

Météo-France Seasonal Forecast Bulletin

AUGUST - SEPTEMBER - OCTOBER 2023

Table of Content

1. Oceanic analysis of June 2023	
1. SST anomalies	3
2. Pacific vertical section	4
3. Hovmöller diagram of the 20°C isotherm	5
4. Pacific Ocean - Nino3.4 index history	6
5. Indian Ocean - DMI index history	7
6. Atlantic Ocean - SAT index history	8
2. Oceanic forecast	
1. SST anomaly	9
2. C3S Nino3.4 re-scaled plume diagrams	10
3. C3S Nino3.4 re-scaled plume diagrams	11

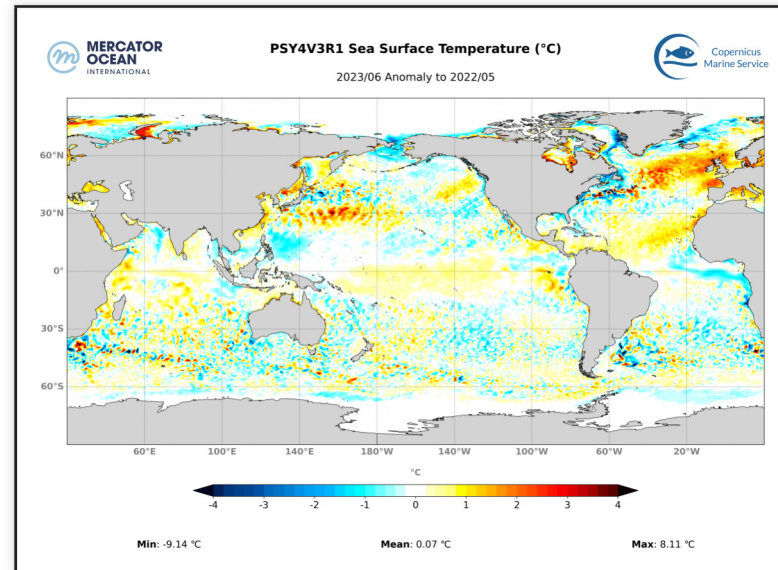
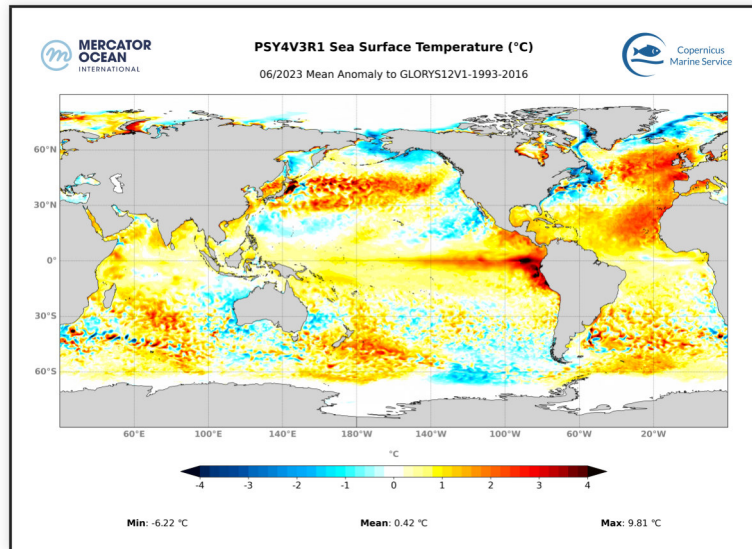
Oceanic analysis of June 2023 : SST anomalies

Current ENSO situation : setting up the positive phase

In the Pacific Ocean : The very strong warm anomaly over the eastern equatorial zone is slowly spreading westwards, reaching the center of the basin. In the Northern Hemisphere, the PDO- pattern remains.

In the Indian Ocean : The positive (to the west) and negative (to the east) anomalies are further accentuated, reinforcing the positive phase of the IOD.

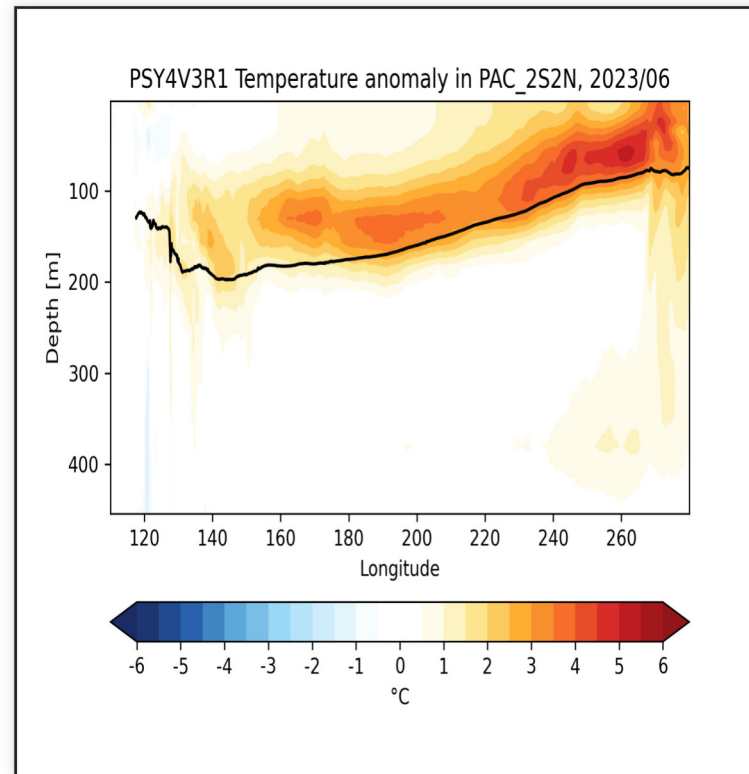
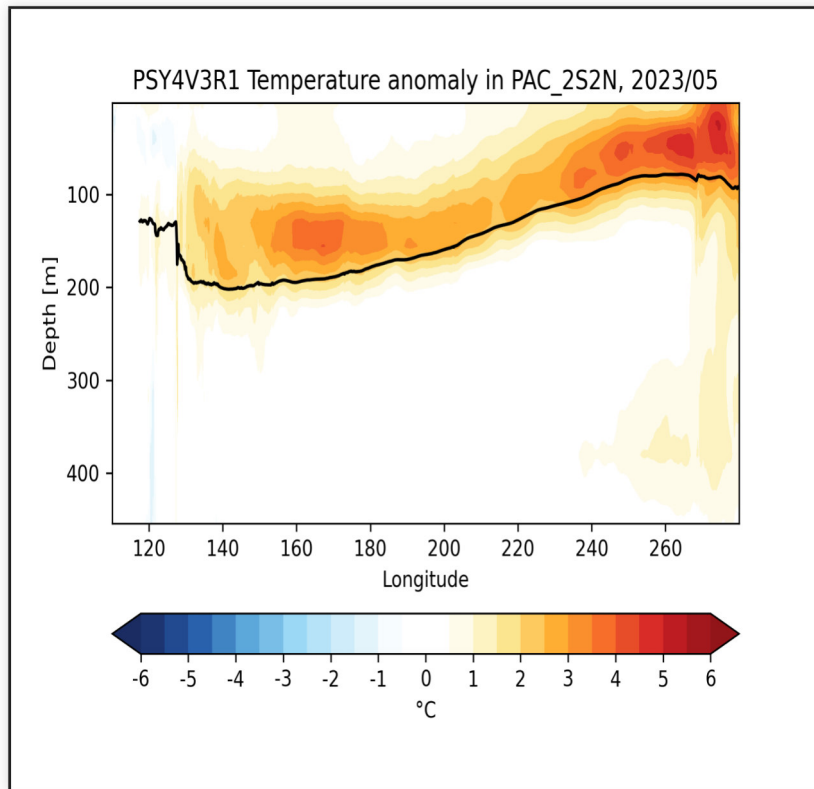
In the Atlantic Ocean : In the equatorial zone, SST is once again neutral. Conversely, in the Northern Hemisphere, the positive anomaly over the eastern basin persists, and is even strengthening off the European coast.



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

Oceanic analysis of June 2023 : Pacific vertical section

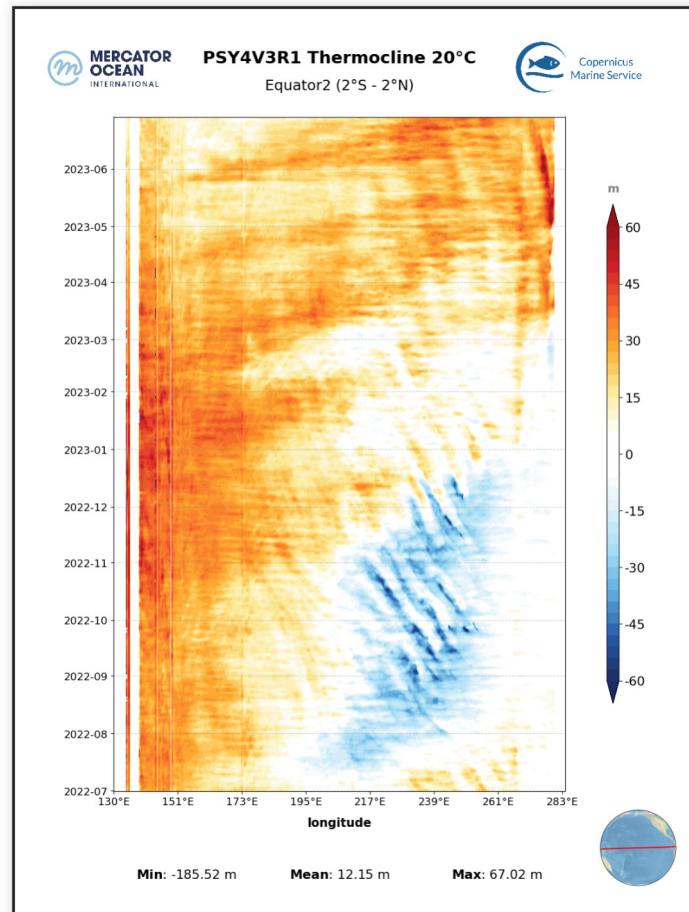
The warm subsurface anomaly is spreading westwards across the basin.



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

Oceanic analysis of June 2023 : Hovmöller diagram of the 20°C isotherm

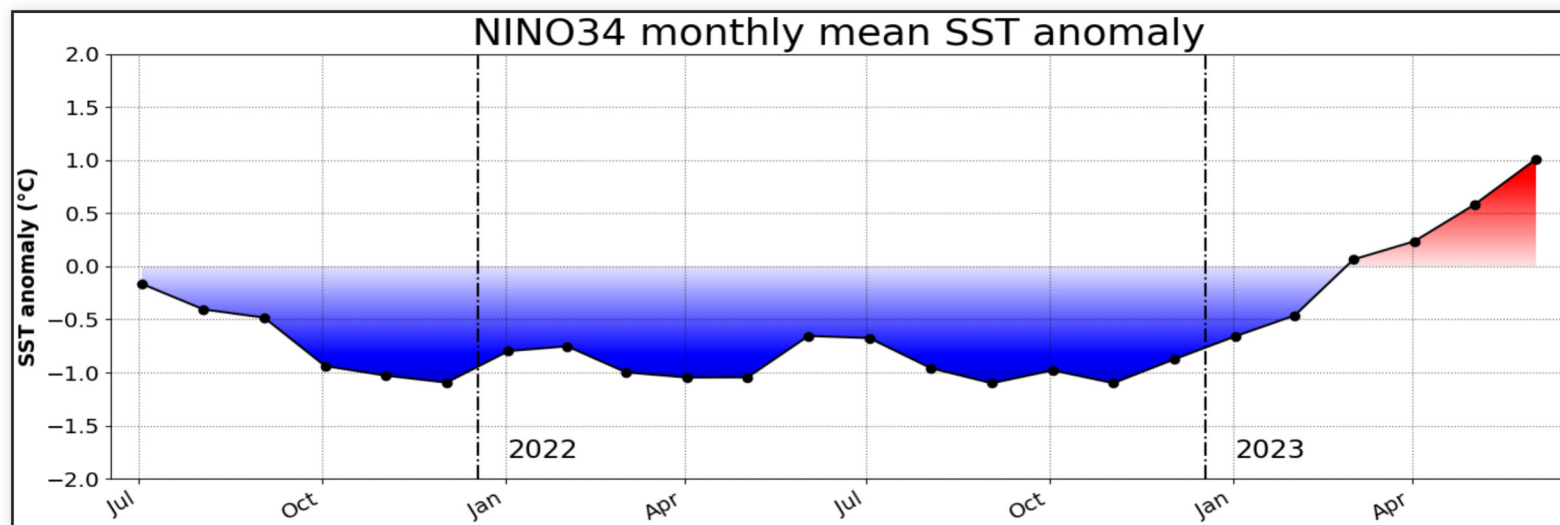
The 20°C thermocline is deeper than normal over the entire Pacific.



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

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

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : close to +1.0°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

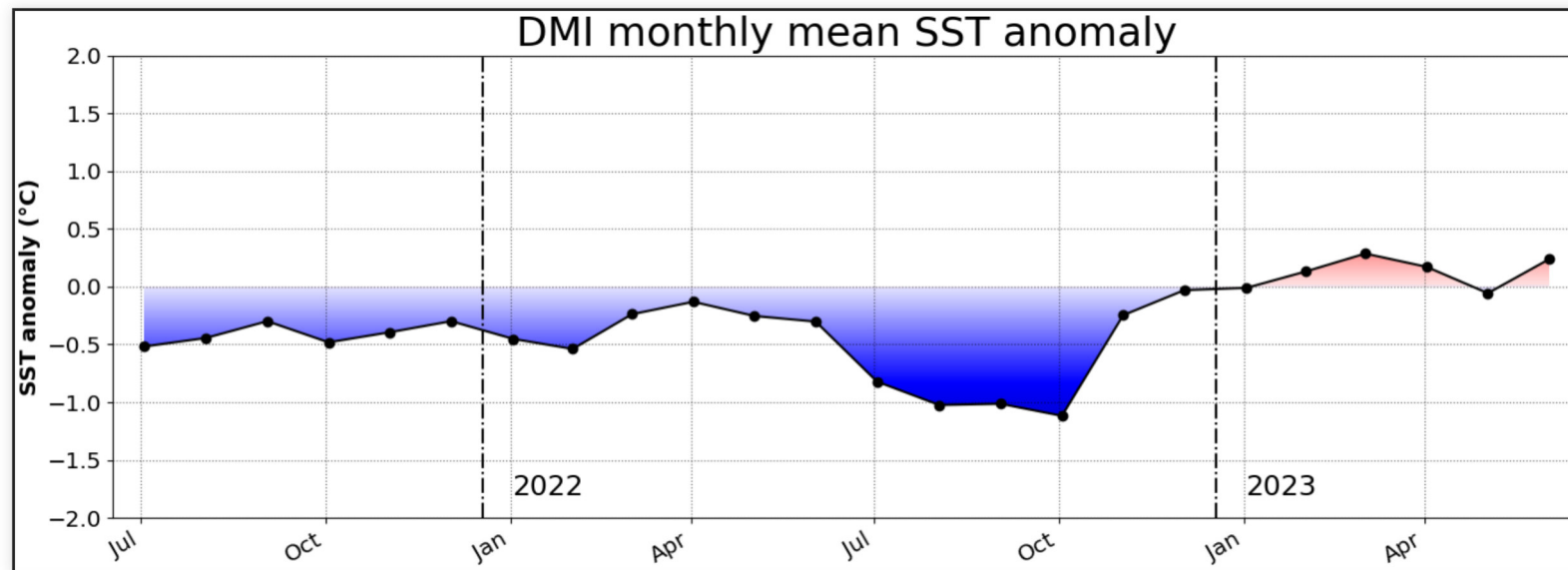


Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

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

DMI Index issued from Mercator Ocean PSYV4R2 analysis : $+0.2^{\circ}\text{C}$

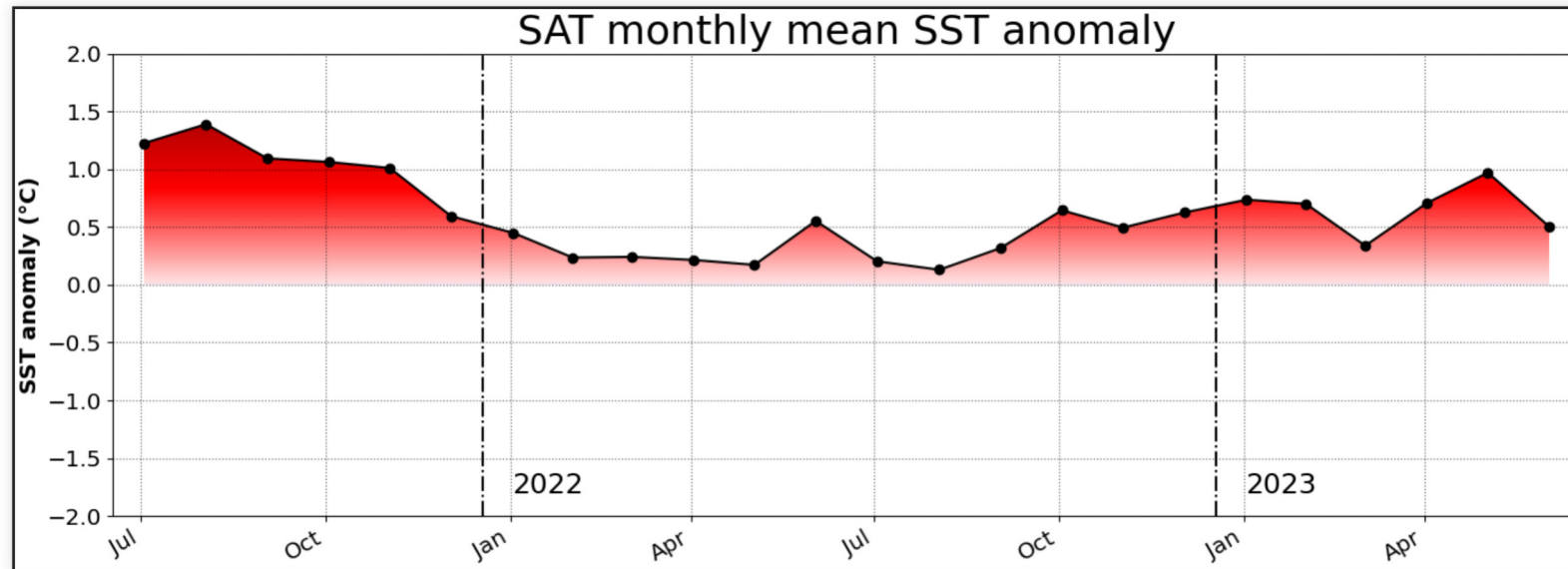
(see BOM site for weekly values : <http://www.bom.gov.au/climate/enso/monitoring/iod1.png>)



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

Oceanic analysis of June 2023 : Atlantic Ocean - SAT index history

SAT index issued from Mercator Ocean PSYV4R2 analysis : +0.5°C



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

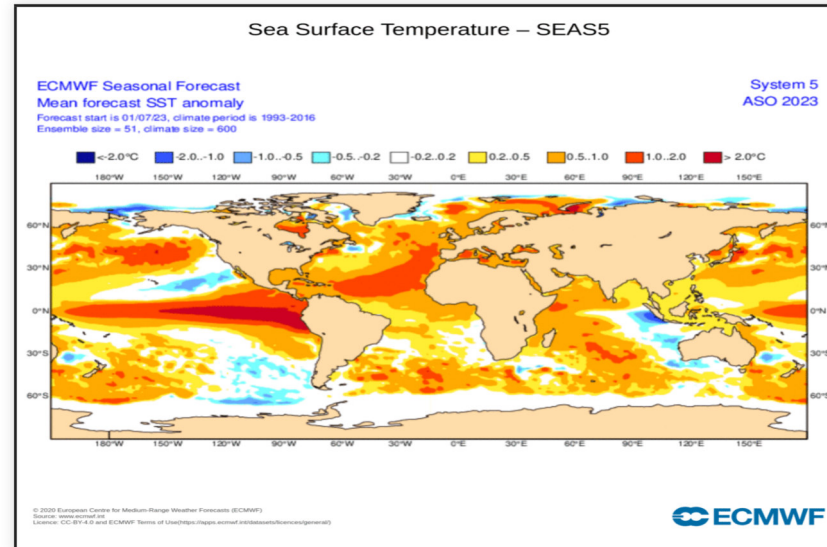
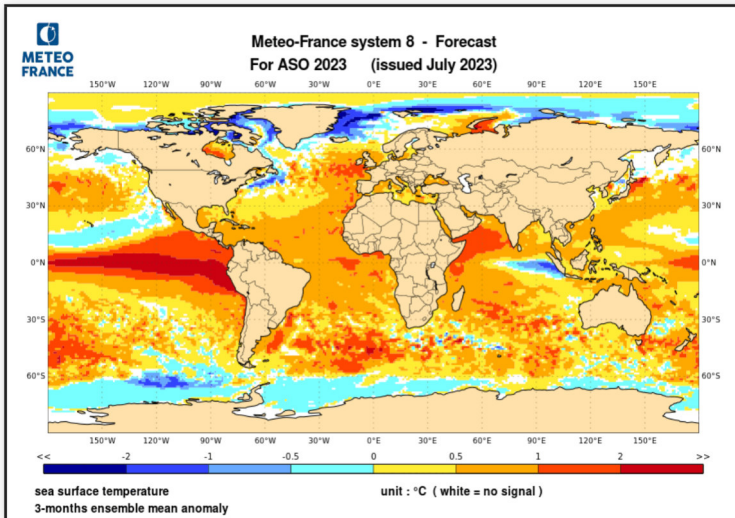
Oceanic forecast : SST anomaly

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

In the Pacific Ocean : In the equatorial zone, the positive anomaly continues to extend westwards this quarter. In the Northern Hemisphere, the PDO- pattern remains in place.

In the Indian Ocean : The positive anomaly (near the African coast) and the negative one (near the Maritime Continent) are well established for both models.

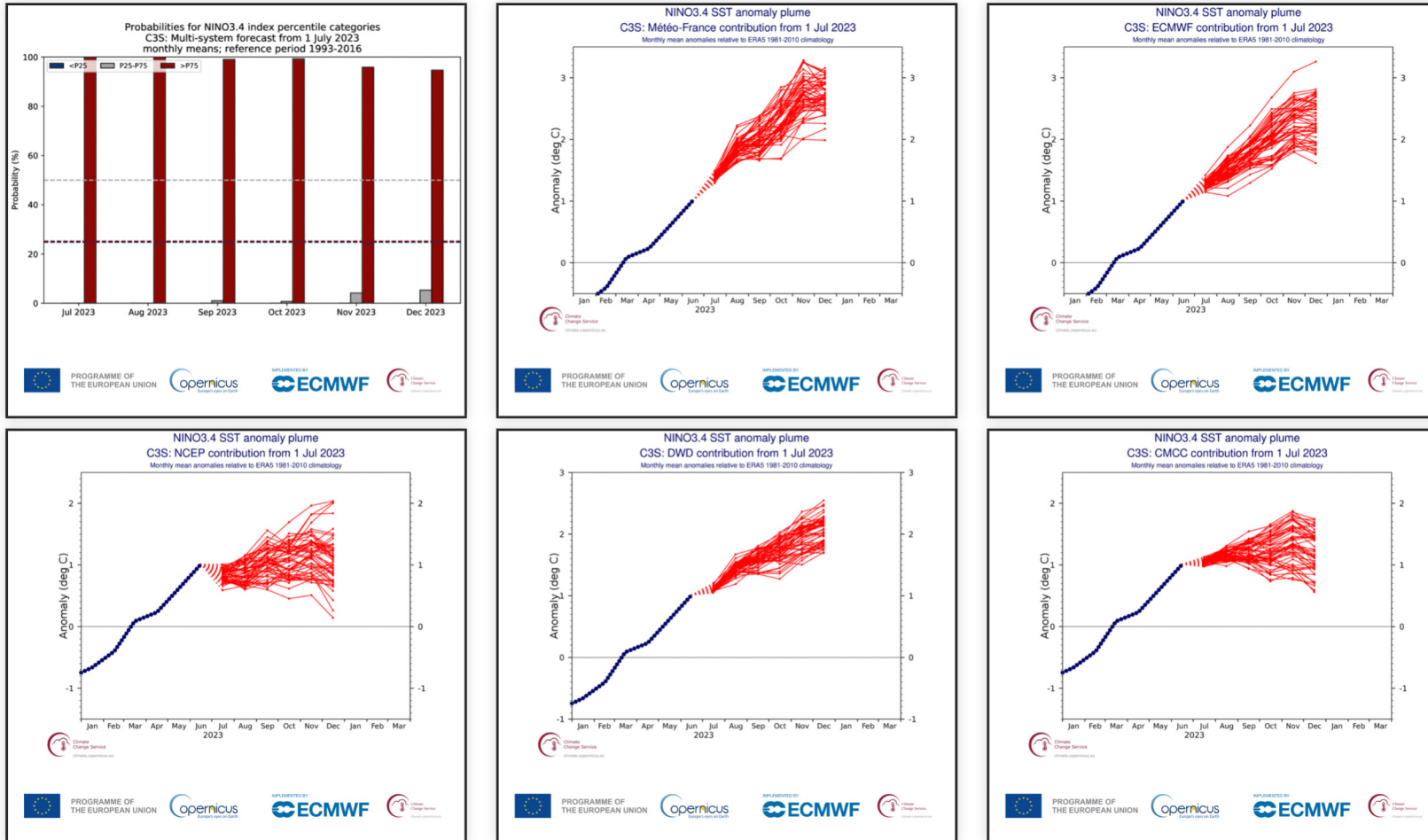
In the Atlantic Ocean : A positive anomaly stretches from the Caribbean to Equatorial Africa and Europe. MF-S8 is warmer near the Equator, while ECMWF-SEAS5 is warmer near the Iberian Peninsula.



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

Three models (MF8, ECMWF, DWD) forecast a rapid increase in the Nino3.4 index (around +2°C by the end of the quarter). The NCEP and CMCC models appear to be out of step with the analysis, and are therefore warming less.

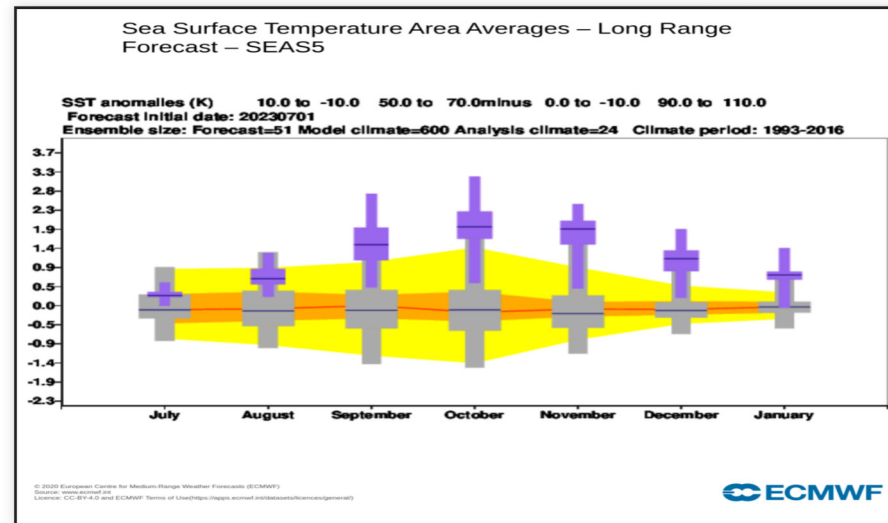
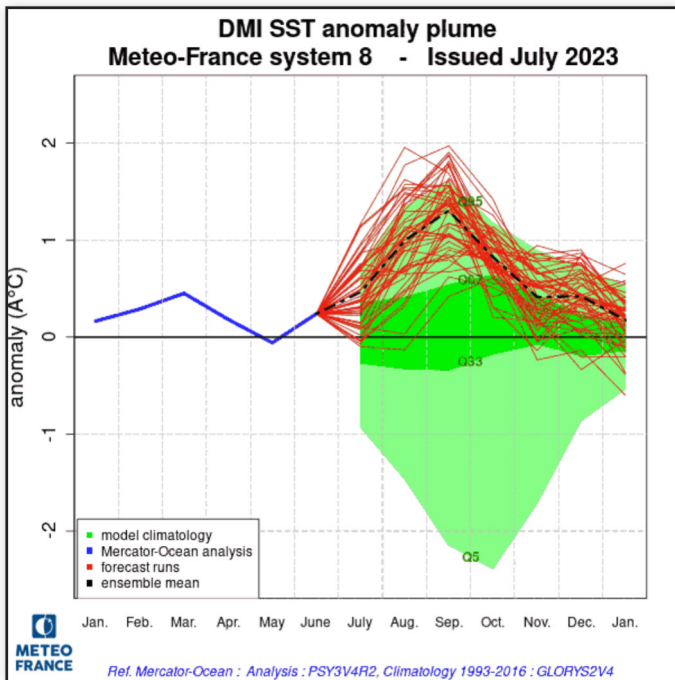
The most likely phase for the next three months : Positive phase



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

Oceanic forecast : Indian ocean - DMI evolution

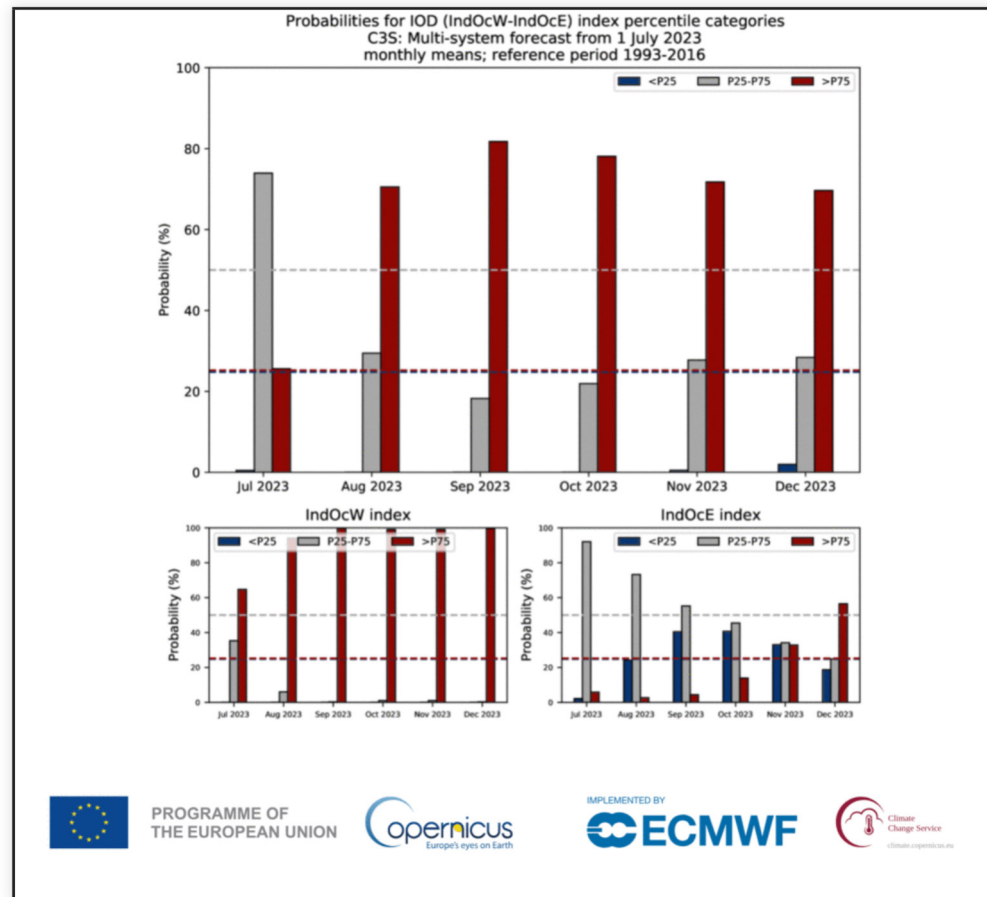
Both models forecast a rapid rise in the DMI index, reaching a maximum at the end of the period, at the limit of climatology.



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

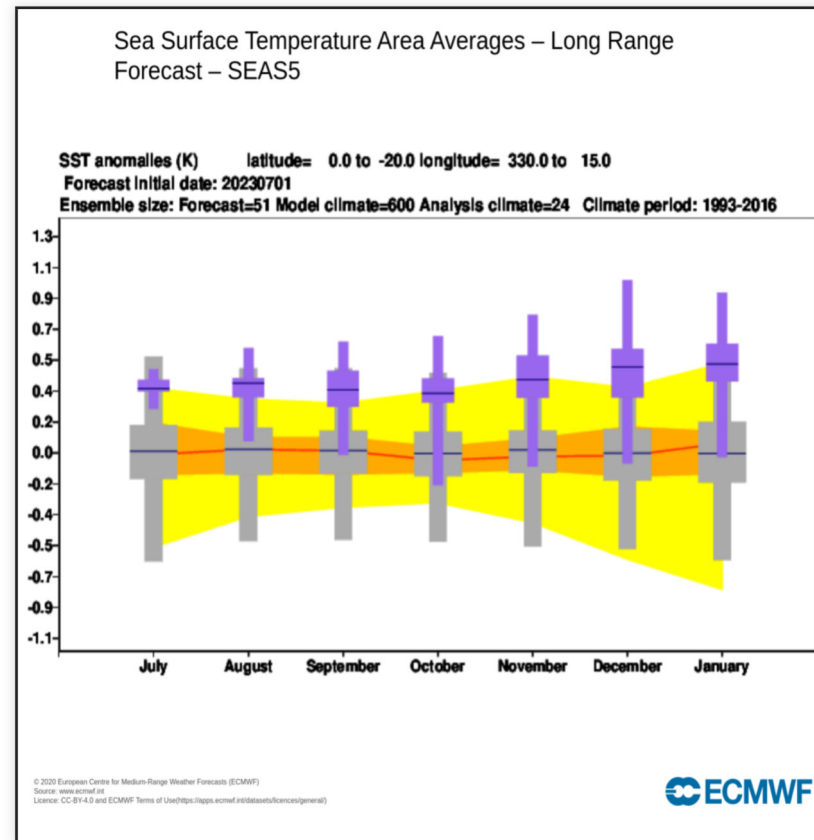
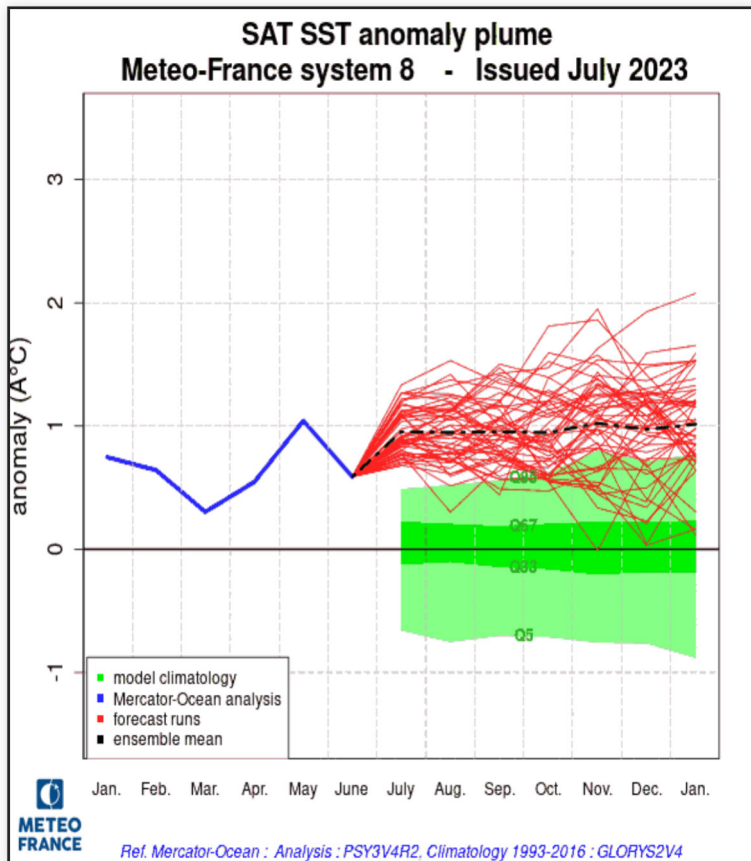
Expected Phase for the next three months : the positive phase is the most likely.



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

Oceanic forecast : Atlantic ocean - SAT evolution

Both models show a strong positive anomaly, at the upper limit of the index climatology.

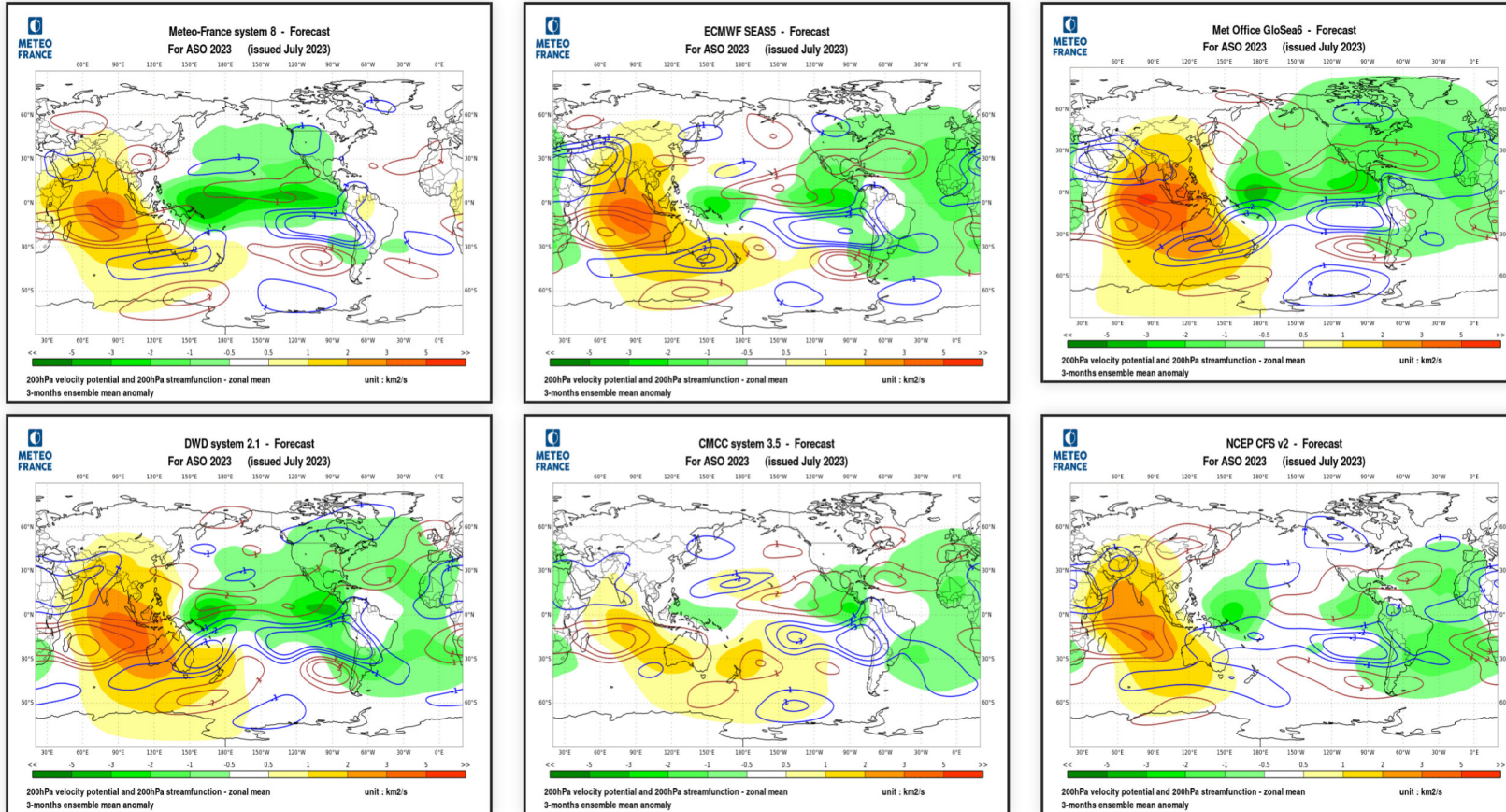


Anomaly on the SAT box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

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

Velocity Potential : The dipole downward motion anomaly over the eastern Indian Ocean / upward motion anomalies over the Pacific is highlighted by most models. Over the Atlantic, the ascending dipole prevails, except for MF8.

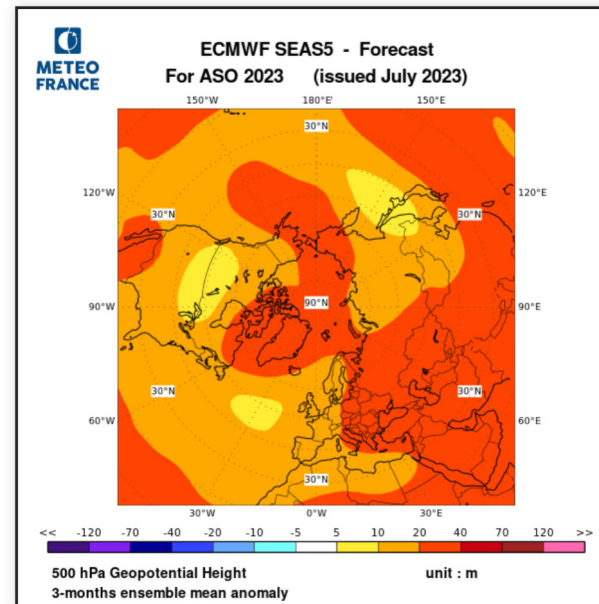
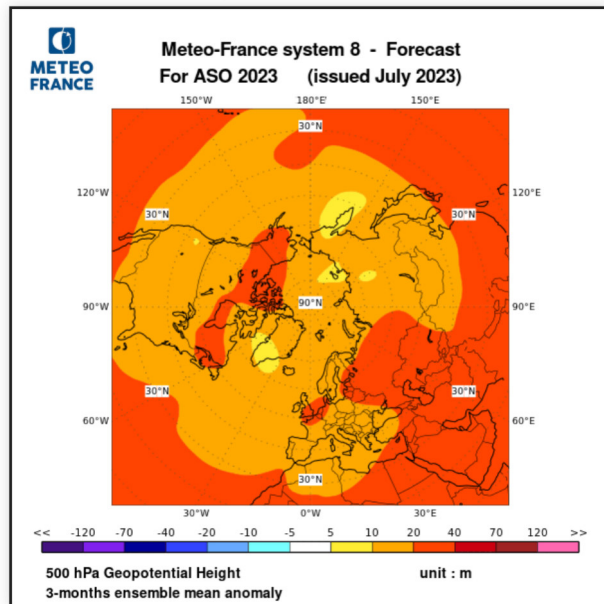
Streamfunction : Indian and Pacific Ocean dipoles are being set up. Teleconnections are clearly visible in the Southern Hemisphere, but not yet in the Northern Hemisphere. A cyclonic curvature is positioned over the eastern Mediterranean, and an anticyclonic curvature over the west for some models.



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

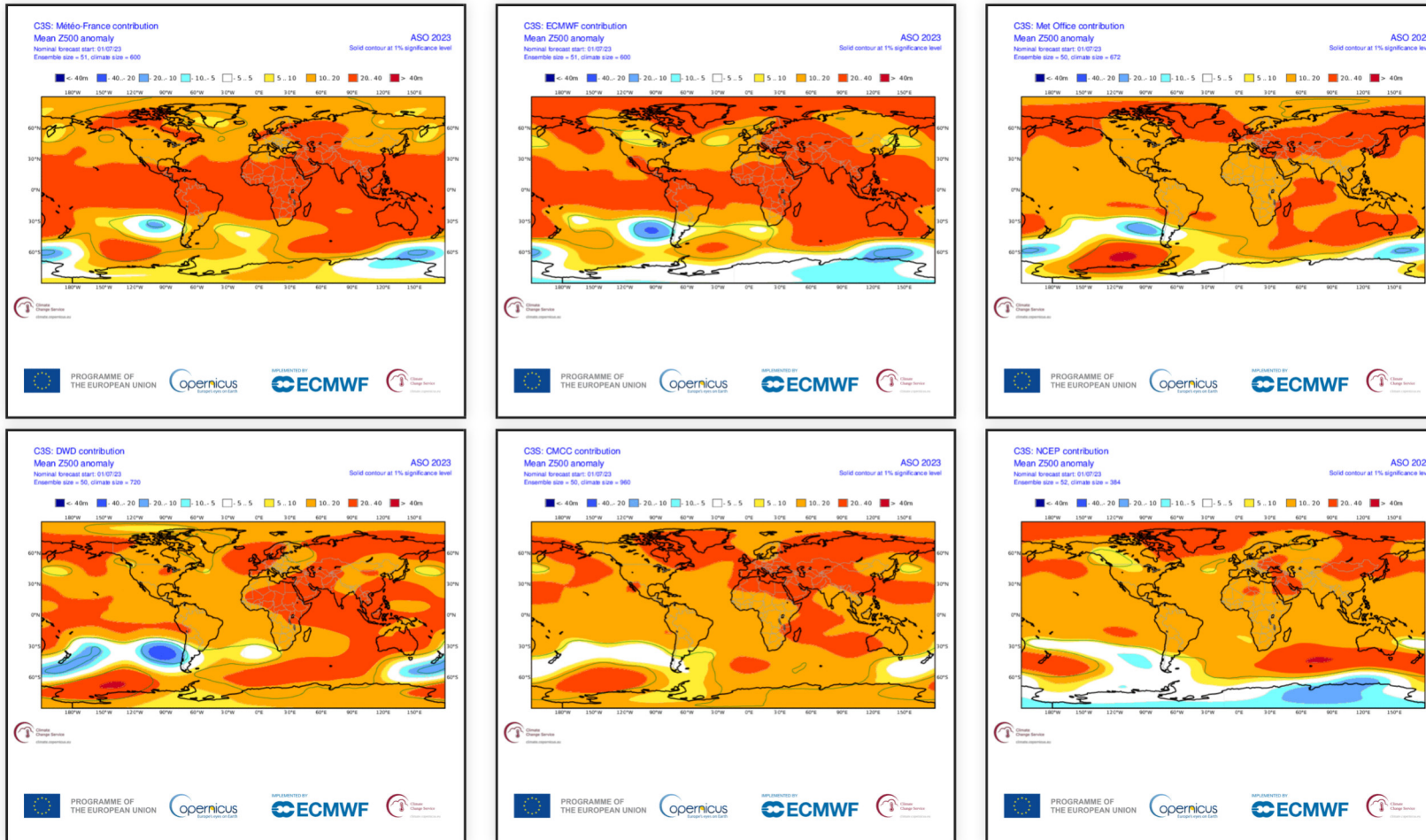
Anomalies are weak and positioned differently depending on the model (see Greenland).



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

Atmospheric circulation forecasts : Z500 anomalies in C3S models

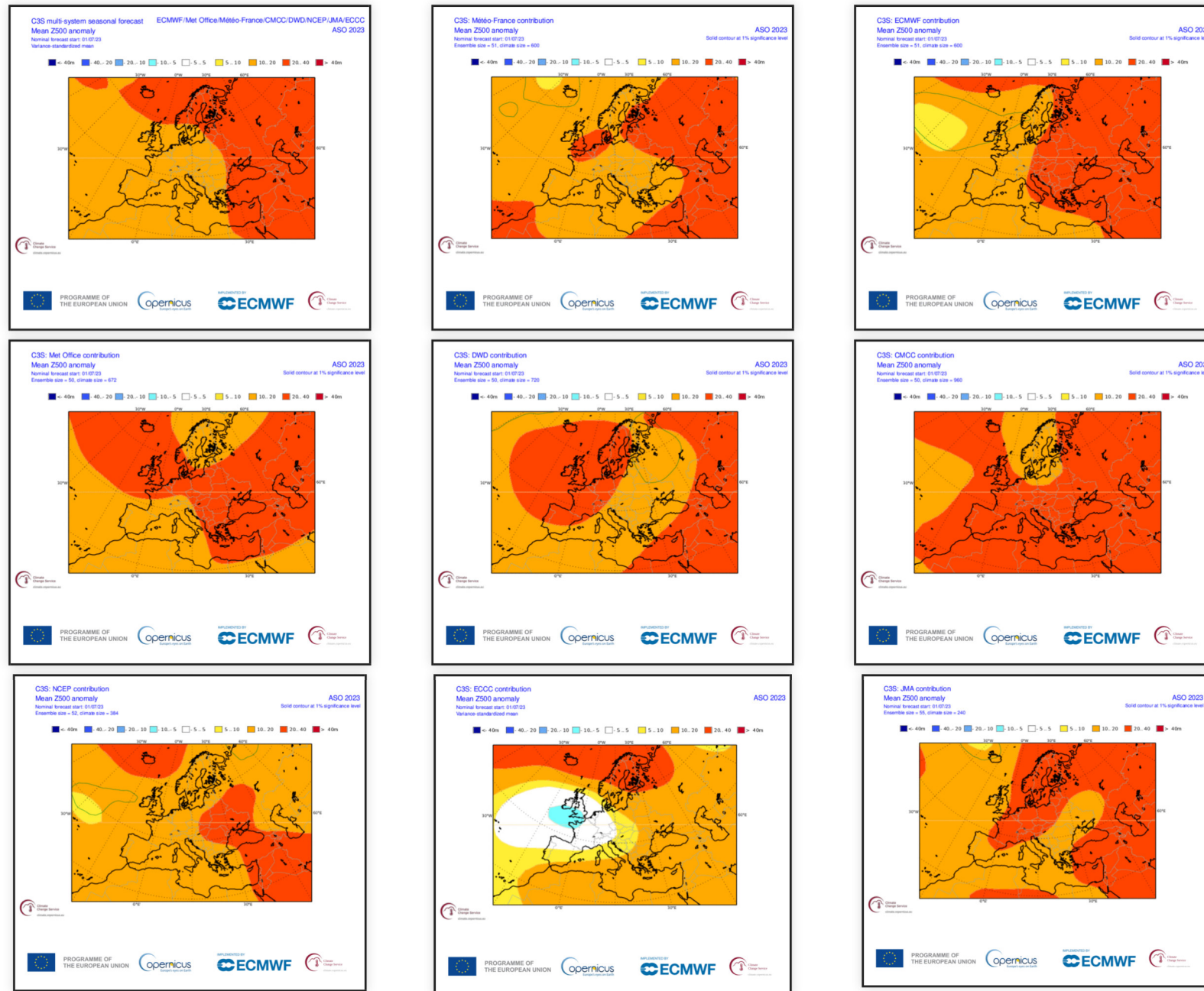
Signals are weak for all models and do not allow us to pinpoint any Z500 anomalies.



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

Atmospheric circulation forecasts : Z500 anomalies in C3S models

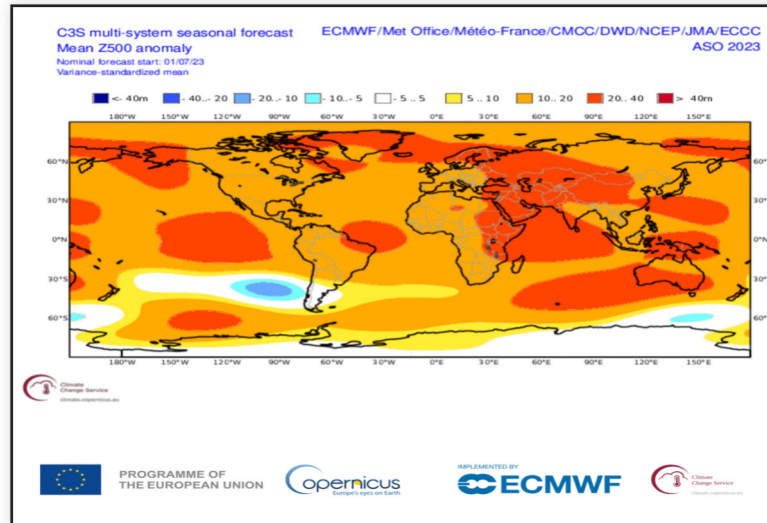
Signals are weak and little convergent.



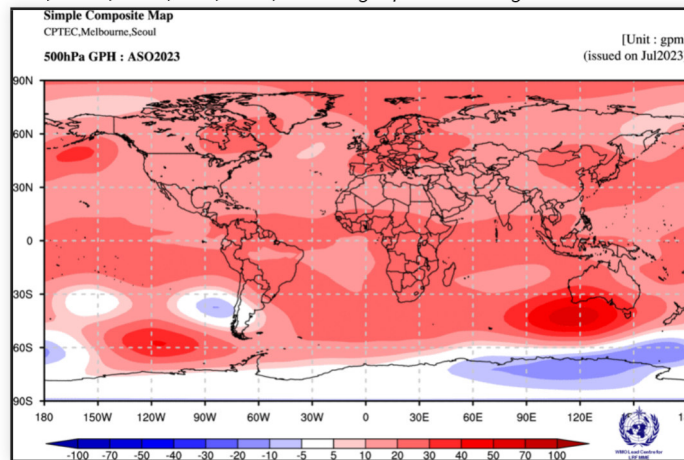
multi-models 500hPa geopotential height anomalies

Atmospheric circulation forecasts : Z500 anomalies multi-systems

In the northern hemisphere, signals are attenuated. However, both multi-models show a stronger positive anomaly around the North Sea and a small weakness in the center of the North Atlantic basin.



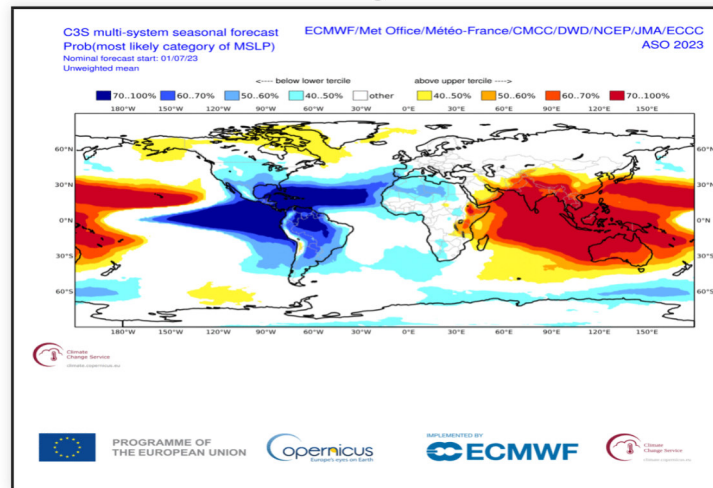
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



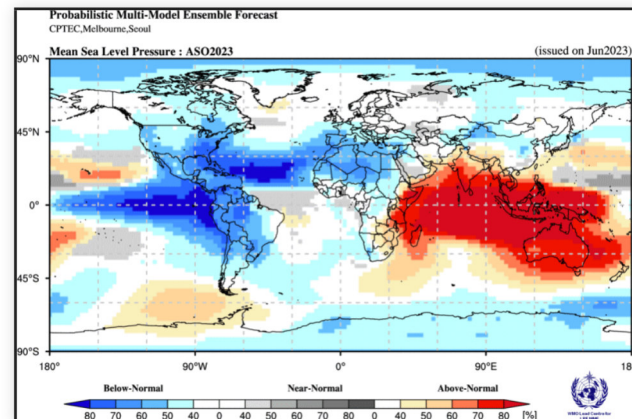
Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilities multi-systems

Both multi-models agree on the MSLP anomalies between the tropics. They also agree over Europe, with a probable positive anomaly over northern Europe and a negative one over the Mediterranean regions.



C3S multi-models MSLP terciles probability.

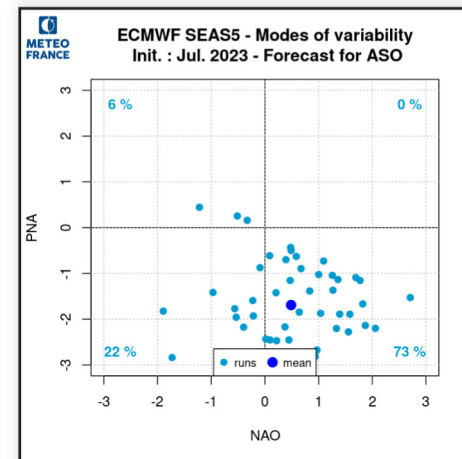
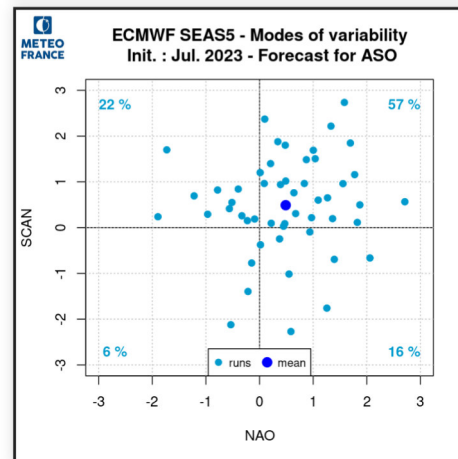
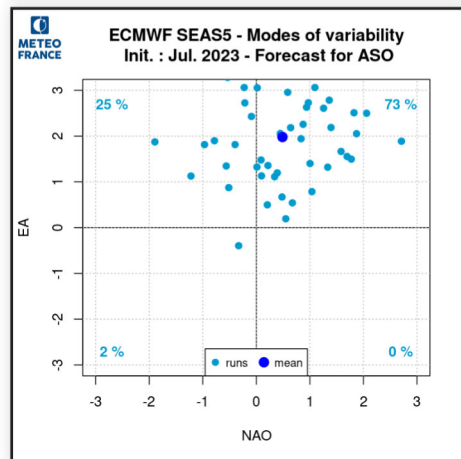
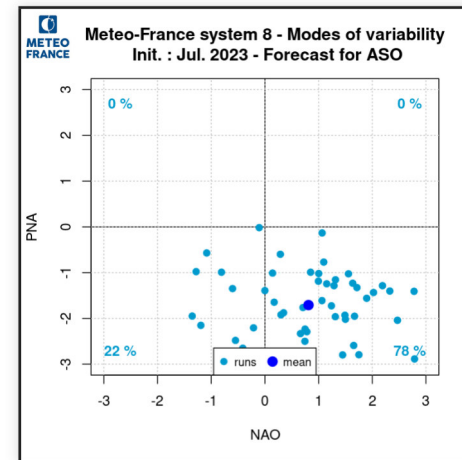
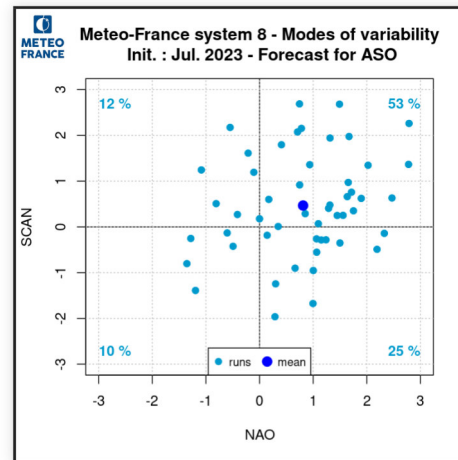
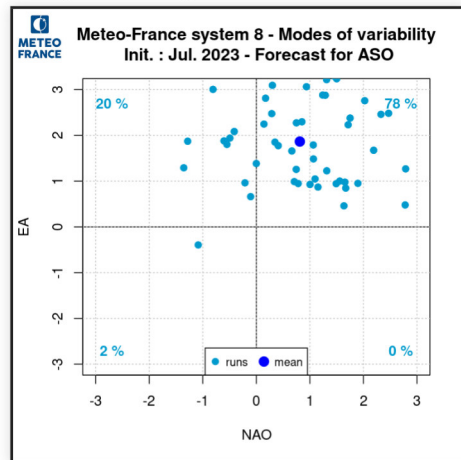


Others models of WMO multi-models MSLP terciles probability.

Modes of variability : forecast

EA+ and PNA- modes, and to a lesser extent NAO+ mode, are preferred.

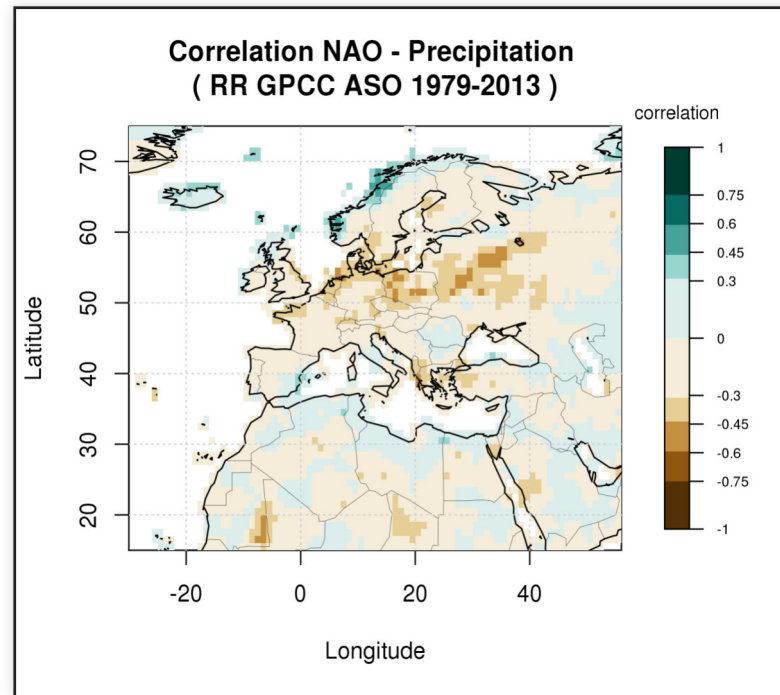
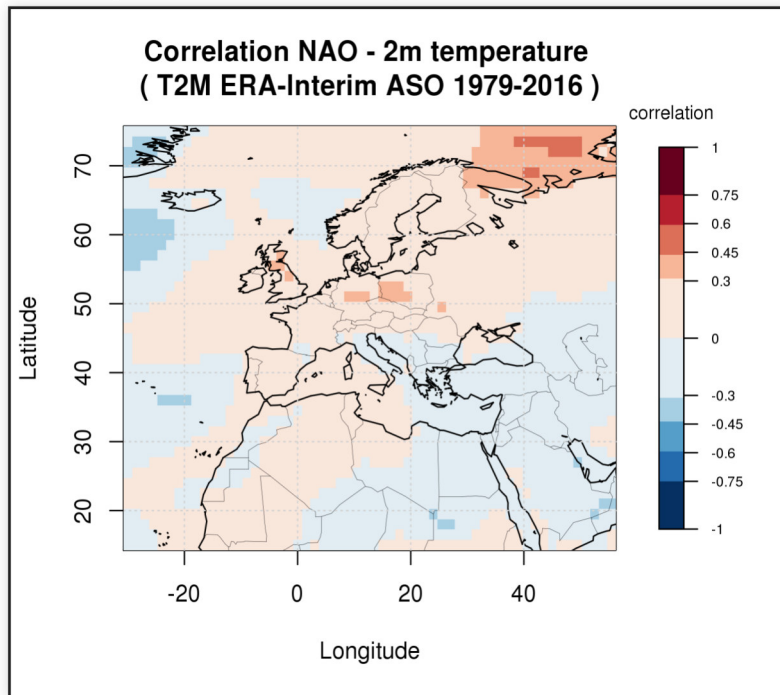
Weak positive signal for SCAN.



See the modes of variability patterns

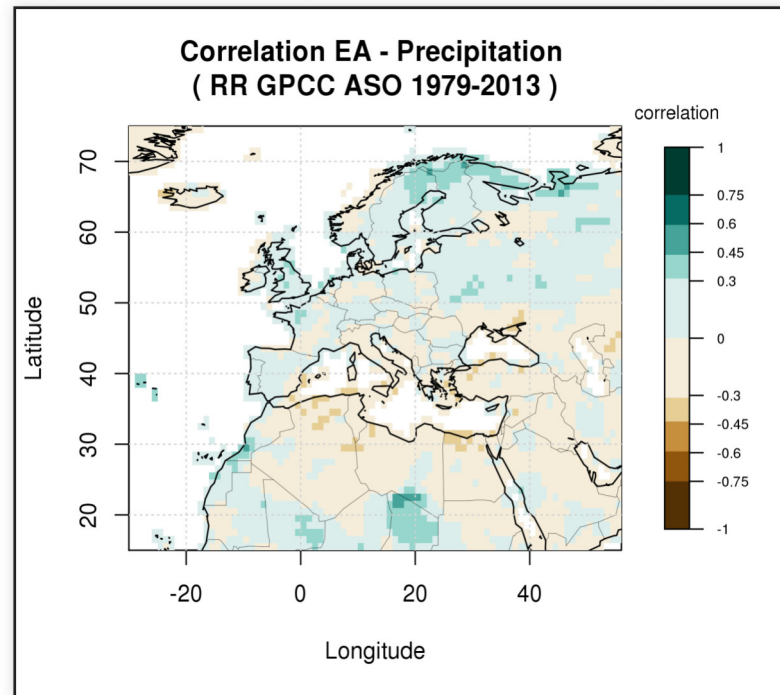
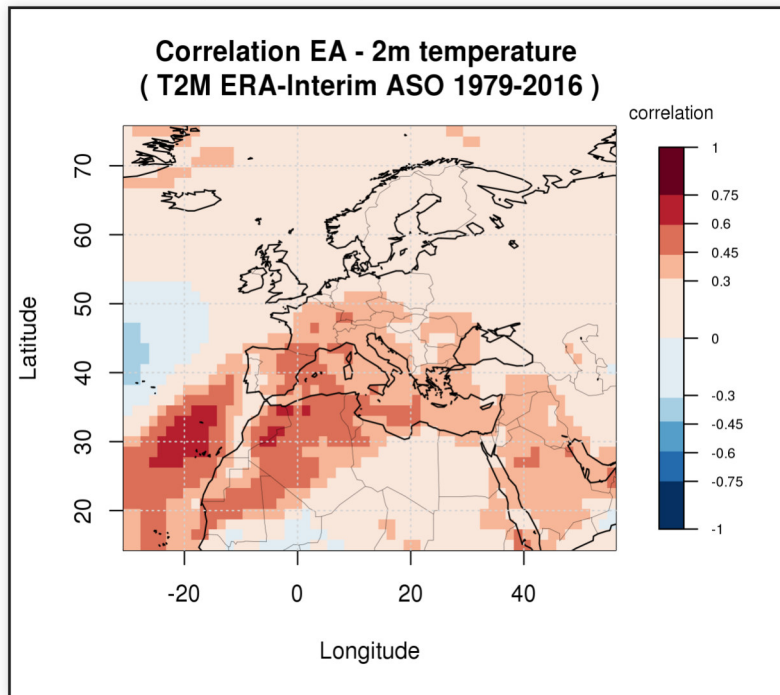
Modes of variability : NAO impacts

Positive phase of the NAO next quarter



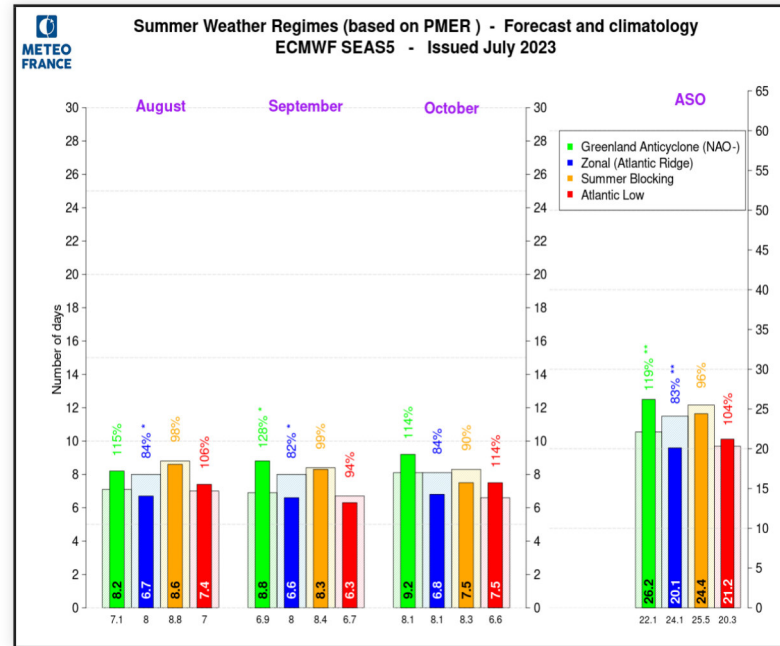
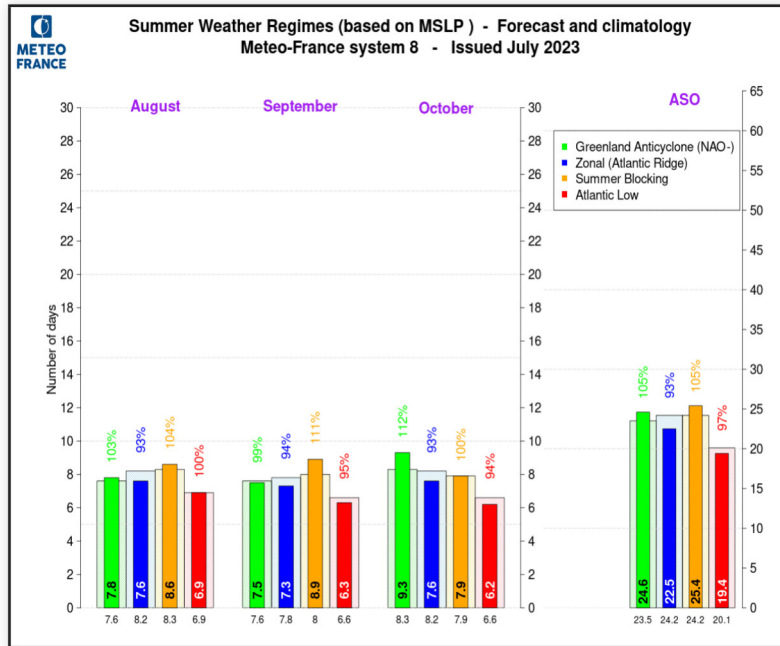
Modes of variability : EA impacts

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



Weather regimes : summer MSLP

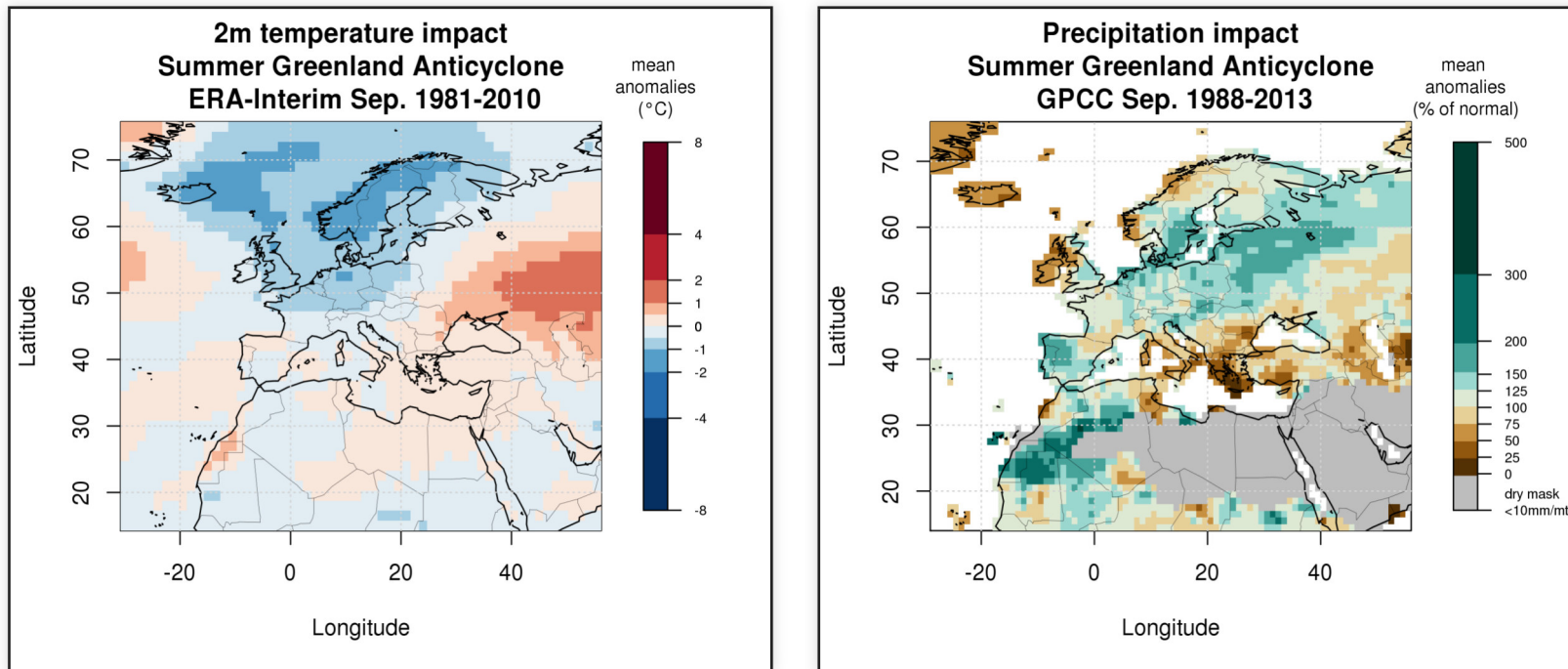
The two models show a very similar pattern distribution. It is slightly more marked with ECMWF-SEAS5, where the "Greenland Anticyclone NAO-" regime is significantly above its climatology and the "Zonal (Atlantic Ridge)" regime significantly below.



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

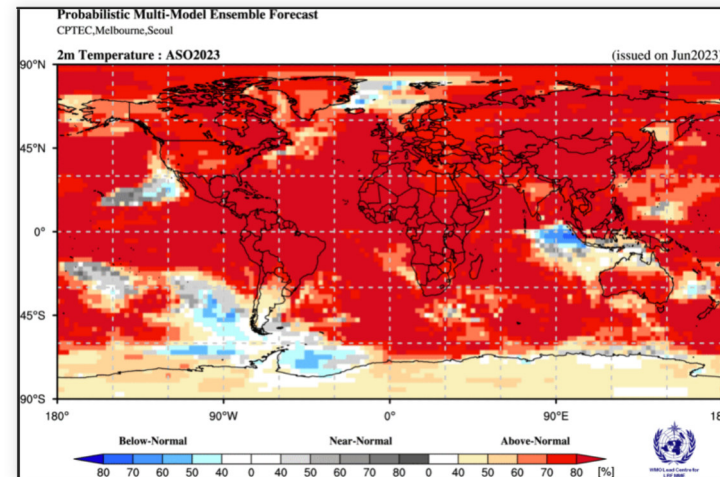
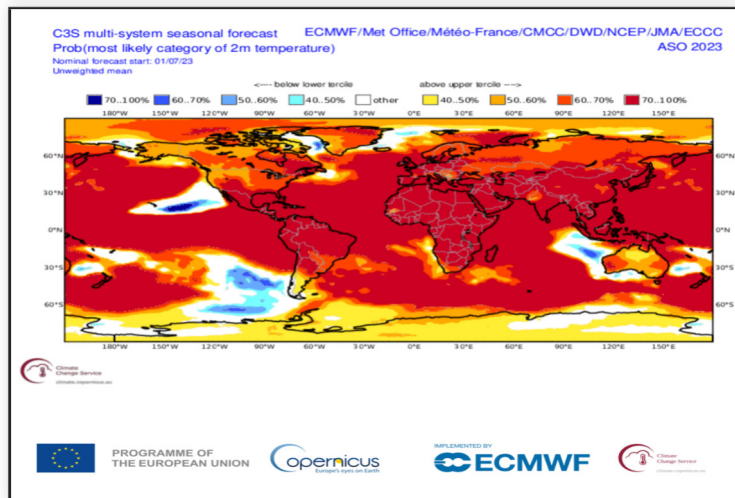
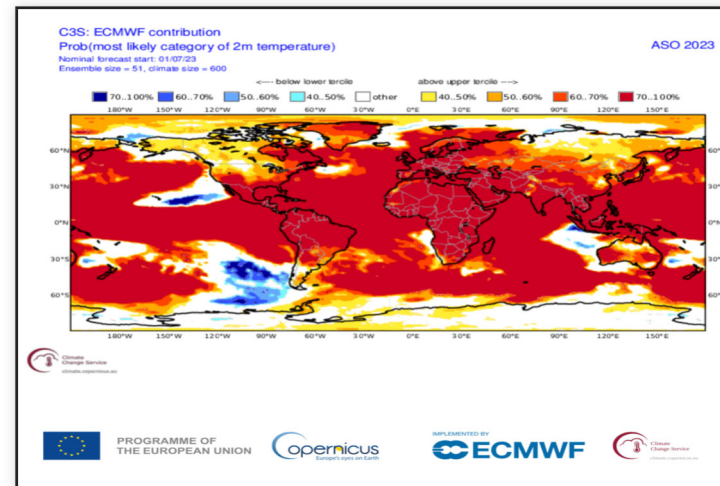
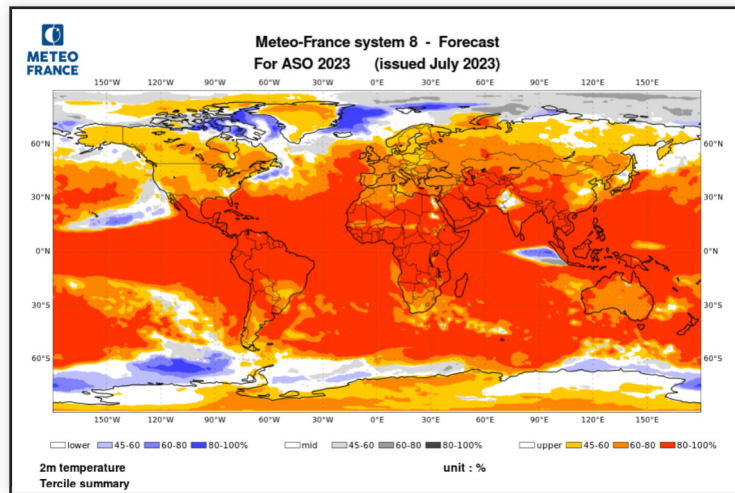
The summer greenland anticyclonic regime favors cold temperature over much of northwestern Europe and rather wet conditions over Europe.



Impact of Summer Atlantic Low weather regime on temperature and precipitation. (ref ERA-interim 1981-2010 and GPCC 1988-2013)

Forecast of climatic parameters : Temperature probabilities

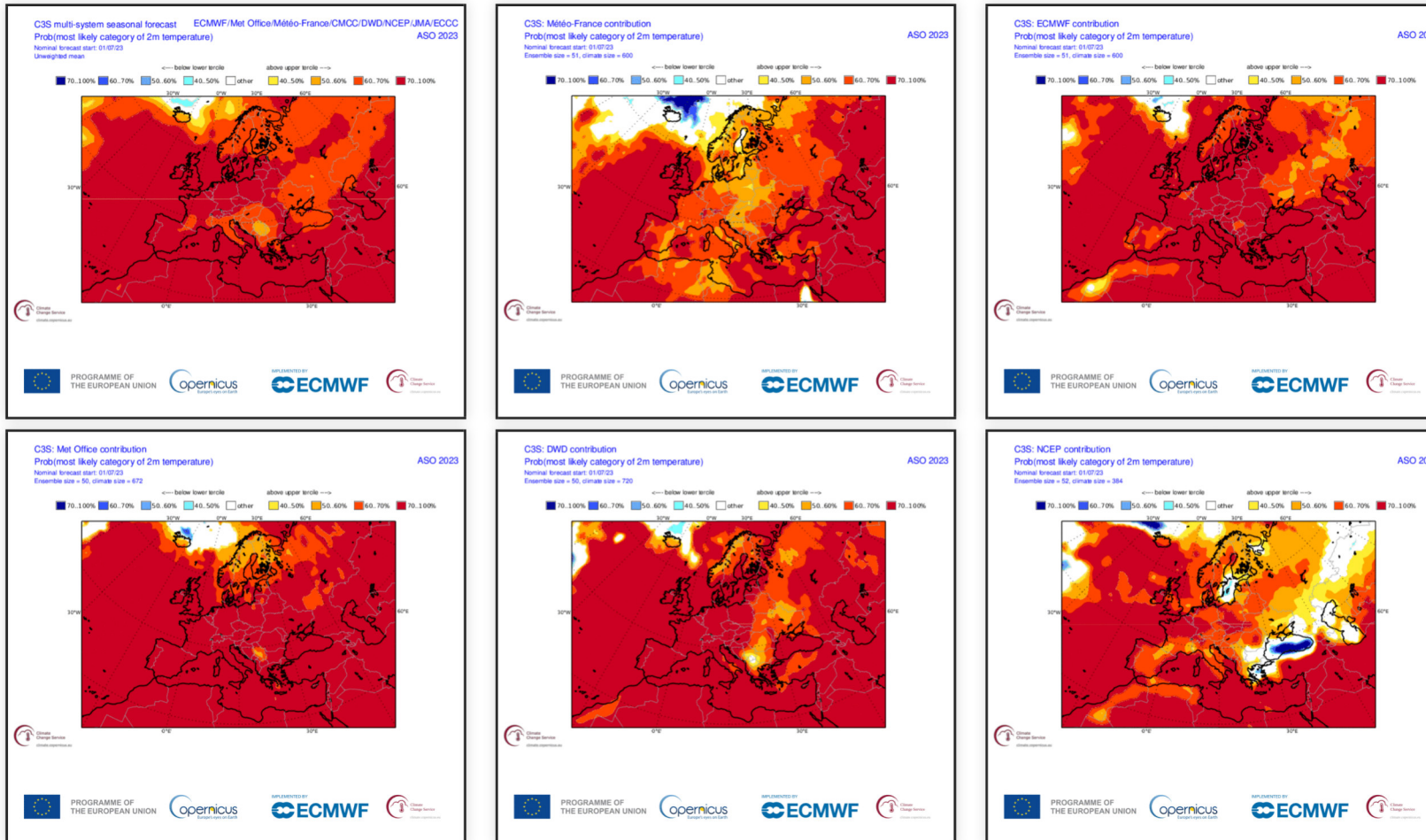
The probability of a warmer-than-normal signal is almost universal across the globe, with the exception of the eastern Indian Ocean and the eastern North and South Pacific.



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 probability of being in the warm tercile exceeds 60% over the entire zone, and even 70% over Western Europe and the Mediterranean Basin.

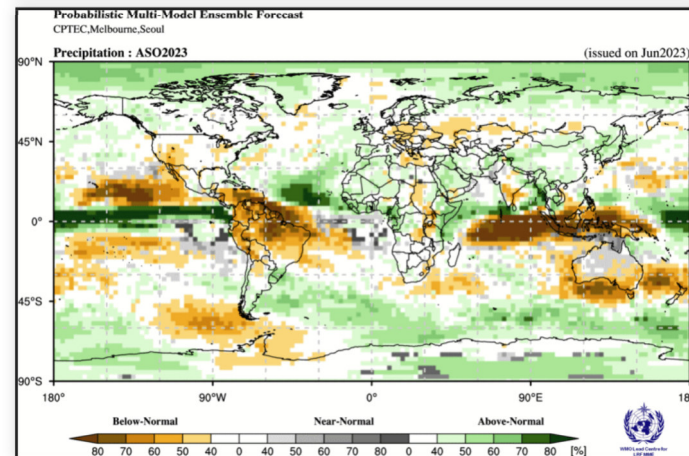
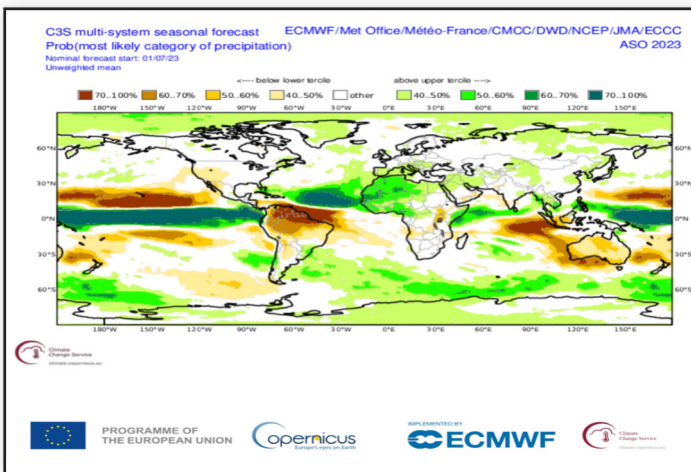
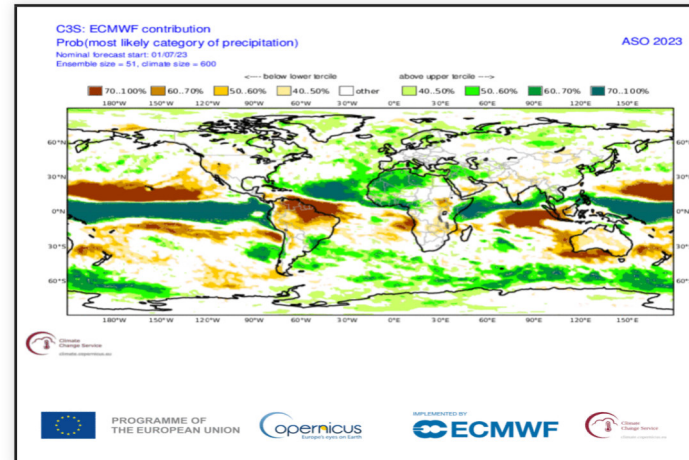
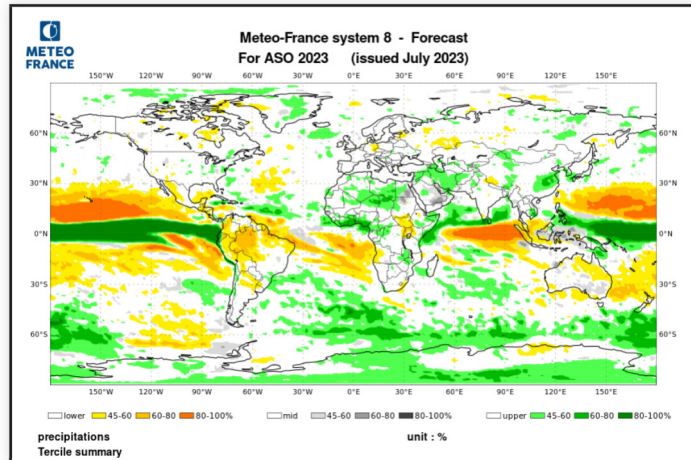


C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Precipitation

The models agree in the intertropics. The consequences of El Niño are beginning to show (dry signals over Australia, the Maritime Continent and northern Brazil).

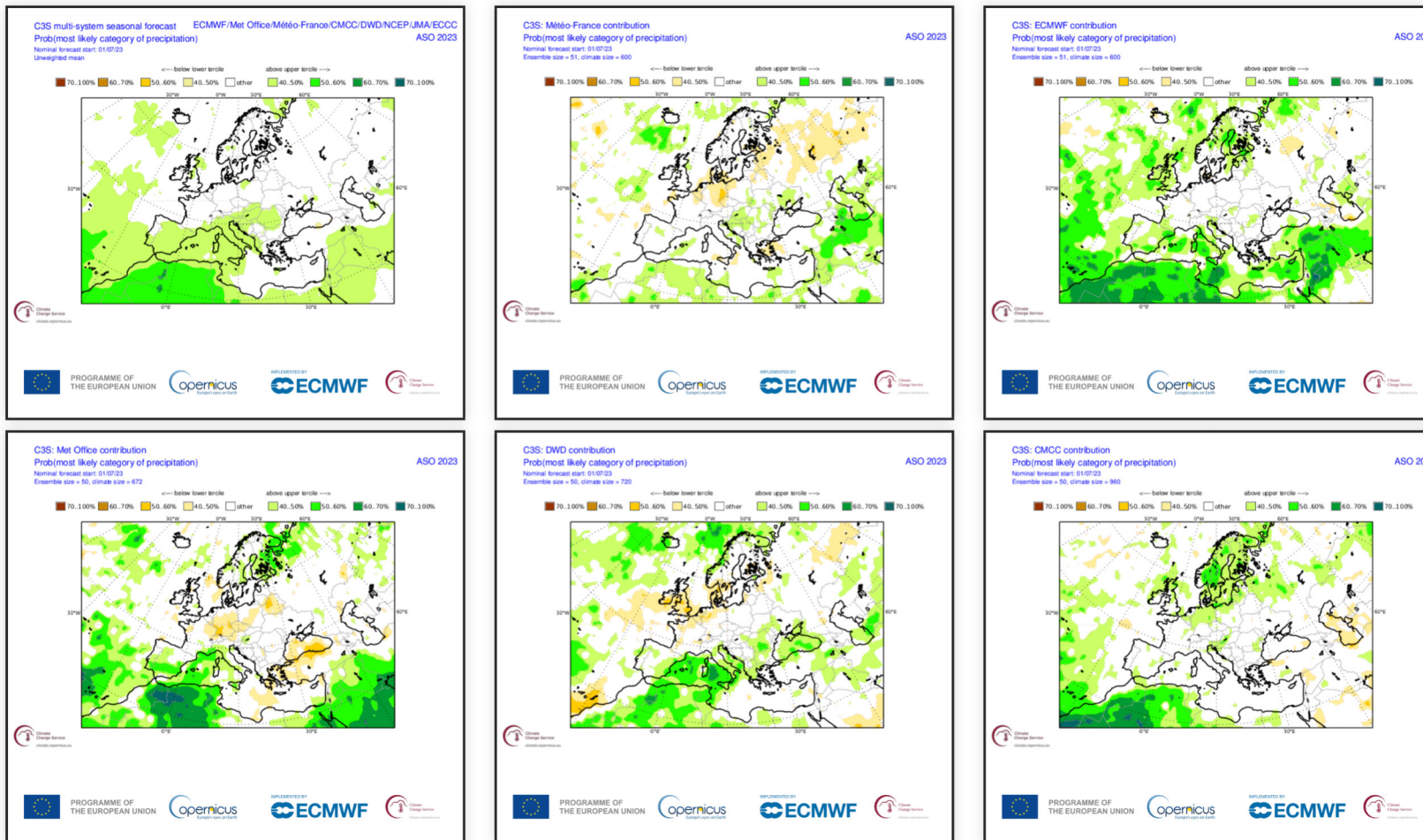
Due to a lack of teleconnections, there is little or no signal in the mid-latitudes of the Northern Hemisphere.



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

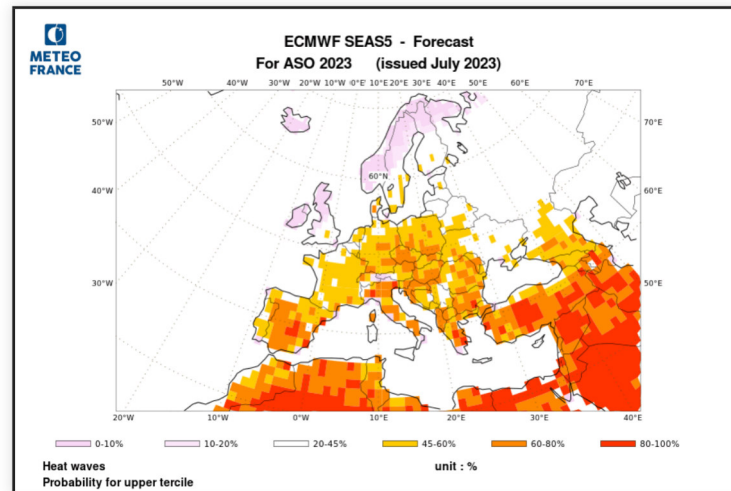
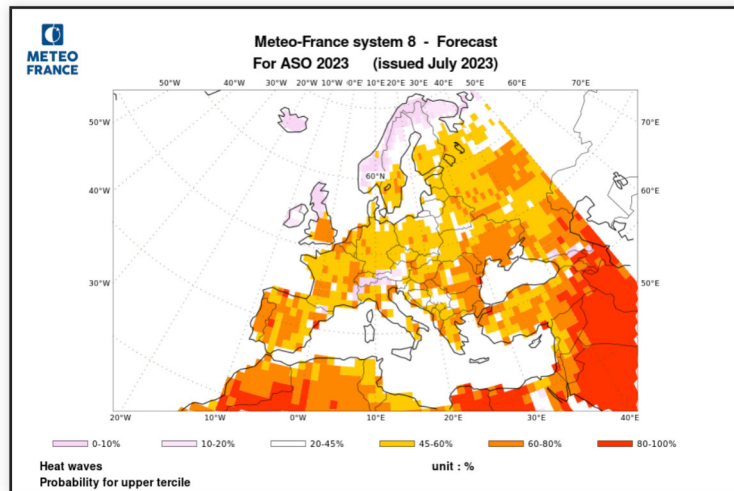
With most models forecasting cyclonic curvature at 200hPa over the Mediterranean Basin, wetter-than-normal conditions are likely over this area. Further north, signals are weak, although some models are forecasting drier-than-normal conditions.



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

Forecast of climatic parameters : Heat waves

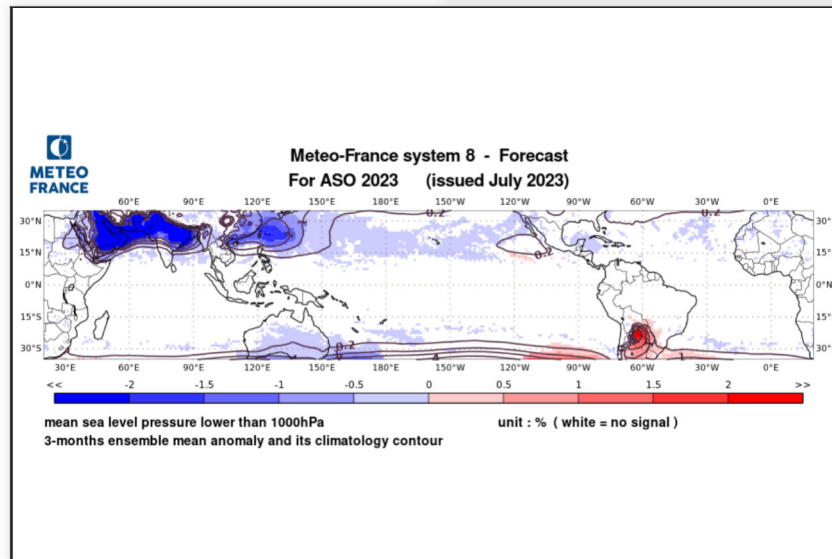
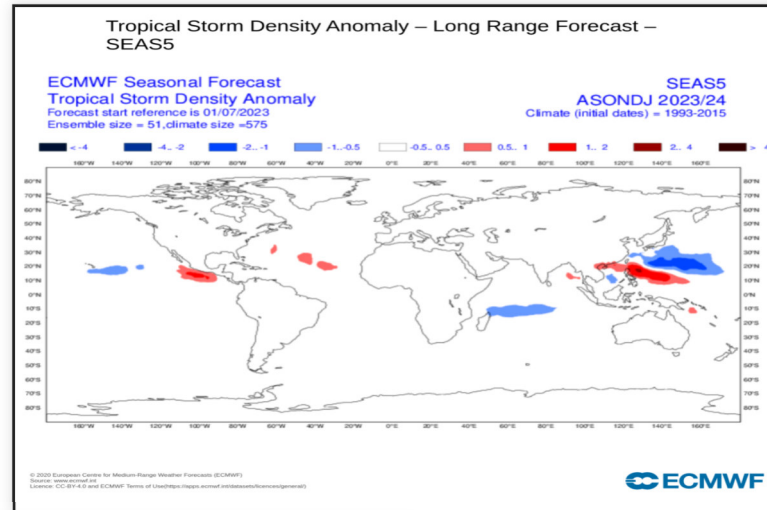
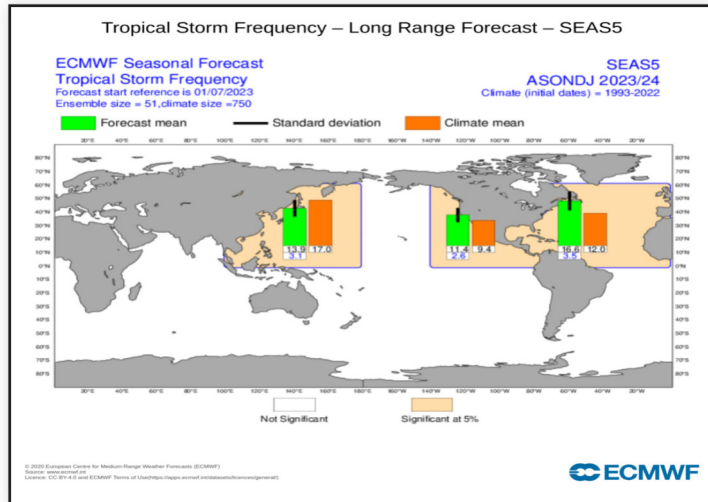
The probability of heat waves is higher than climatology over most of Europe for both models.



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

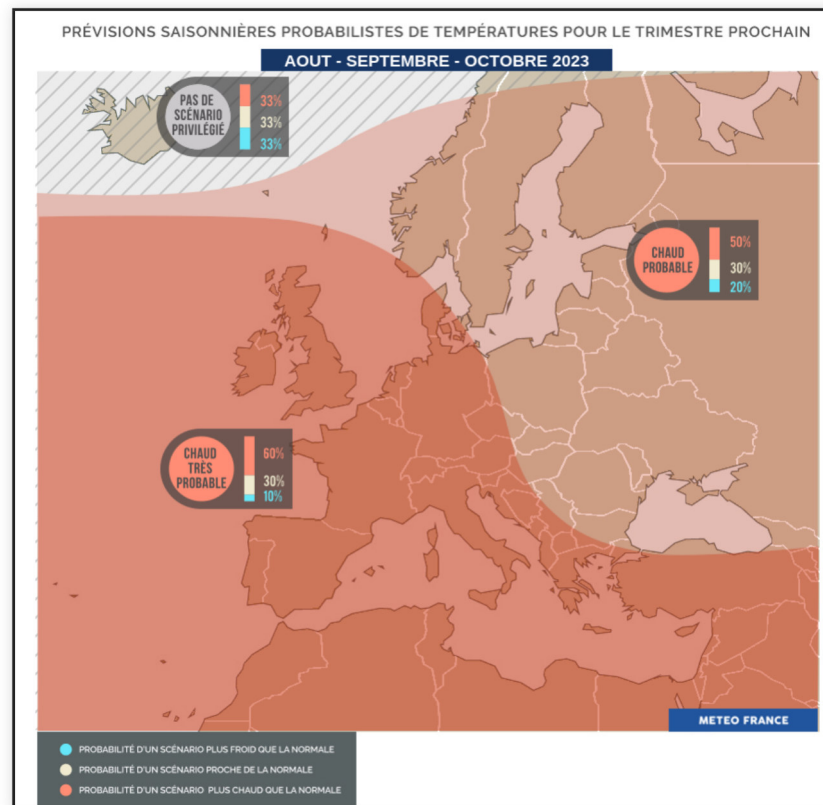
The frequency of tropical storms in the Atlantic is higher than normal.



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Synthesis map for Europe : Temperature

A warmer-than-normal scenario is likely, if not very likely, over Europe and Mediterranean regions.

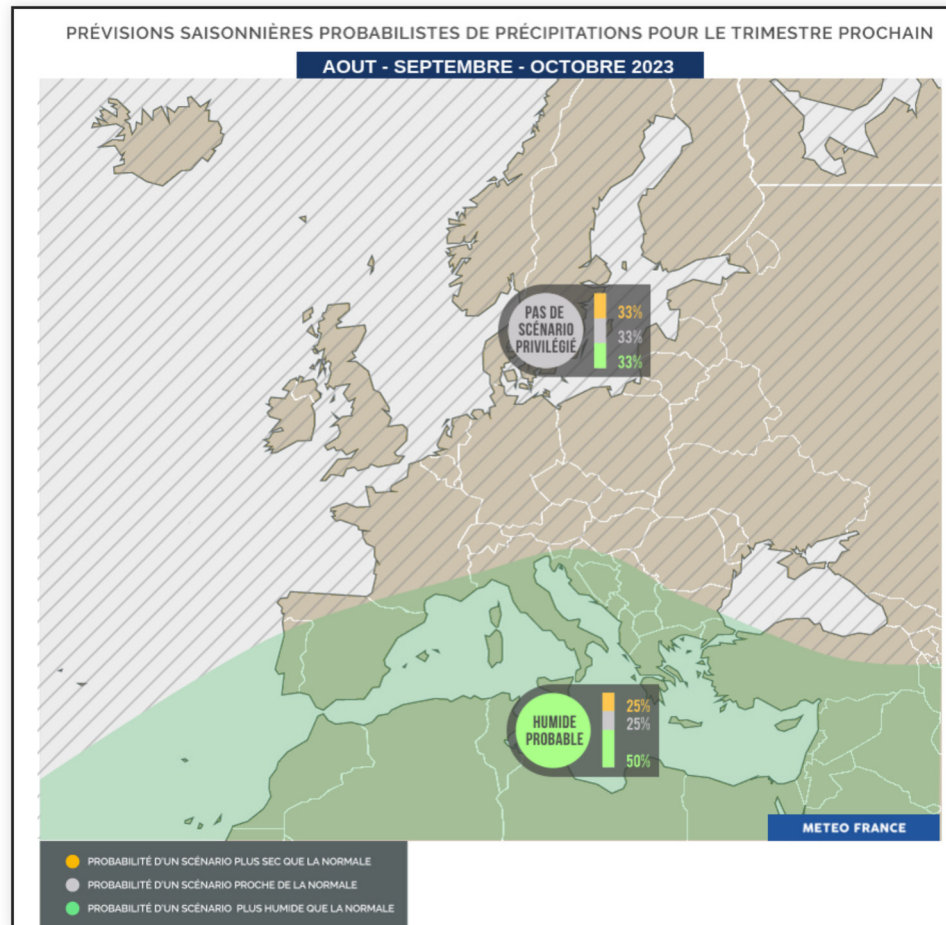


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

Most models converge on a wetter (or less dry) than normal scenario for the Mediterranean basin.

No scenario is preferred elsewhere.



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