Météo-France Seasonal Forecast Bulletin

MAY - JUNE - JULY 2023

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General synthesis : MJJ 2023

La Niña fades last quarter, while a significant warming occurred off the South America coast.

Next quarter El Niño conditions are set up and the cooling on the east of Indian Ocean induce an increase in the DMI index

A) Oceanic forecast :

- ENSO : El Niño conditions are most likely.

- IOD : positive phase is most likely

- Tropical Atlantic : positive anomaly

B) Drivers :

C) Atmospheric circulation :

Updrafts over the western Pacific and subsidence over the Indian Ocean without teleconnections to the northern hemisphere.

D) Most likely conditions :

Temperatures : A warmer than normal scenario is most likely over a large part part of Europe.

Precipitations : Due to the lack of signal proposed by the models, no scenario is preferred over Europe.

Next bulletin : scheduled on May 16th

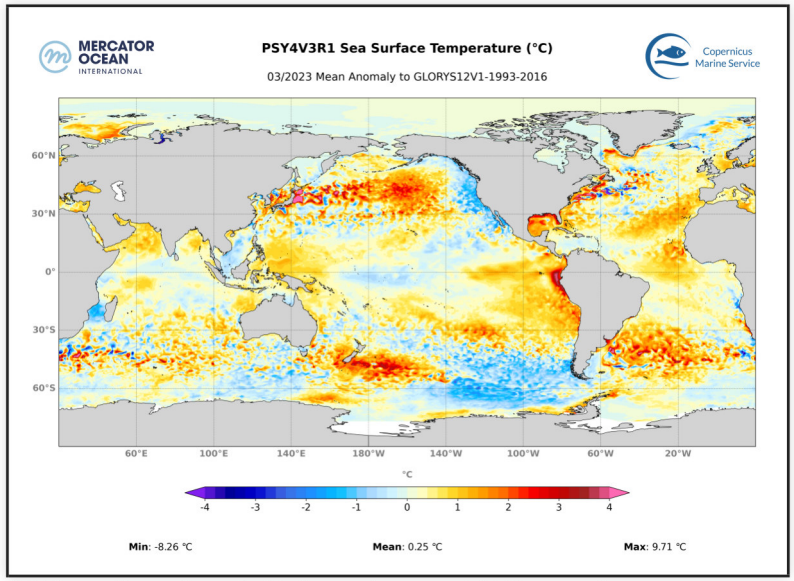
Oceanic analysis of March 2023 : SST anomalies

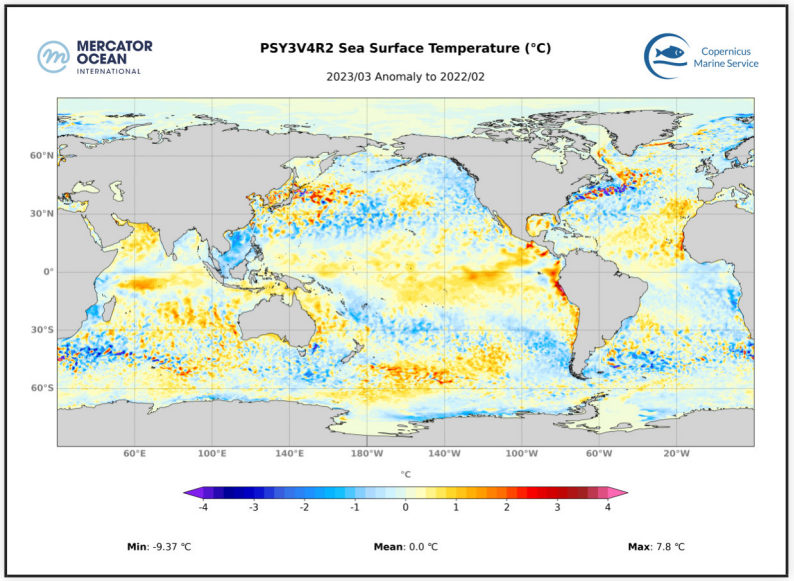
Current ENSO situation : "La Niña" weakening

In the Pacific Ocean : In the Equatorial area, the traces of "La Niña" are dissipated. In the Northern Hemisphere, the PDO- pattern is still present.

In the Indian Ocean : The signal is weak. However, we can see a refreshment on the eastern part of the basin.

In the Atlantic Ocean : A cooling is visible on the eastern side of the basin and an accentuation of the warm anomaly from the African coasts to caribbean.

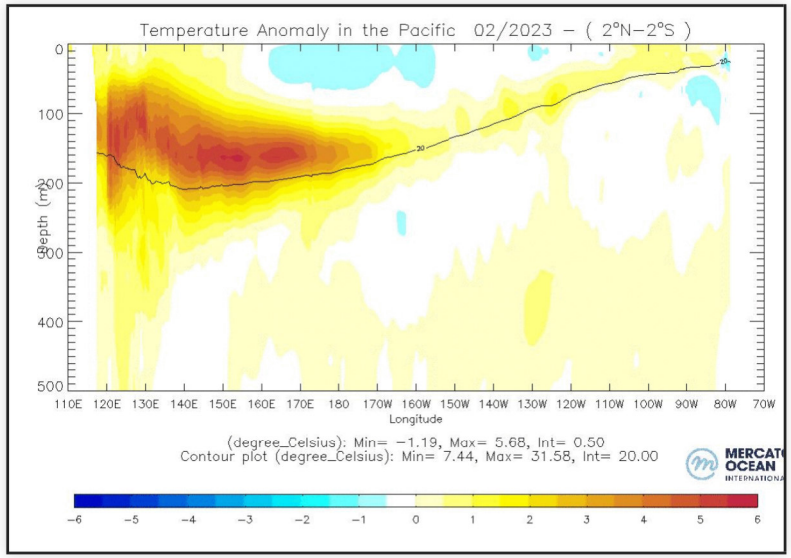


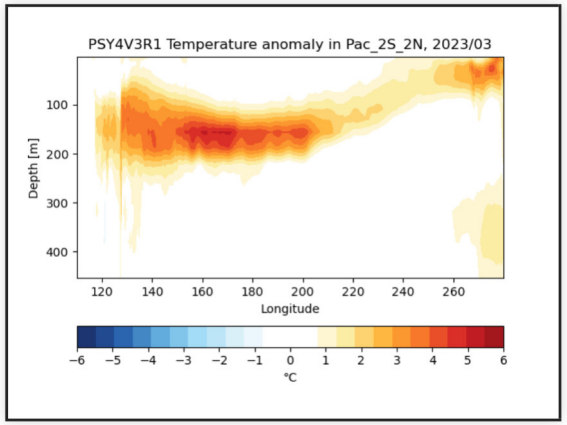


SST Anomalies and trend with the previous month (c) Mercator-Ocean

Oceanic analysis of March 2023 : Pacific vertical section

A strong warming is taking place on the eastern part of the basin.

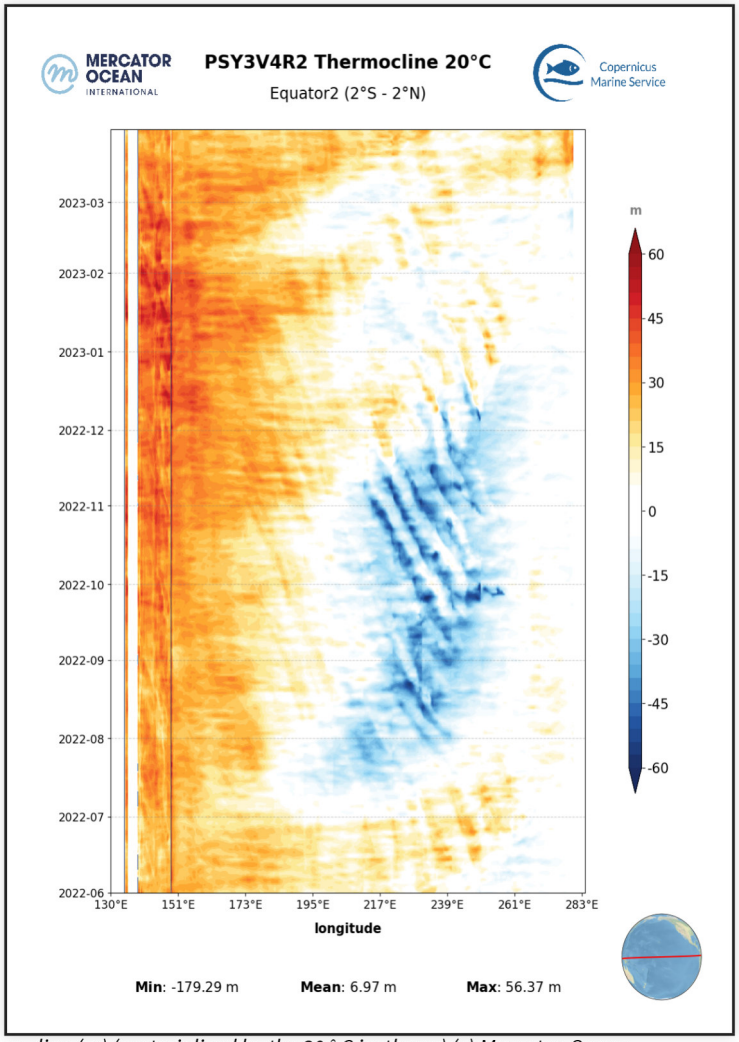




Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

Oceanic analysis of March 2023 : Hovmüller diagram of the 20°C isotherm

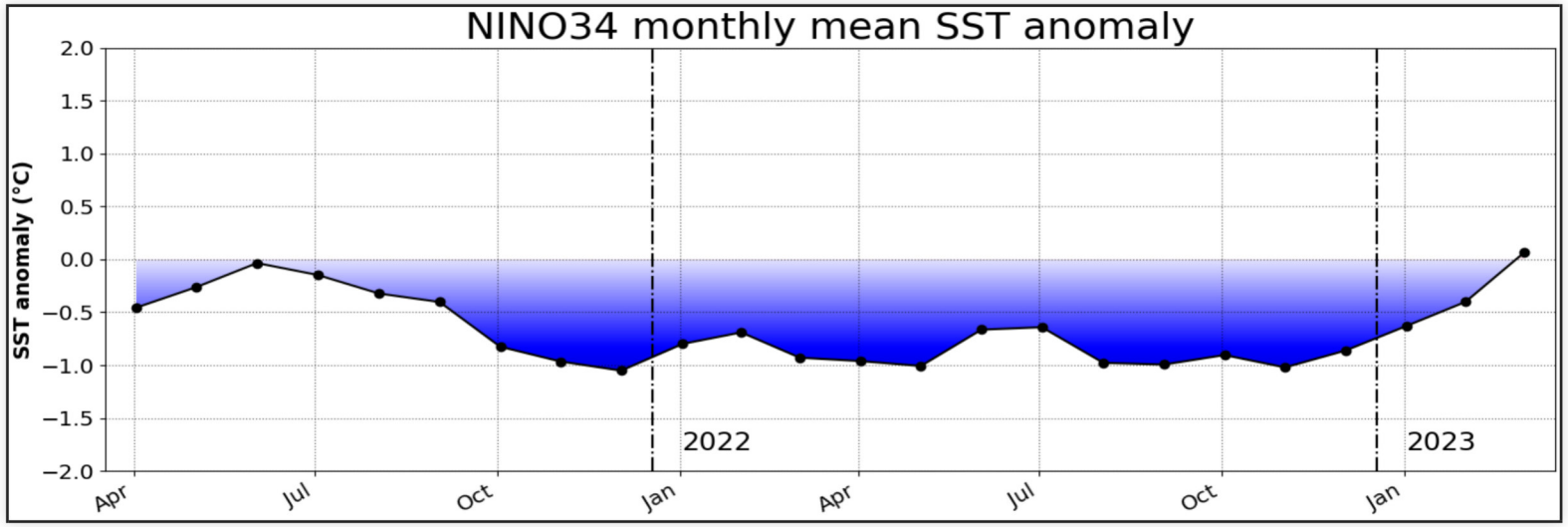
In March there is a warming in the central and extrem west of the basin.



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

Oceanic analysis of March 2023 : Pacific Ocean - Nino3.4 index history

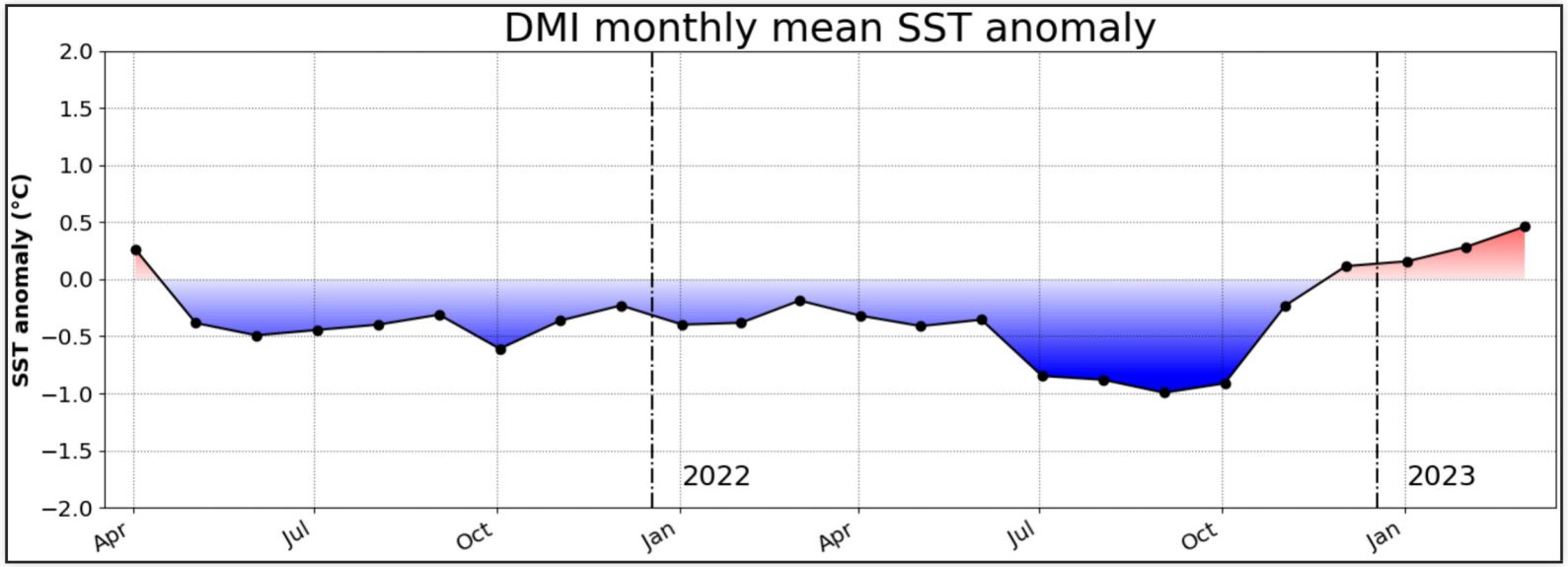
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : close to 0°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

Oceanic analysis of March 2023 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : +0.5°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

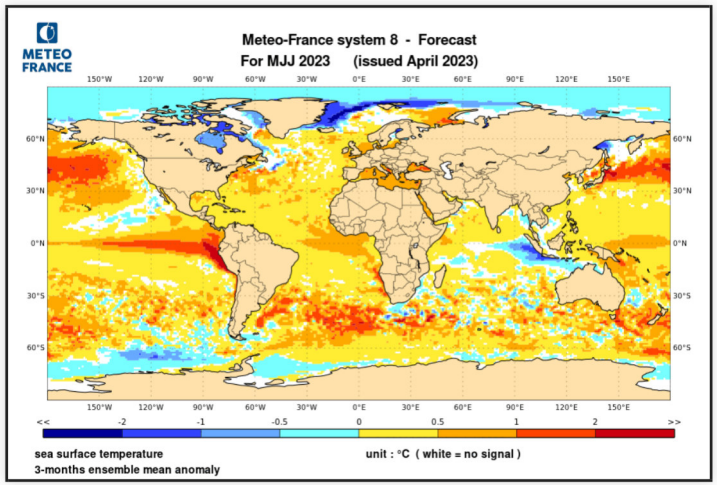
Oceanic forecast : SST anomaly

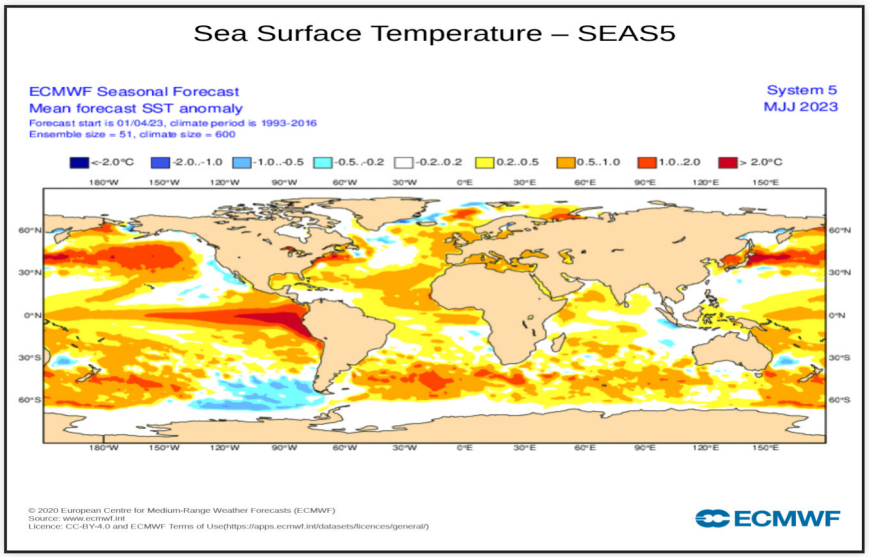
Good agreement between MF-S8 and ECMWF-SEAS5 in the main anomaly patterns.

In the Pacific Ocean : A warm anomaly over the Eastern Equatorial Pacific Ocean is starting to be well established. In the Northern Hemisphere, the PDO- pattern is maintained (warm anomaly in the center of the basin and cold anomaly along the US coast).

In the Indian Ocean : The signal is still weak, but a small cold anomaly is emerging near the Maritime Continent.

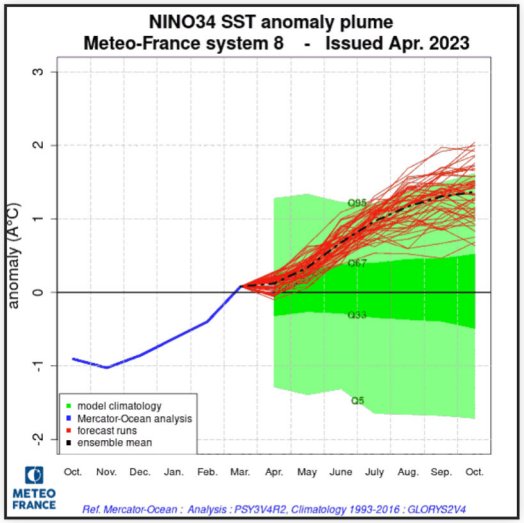
In the Atlantic Ocean : A positive anomaly is forecast by both models over the equatorial zone.
Similarly, a moderate warm anomaly is forecast over the North Atlantic and the Mediterranean Sea.

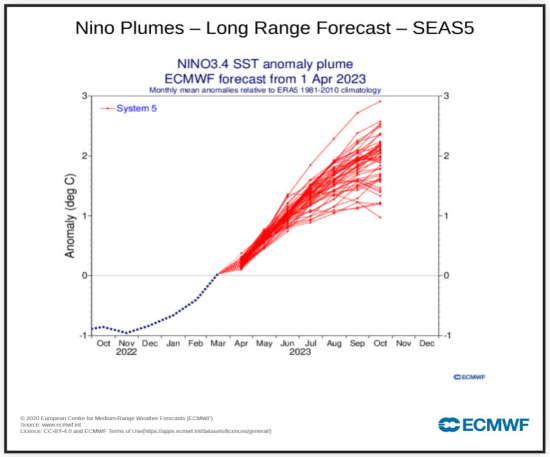




Oceanic forecast : NINO3.4 Plume diagrams

Both models predict a rapid and sustainable return to clearly positive values.

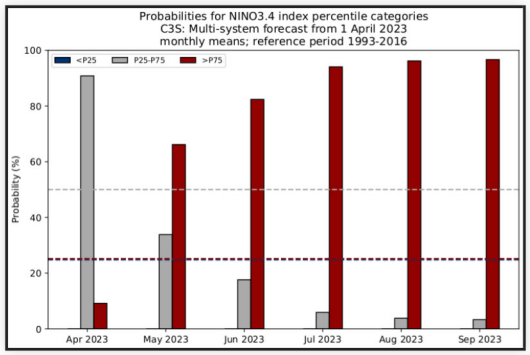


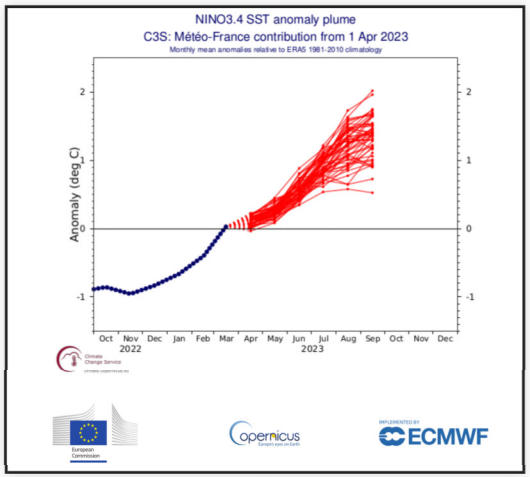


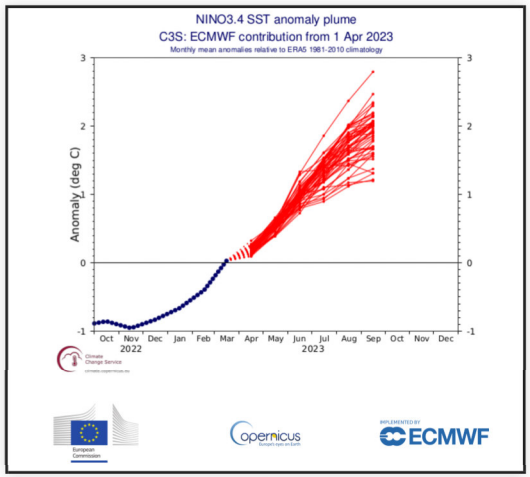
Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

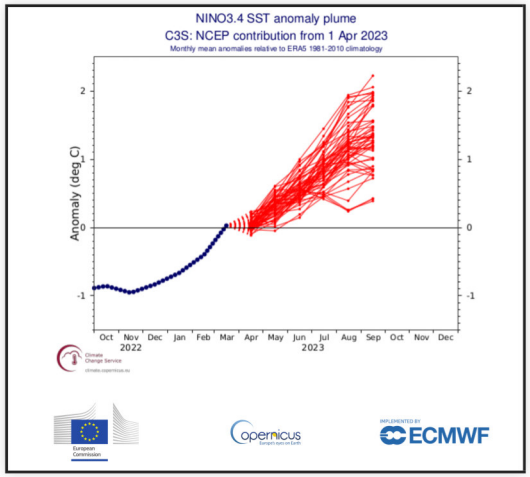
All models predict a rise to this index and the majority move into a positive phase during quarter. However, the evolution is slower with the DWD model.

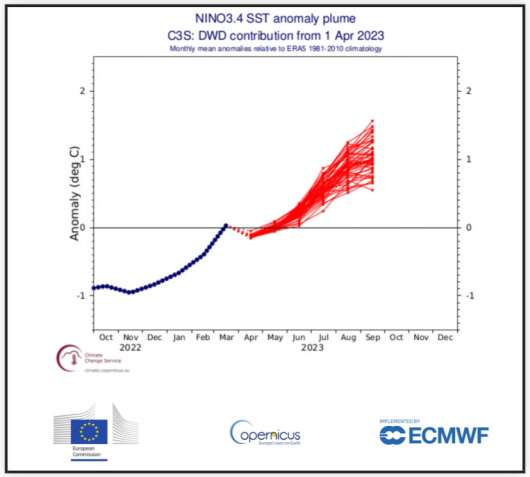
The most likely phase for the next three months : Positive phase

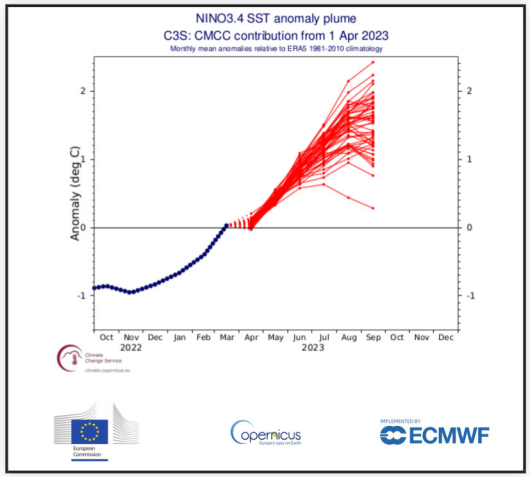








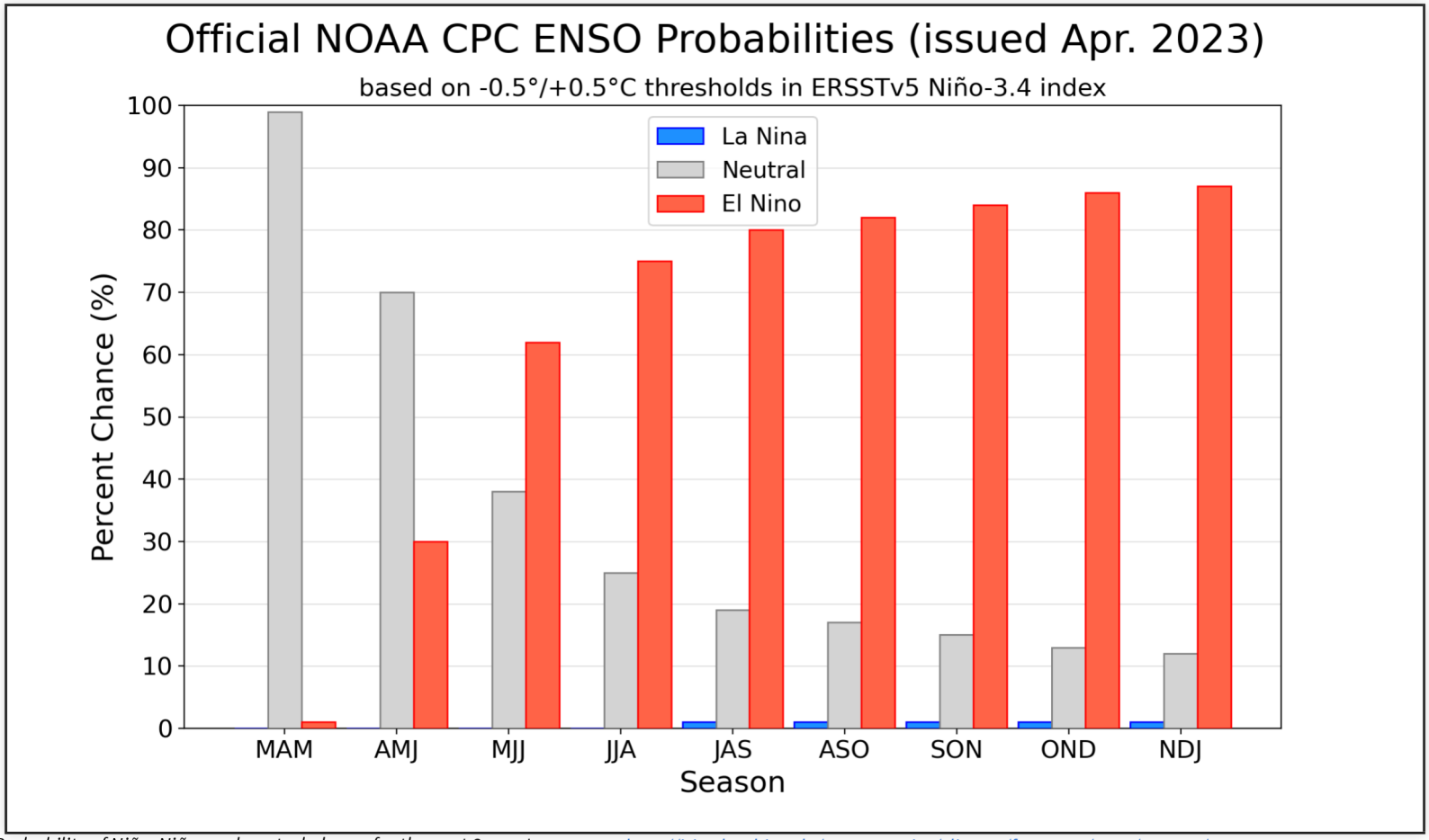




C3S multi-system probabilty forecast (top left figure) and C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

Oceanic forecast : Synthesis from IRI

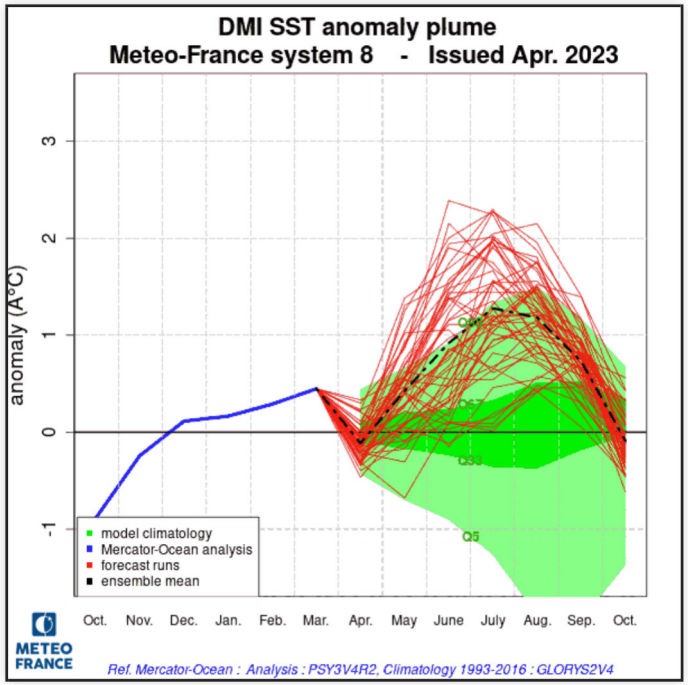
IRI forecast : more than 60 % of positive condiions for MJJ.

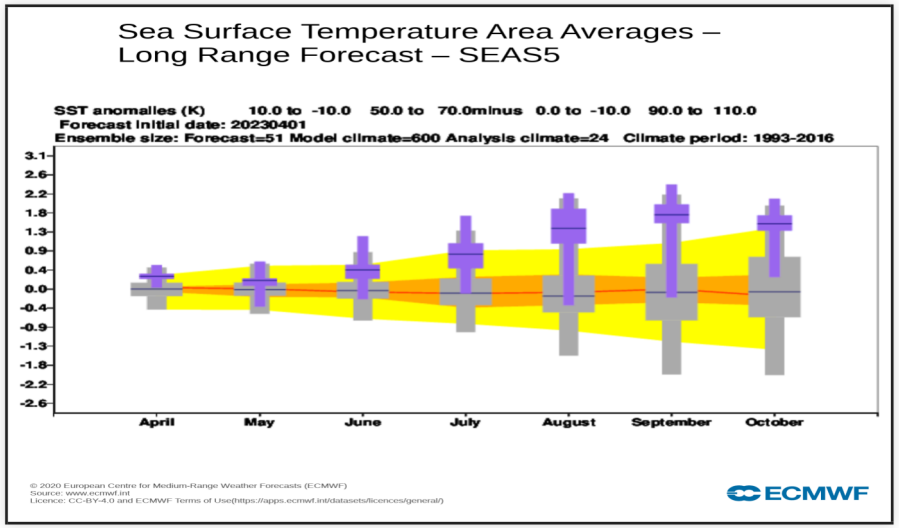


Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Oceanic forecast : Indian ocean - DMI evolution

The forecasted conditions are neutral at the beginning of the period before moving towards more clearly positive values. The spread is quite wide.

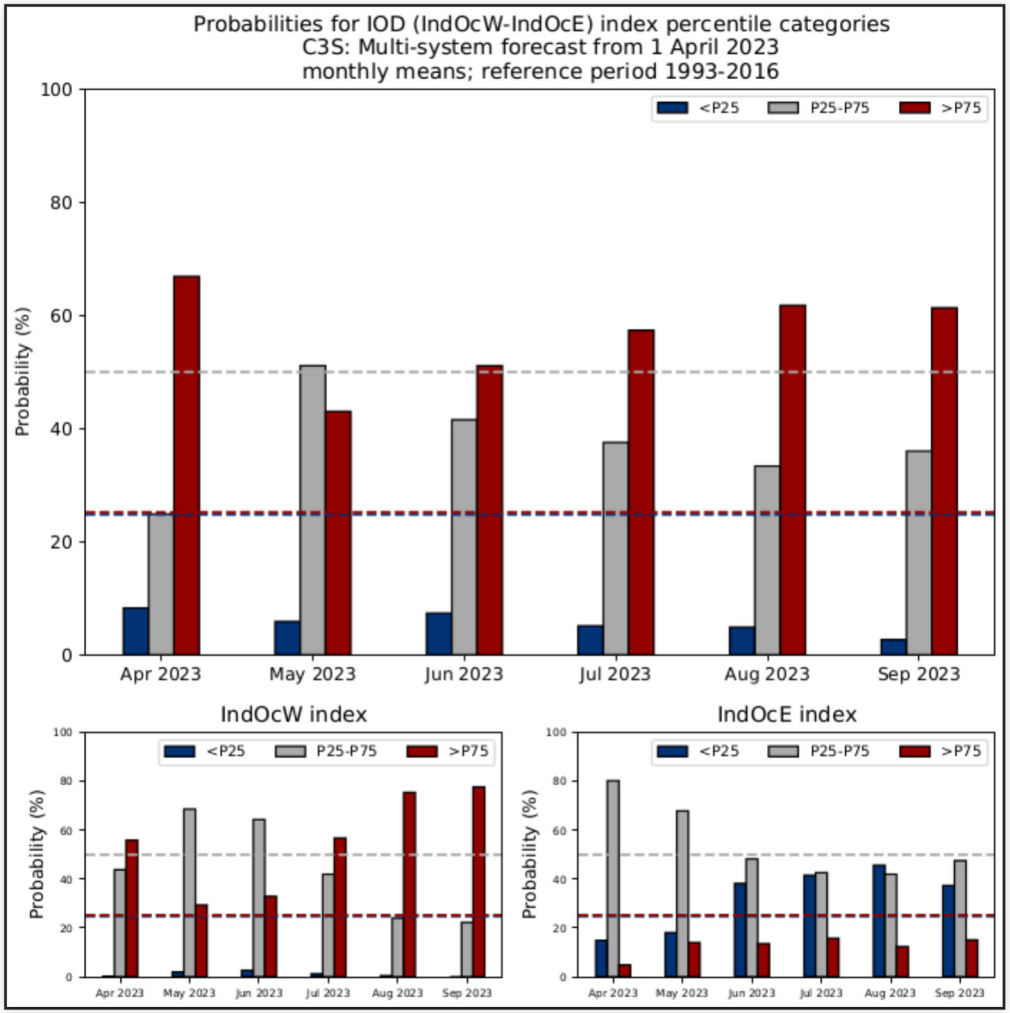




DMI index : analysis, forecasts and model climatology with MF-S8 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

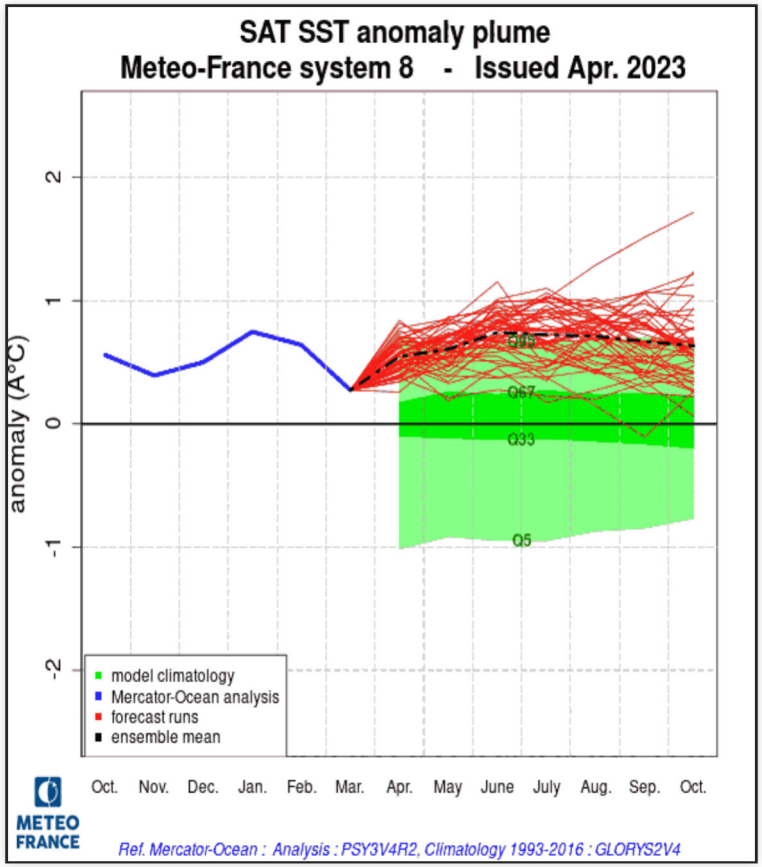
Expected Phase for the next three months : the positive phase is the most likely.

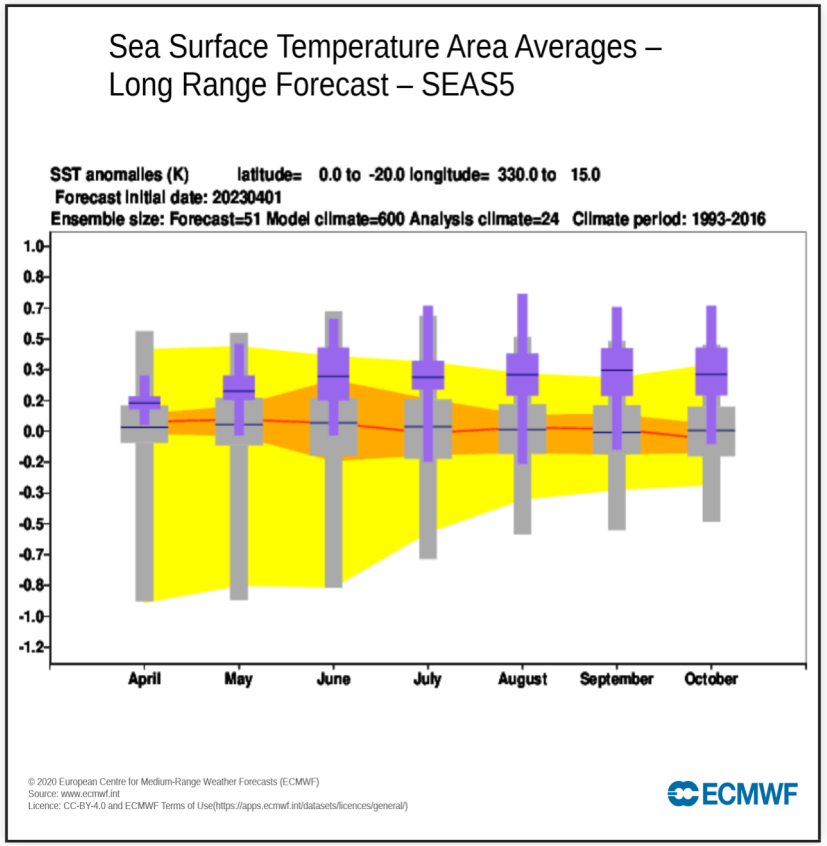


C3S multi-system probabilty forecast

Oceanic forecast : Atlantic ocean - SAT evolution

Both models predict that the index will remain in the warm tercile.



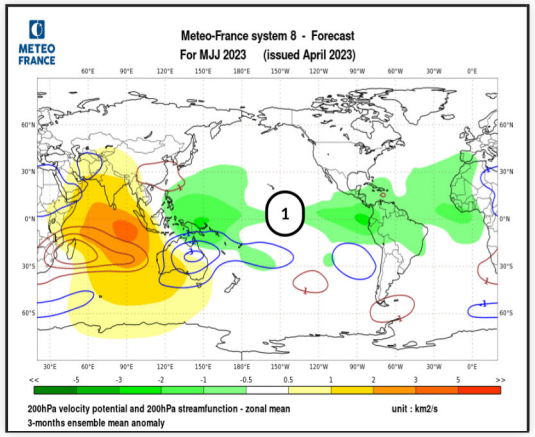


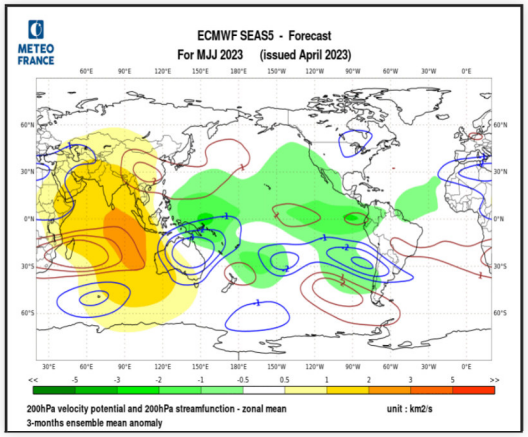
Anomaly on the SAT box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

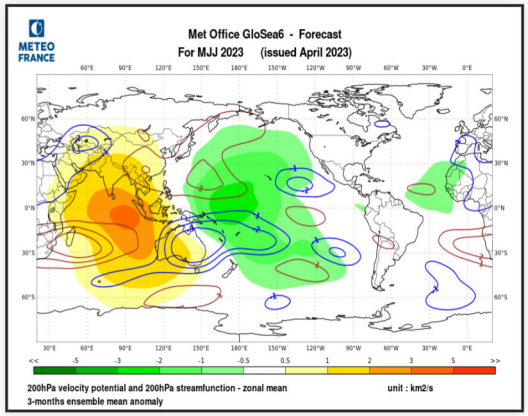
Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

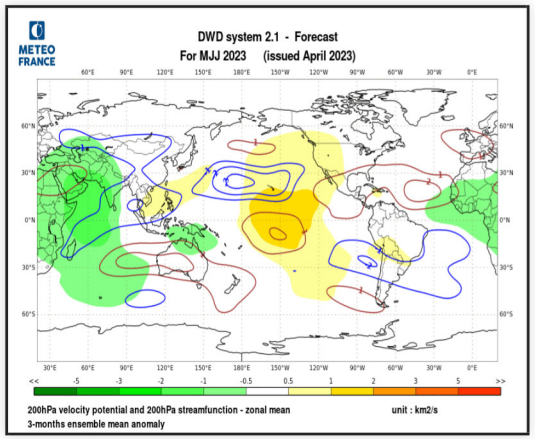
Velocity Potential : Divergences appear between the models. Most of them predict the disappearance of the Pacific downward motion anomaly. Only the DWD model, which is slow to warm up the Nino3.4 index, maintains a typical "La Niña" velocity potential distribution. Over the Indian Ocean downward motion is more marked in the eastern part where the cold anomaly of sea surface is higher. Upwards motion are more likely over western Pacific and Africa.

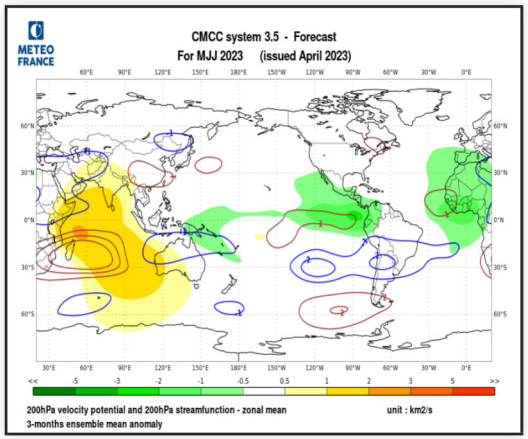
Streamfunction : The dipoles over the western Indian Ocean and the western Pacific are more or less attenuated depending on the model. They have almost disappeared with MF-S8 or CMCC. On the contrary, they are pronouced in the NCEP and Met Office models. No predict teleconnections to the northern hemisphere.

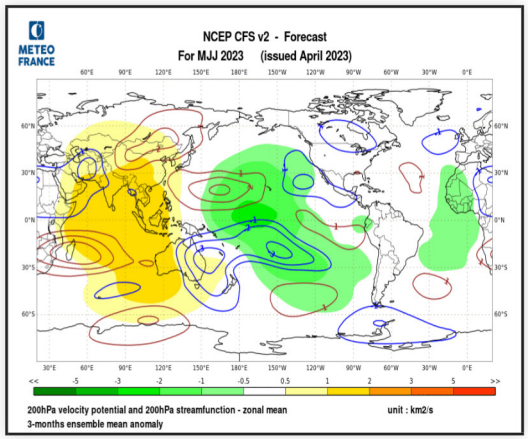










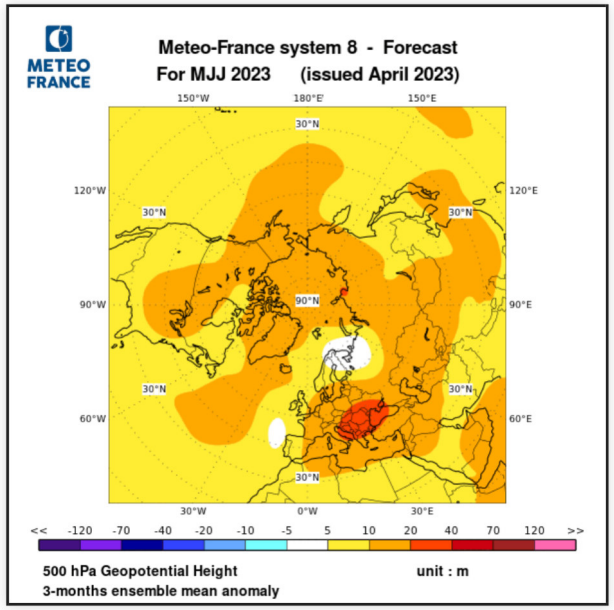


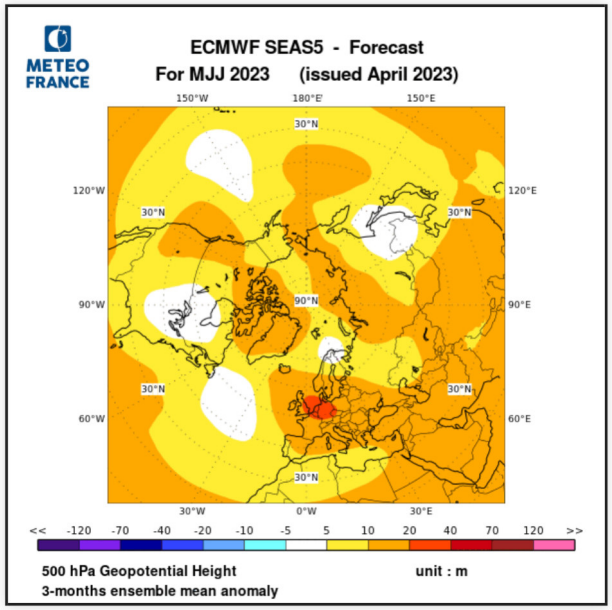
MF8,SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

1 - disappearance of downward motion anomalies

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Some similarities from Eurasia to Pacific. Strong differences from North America to the Atlantic.



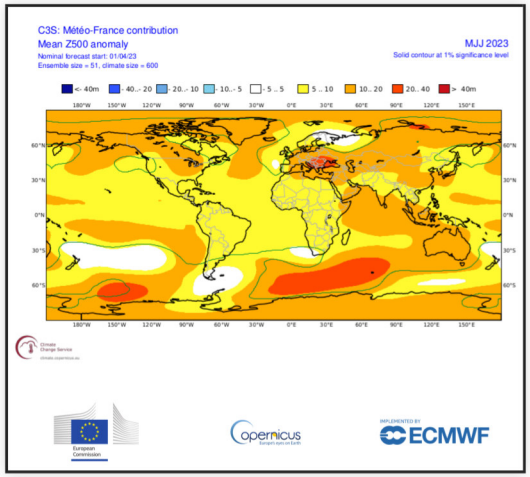


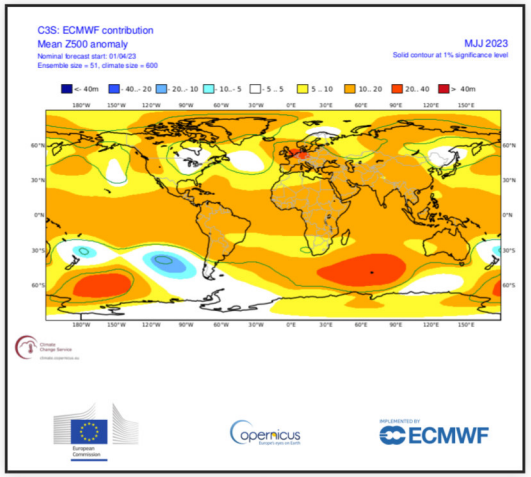
polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

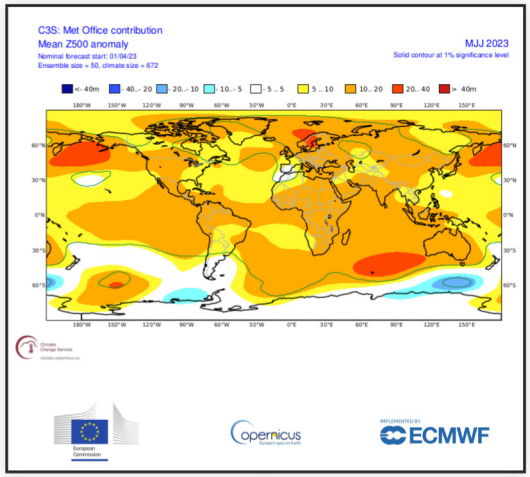
Atmospheric circulation forecasts : Z500 anomalies in C3S models

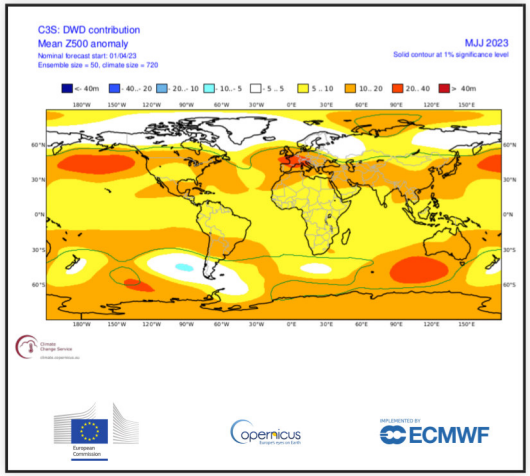
In the southern hemisphere there are some simalarity between models.

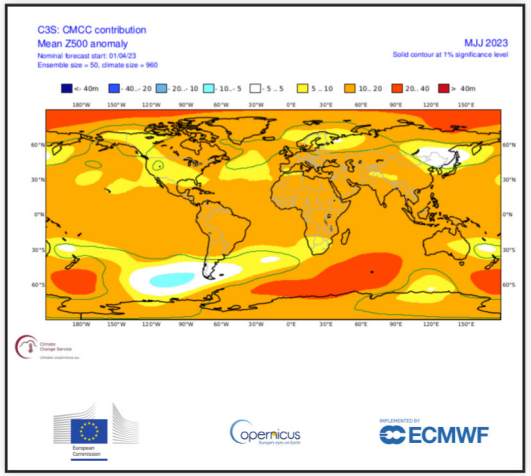
On the contrary in the northern hemisphere therere are few or no large scale anomalies and few similarities between models.

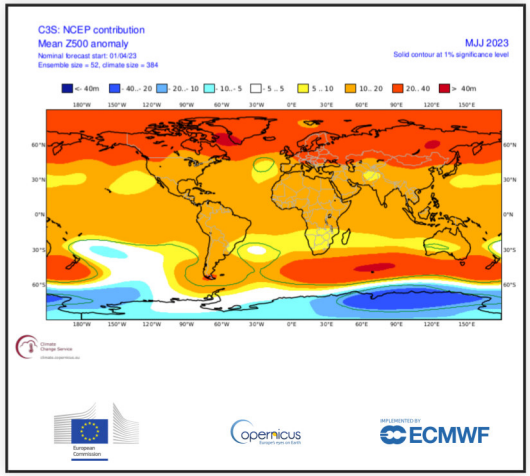








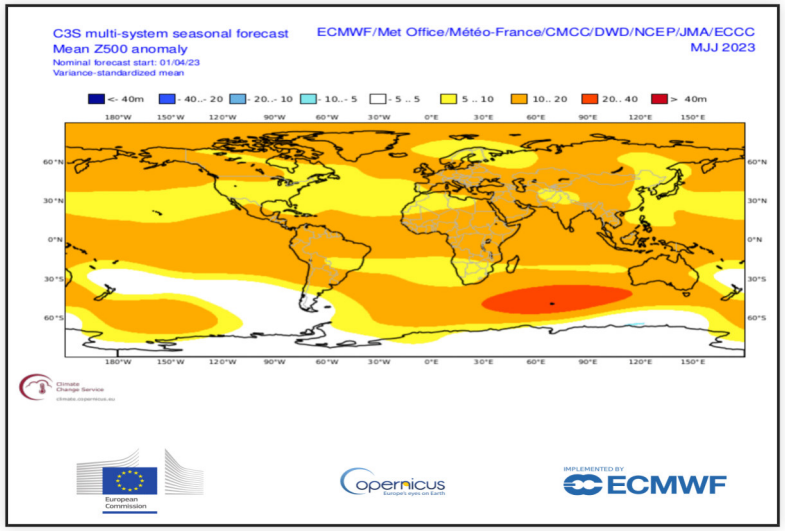




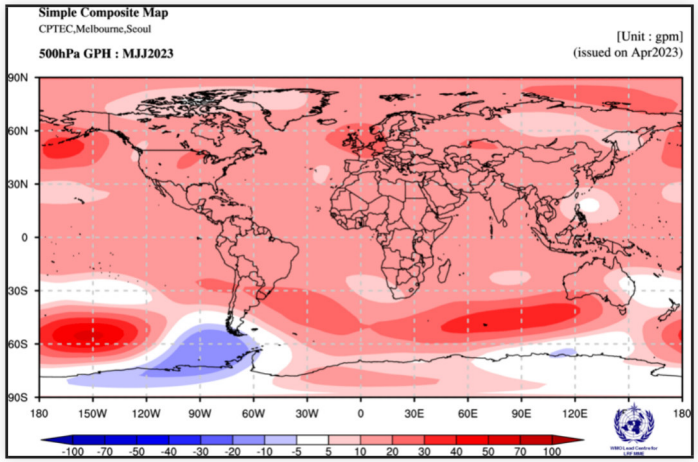
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

In the northern hemisphere multimodel aren't informative and doesn't highlight privilegied circulation.



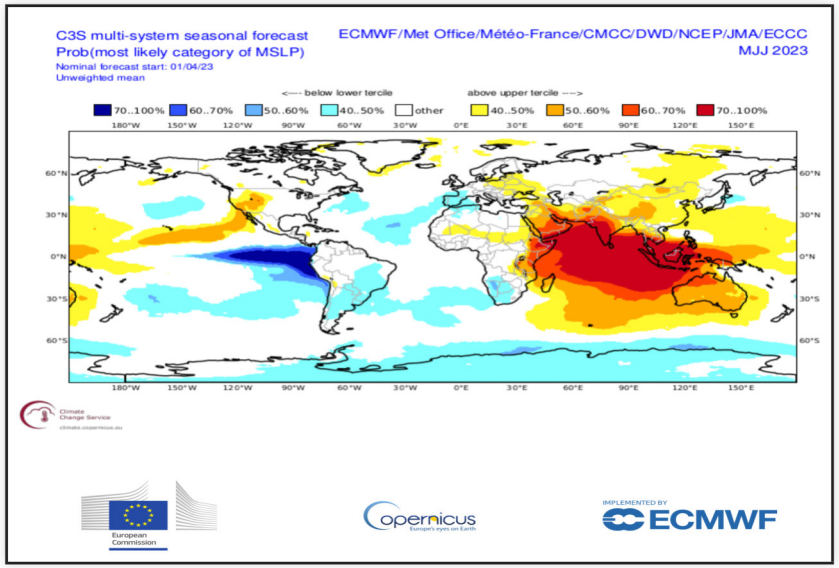
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



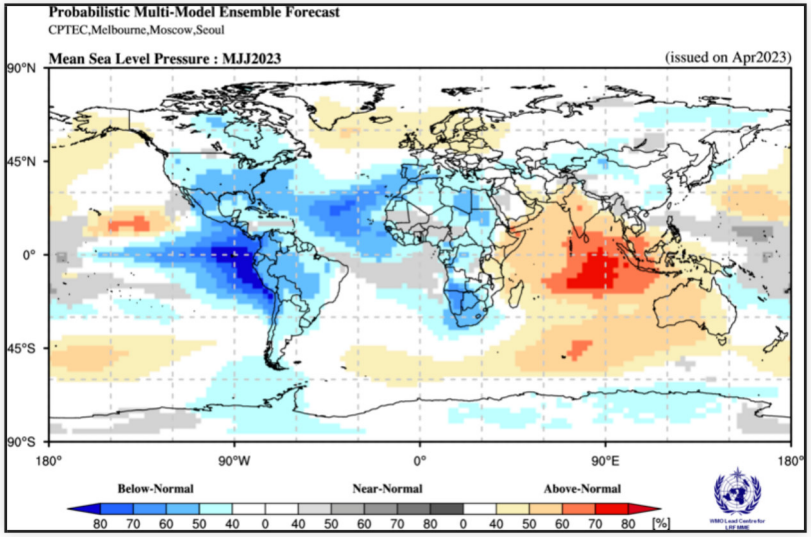
Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilites multi-systems

The two multi-models agree on most of the anomalies.



C3S multi-models MSLP terciles probability.

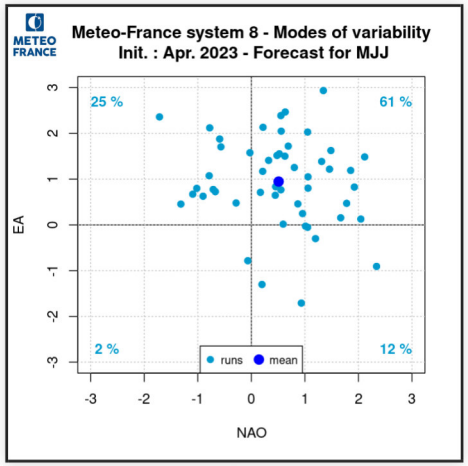


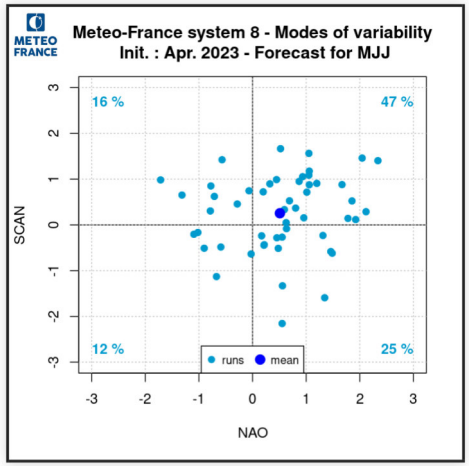
Others models of WMO multi-models MSLP terciles probability.

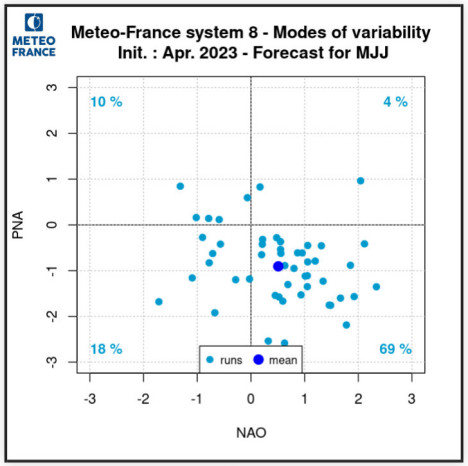
Modes of variability : forecast

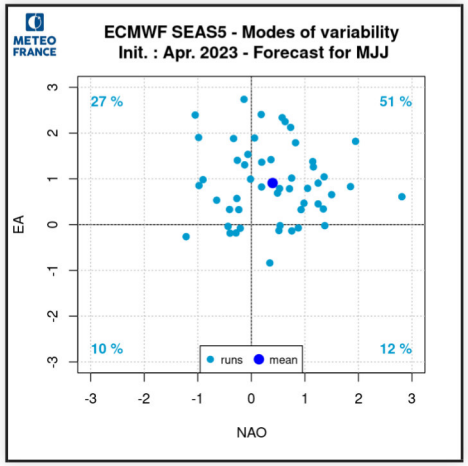
The two models are quite close for the PNA-, NAO+ and EA+ modes.

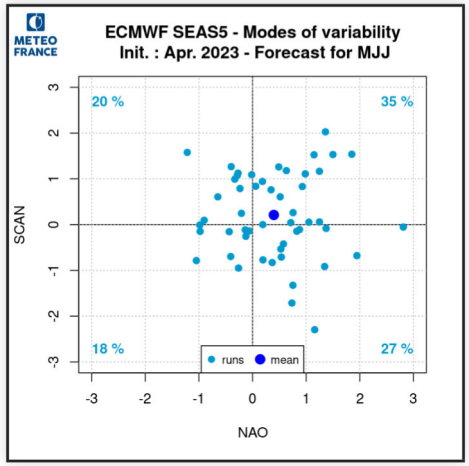
SCAN + is more likely.

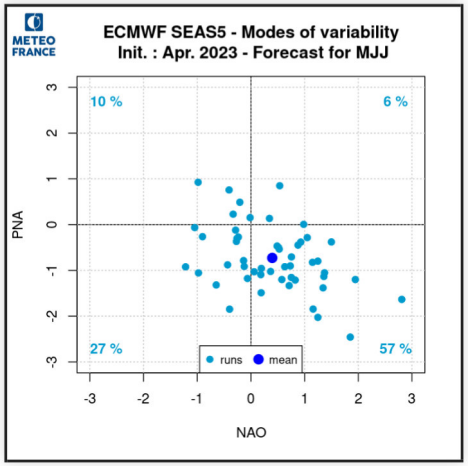








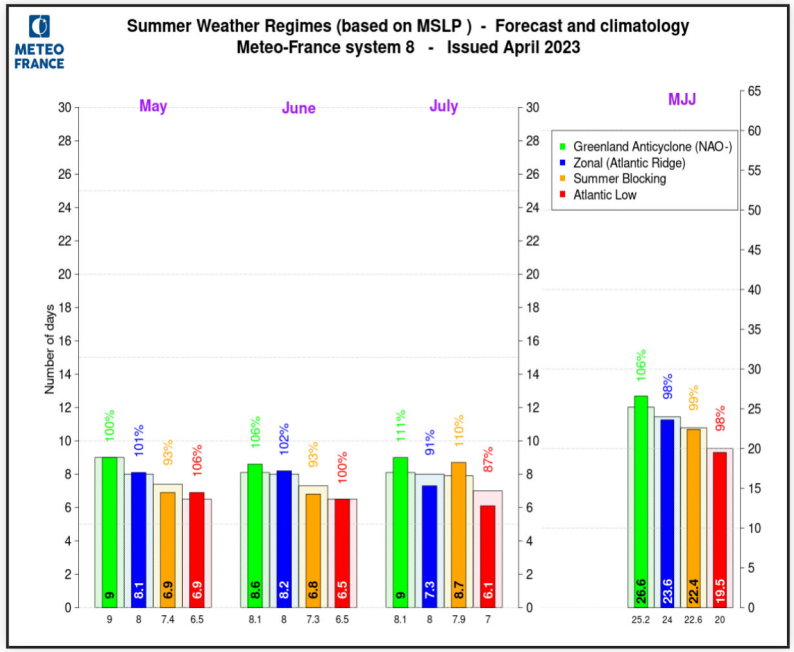


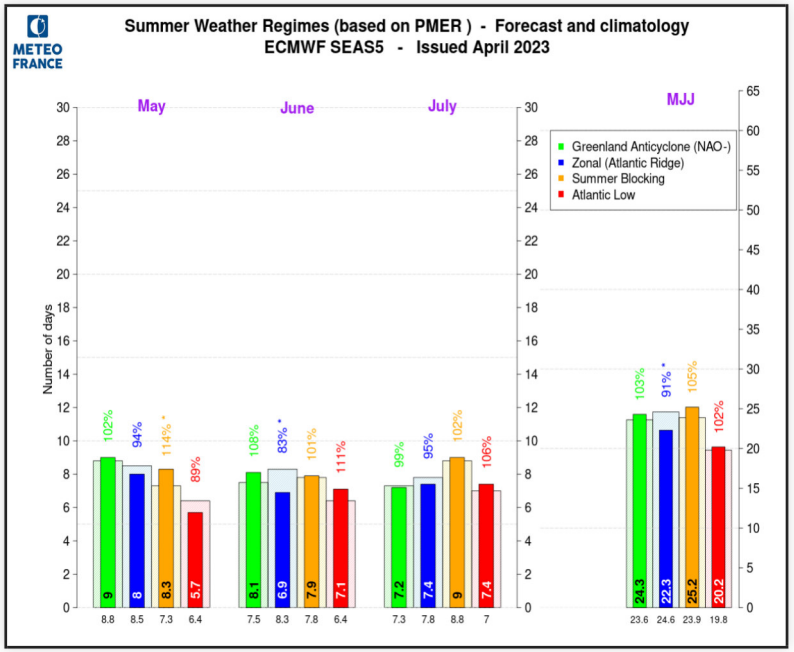


See the modes of variability patterns

Weather regimes : summer MSLP

The quarterly data are close to the climatology with a limited underrepresentation of the "Zonal" regime significant for ECMWF.

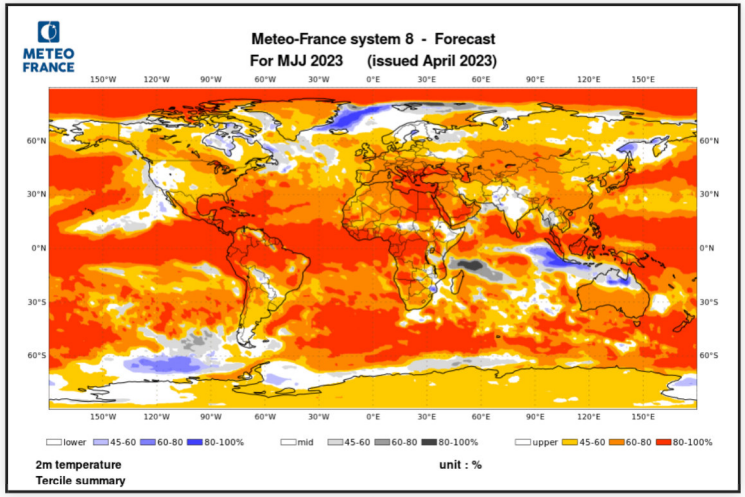


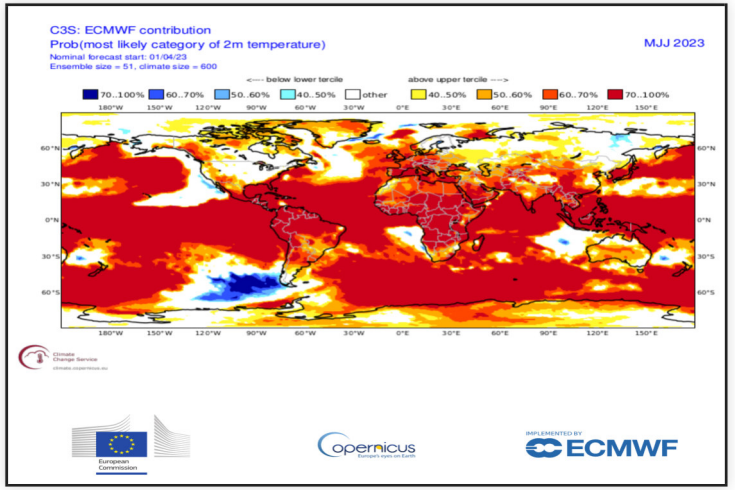


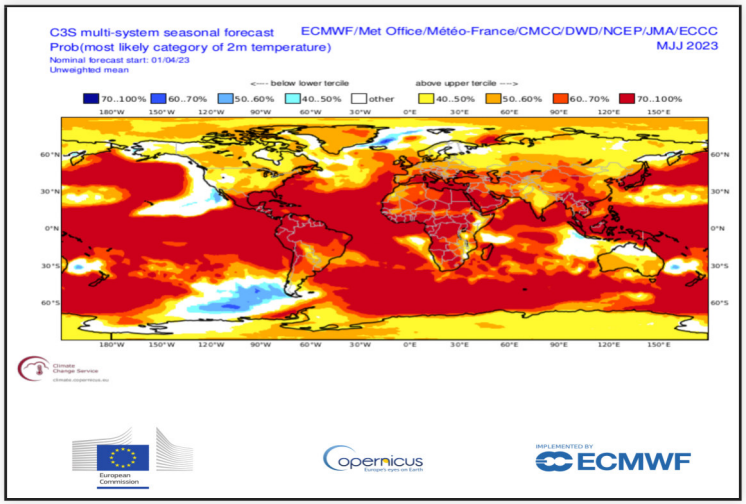
Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S8 (left) and SEAS5 (right).

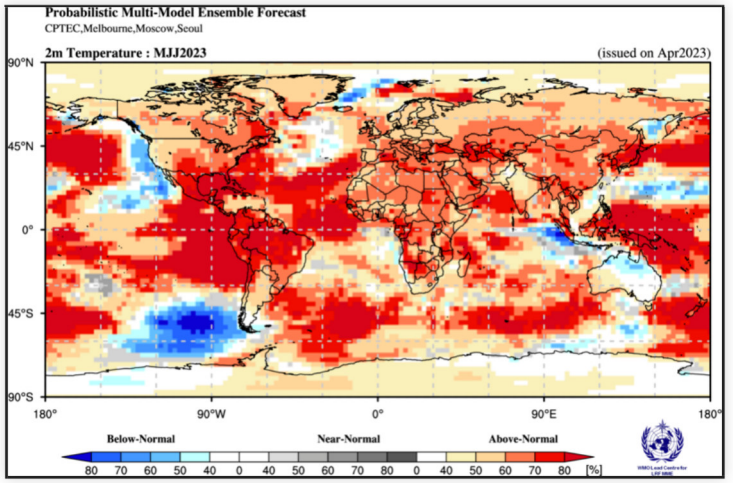
Forecast of climatic parameters : Temperature probabilities

In the tropics there is high probability of warm anomalie except on the eastern Indian Ocean. Elsewhere the warm signal is also largely dominant.





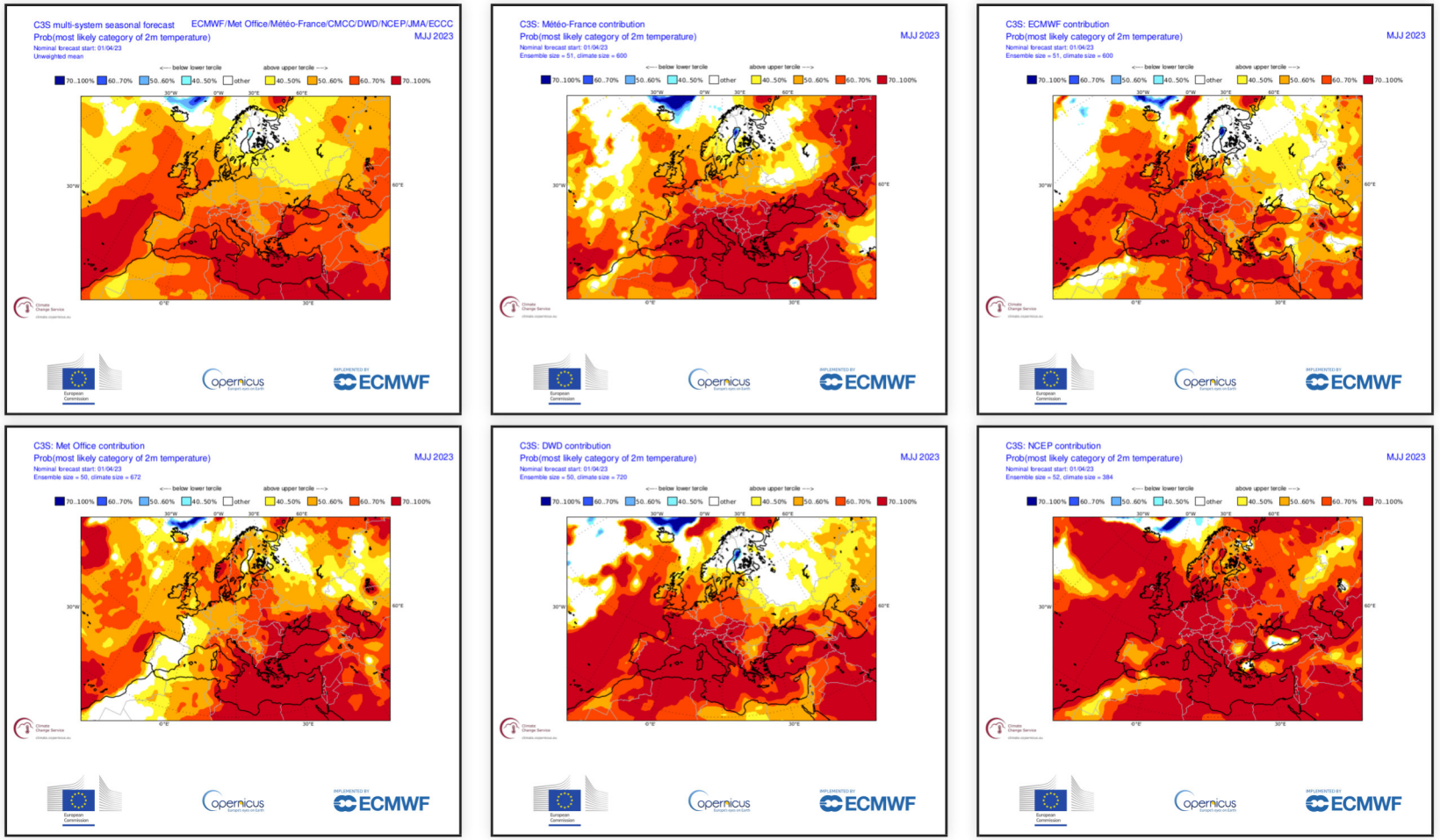




2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

The warm tercile is favored over a large part of Europe with high probability over Mediterranean basin.

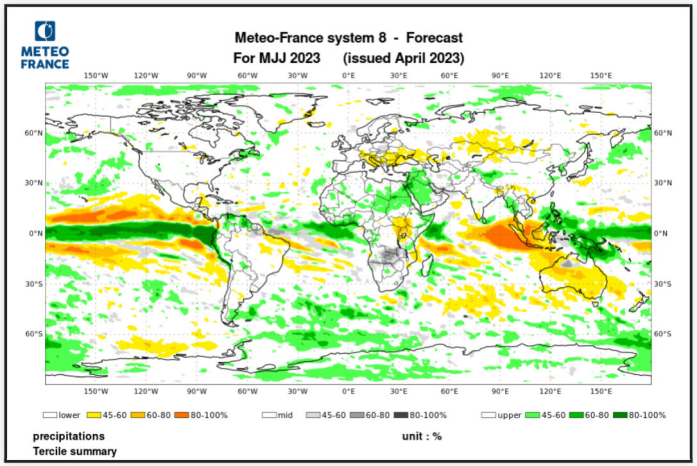


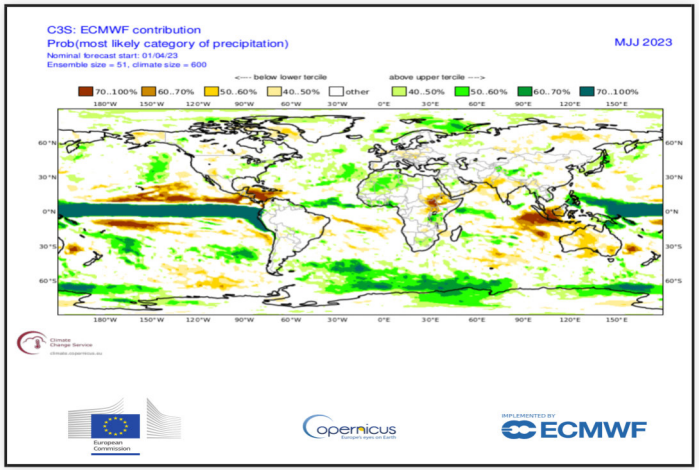
C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO , DWD, CMCC models.

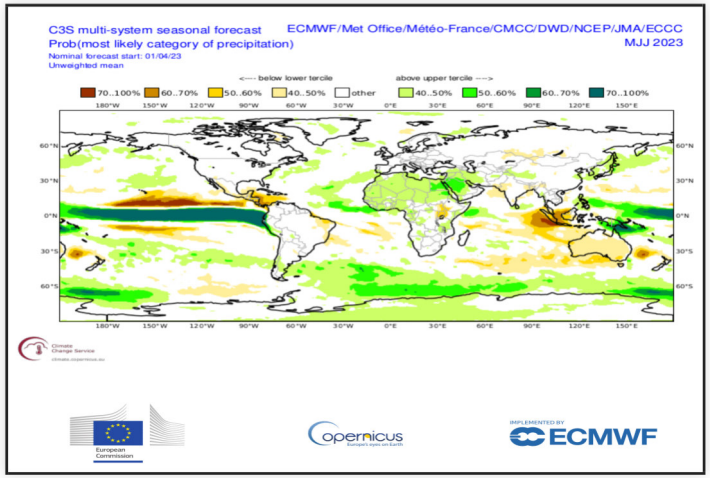
Forecast of climatic parameters : Precipitation

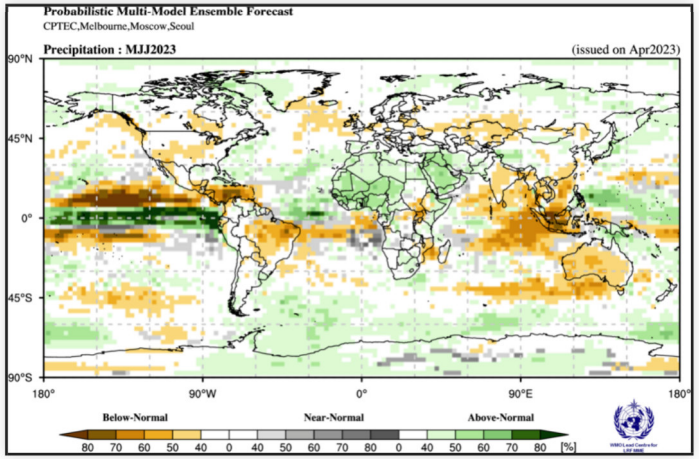
Good convergence between models in the intertropical zone (type El Nino and IOD +)

Few or no signal in the mid-latitudes of the northern hemisphere.





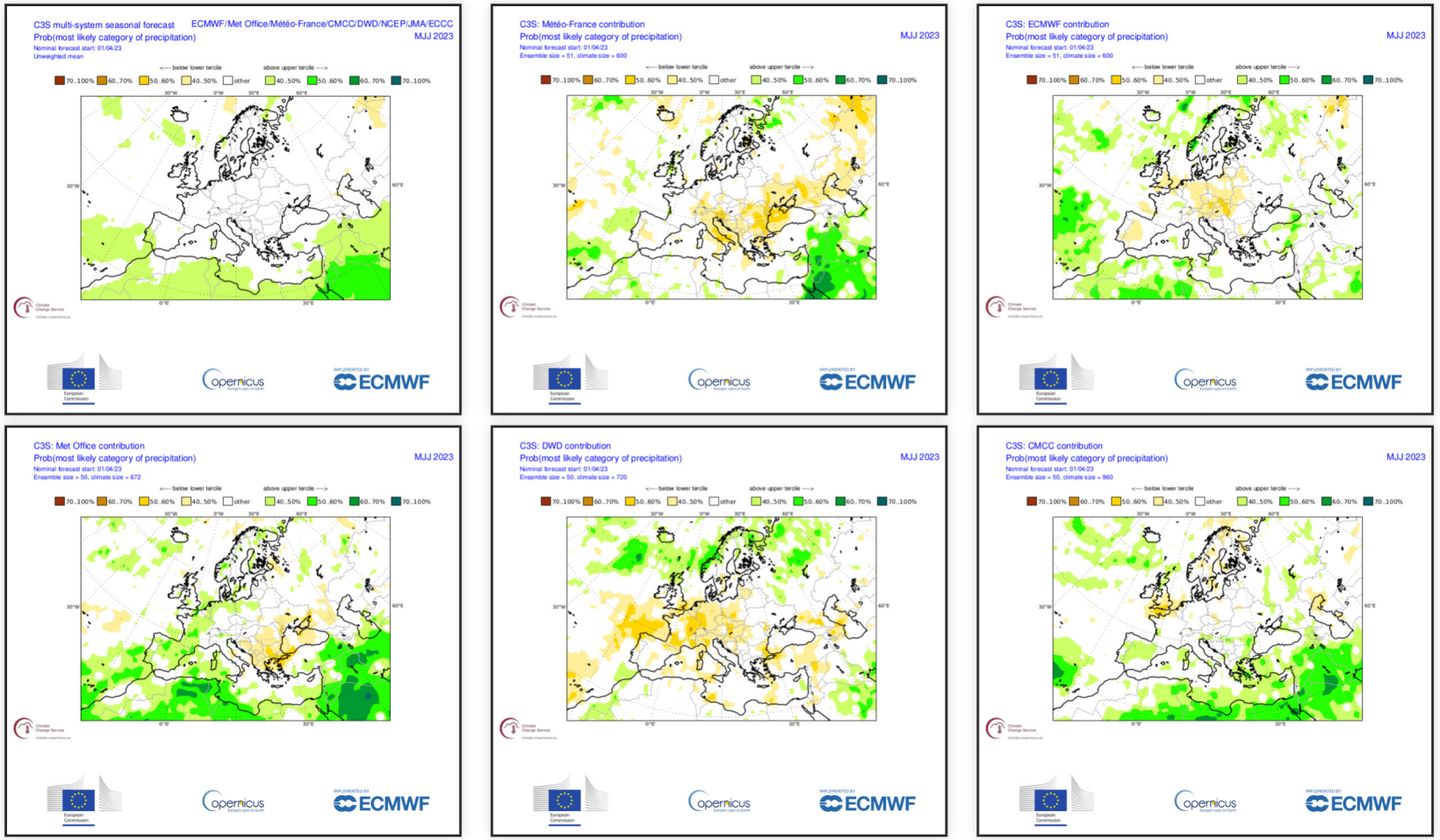




precipitation probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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

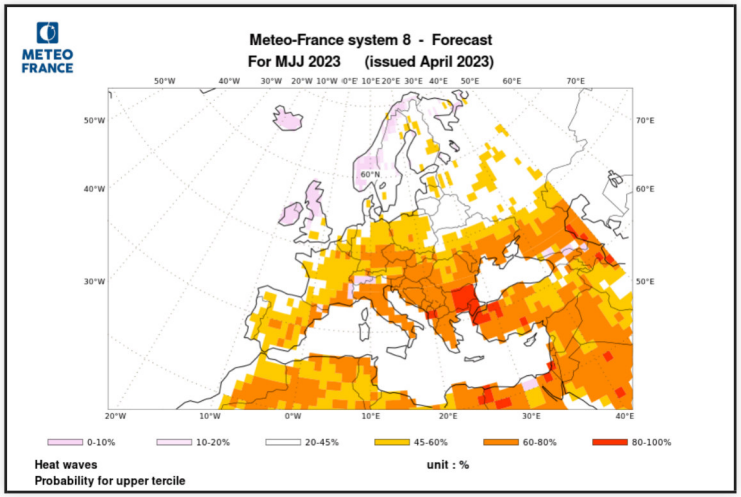
The models agree in proposing divergent signal over Europe.

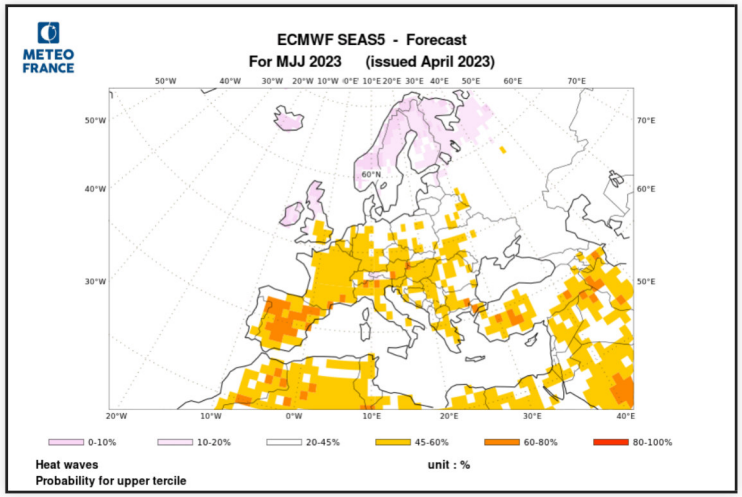


C3S multi-models probability map (top left) and MF-S8, SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Heat waves

The probability of heat waves remains high for the quarter over Southern Europe and especially with MF8.

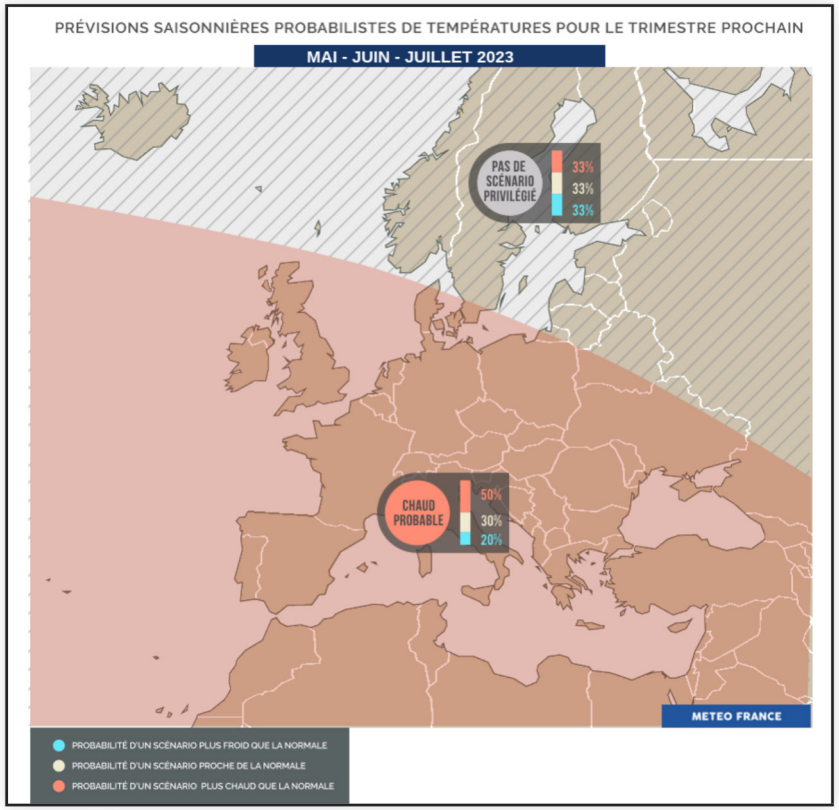




Heat wave probability for MF8 (right) and ECMWF (left). A heat wave is detected if the corrected T2M is above the daily 90th percentile and a fixed 20°C threshold. *more details here*

Synthesis map for Europe : Temperature

A warmer-than-normal scenario is more likely on most European country.

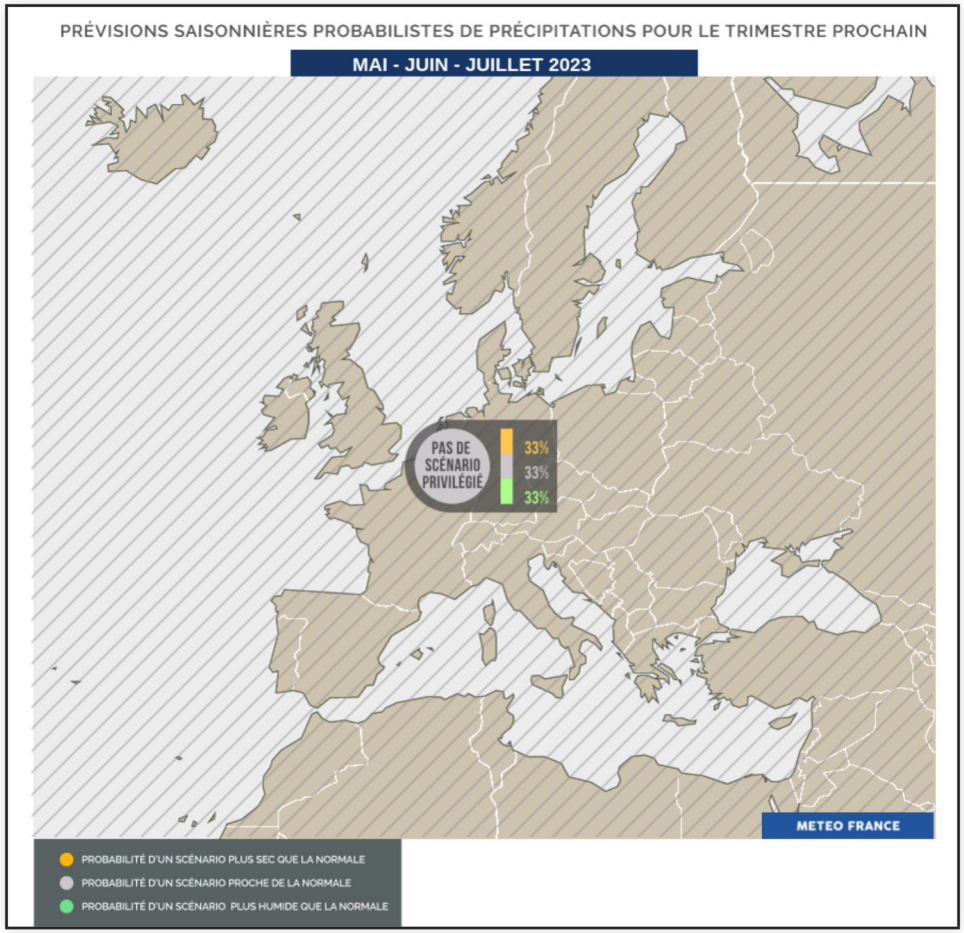


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

The models offer disparate precipitation signal over Europe. It is therefore not possible to establish a scenario.

No scenario is therefore chosen, either over France or over Europe.



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