

Météo-France Seasonal Forecast Bulletin

SEPTEMBER - OCTOBER - NOVEMBER 2023

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General synthesis : SON 2023

The EL Nino phenomenon continues to develop and positive phase of IOD is more likely next months, with an atmospheric response taking shape.

A) Oceanic forecast :

- ENSO : El Niño conditions.
- IOD : positive phase
- Equatorial and tropical Atlantic, Northeastern Atlantic : positive anomaly

B) Drivers :

El Niño and IOD

C) Atmospheric circulation :

EL Nino conditions and positive phase of IOD are now having an impact on atmospheric circulation, with downward motion anomalies over the Indian Ocean and upward motion anomalies over the Pacific Ocean. Teleconnections to the Northern Hemisphere have not been established.

D) Most likely conditions :

Temperatures : Warmer-than-normal scenario likely to very likely across Europe.

Precipitations : Wetter than normal around the Mediterranean.

Next bulletin : scheduled on September 21st

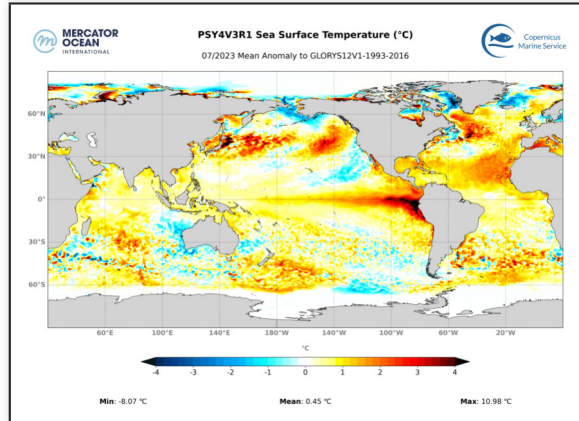
Oceanic analysis of July 2023 : SST anomalies

Current ENSO situation : setting up the positive phase

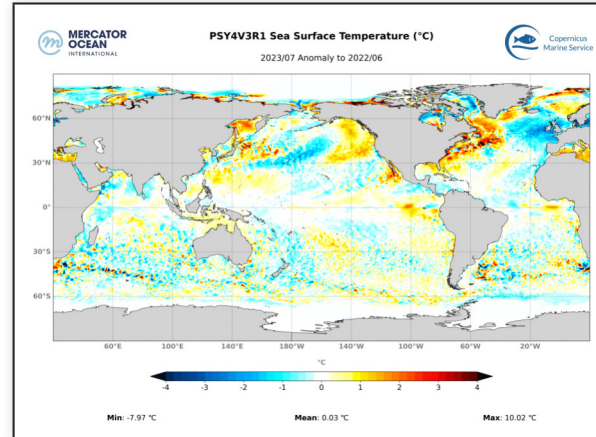
In the Pacific Ocean : The very strong warm anomaly over the eastern equatorial zone is slowly spreading westwards, reaching the center of the basin. In the Northern Hemisphere, the PDO- pattern remains.

In the Indian Ocean : No change from previous month. No contrast between the west and east of the basin

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, although weakening off the European coast.

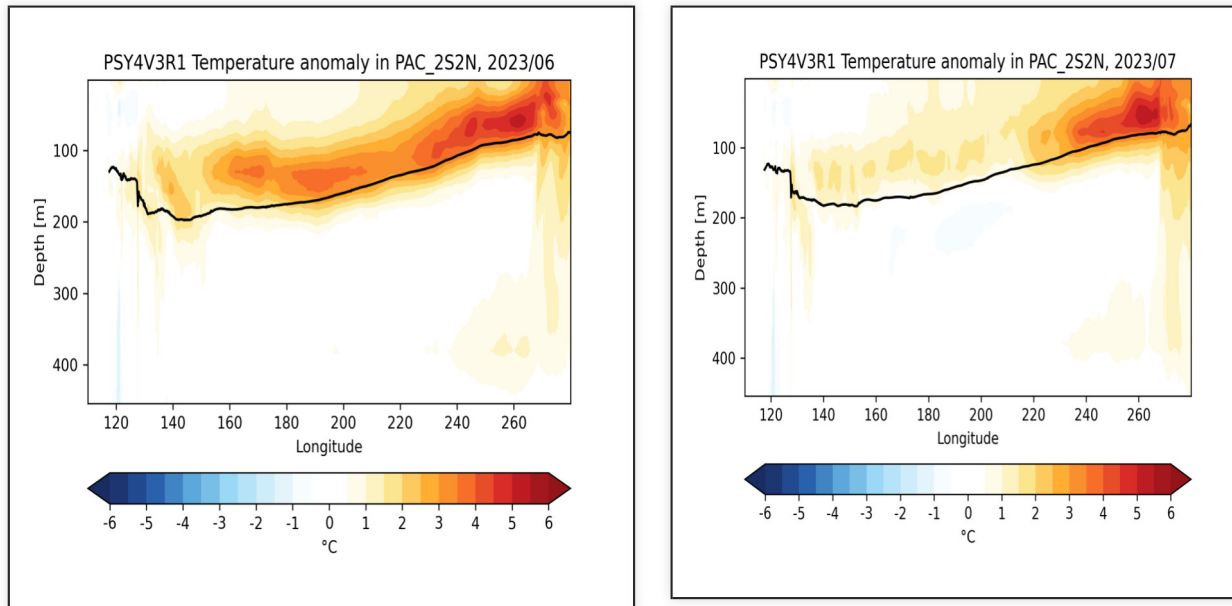


SST Anomalies and trend with the previous month (c) Mercator-Ocean



Oceanic analysis of July 2023 : Pacific vertical section

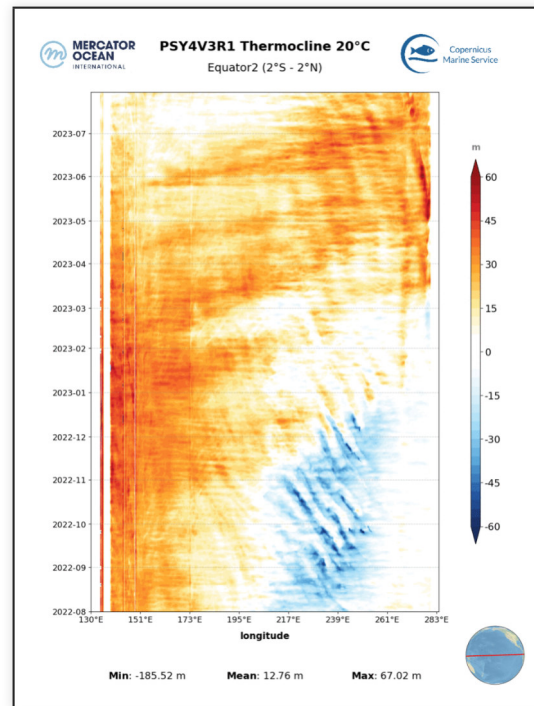
The warm subsurface anomaly mainly concerns east of the basin.



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

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

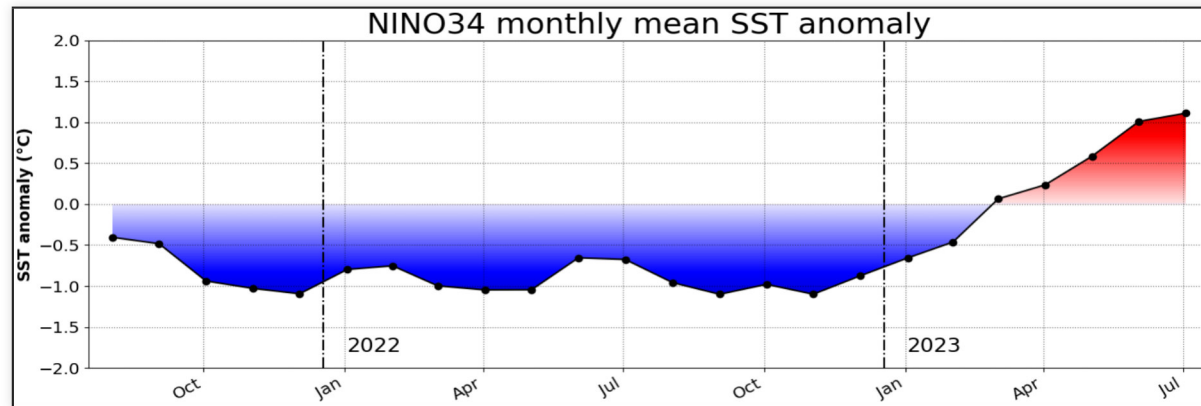
The 20°C thermocline is deeper than normal on the east of the Pacific.



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

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

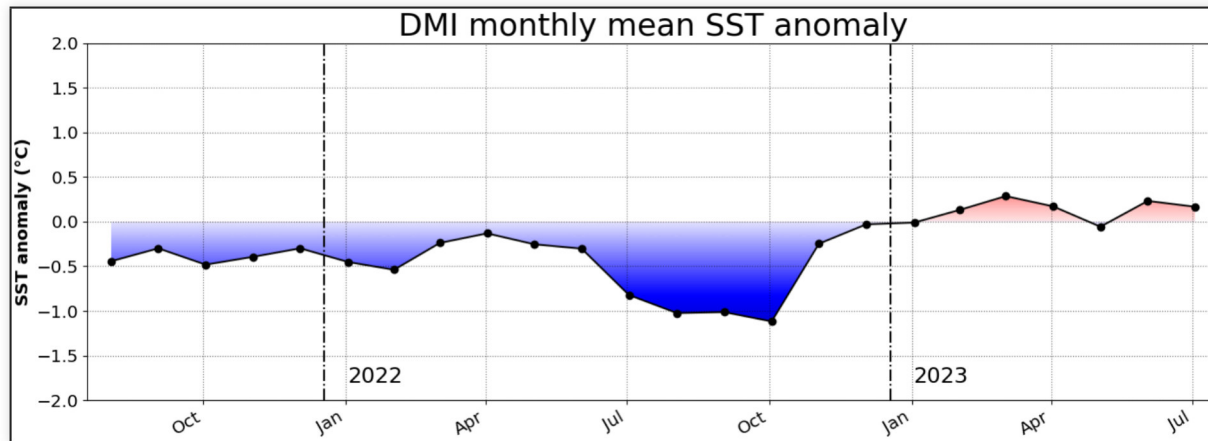
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : close to +1.0°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

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

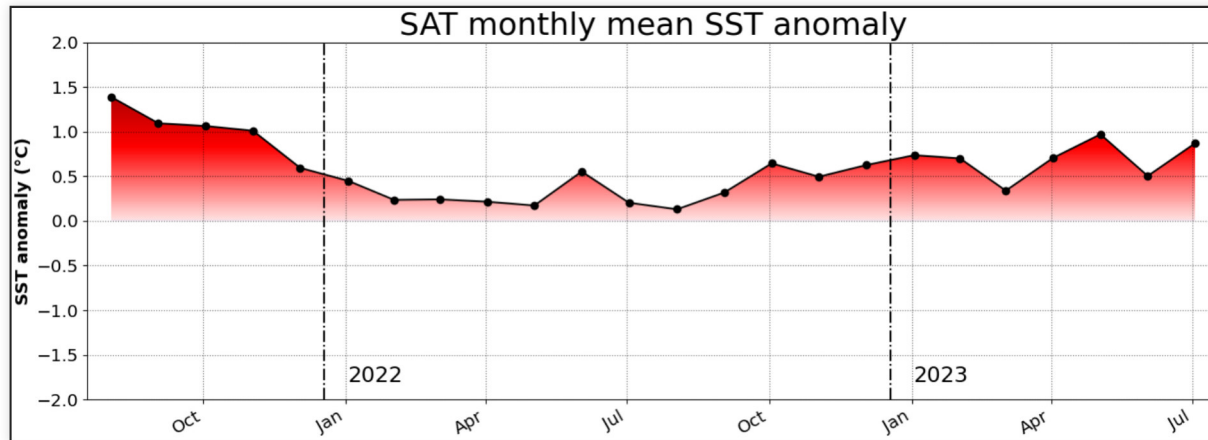
DMI Index issued from Mercator Ocean PSYV4R2 analysis : +0.2°C
(see BOM site for weekly values : <http://www.bom.gov.au/climate/enso/monitoring/iod1.png>)



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

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

SAT index issued from Mercator Ocean PSYV4R2 analysis : +0.8°C



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

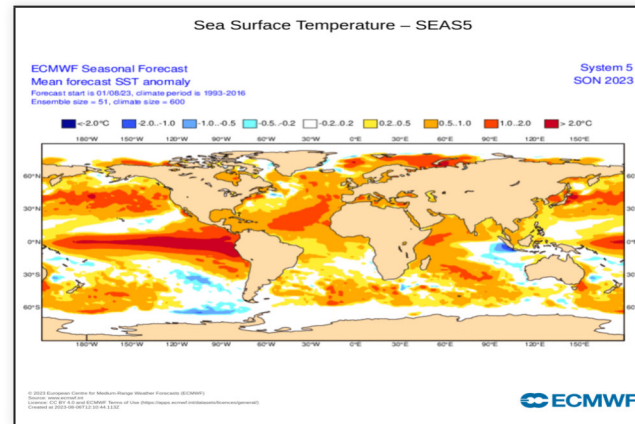
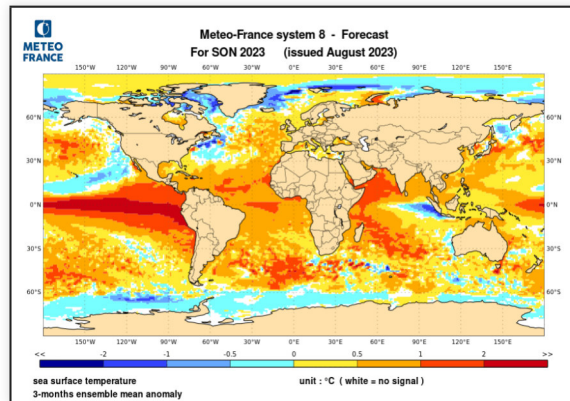
Oceanic forecast : SST anomaly

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.

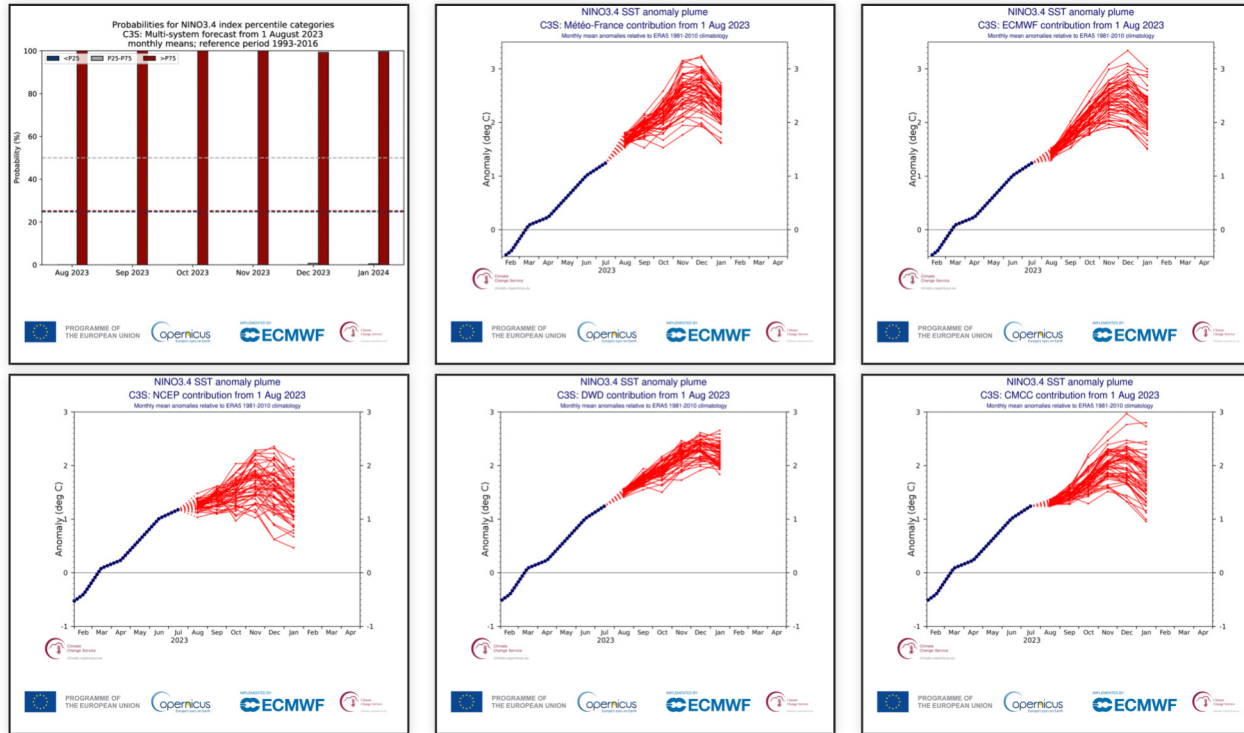
In the Atlantic Ocean : A positive anomaly stretches from the Caribbean to Equatorial Africa and Europe. MF-S8 is warmer near the Equator, while ECMWF-SEAS5 is warmer near the Iberian Peninsula.



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 heat up much slower.

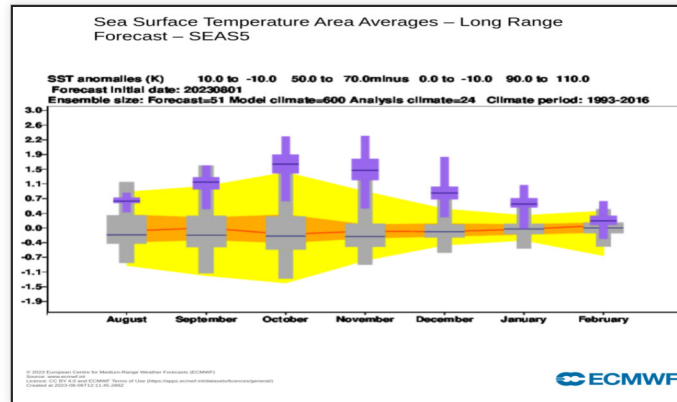
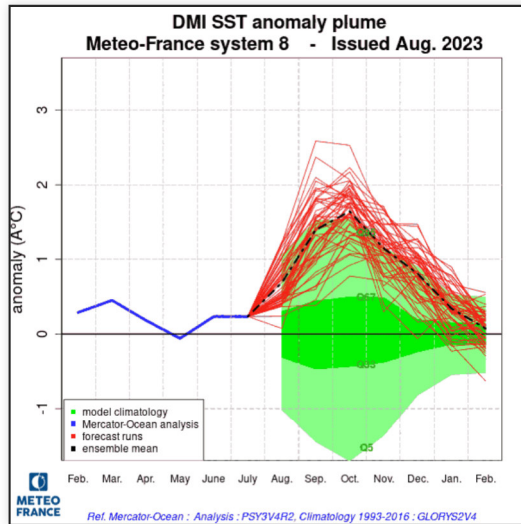
The most likely phase for the next three months : Positive phase



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

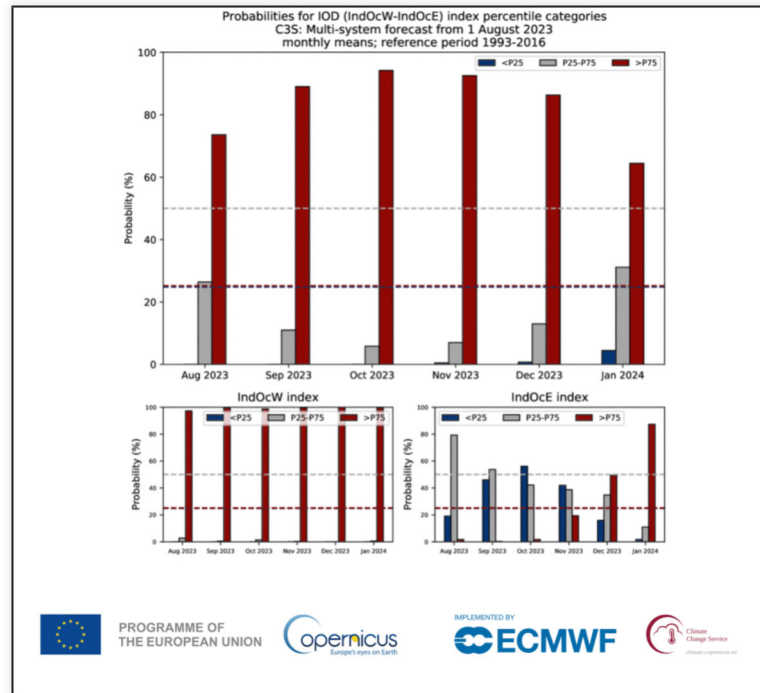
Both models forecast a rapid rise in the DMI index, reaching a maximum at the end of the period



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

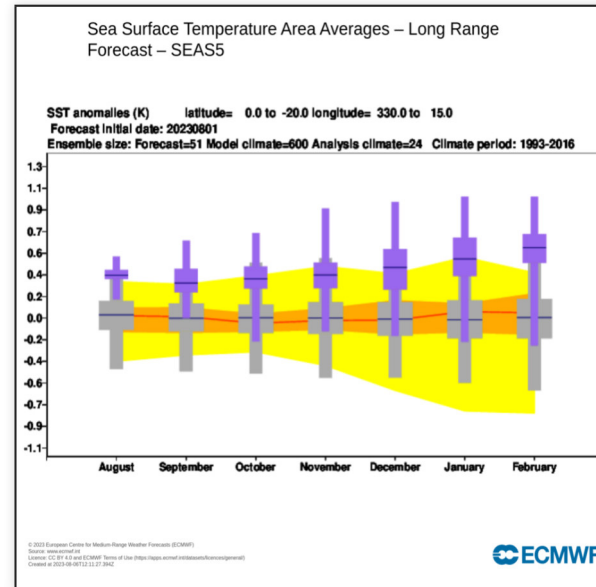
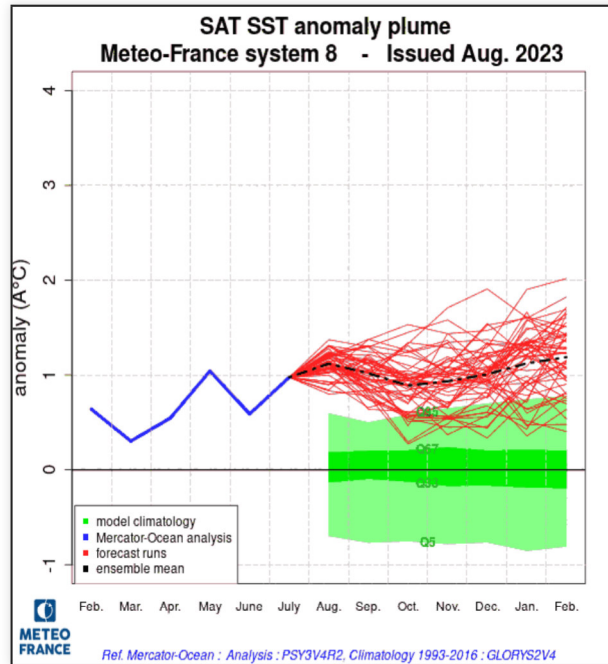
Expected Phase for the next three months : the positive phase is the most likely.



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.

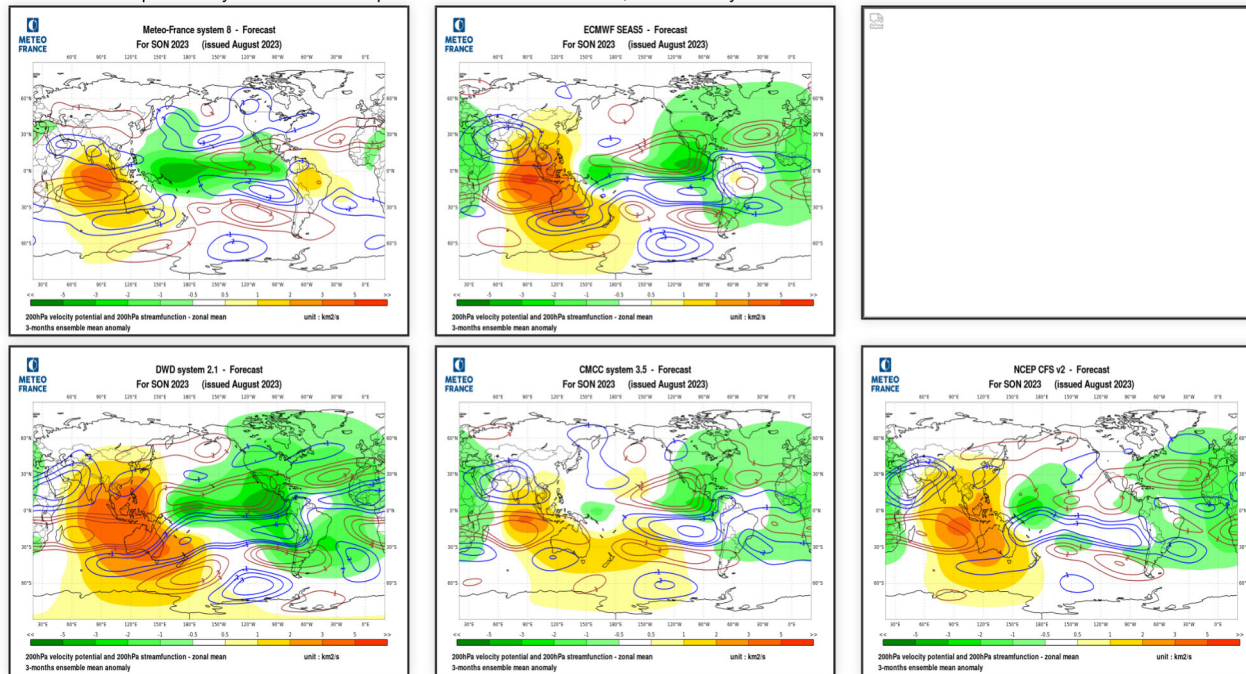


Anomaly on the SAT box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

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, in linked with El Niño and IOD + . Incertainties about the location of main upwards motion over the Pacific (located west with MF8 and NCEP or east with SEAS5 or DWD). Most of models suggests downdraft motion over South America and updraft motion over Atlantic (linked to warm anomalies of SST).

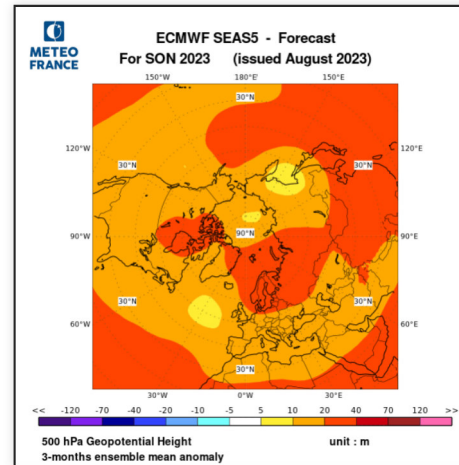
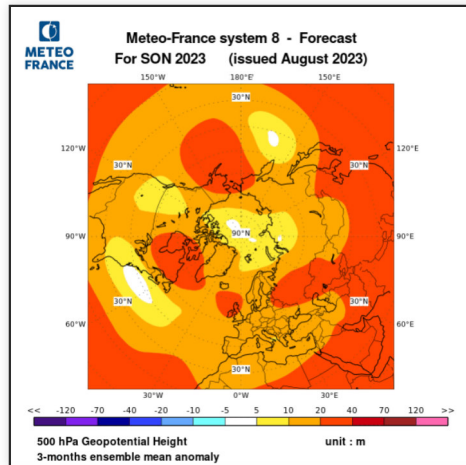
Streamfunction : Indian and Pacific Ocean dipoles are being set up. Teleconnections are clearly visible in the Southern Hemisphere, but not yet in the Northern Hemisphere. A cyclonic curvature is positioned over the Middle East, and an anticyclonic curvature off the coast of Morocco.



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

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

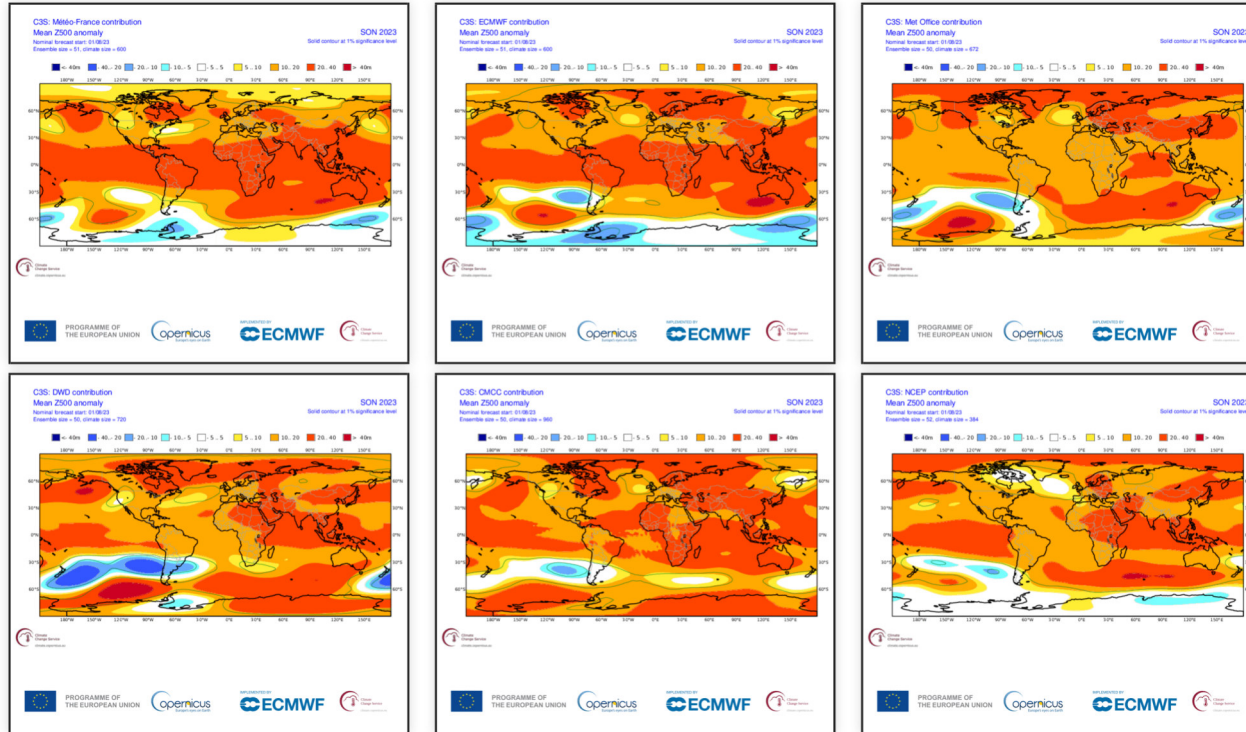
Some similarities over Atlantic but differences around Pacific.



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

Atmospheric circulation forecasts : Z500 anomalies in C3S models

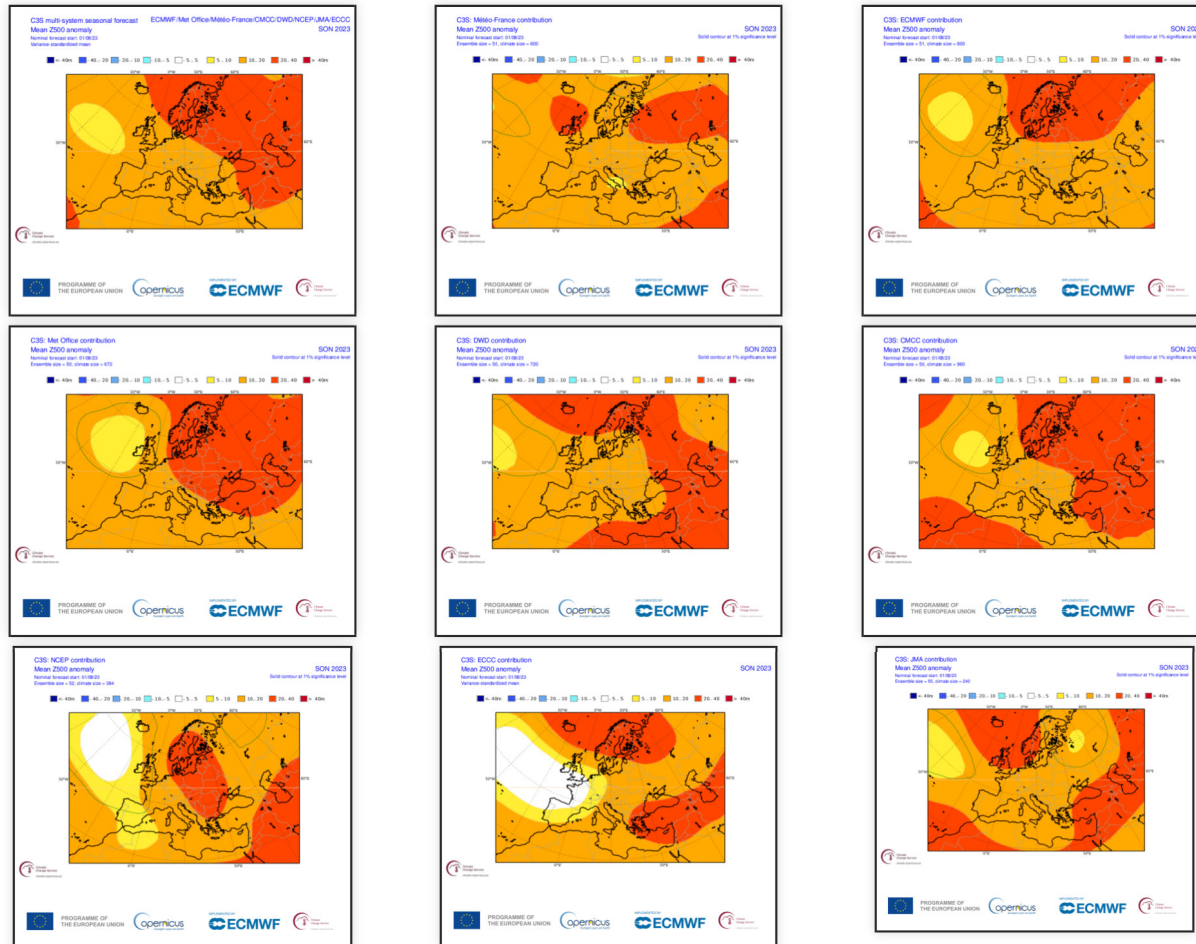
Most of models suggests relative weakness from United States to Atlantic. In addition the highlight stronger anomalies over the northern Pacific as well as from Greenland to Scandinavia.



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

Atmospheric circulation forecasts : Z500 anomalies in C3S models

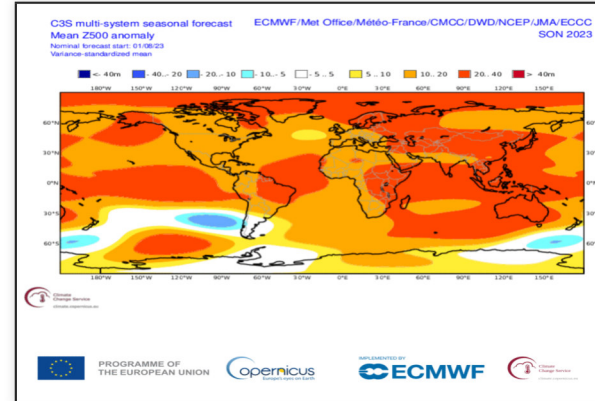
Signals are weak. there is a weaker anomaly on the Atlantic and a stronger anomaly on the north and east of Europe



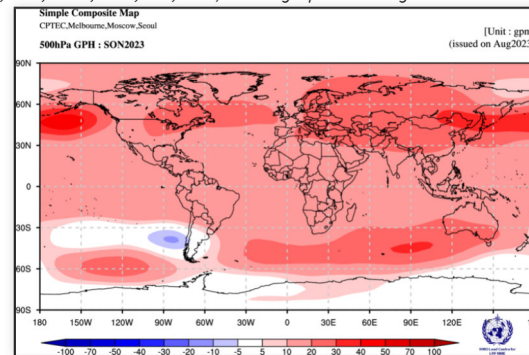
multi-models 500hPa geopotential height anomalies

Atmospheric circulation forecasts : Z500 anomalies multi-systems

In the northern hemisphere, signals are attenuated. However, C3S multi-models show a stronger positive anomaly from Greenland to Scandinavia and a small weakness in the center of the North Atlantic basin.



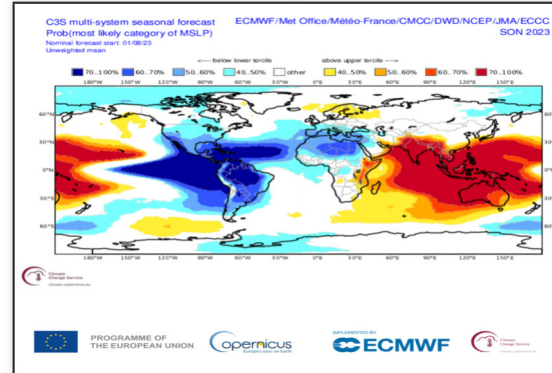
C3S multi-models (MF-S8, ECMWF-SEASS, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



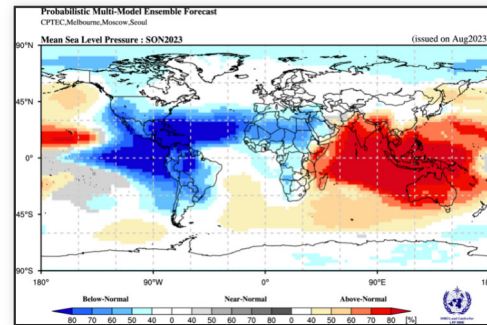
Others models of WMO multi-models 500hPa geopotential height anomalies.

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.

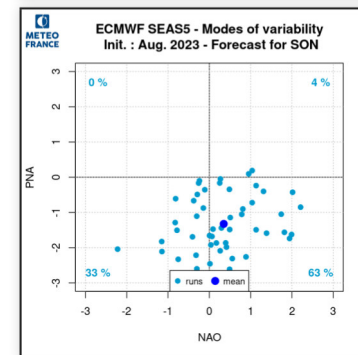
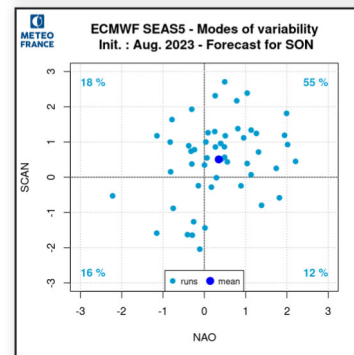
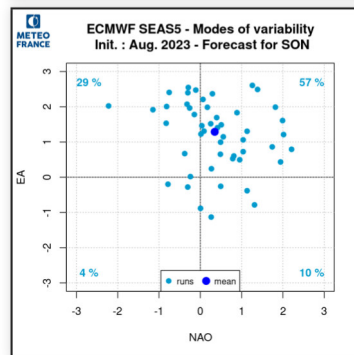
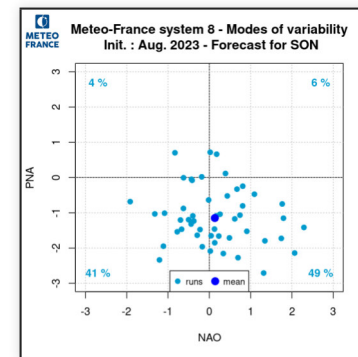
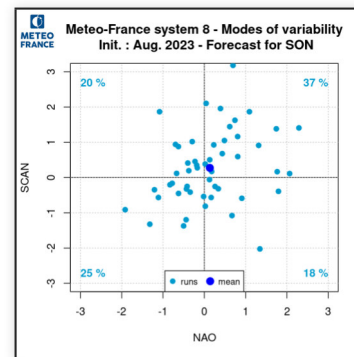
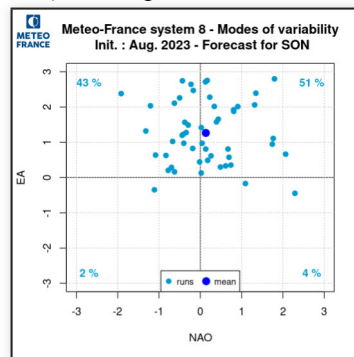


Others models of WMO multi-models MSLP terciles probability.

Modes of variability : forecast

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

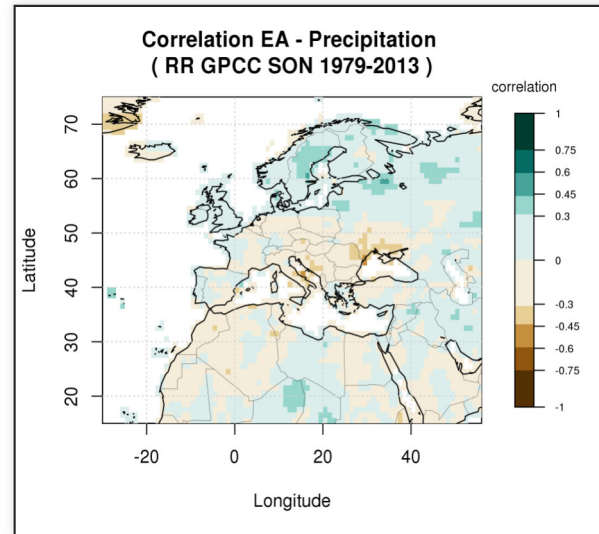
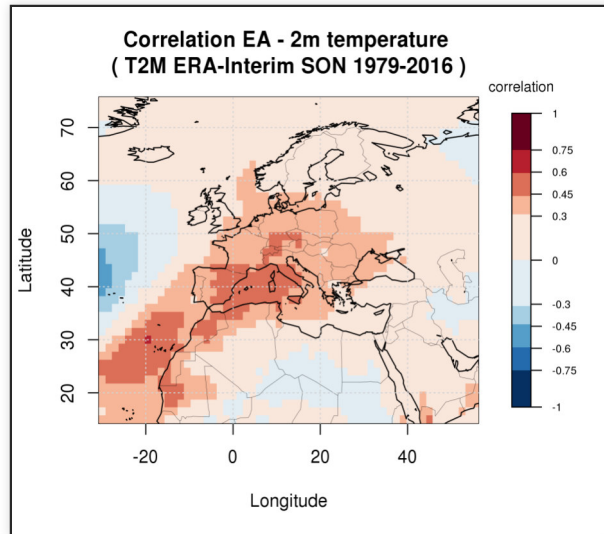
Weak positive signal for SCAN.



[See the modes of variability patterns](#)

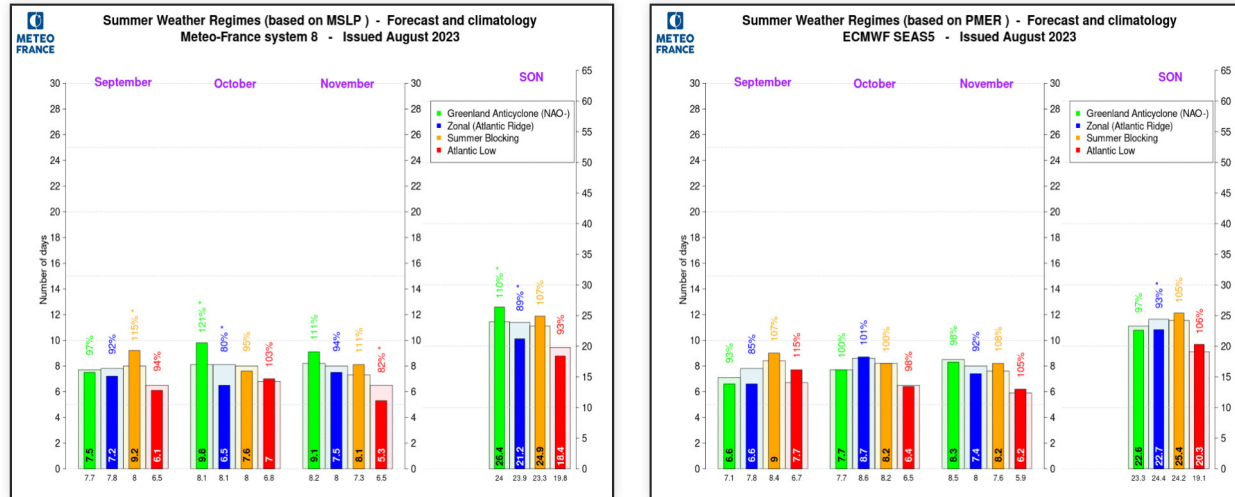
Modes of variability : EA impacts

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

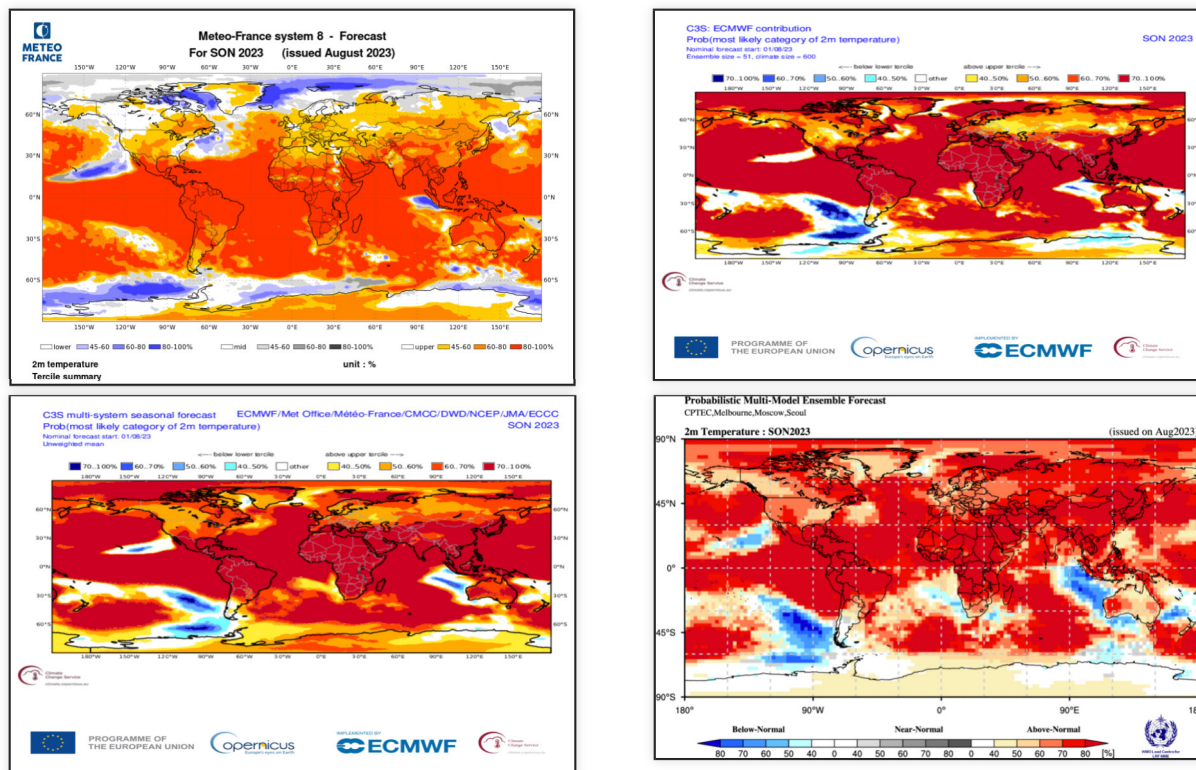
The two models show "Zonal (Atlantic Ridge)" regime significantly below its climatology. and ECMWF-SEAS5 favors the "Greenland Anticyclone NAO-" regime.



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

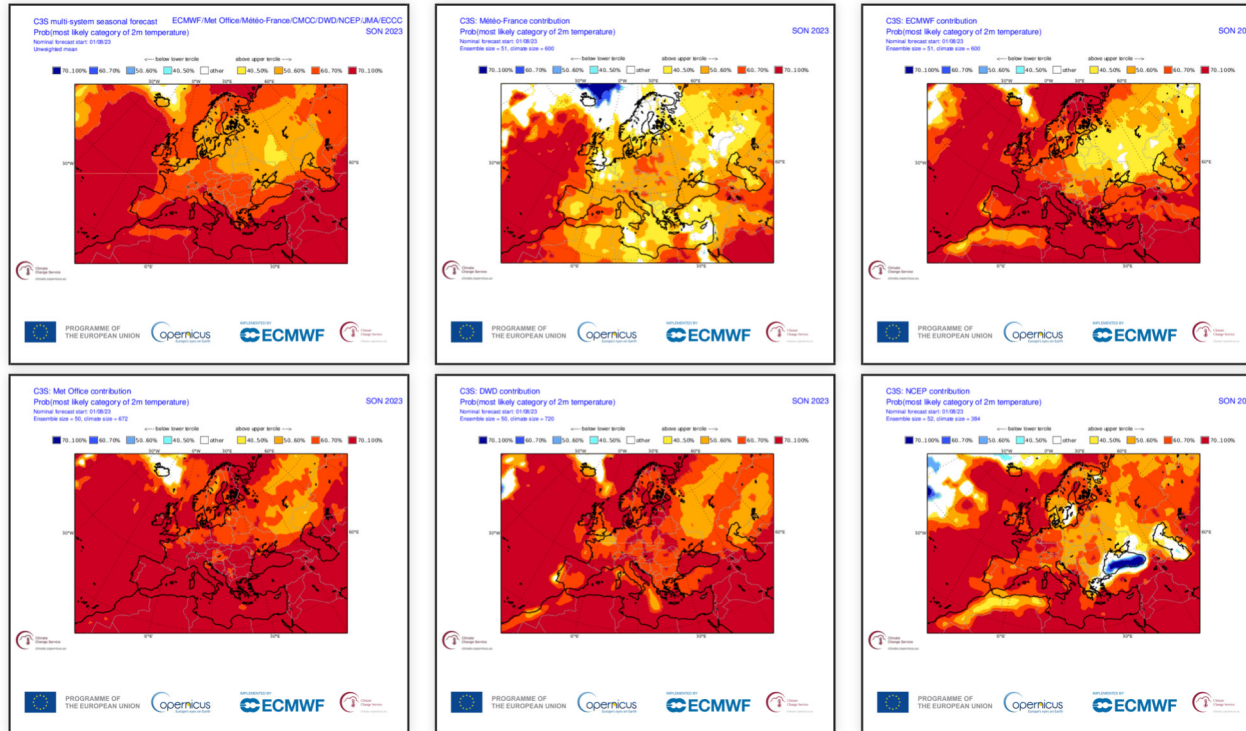
The probability of a warmer-than-normal signal is almost universal across the globe, with the exception of the eastern Indian Ocean and some areas on the Pacific.



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.

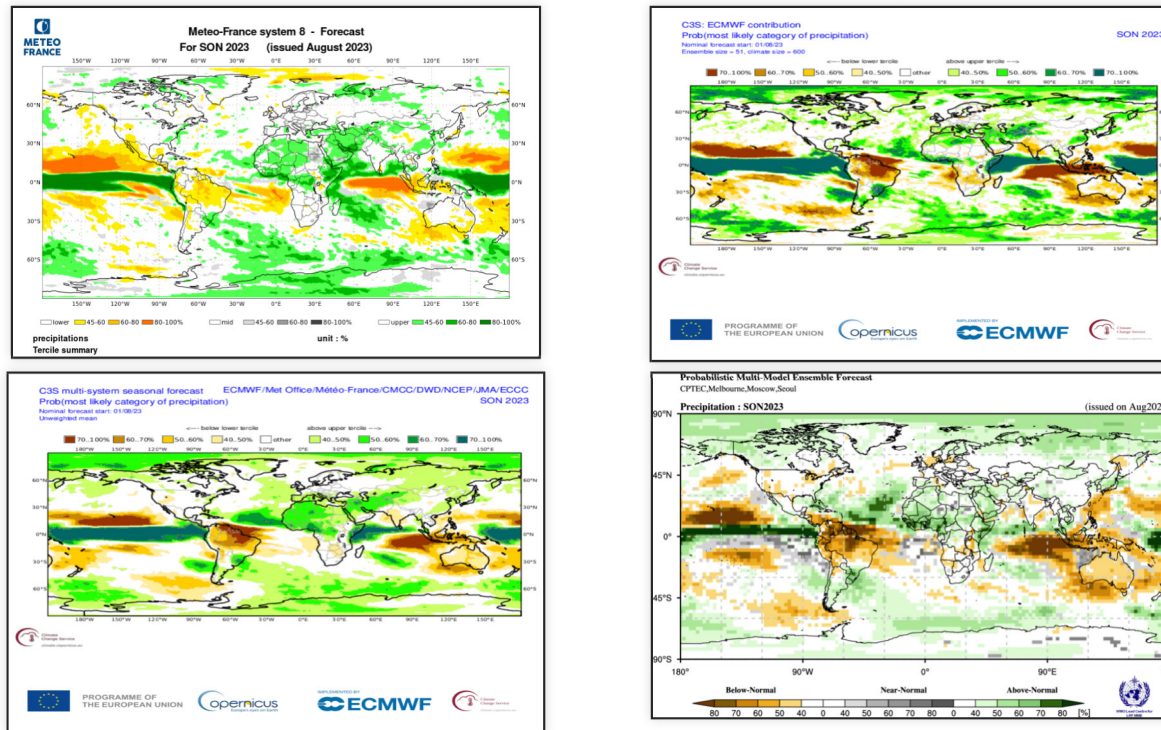


C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC models.

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).

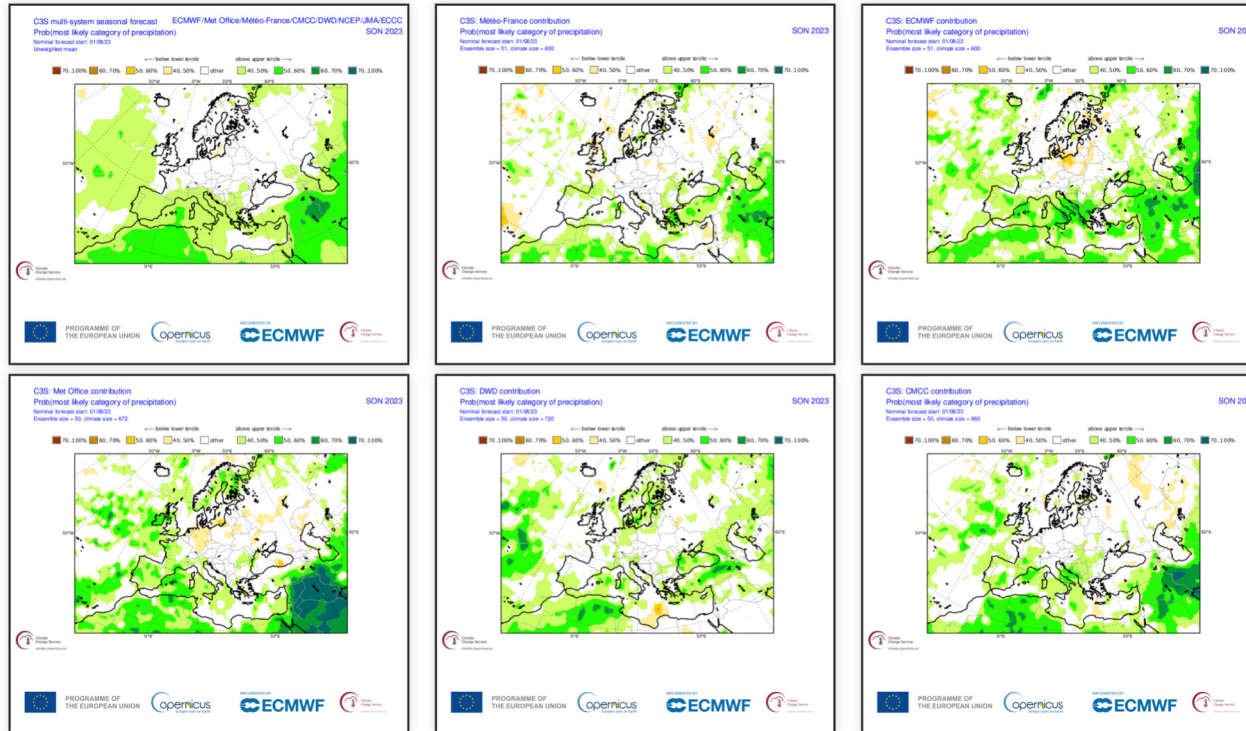
Due to a lack of teleconnections, there is little or no signal in the mid-latitudes of the Northern Hemisphere.



precipitation probability map from MF-S8 (top left), ECMWF-SEASS (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

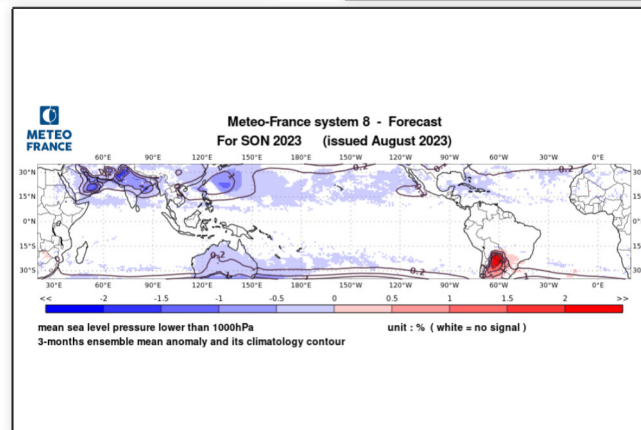
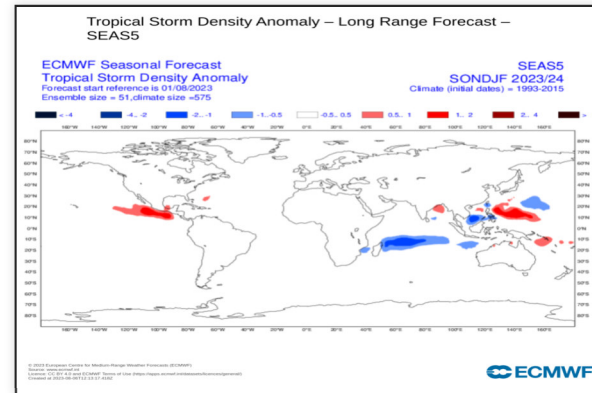
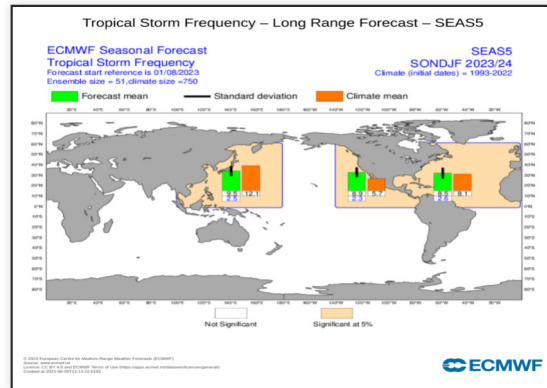
With most models favoring lower atmospheric pressure than normal over the Mediterranean Basin, wetter-than-normal conditions are likely over this area. Further north, signals are weak, although some models are forecasting drier-than-normal conditions.



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

Forecast of climatic parameters : Tropical Storm Frequency

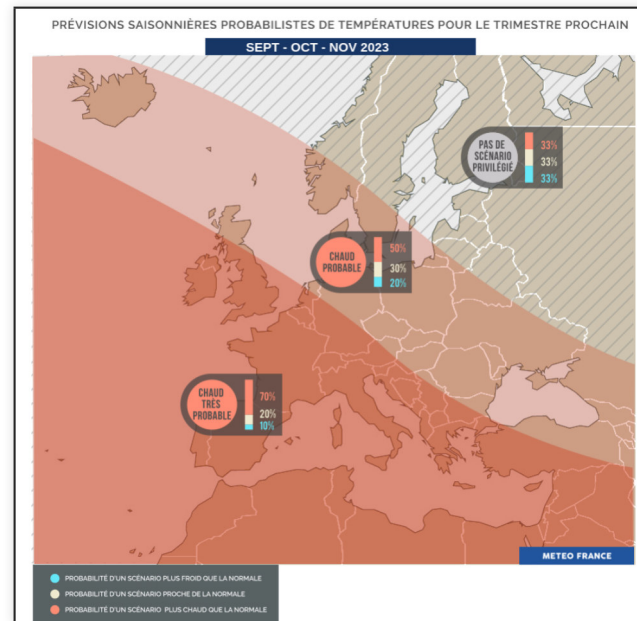
The frequency of tropical storms in the Atlantic is higher than normal.



legende

Synthesis map for Europe : Temperature

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

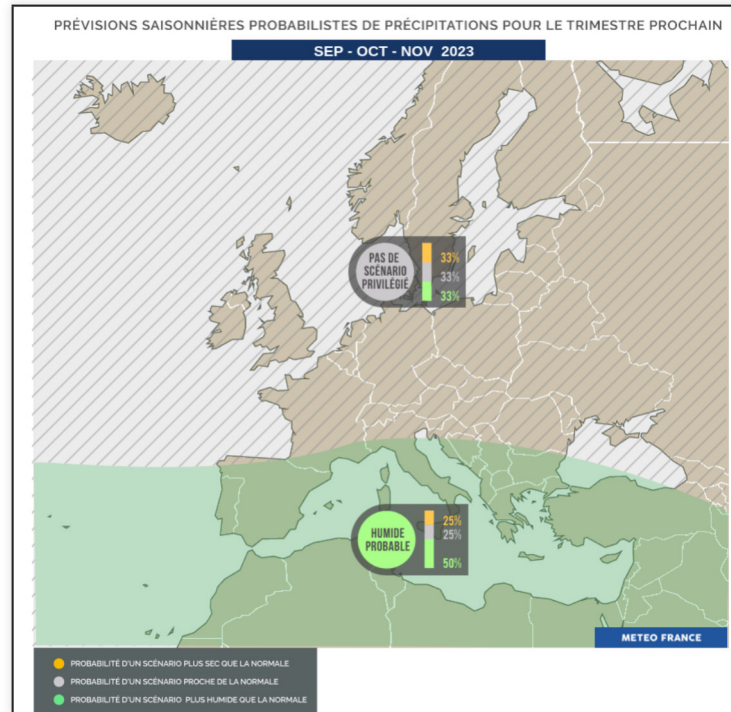


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

Most models converge on a wetter than normal scenario for the Mediterranean basin.

No scenario is preferred elsewhere.



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