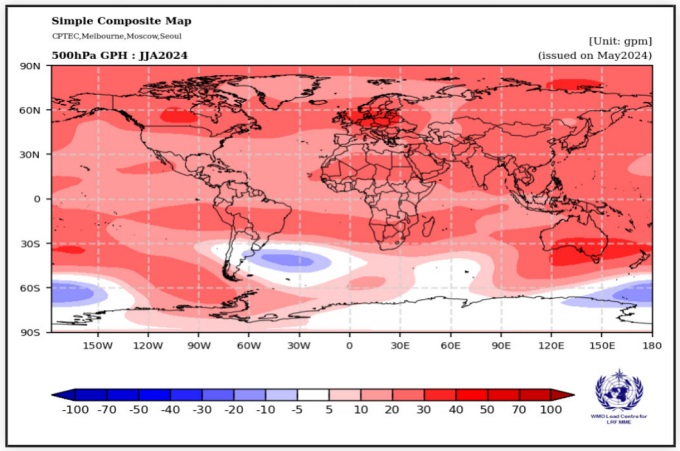
multi-models 500hPa geopotential height anomalies

Atmospheric circulation forecasts : Z500 anomalies multi-systems

The two multi-models are in good agreement in the southern hemisphere. In the north, they share some similarities in America. Elsewhere, and particularly in Europe, the suggested patterns differ. ///



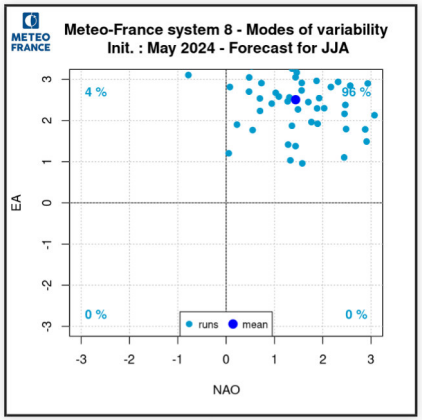
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.

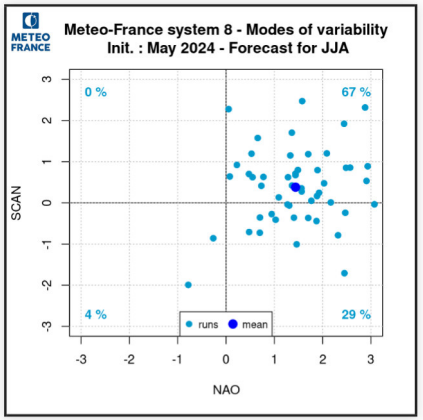


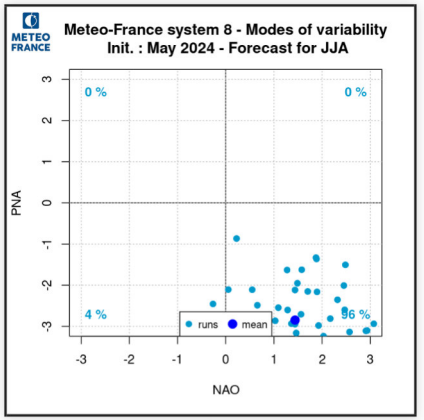
Others models of WMO multi-models 500hPa geopotential height anomalies.

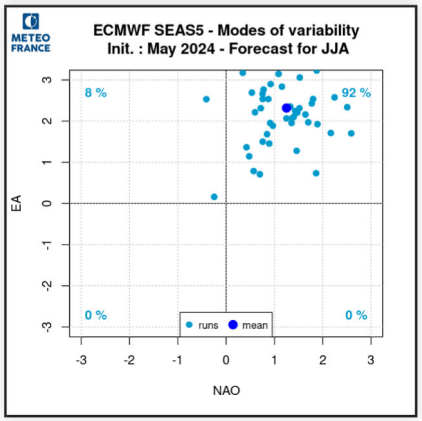
Modes of variability : forecast

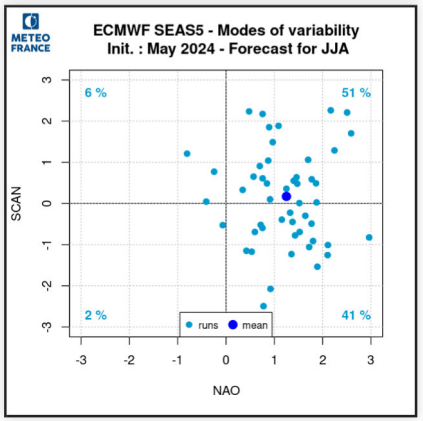
However, when it comes to variability modes, the two models are very close. The NAO+, EA+ and PNA- modes are clearly preferred. The SCAN+ mode signal is weaker.

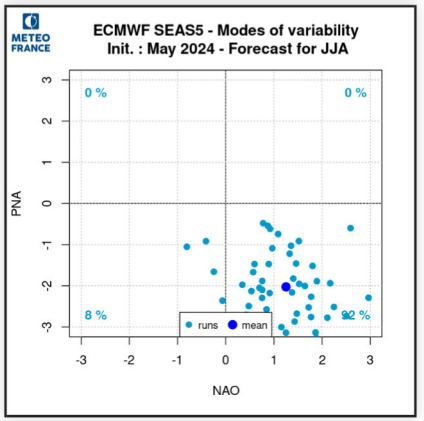








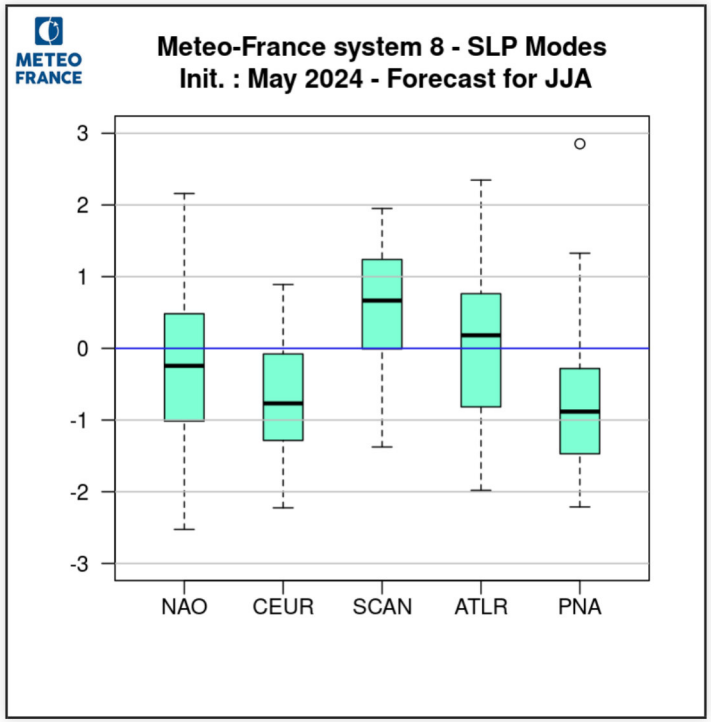


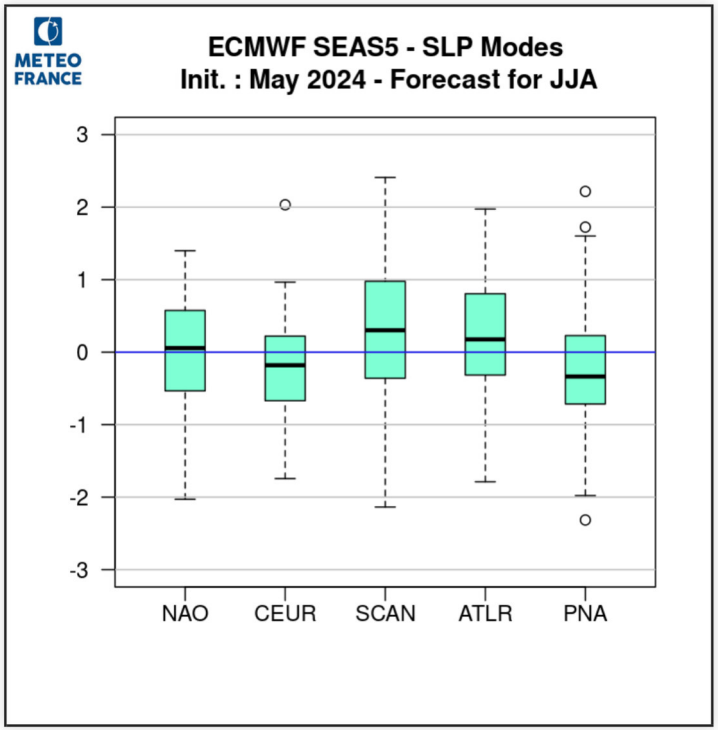


See the modes of variability patterns

Modes of variability : SLP Modes forecast

In Pmer modes, both models prefer CEUR-, SCAN+ and PNA-. ECMWF is more neutral.

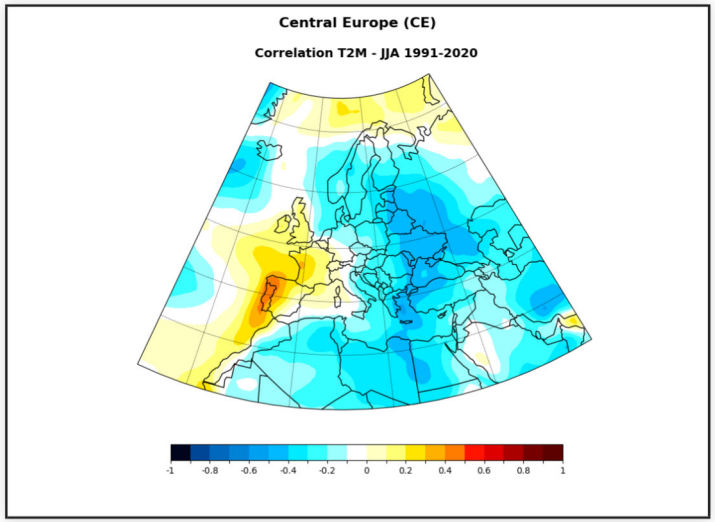


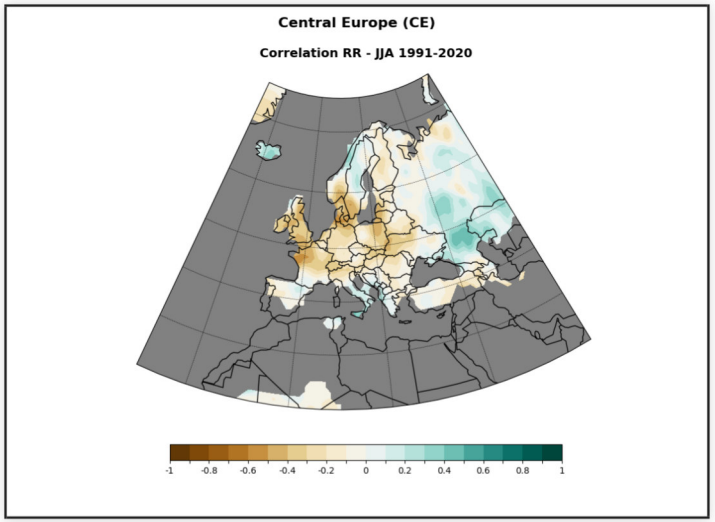


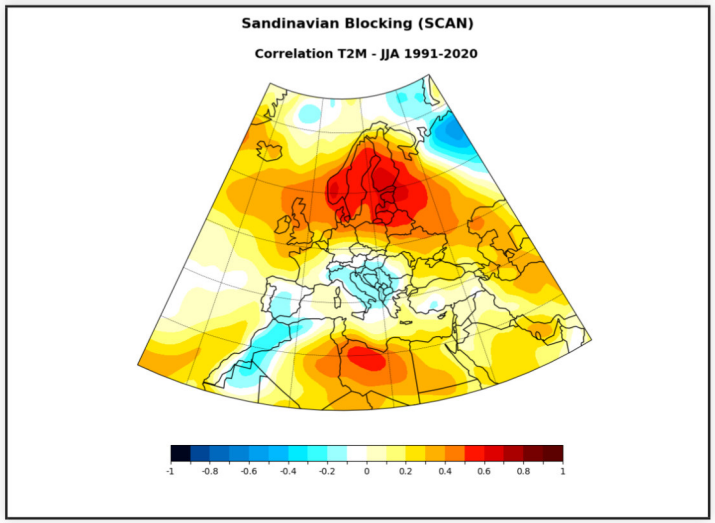
MF-S8 and ECMWF-SAES-S5 boxplot of MSLP modes of variability. *link to pattern*

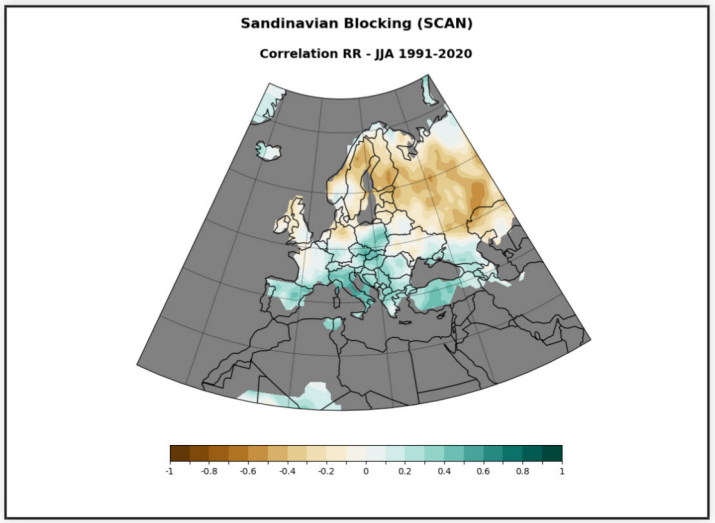
Modes of variability : SLP Modes impacts

Two modes favored : negative CEUR and positive SCAN.





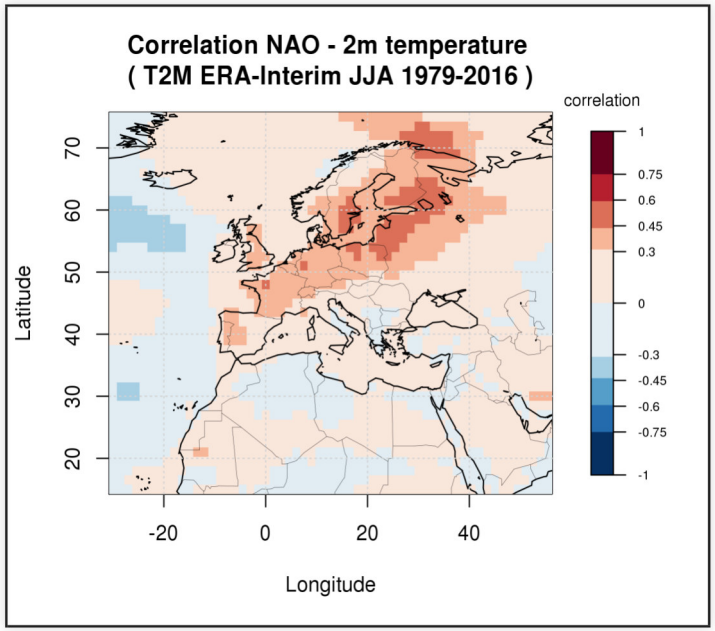


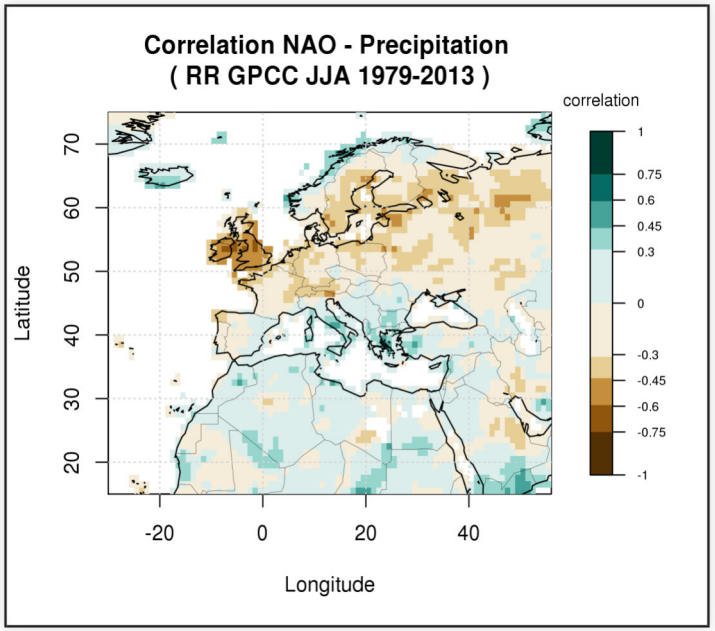


Impact of NAO and Blocking mslp Modes on temperature and precipitation. (ref ERA5 1991-2020) *link to impact*

Modes of variability : NAO impacts

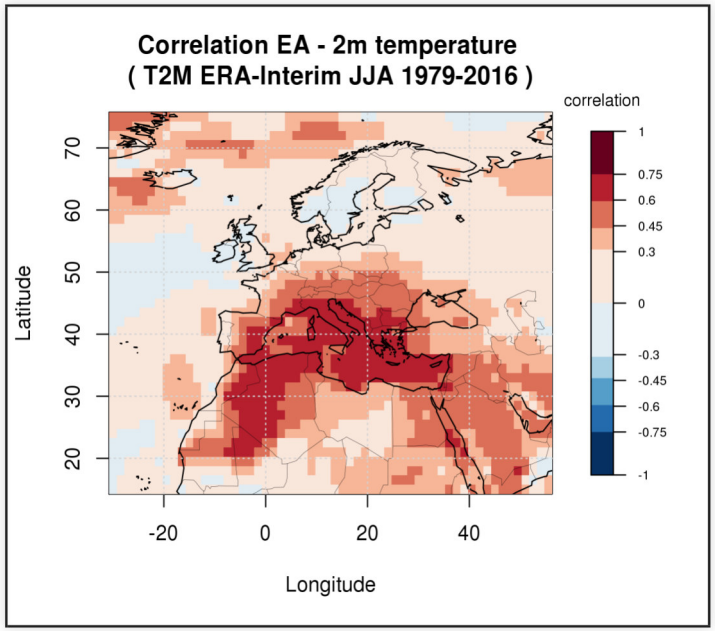
Positive phase of the NAO next quarter.

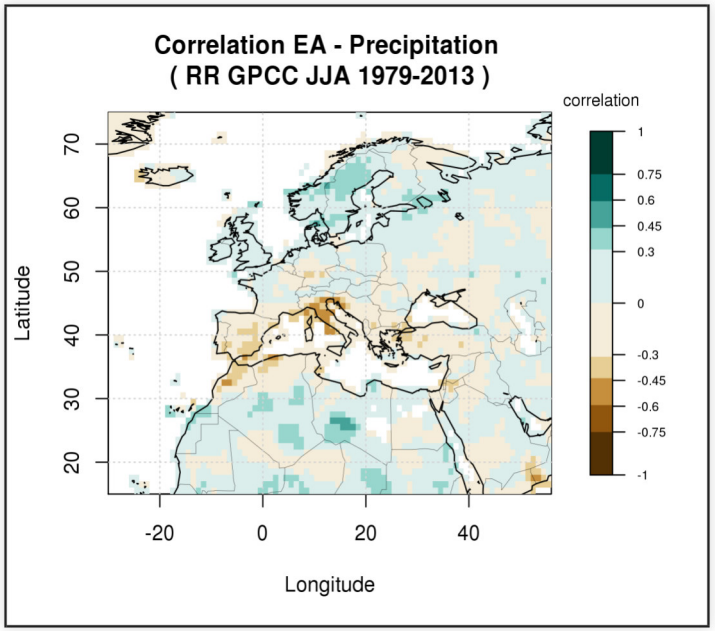




Modes of variability : EA impacts

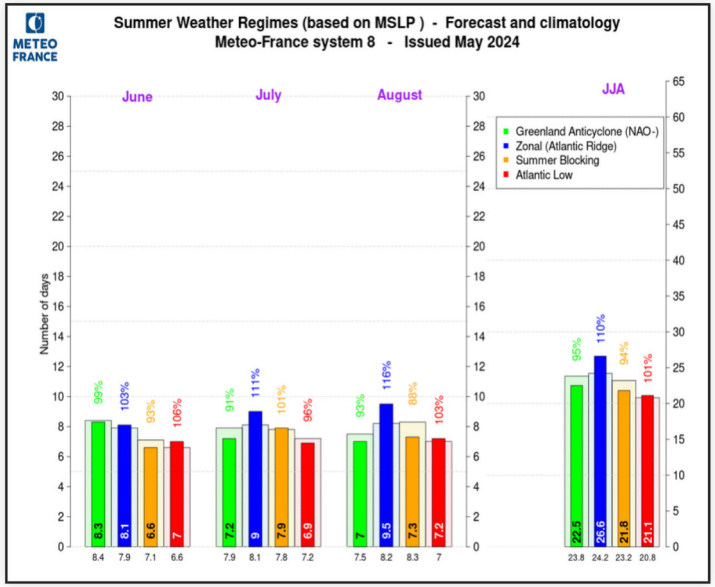
Positive EA is expected next quarter. This mode has a strong influence in particular on the temperature on southern Europe.

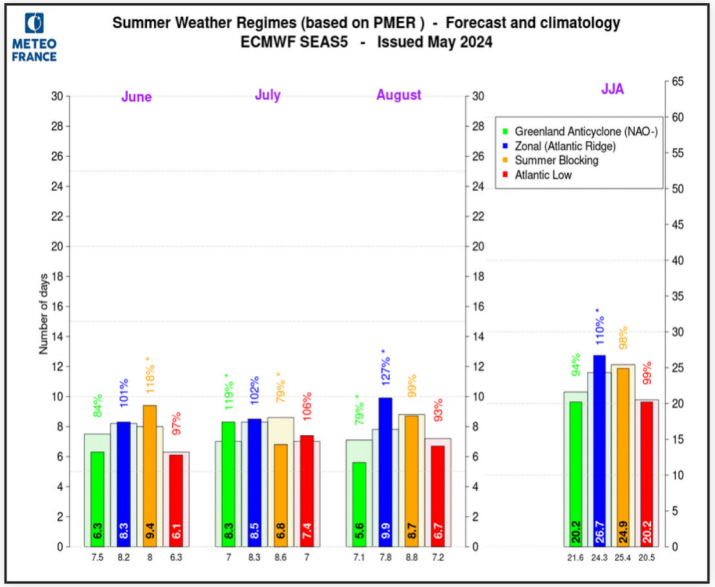




Weather regimes : summer MSLP

The two models converge in the quarterly summary in favor of a Zonal regime, with a significant anomaly for ECMWF. MF8favors the Zonal regime for july and august, but in June, it tend to be neutral. ECMWF has a significant Blocking anomaly, and then he reaches MF8.

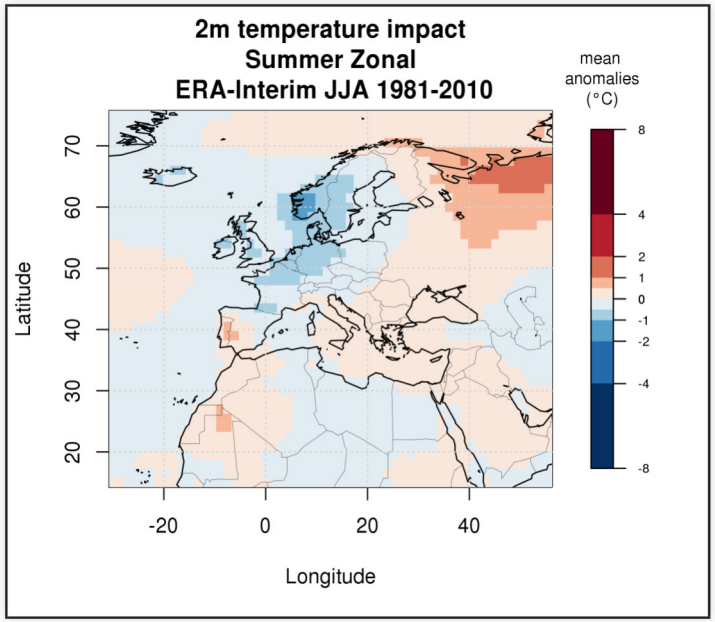


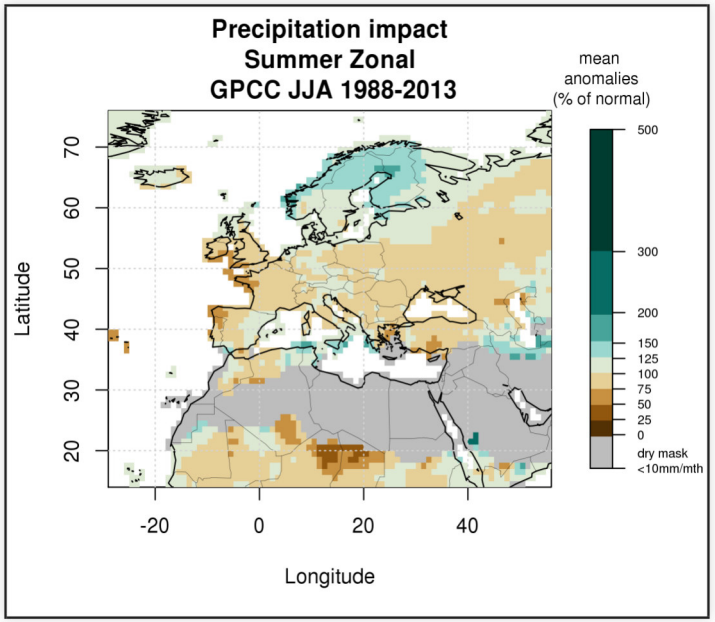


Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S8 (left) and SEAS5 (right).

Weather regimes : Impacts

The Summer Blocking regime favors colder-than-normal conditions over northwestern Europe, and drier-than-normal conditions over all of Europe except Scandinavia,

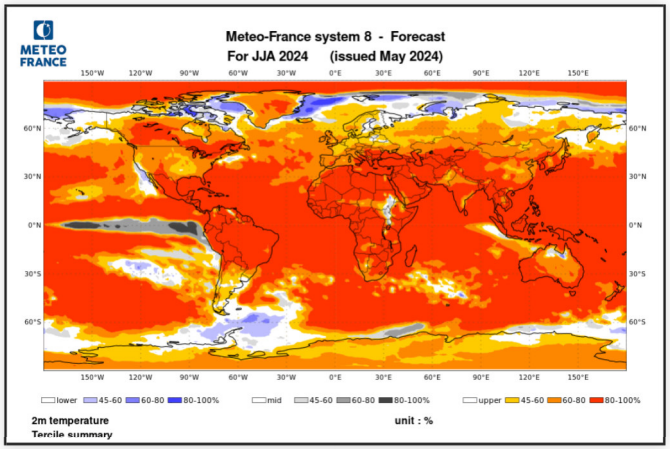


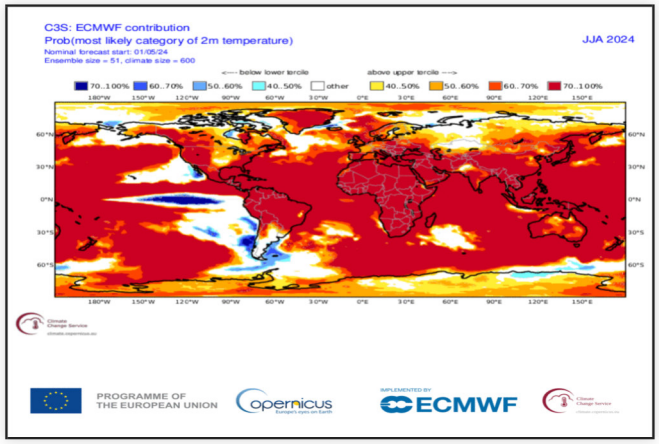


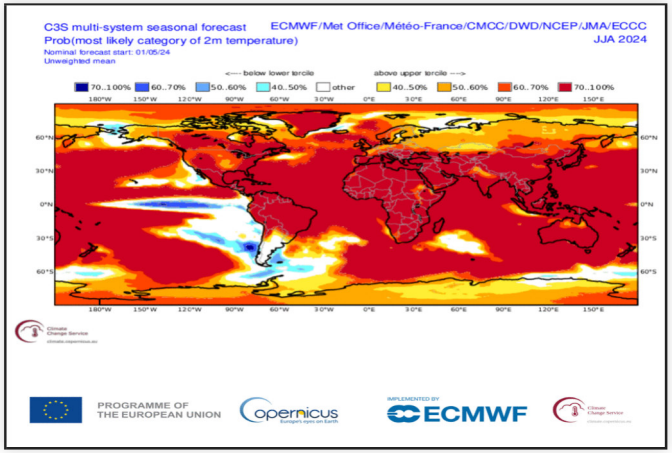
Impact of Summer Zonal weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

A warmer-than-normal signal is most likely over the whole globe, with the exception of southern South America.



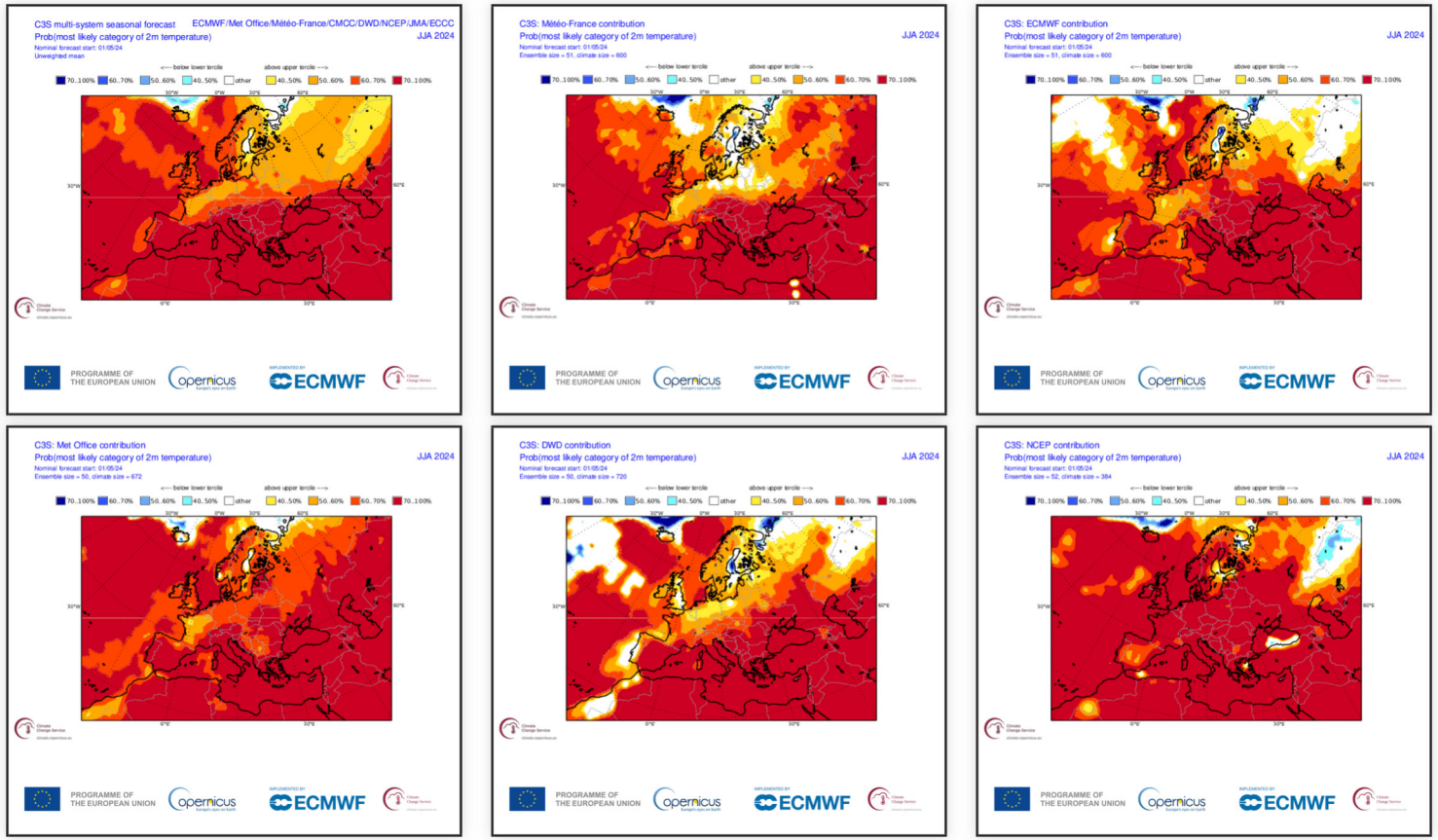




2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

Forecast of climatic parameters : T2M probabilities over Europe in C3S models

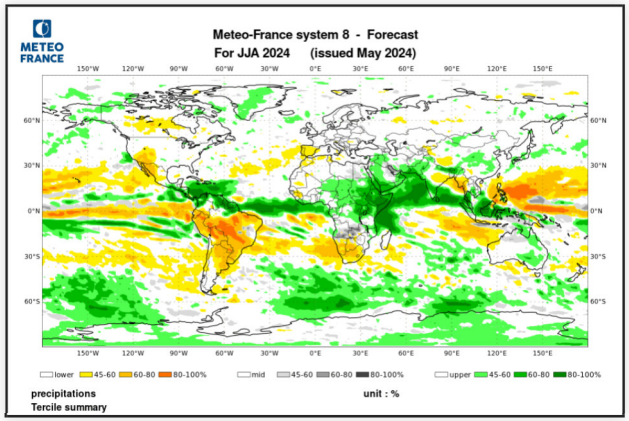
A warmer-than-normal scenario is very likely over the Mediterranean Basin related to the anticyclonic curvature at 200 hPa.
Probabilities are weaker from north of France to Scandinavia.

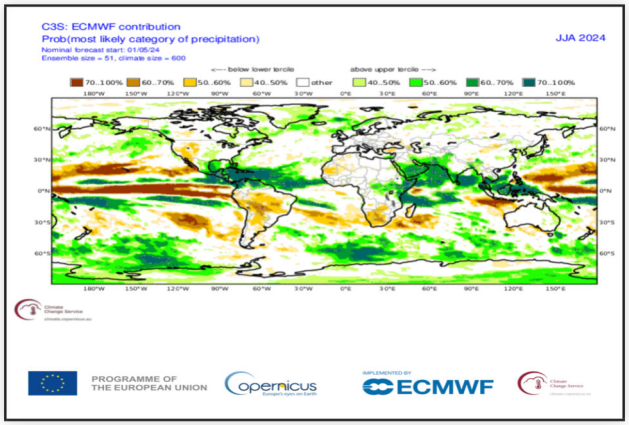


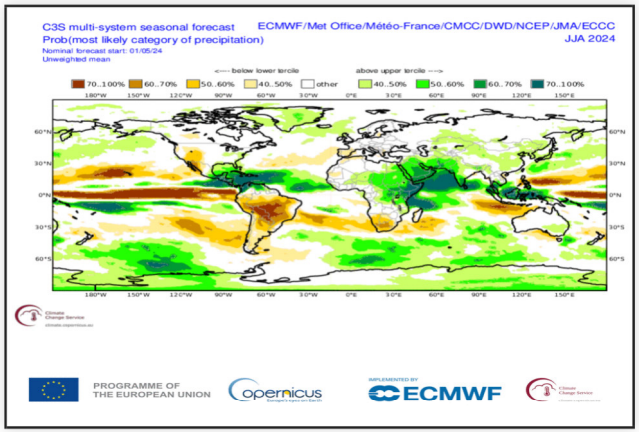
C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO , DWD, CMCC models.

Forecast of climatic parameters : Precipitation

In the Northern Hemisphere, signals are fairly weak.



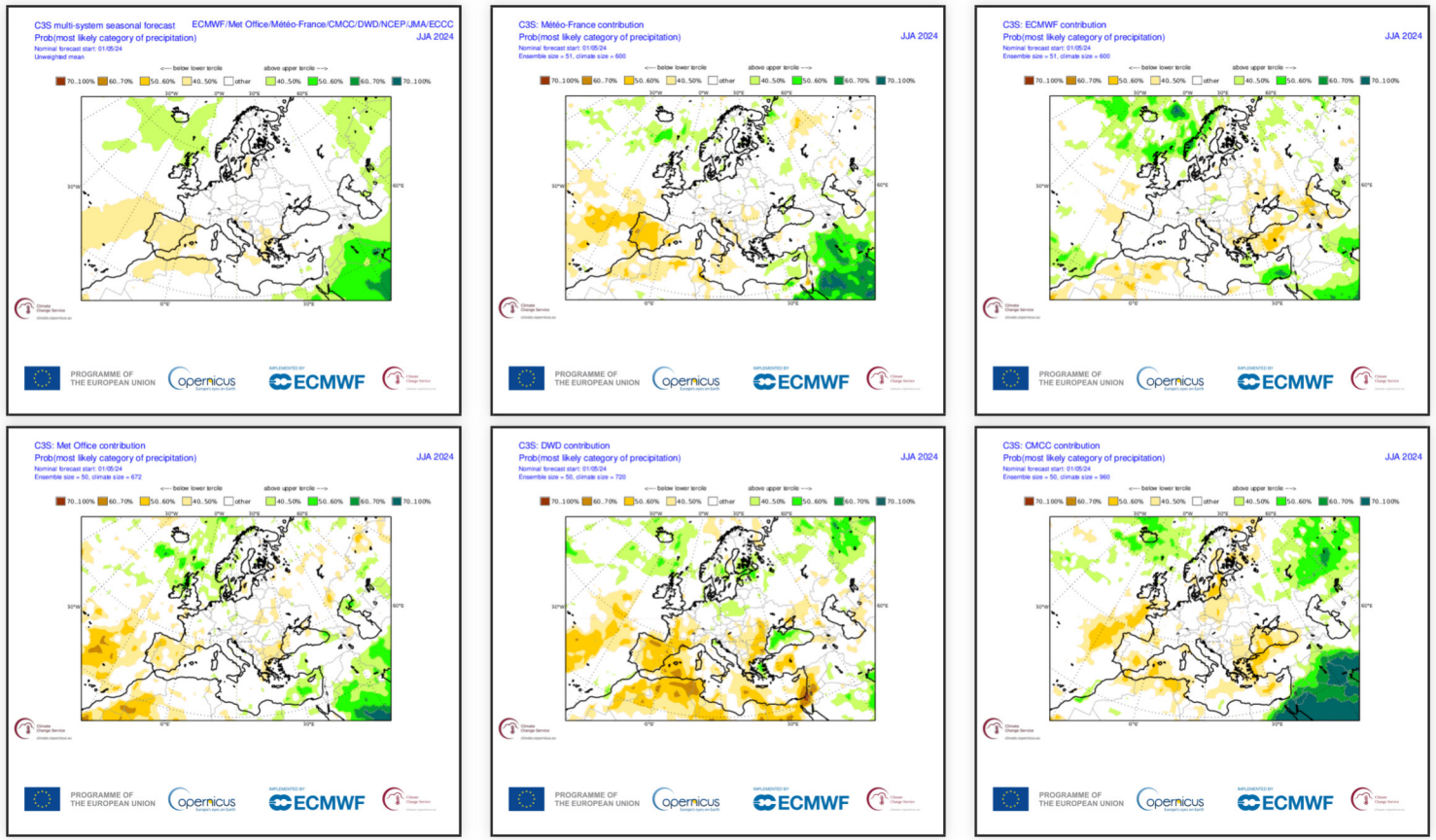




precipitation probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

Forecast of climatic parameters : Precipitation probabilities over Europe in C3S models

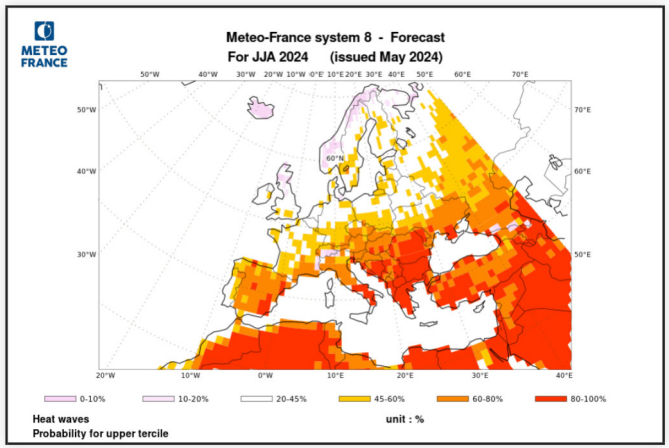
The southwest of Europe seems to be dryer-than-average, particularily Spain and Portugal. This dryry signal will also affect the extreme nothwest of Africa.

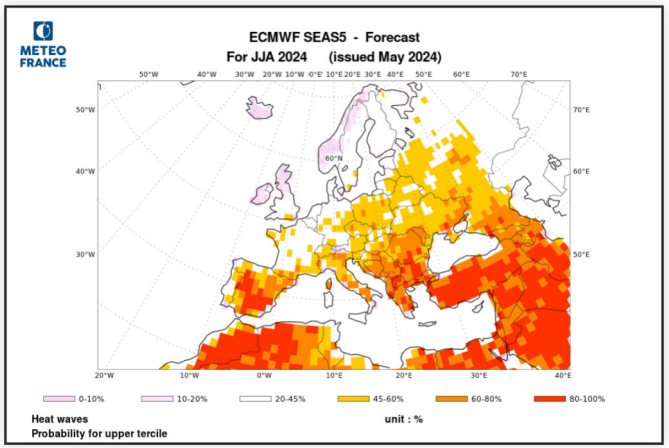


C3S multi-models probability map (top left) and MF-S8, SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Heat waves

The probability of heat waves is higher than climatology over south of Europe for both models.

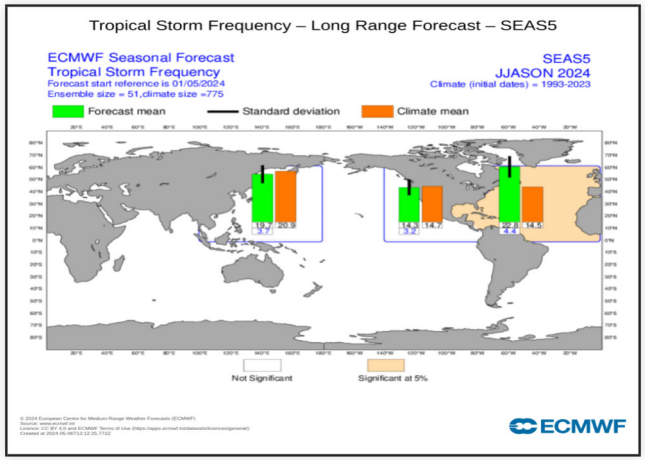


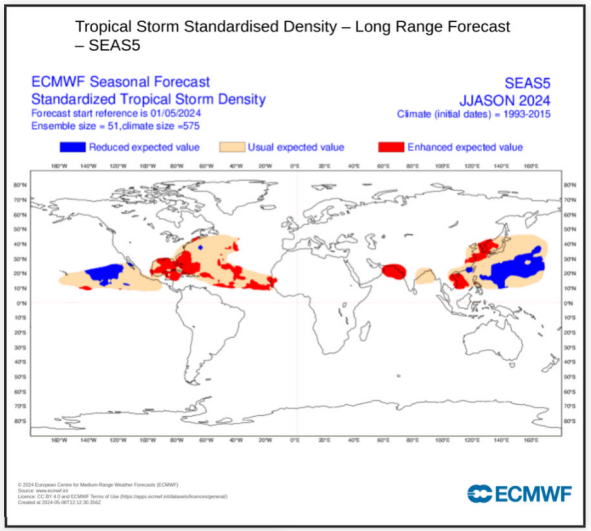


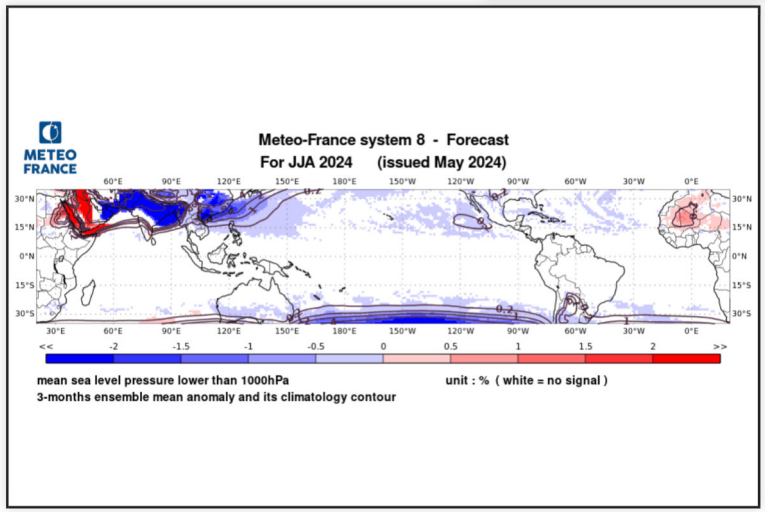
Heat wave probability for MF8 (left) and ECMWF (right). A heat wave is detected if the corrected T2M is above the daily 90th percentile and a fixed 20°C threshold. *more details here*

Forecast of climatic parameters : Tropical Storm Frequency

The frequency of tropical storms in the Atlantic is higher than normal.

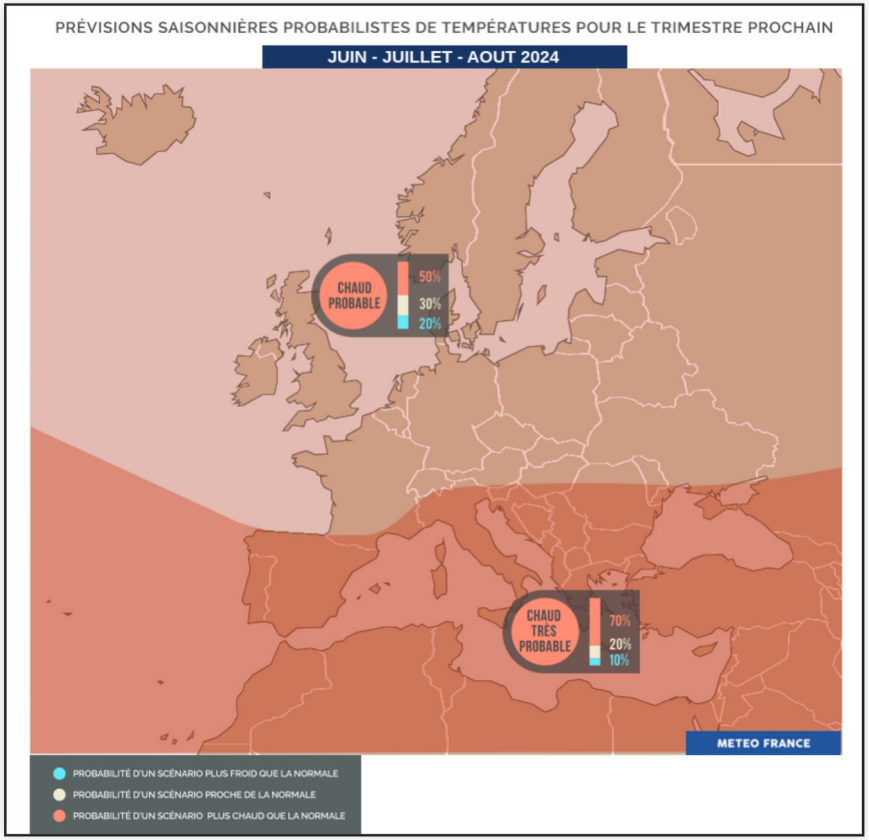






Synthesis map for Europe : Temperature

A warmer-than-normal scenario is likely across Europe, and very likely around the Mediterranean.

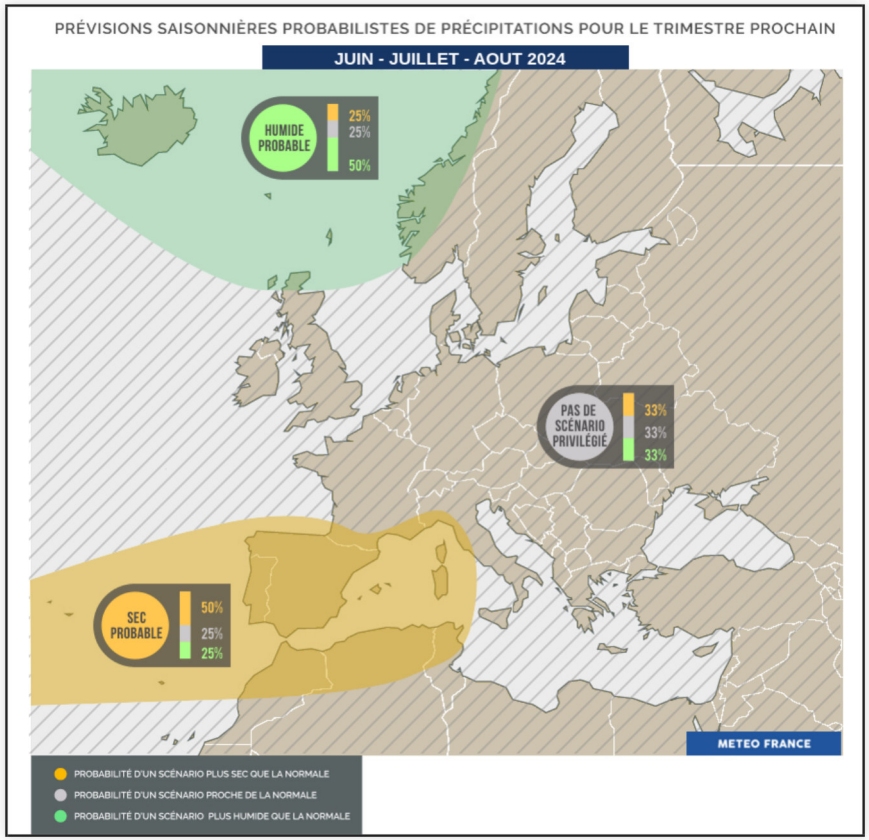


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

A wetter-than-normal scenario is likely for the Near and Middle East.

No scenario emerges elsewhere.



Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS