Météo-France Seasonal Forecast Bulletin

AUGUST - SEPTEMBER - OCTOBER 2022

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General synthesis : ASO 2022

In the Pacific Ocean, the "La Niña" phenomenon is expected to continue in the coming months, despite an attenuation in July-August. In the Indian Ocean, a negative phase of the IOD is developing rapidly. These two phenomena will largely impact the climatic conditions of equatorial and tropical regions.
With teleconnections to the mid-latitudes, they provide some predictability over Europe. However, there are discrepancies between models on the positioning of some anomalies (Z500 for example).

A) Oceanic forecast :

- ENSO : weak La Niña.

- IOD : becoming strongly negative

- Equatorial Atlantic : warm anomaly

B) Drivers :

- "La Niña" and negative IOD

C) Atmospheric circulation :

A positive anomaly of Z500 extends from the Caribbean Arc to the western side of Europe. This pattern is close to the patterns of the NAO+ and EA+ variability modes.

D) Most likely conditions :

The warm tercile is the most likely over Europe. No scenario elsewhere

The dry tercile is most likely over a large part of central Europe. No scenario elsewhere

Next bulletin : scheduled on August 24th

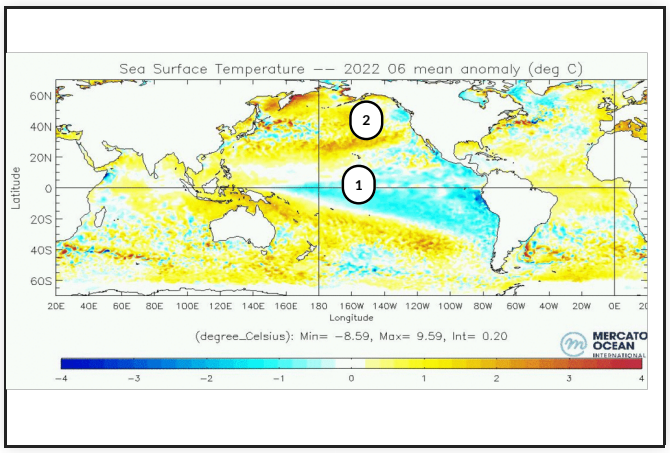
Oceanic analysis of June 2022 : SST anomalies

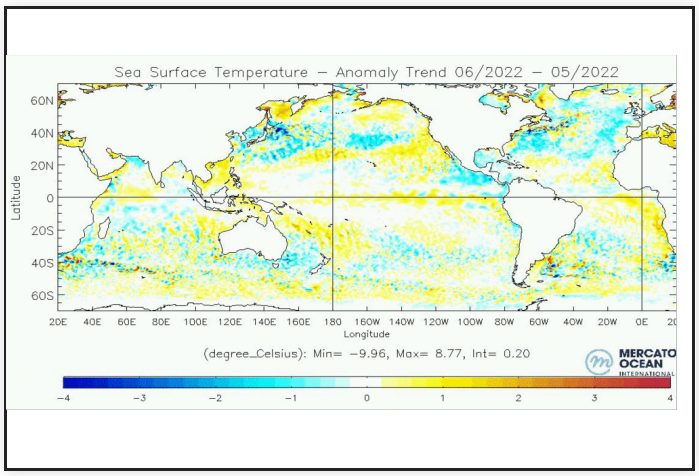
Current ENSO situation : moderate La Niña

In the Pacific Ocean : Anomalies tend to decrease. However, the cold anomaly along the equator, typical of "La Niña", and the warm anomalies around the 30th North and South, typical of PDO-, are still clearly visible.

In the Indian Ocean : Basin slightly warmer than normal, with a weak East/West constrast (negative IOD)

In the Atlantic Ocean : The warm anomaly is maintained around the equator. On the other hand, in the Northern Hemisphere, the positive anomaly is less pronounced.



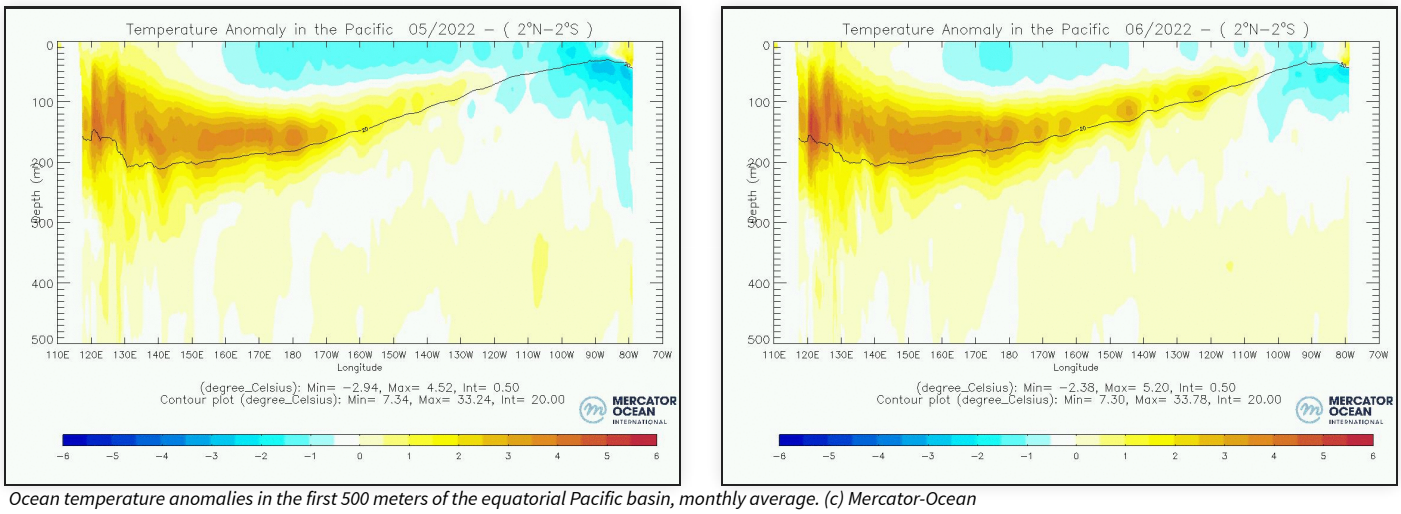


SST Anomalies and trend with the previous month (c) Mercator-Ocean

1 - La Niña pattern
2 - Negative PDO pattern

Oceanic analysis of June 2022 : Pacific vertical section

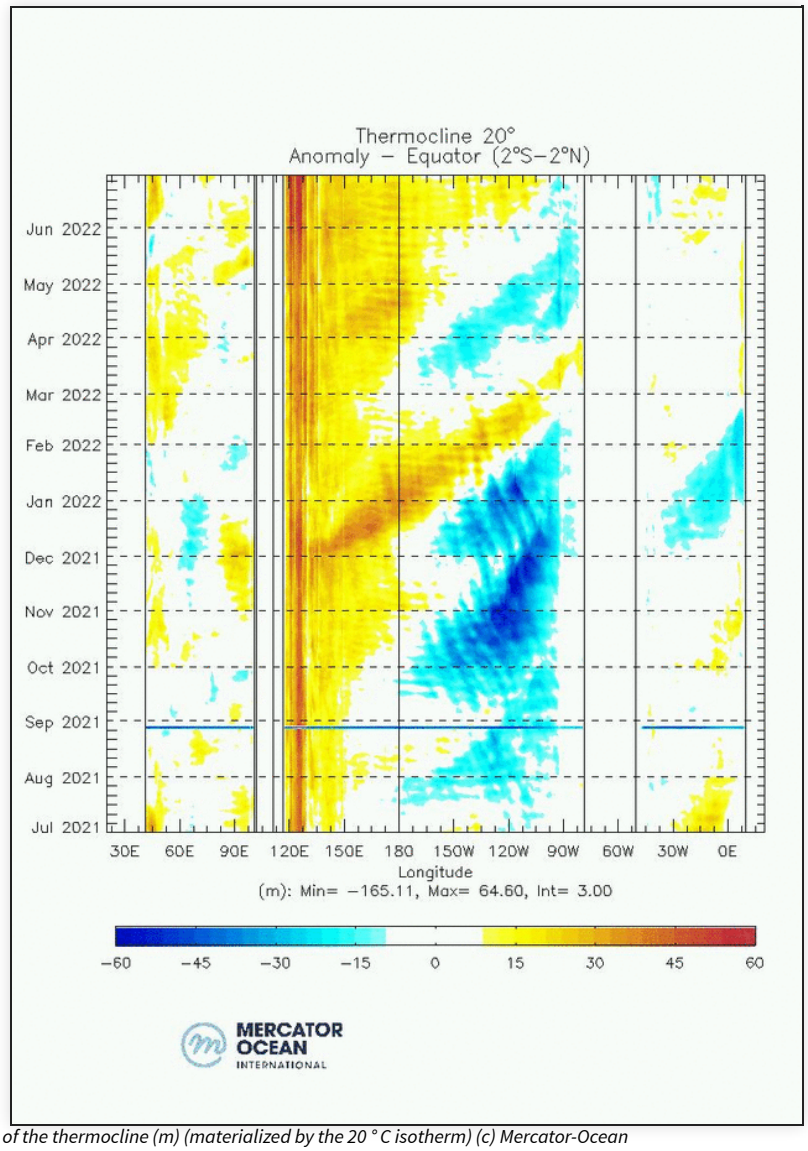
The warm subsurface anomaly propagates eastward, and impacts the SST, which is close to normal.



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

Oceanic analysis of June 2022 : Hovmüller diagram of the 20°C isotherm

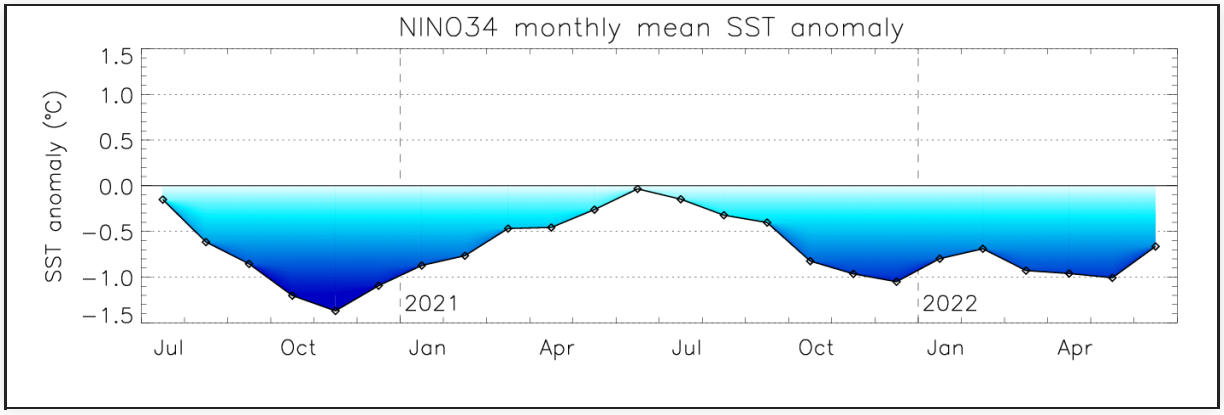
In the Pacific Ocean, the cold Kelvin wave has now disappeared. It is replaced by a warm wave, less marked but very extensive.



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

Oceanic analysis of June 2022 : Pacific Ocean - Nino3.4 index history

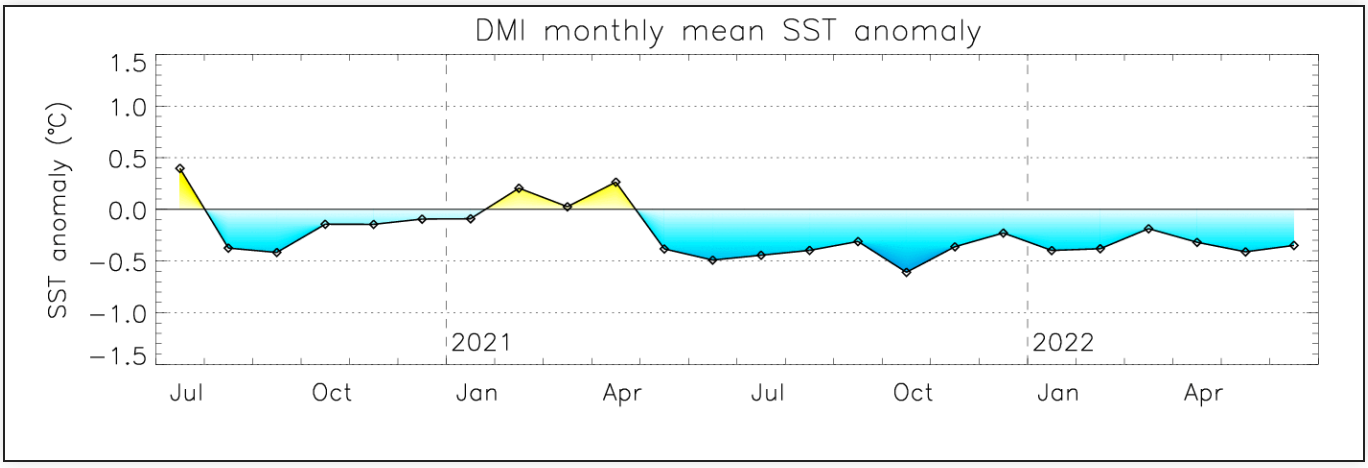
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -0.7°C
BOM weekly values : -0.32°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

Oceanic analysis of June 2022 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.35°C
Bom weekly value : -0.96°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

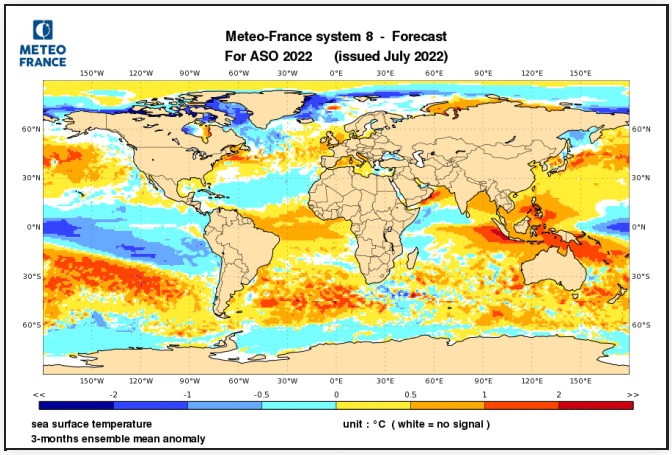
Oceanic forecast : SST anomaly

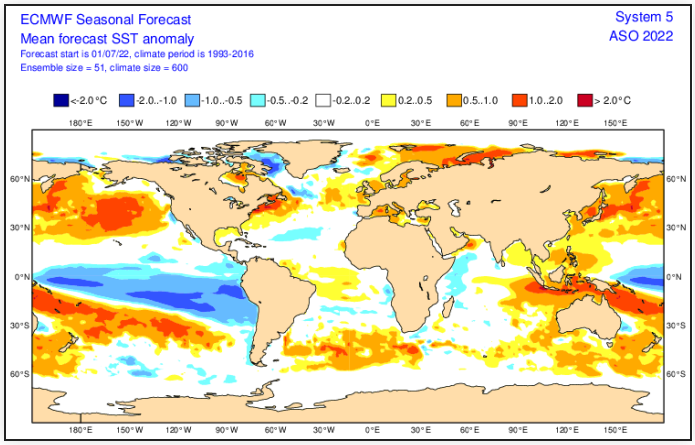
Good agreement between MF-S8 and ECMWF-SEAS5 in the main anomaly patterns.

In the Pacific Ocean : Persistence of the two main patterns, La Niña and PDO-, although the anomalies seem to be less marked with MF-S8.

In the Indian Ocean : The East/West contrast is clearly accentuated (negative IOD).

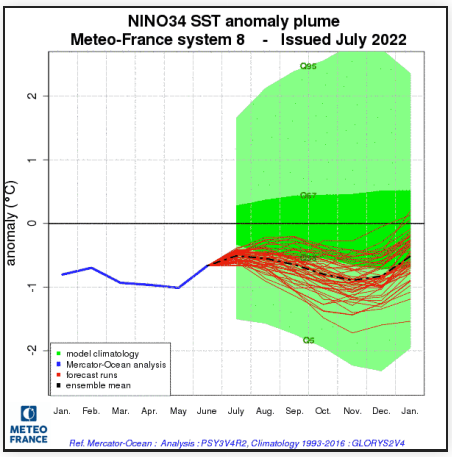
In the Atlantic Ocean : The warm anomaly along the equator is stronger with MF-S8 than with ECMWF-SEAS5. In the North Atlantic, the warm anomaly is weakening.

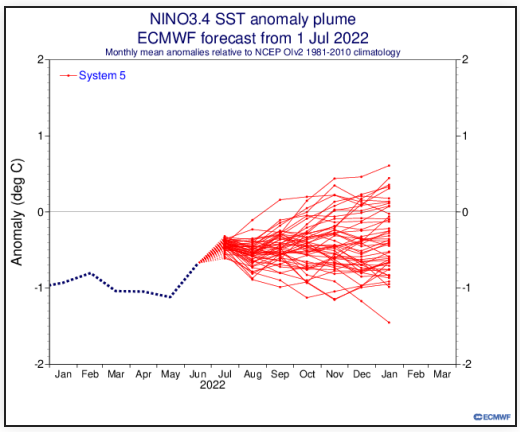




Oceanic forecast : NINO3.4 Plume diagrams

Tendency to return to a weak "La Niña" situation for MF-S8, less visible with ECMWF where the dispersion is greater.

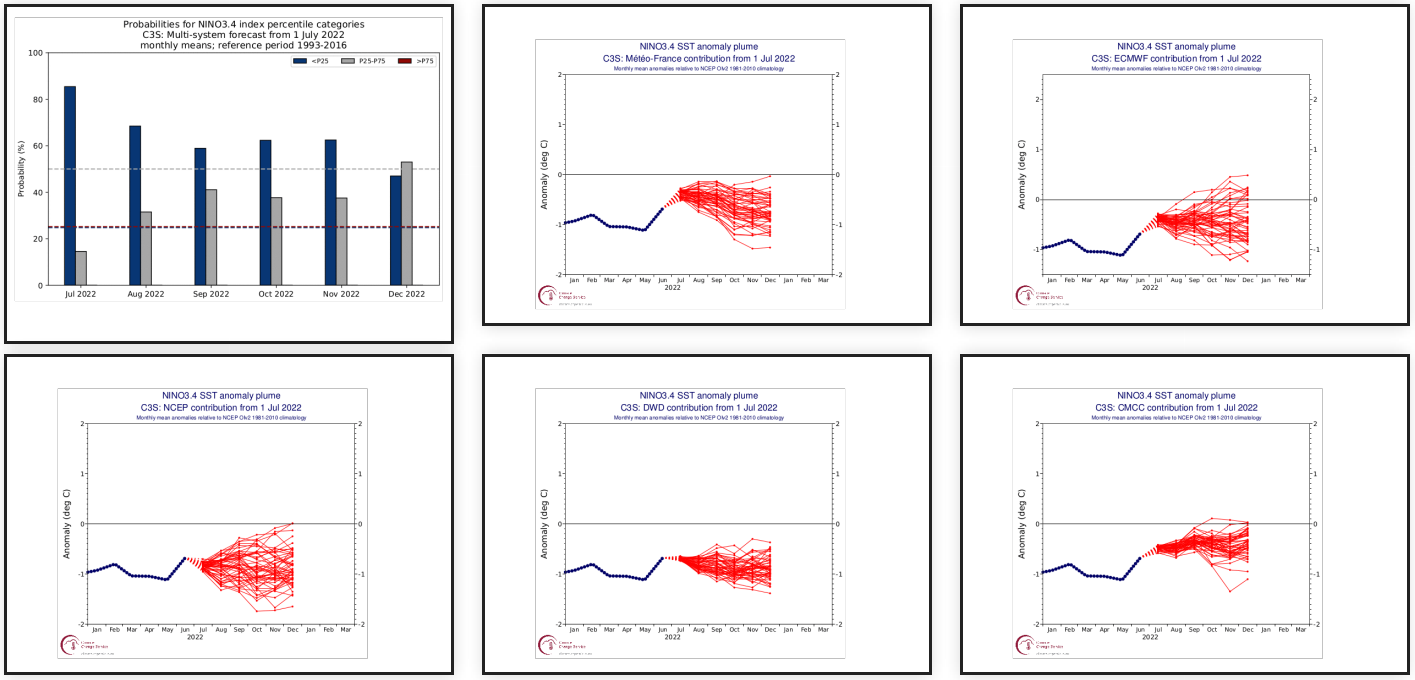




Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

The index warmed up significantly in June. For the coming months, some models (including ECMWF) maintain a scenario close to neutral, while others (including M) opt for a further weak cooling.

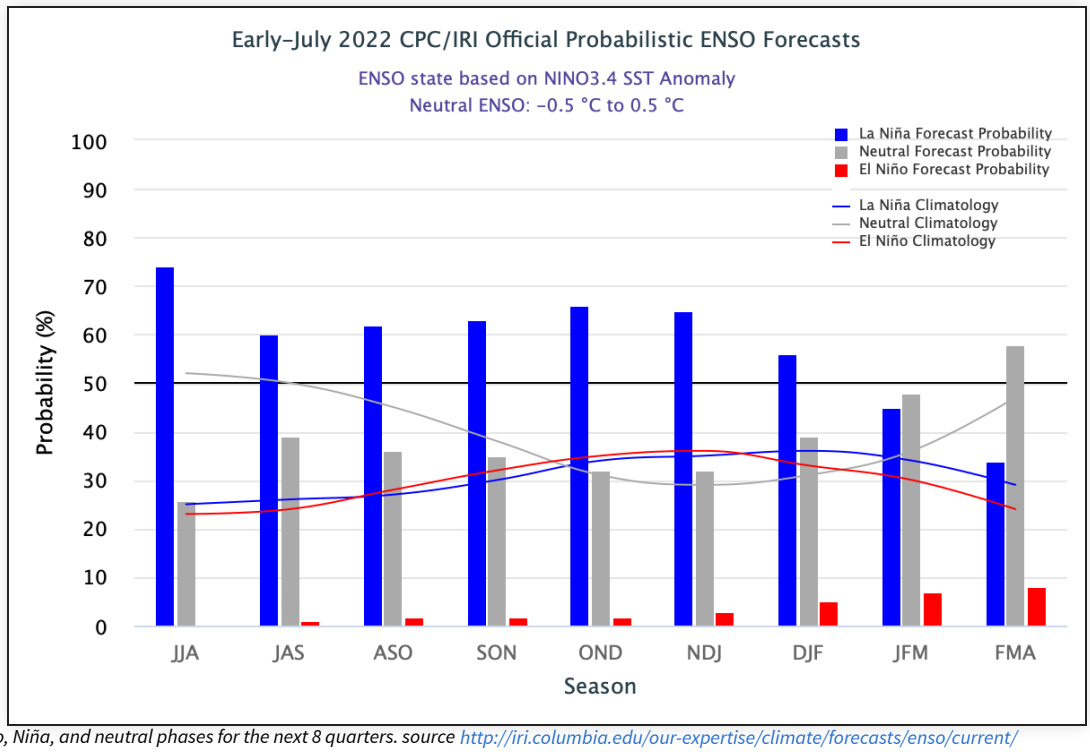
The most likely phase for the next three months : Weak La Niña or neutral.



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

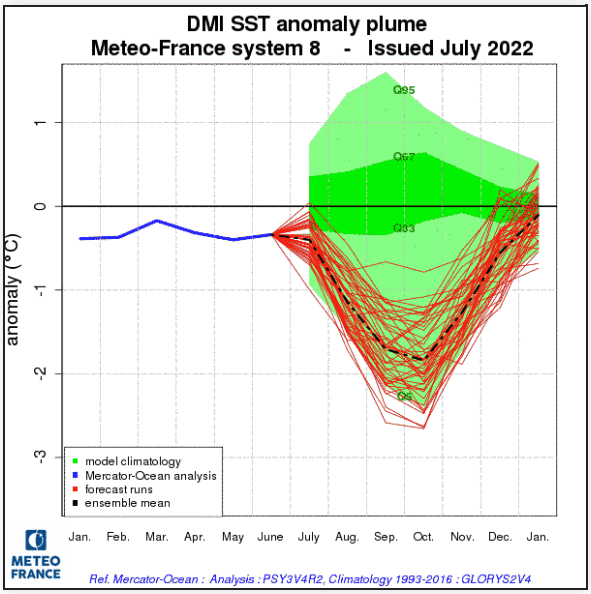
IRI forecast : about 60% chance of "La Nina" and 40% of neutral condition for ASO.

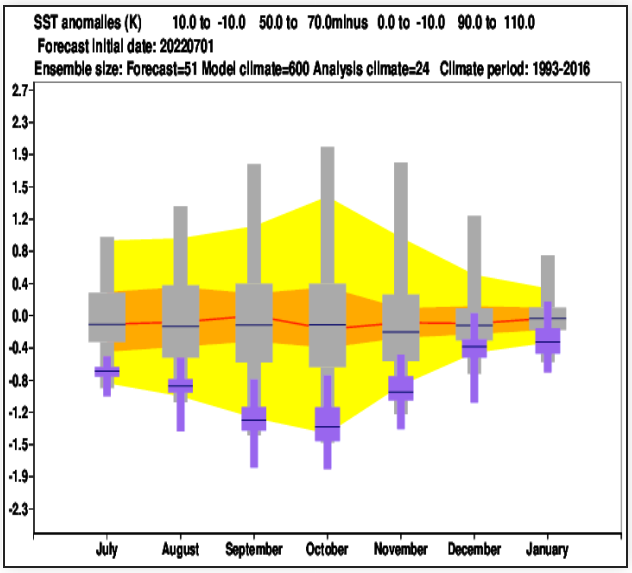


Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Oceanic forecast : Indian ocean - DMI evolution

Very negative DMI expected for the next few months, for both models.



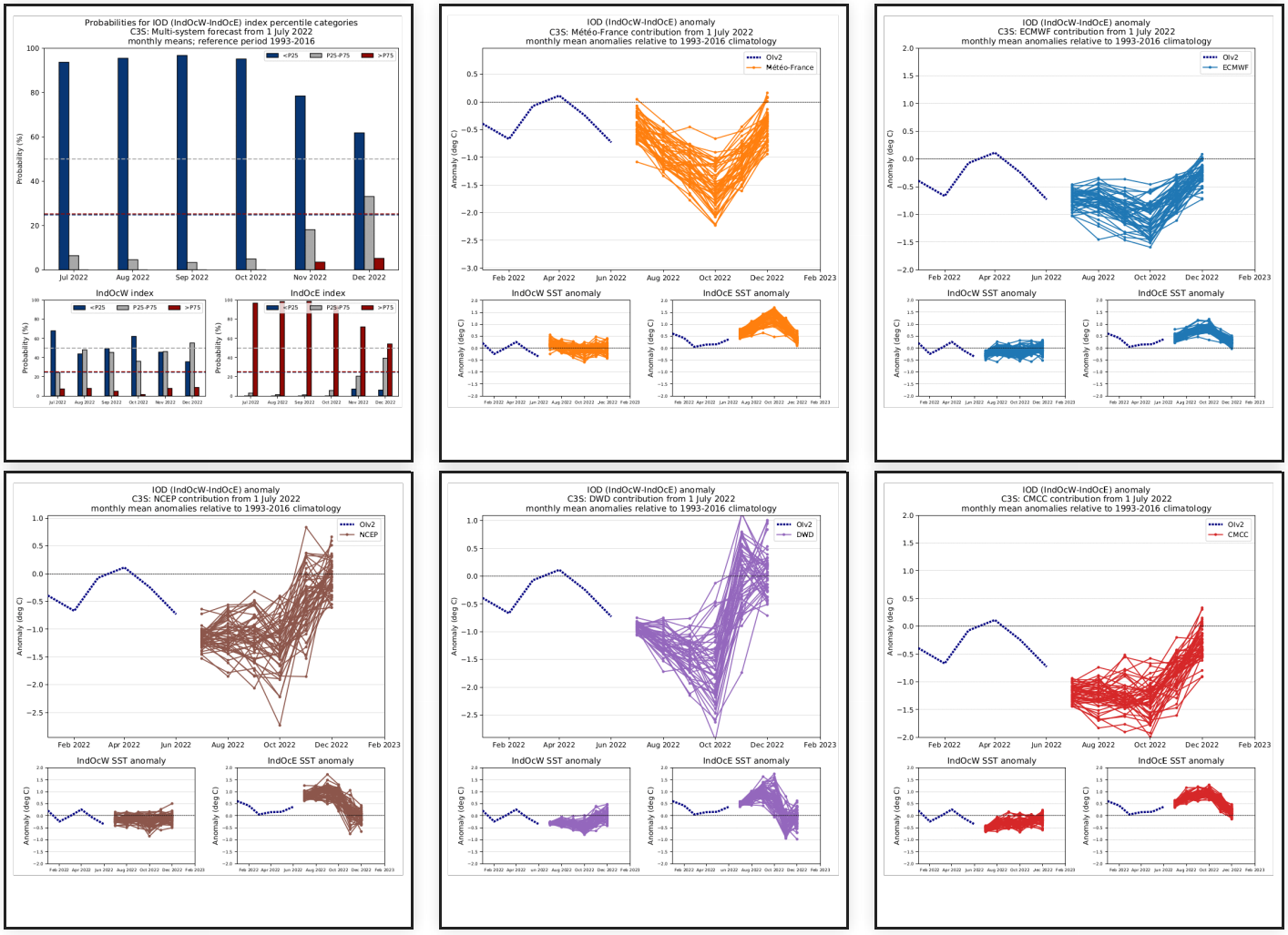


DMI index : analysis, forecasts and model climatology with MF-S8 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

Good agreement between C3S models on a marked warming in the east box, responsible for a negative IOD .

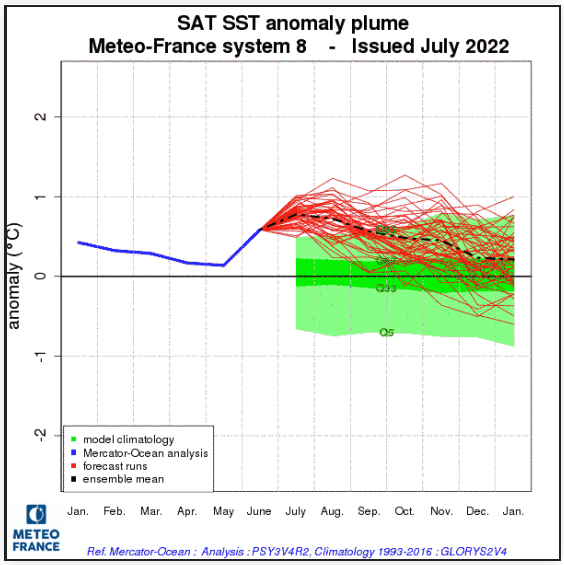
Expected Phase for the next three months : negative.

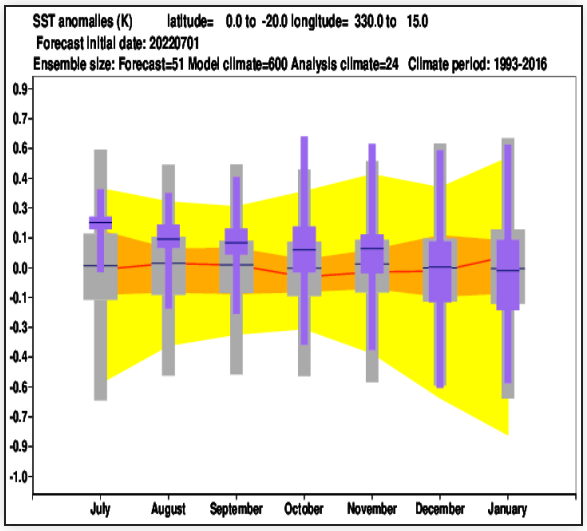


C3S multi-system probabilty forecast (top left figure) and C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

Oceanic forecast : Atlantic ocean - SAT evolution

Both models predict warmer than normal conditions, with the MF-S8 model being more intense.





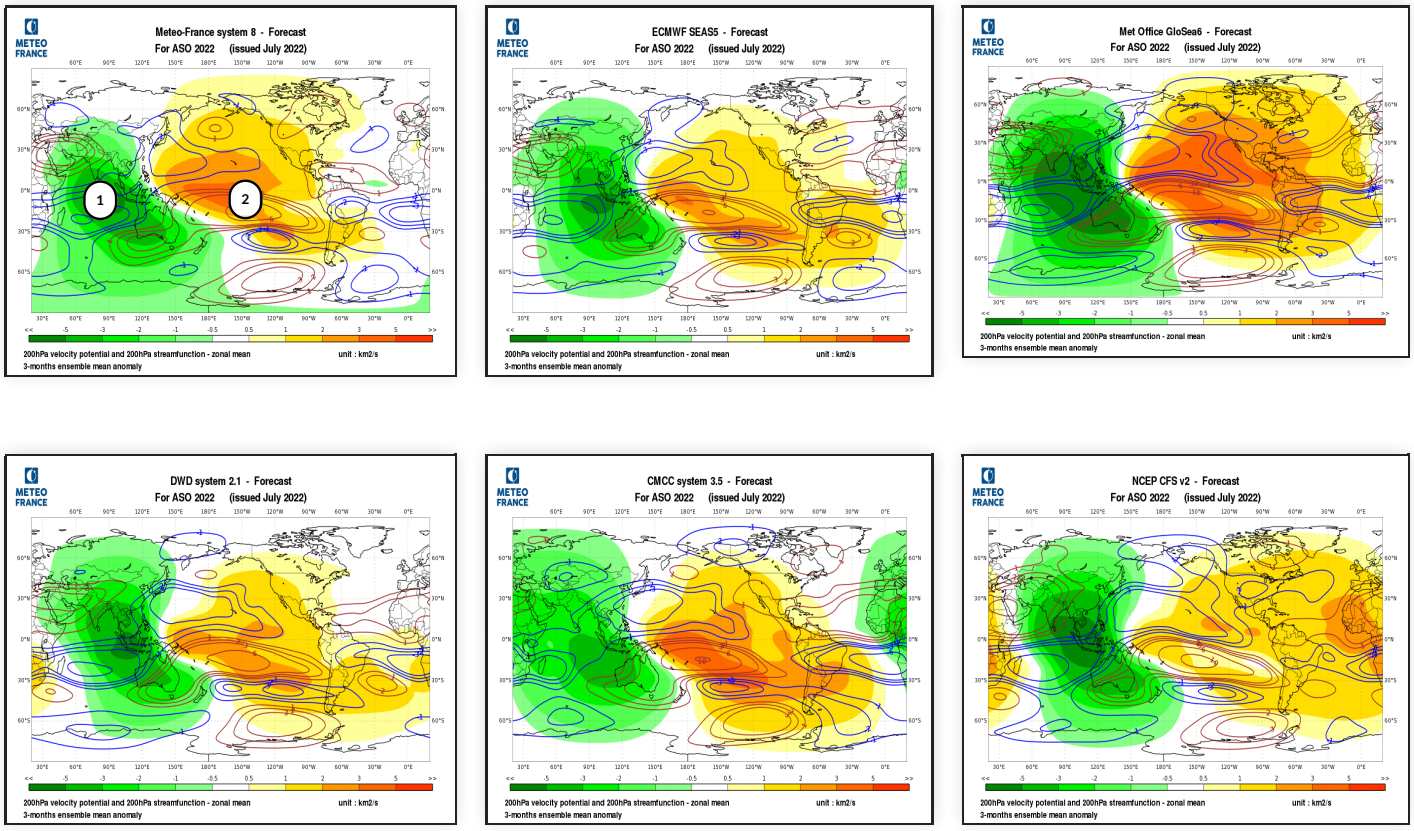
Anomaly on the SAT box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

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

Very good agreement between models.

Velocity Potential : Strong dipole over Indian and Pacific Oceans: a downward motion anomaly centered over the western Central Pacific (linked to La Niña); a strong upward motion anomaly centered over the eastern Indian Ocean (linked to La Niña combined with a negative IOD). PV less marked over the Atlantic (models disagree).

Streamfunction : Strong dipoles are visible on the three oceans. Over the western Pacific, teleconnections to North America are even visible with some models. The dipole over the Indian Ocean extends over Africa and the Atlantic Ocean, a zone of anticyclonic curvature stretching from the Arabian Peninsula to northern Africa and the Caribbean Arc.

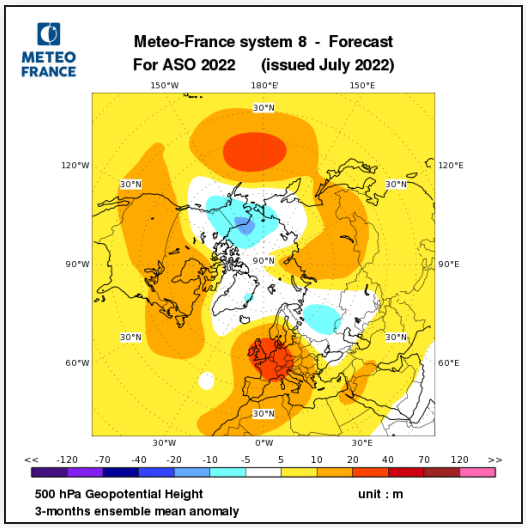


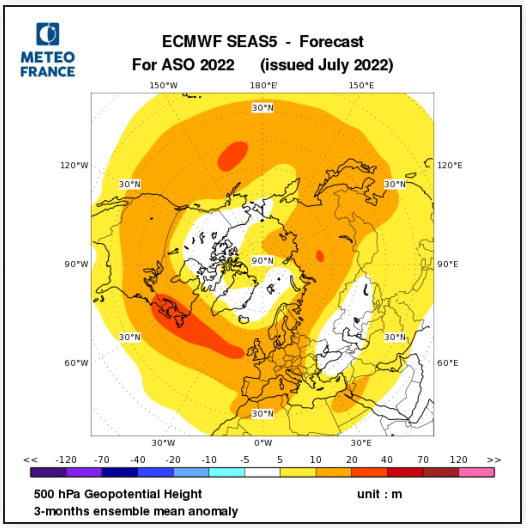
MF8,SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

1 - VP : upward motion anomaly related to La Nina and the SST anomaly gradient in the Indian Ocean
2 - VP : downward motion anomaly related to La Nina

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Globally, MF-S8 is more contrasted than ECMWF: over North America, the PNA- pattern is very visible with MF-S8 but more diffuse with ECMWF; similarly, over Europe, MF-S8 clearly draws a positive anomaly dipole over Western Europe and a negative anomaly over Western Russia, which ECMWF does not see.

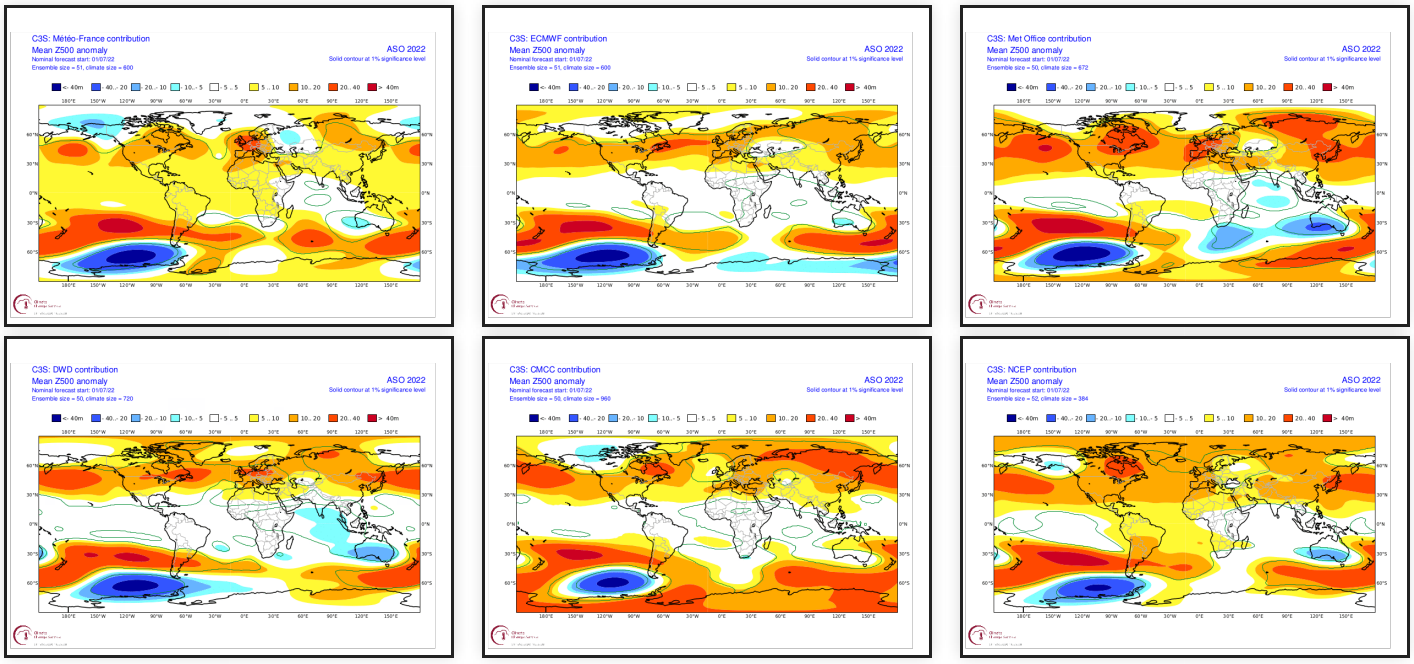




polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

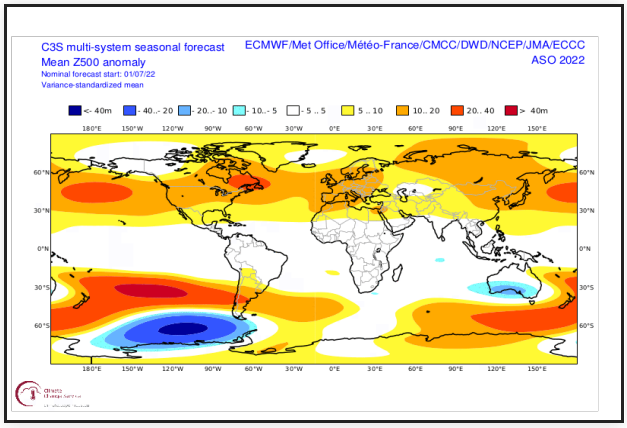
All models (ECMWF to a lesser extent) show a PNA- pattern over western North America. Similarly, around the North Atlantic, most models (except ECMWF) show two positive anomalies, one centered over Quebec and the other over Western Europe.



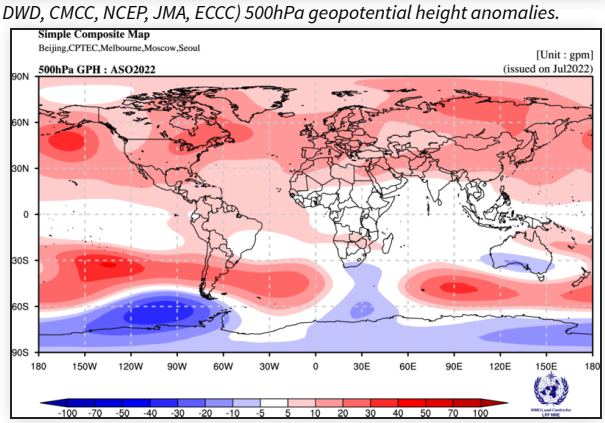
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

Both multi-models agree on the main anomalies in Z500, both in the southern and northern hemispheres.



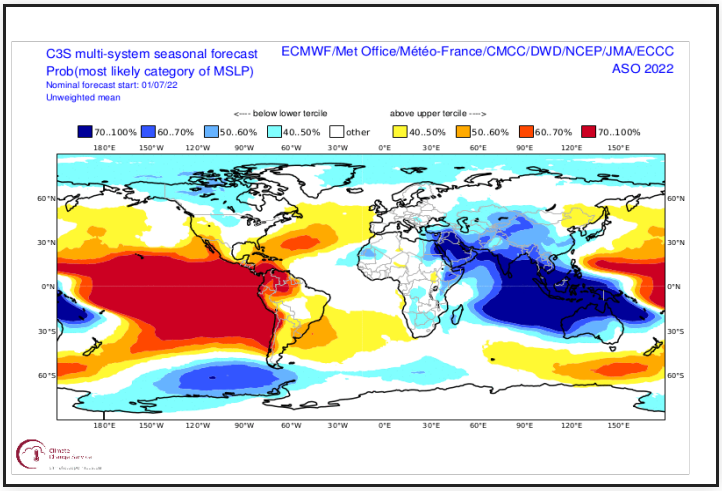
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



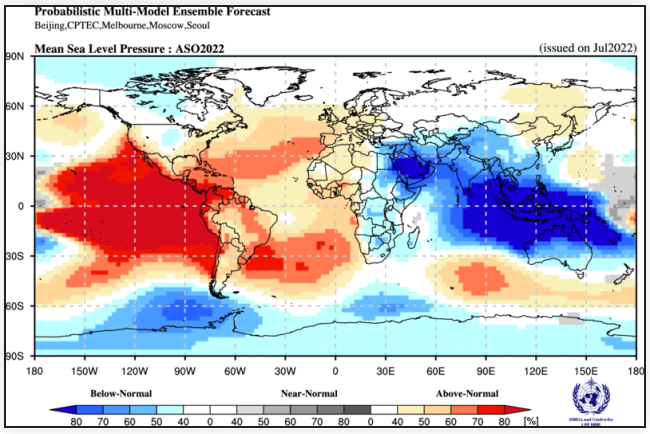
Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilites multi-systems

Both multi-models agree on the probabilities in MSLP, in the intertropical zone (impacts of "la Niña" and negative IOD) as well as in the mid-latitudes. Europe is at the limit of the positive anomaly that extends from the Caribbean to Spain and the thermal low centered on the Arabian Peninsula.



C3S multi-models MSLP terciles probability.

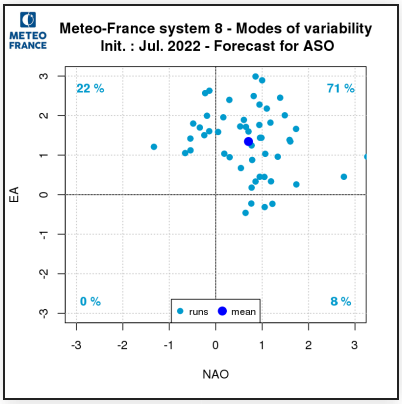


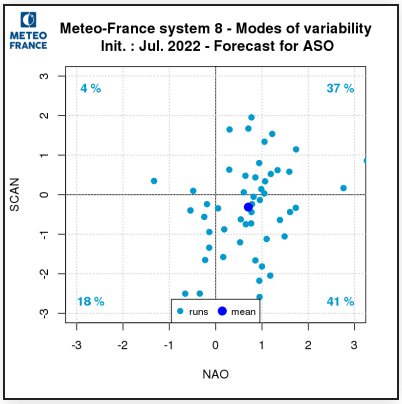
Others models of WMO multi-models MSLP terciles probability.

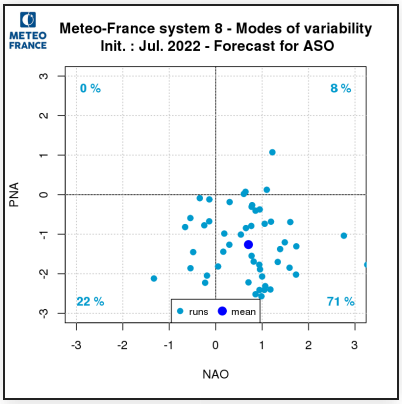
Modes of variability : forecast

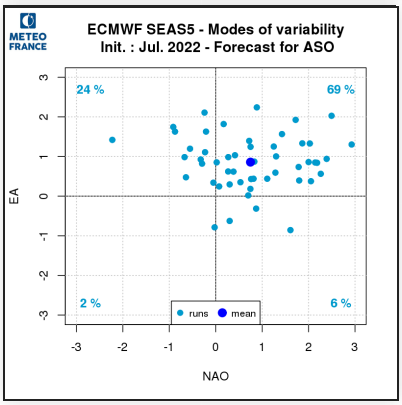
Good agreement between the two models :

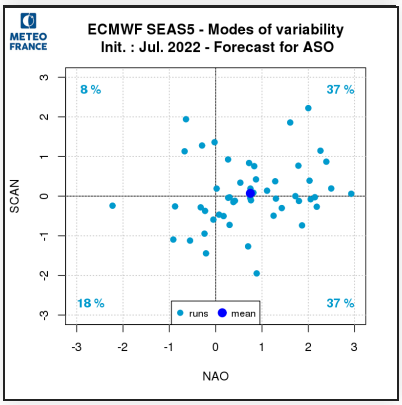
Still good confidence in PNA-, NAO+ and EA+, but no signal for SCAN.

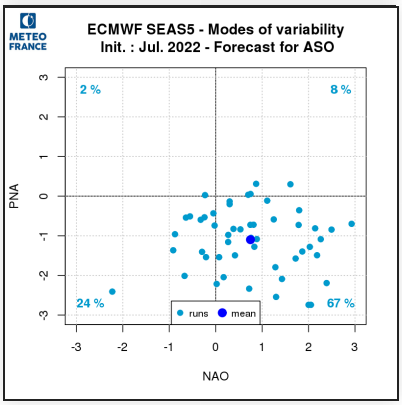








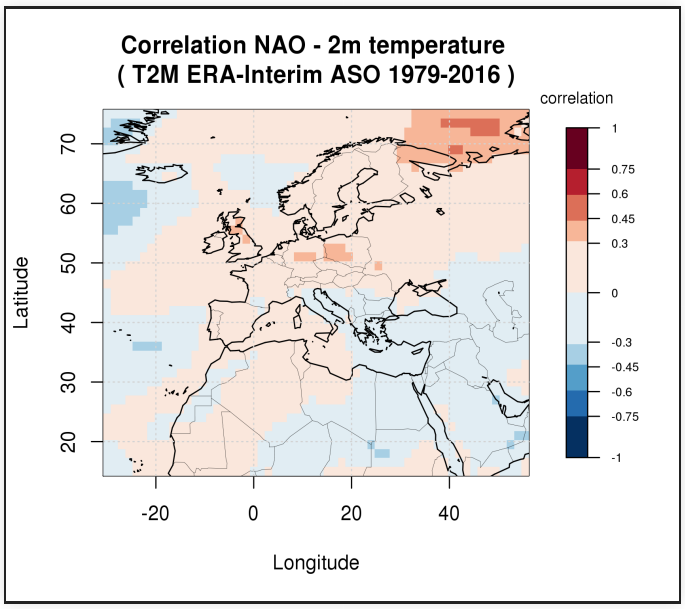


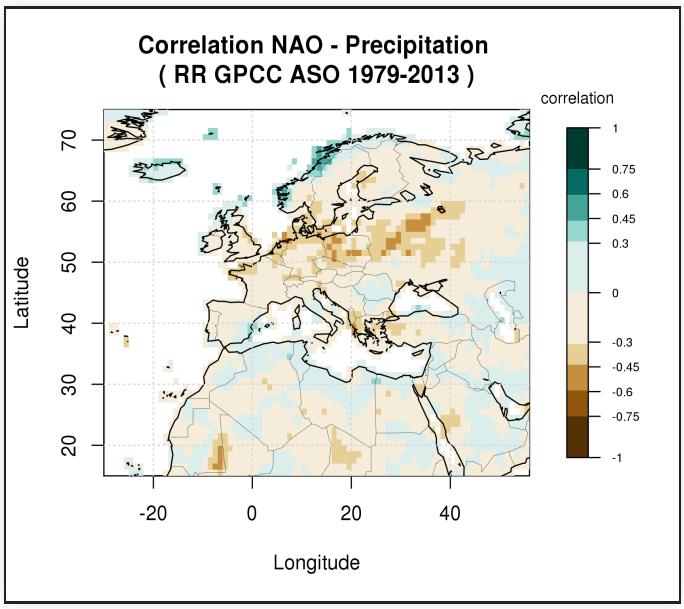


See the modes of variability patterns

Modes of variability : NAO impacts

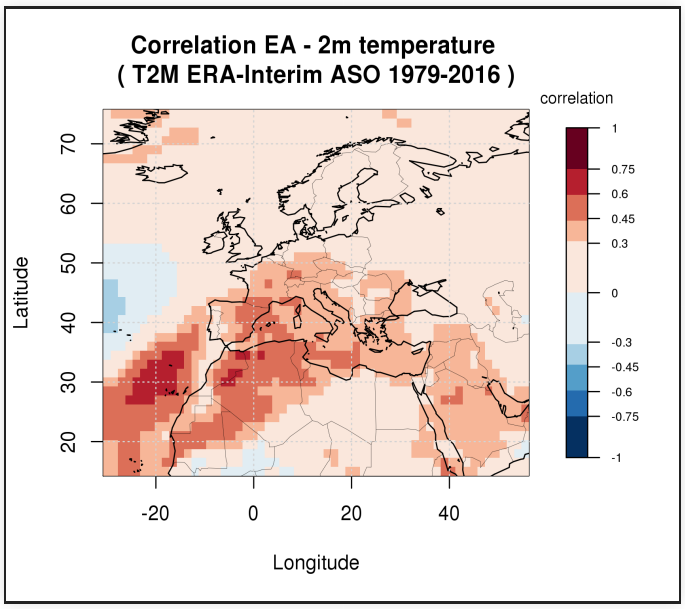
Positive phase of the NAO next quarter

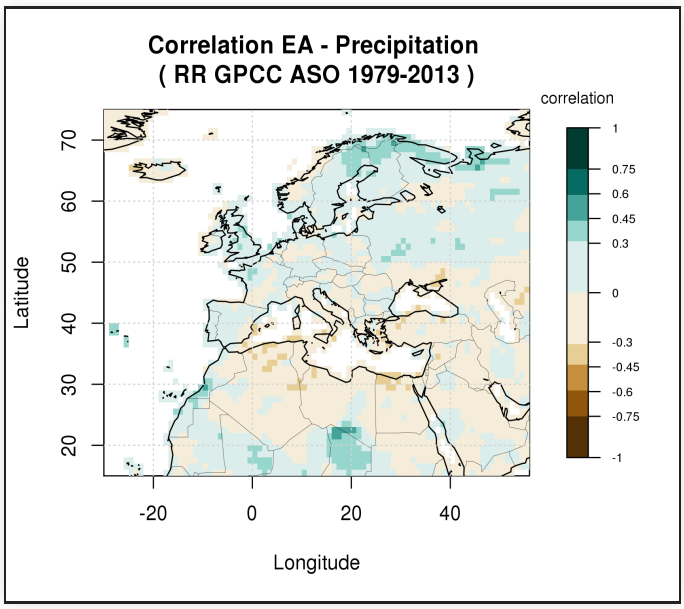




Modes of variability : EA impacts

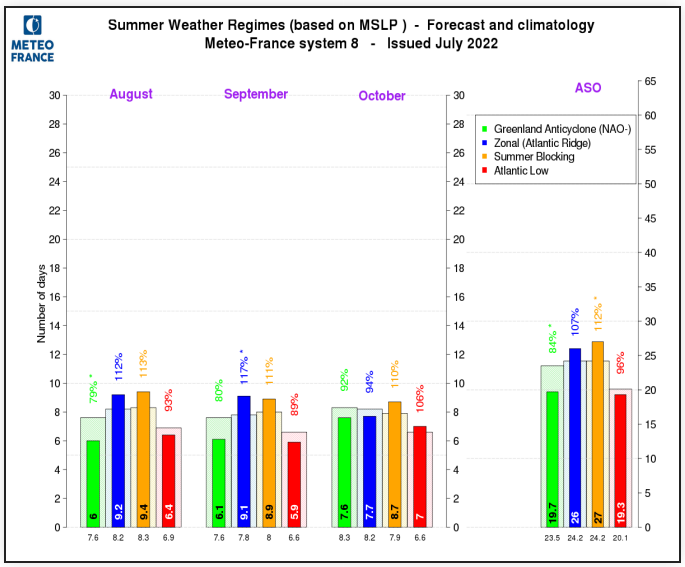
Positive EA is expected next quarter. This mode has a strong influence in particular on the temperature on the south of Europe.

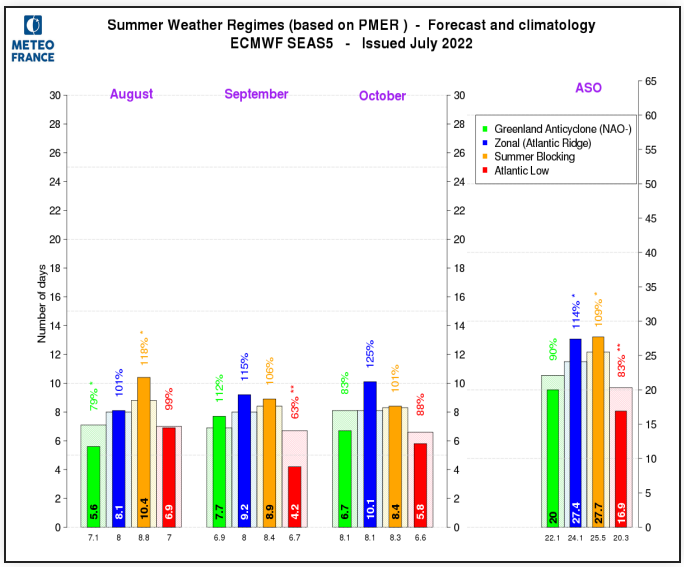




Weather regimes : summer MSLP

Two regimes are dominant, zonal and summer blocking, but with limited differences from their climatology.

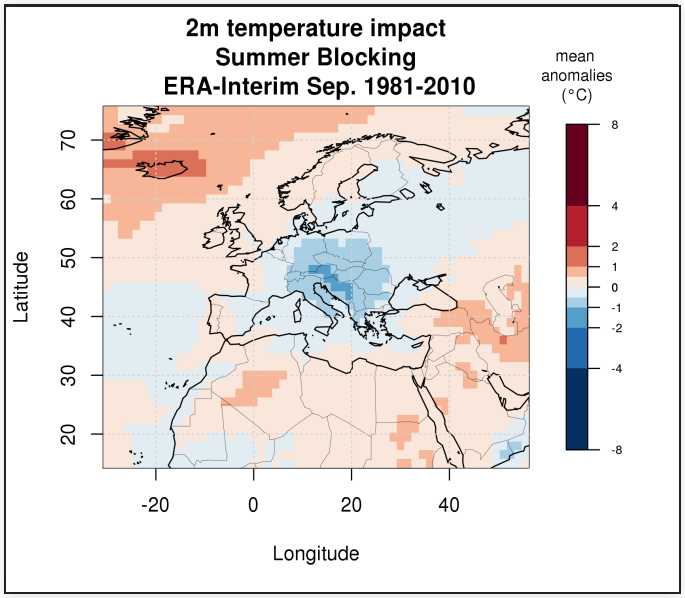


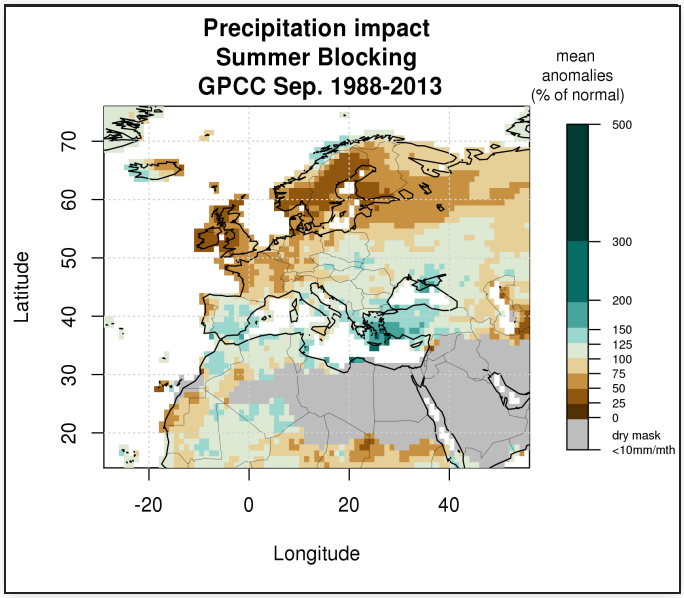


Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S8 (left) and SEAS5 (right).

Weather regimes : Impacts

The summer blocking regime favors drier than normal conditions over much of northwestern Europe and cooler than normal over Central Europe.

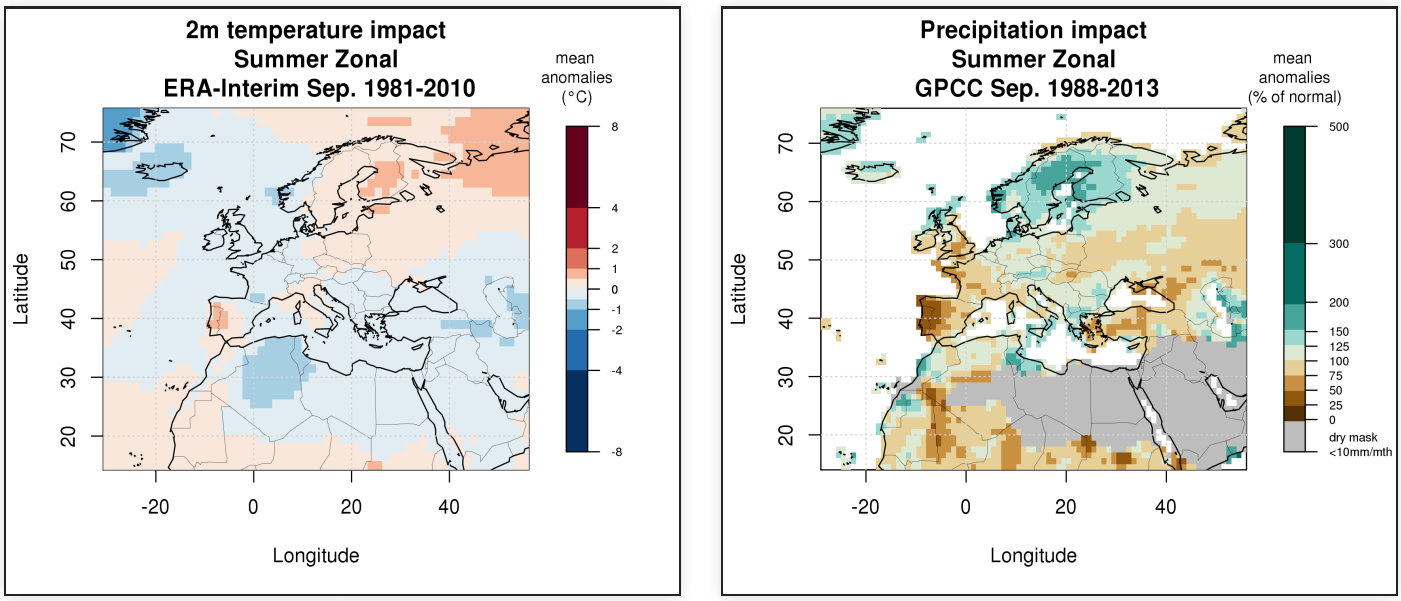




Impact of Summer Atlantic Low weather regime on temperature and precipitation. (ref ERA-interim 1981-2010 and GPCC 1988-2013)

Weather regimes : Impacts

Over Western Europe, the zonal summer regime favors drier and cooler than normal conditions.

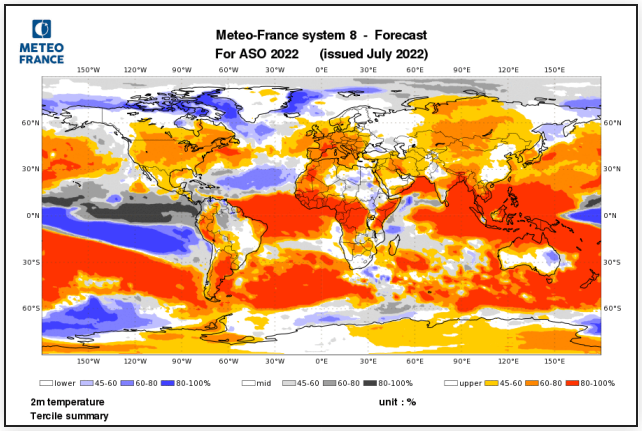


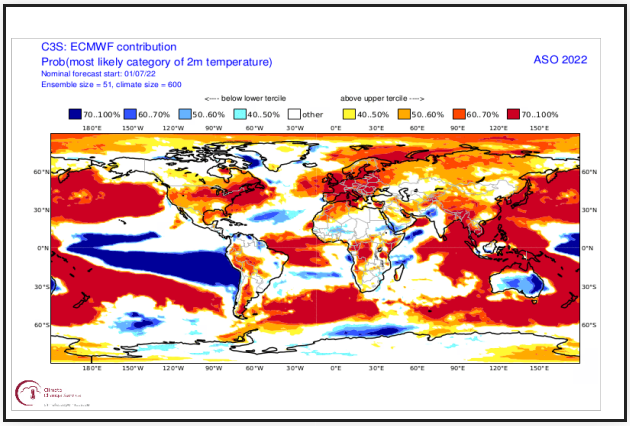
Impact of Summer Zonal weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

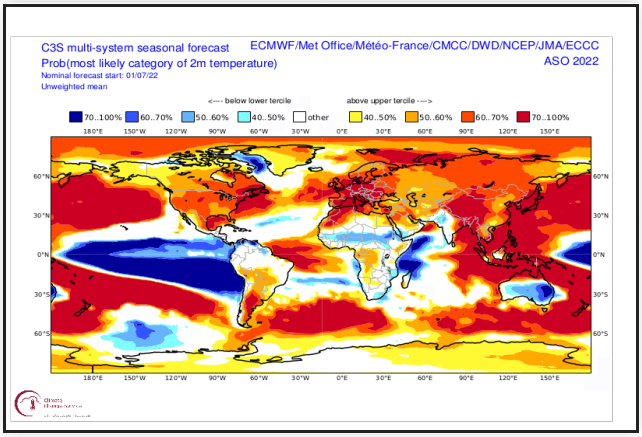
Forecast of climatic parameters : Temperature probabilities

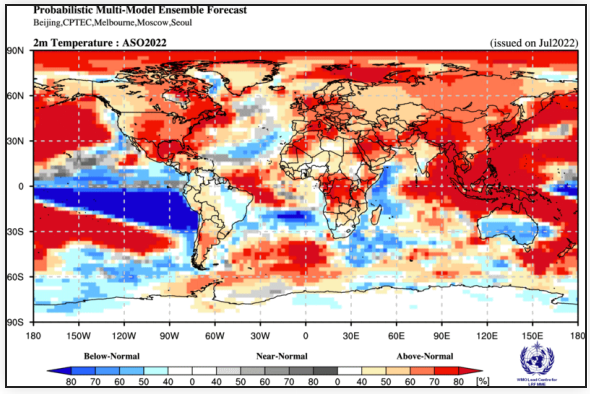
Good agreement between models.

The forecasts are close, both in the intertropics and in the mid-latitudes.





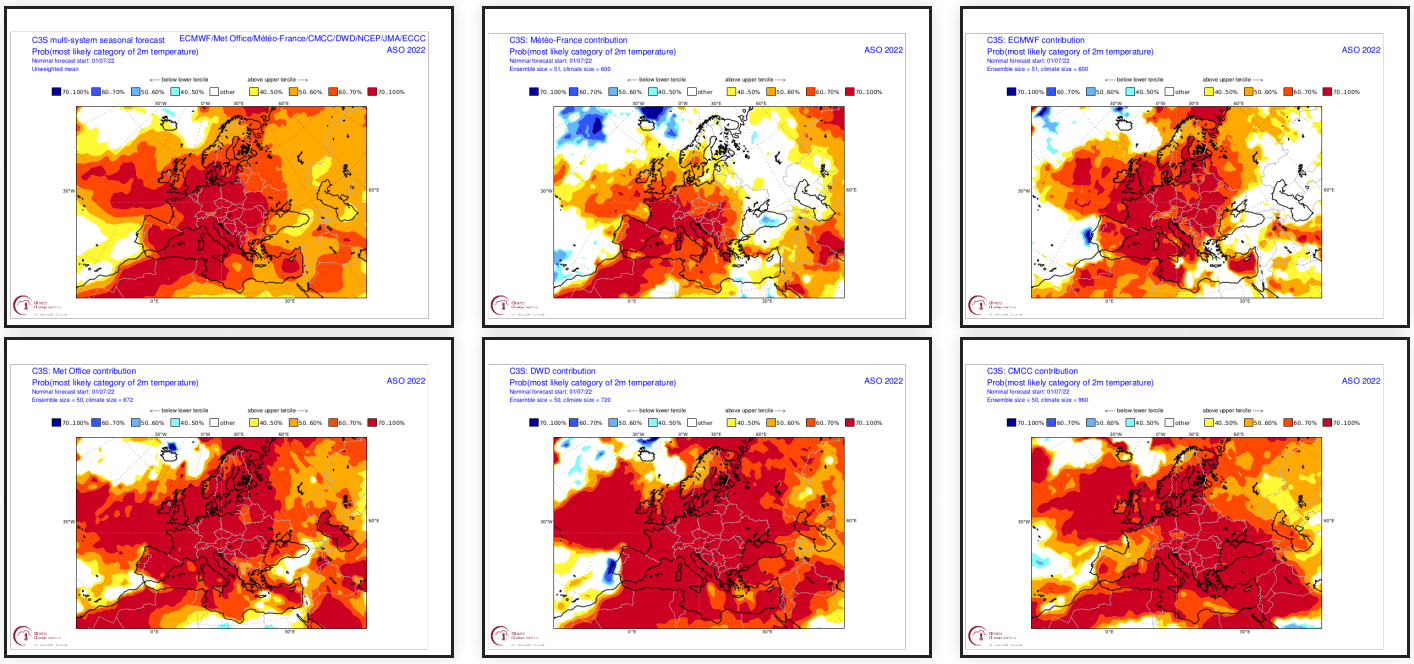




2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

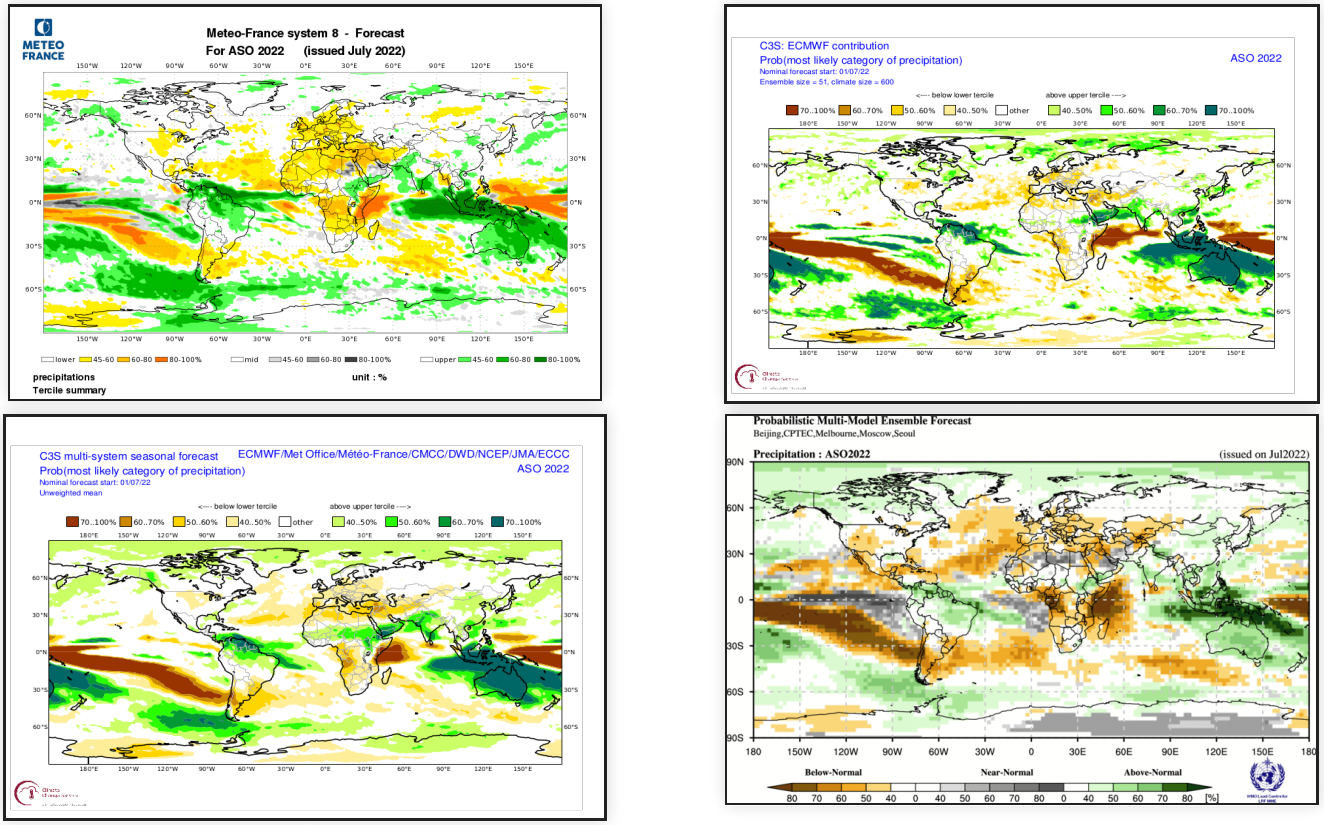
Over Western Europe and North Africa, the probability of being in the upper tercile is very high, in connection with the EA+ and, to a lesser extent, NAO+ modes of variability .



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

Forecast of climatic parameters : Precipitation

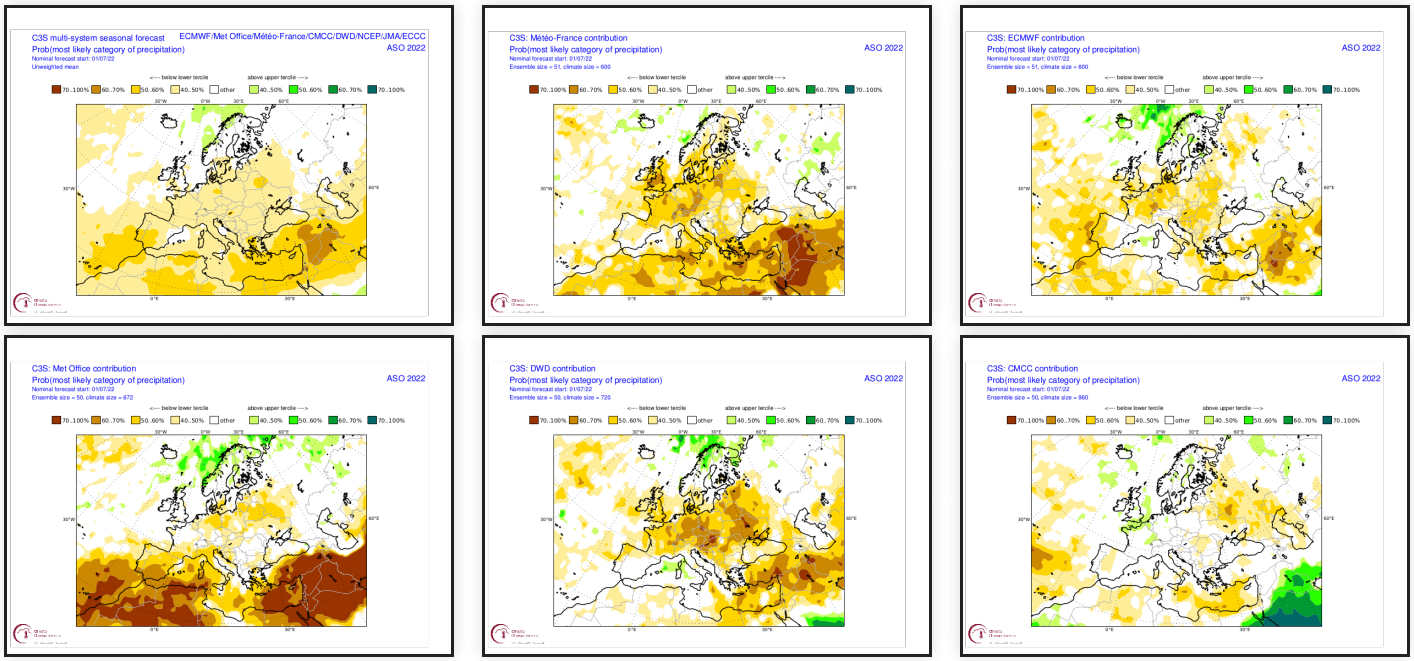
All models agree on the main anomalies related to the "la Niña" and negative IOD phenomena, especially in the equatorial zones and up to the tropics.
In Europe, the probability of being in the dry tercile is still dominant.



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

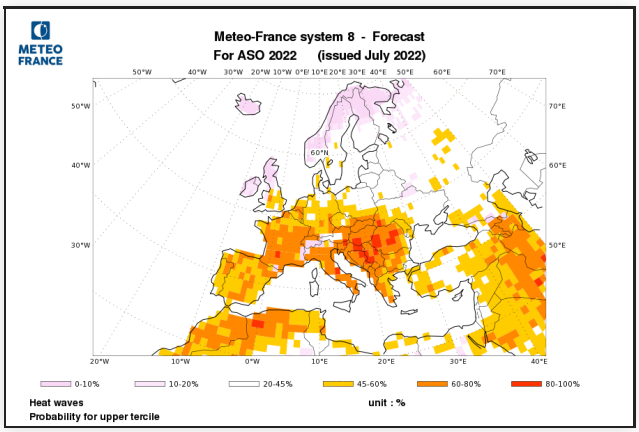
Only the dry signal over the Near East has a good consensus between the models.
Elsewhere, the models sometimes show significant differences. However, three of the main models (MF-S8, ECMWF-SAE5 and DWD) show a significant dry signal from France to Central Europe (impact of the NAO+ mode of variability).

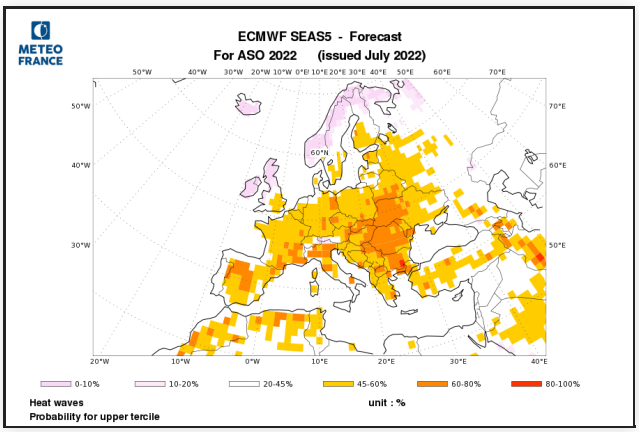


C3S multi-models probability map (top left) and MF-S8, SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Heat waves

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

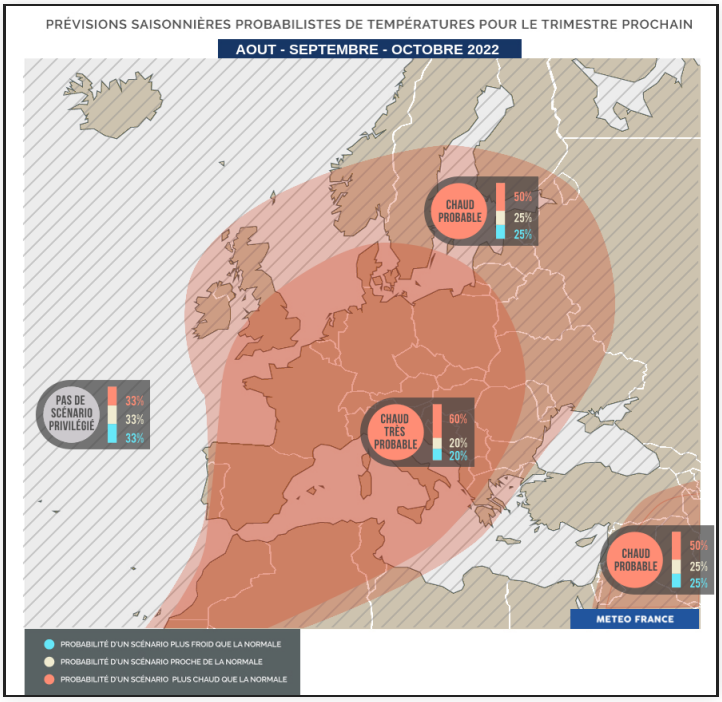




Heat wave probability for MF8 (right) and ECMWF (left). A heat wave is detected if the corrected T2M is above the daily 90th percentile and a fixed 20°C threshold. more details here

Synthesis map for Europe : Temperature

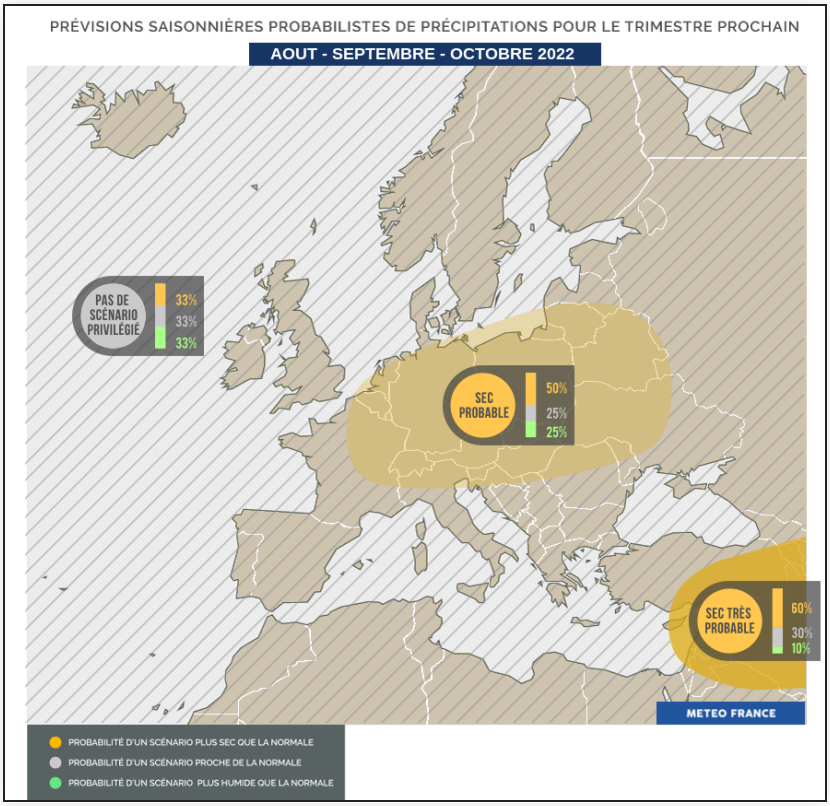
All models agree on a high probability of being in the warm tercile over the southern two-thirds of Europe, which is consistent with the NAO+ and EA+ modes of.variability.



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

Synthesis map for Europe : Precipitation

There are more differences between the models for precipitation, except over the Near East. For Europe, the scenario is based on the main models (MF-S8 and ECMWF-SAE5), consistent with the NAO+ mode.



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