VERIFICATION BULLETIN

JUNE - JULY - AGUST 2022

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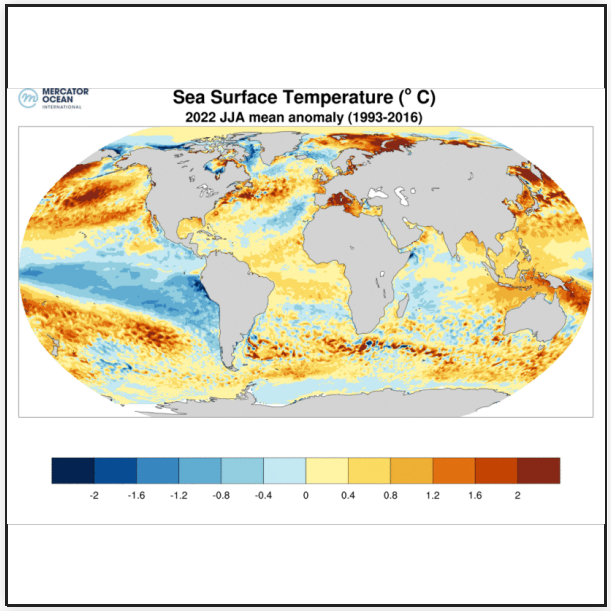
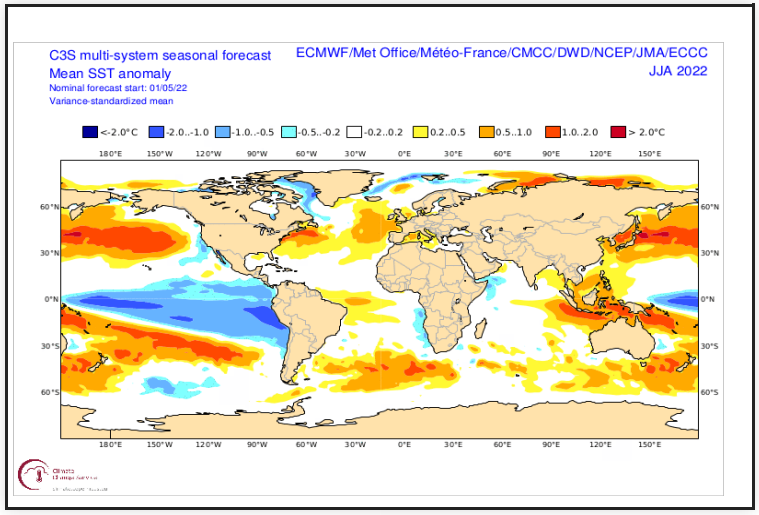
Introduction : Objective

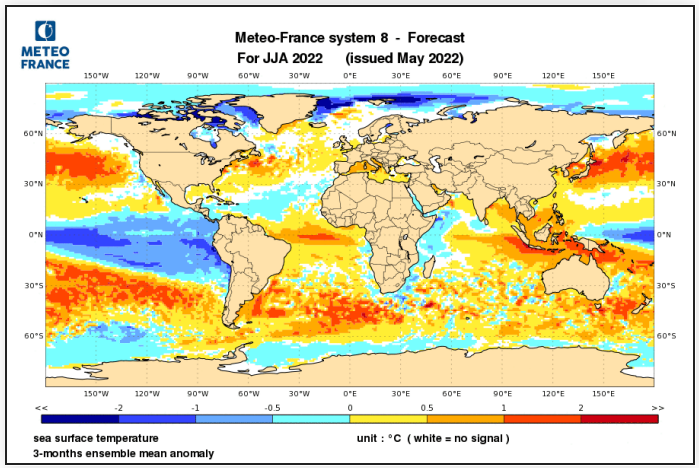
- **The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean Basin.**
- **The aim is not to evaluate the mean skill of Seasonal Forecast models, for which scores are calculated over the whole hindcast period, but to enhance the knowledge of the behavior of models for advanced users (as National Meteorological Services), in parallel with an assessment of expertised forecast. This approach meets the need of many users, who want to know the recent real-time performances of forecasts, for specific events.**
- **Thanks to Mercator-Ocean and DWD (RCC-Climate Monitoring node for Europe) for providing products and analysis on the monitoring part.**

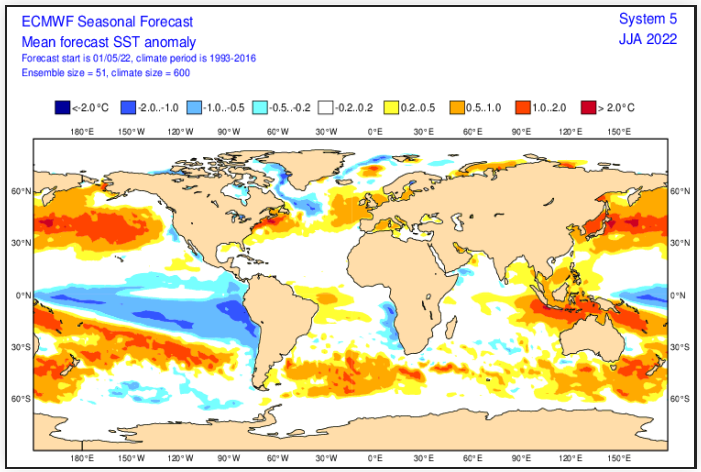
Oceans : surface temperature anomalies

In the Pacific Ocean, the main anomalies, related to "La Niña" and PDO-, are well predicted by both models, both in location and intensity.
In the other two oceans, Indian and Atlantic, the forecasts are also confirmed by the analysis. In the North Atlantic, the warm anomaly (from the American coasts to Europe) and the small cold anomaly around Greenland are present. In the equatorial Atlantic, the warm anomaly of MF-S8 was exegerated. In the Indian Ocean, the West-East dipole was correctly predicted.







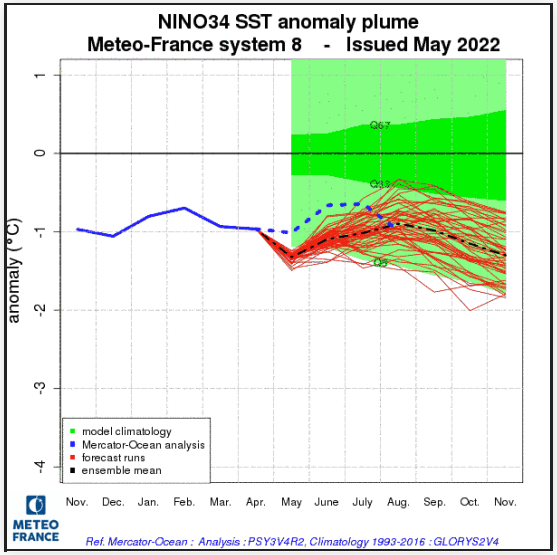


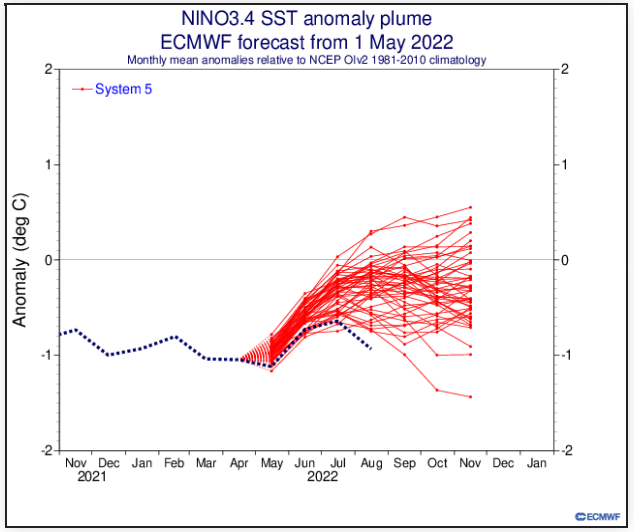
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

CAUTION : reference analyses differ between MF-S8 (Mercator-Ocean 1993-2016) and ECMWF-SEAS5 (NCEP 1981-2010).

Quite good forecasts, even if the observation is at the border of the ensemble spread for each model (underdispersion). The weakening of the index was well predicted.

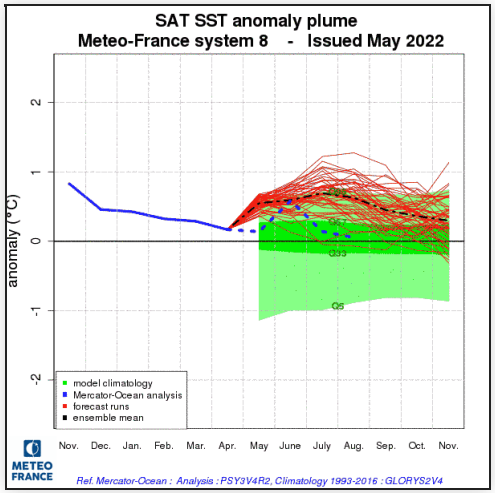


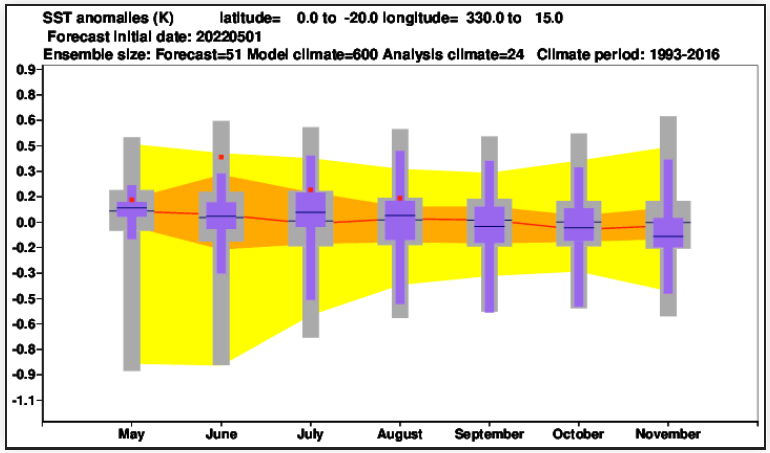


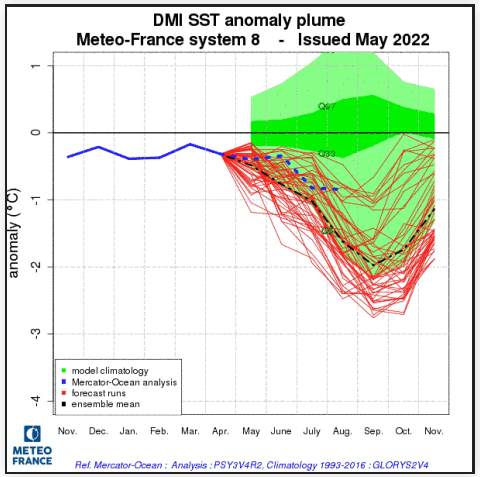
Oceans : tropical Atlantic and Indian Ocean index

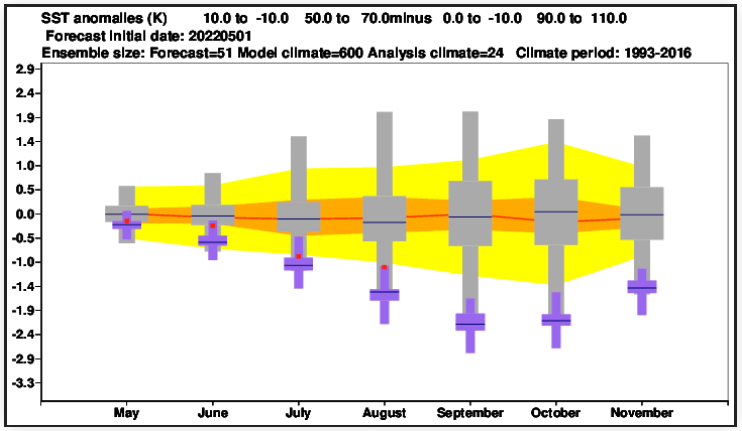
SAT : MF8 too warm on average over the quarter

DMI : Rather good forecast for both models (sign and trend)



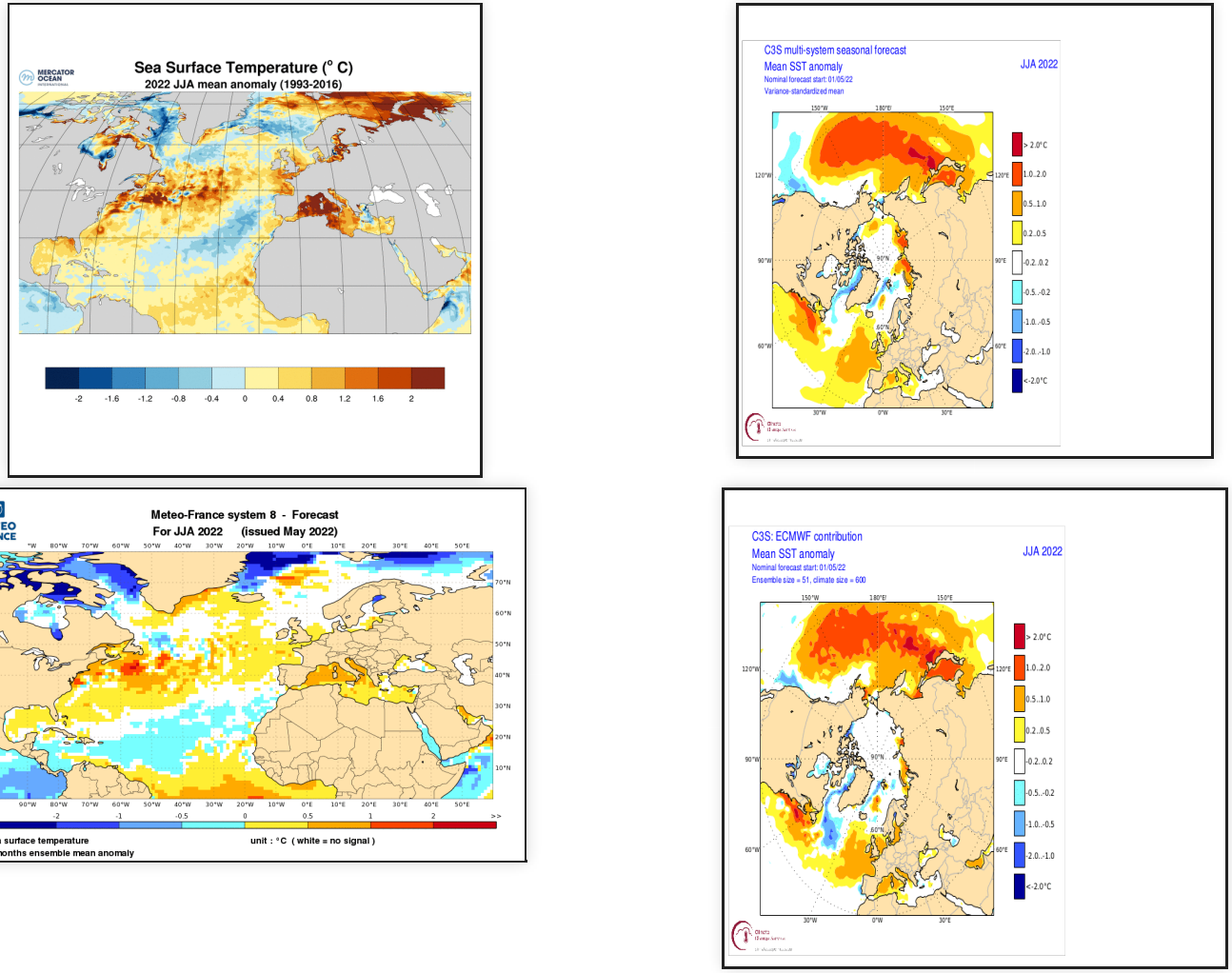






Oceans : North Atlantic SST

In the North Atlantic, the warm anomalies between the USA and Europe, as well as the cold anomaly around Greenland, are well seen by the ECMWF-SEAS5 model. The warm anomalie in the Barents Sea and the Kara Sea wasn't predicted by models.
The extremely warm anomaly of the Mediterranean Sea was underestimated by models (MF-S8 better than ECMWF-S5)

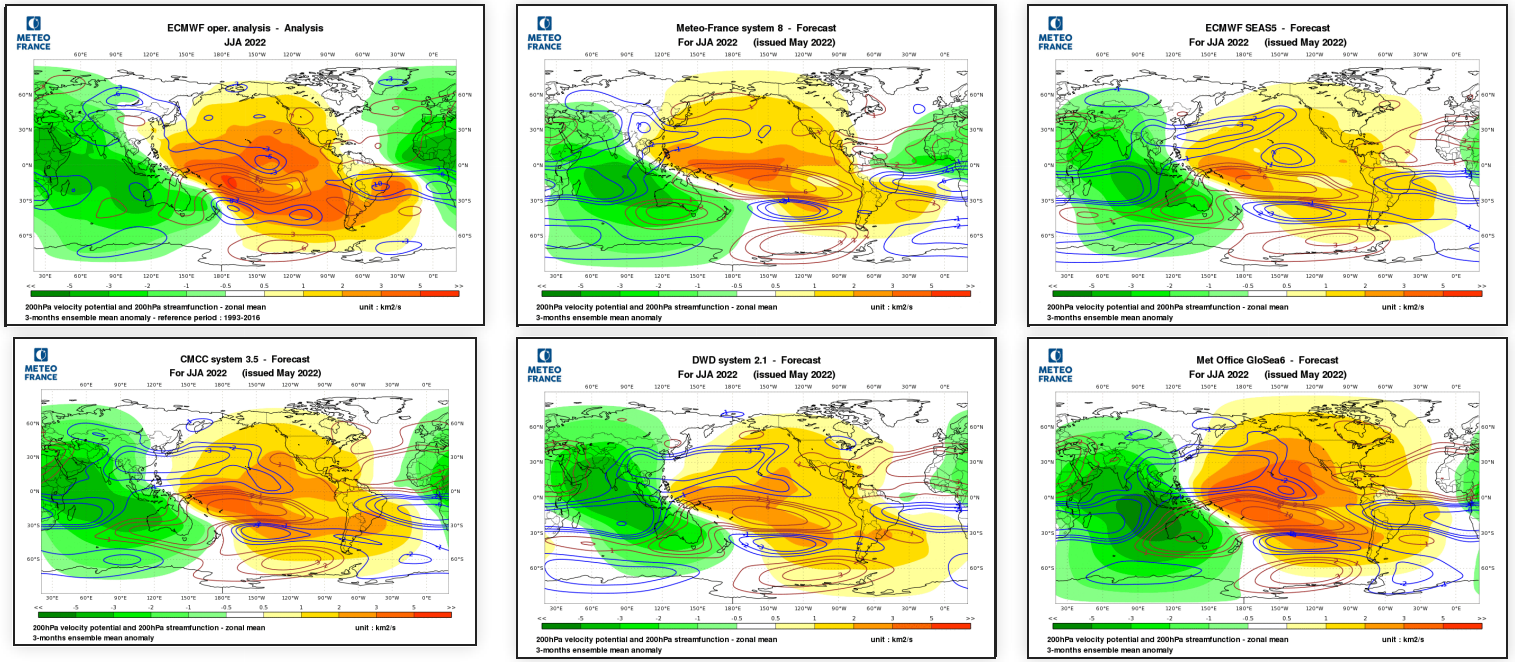


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : The large scale dipole (downward motion anomaly over the Pacific and upward motion anomaly over the Maritime Continent), typical of "La Niña", was very well predicted by all models.
The extension of negative anomalies over West Africa was correctly predicted.

SF : in the tropics, the dipoles on both sides of the equator on the Pacific and Atlantic Oceans were well predicted. In the western part of the Indian Ocean there is a trace of dipole, comparable to the signal present in the models (NB : we have to keep in mind that isolines are different in the models and in the analysis). No clear trace of teleconnection to mid-latitudes in northern hemisphere in contrast to the southern hemisphere.

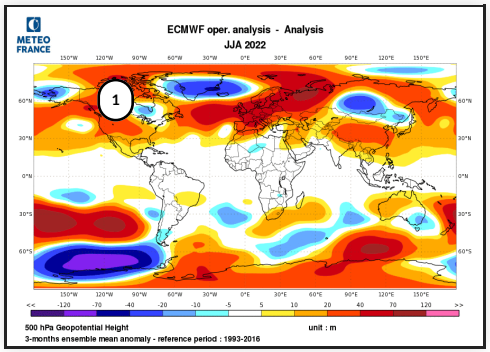


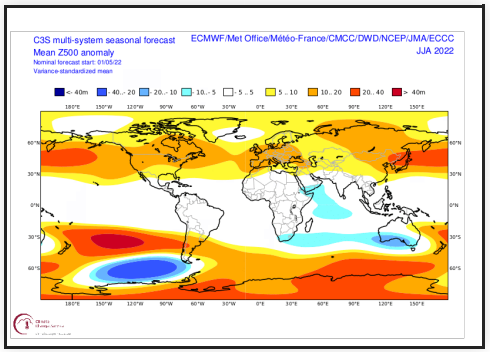
ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

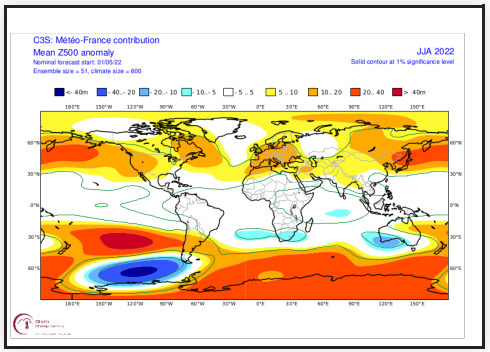
Atmospheric circulation : 500hPa Geopotential height

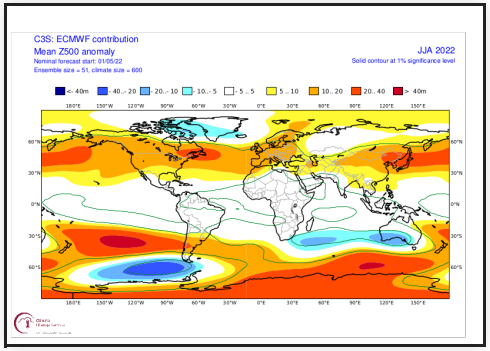
In North America, the PNA- pattern forecasted by all the models, linked to "La Niña", is present in the analysis (unless there are "small" scale patterns in the analysis, for instance the minimum in the Gulf af Alaska or near the Great Lakes)

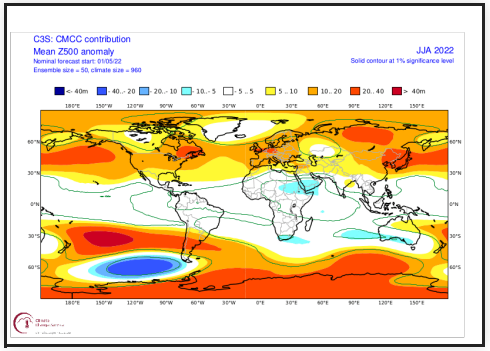
Over the North Atlantic, the positive anomaly extending from the USA to Europe was globally predicted by models as well as the negative anomaly around Greenland . The dipole over Russia wasn't forecasted by models.

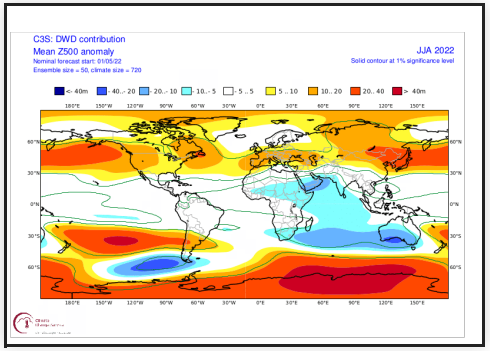












ECMWF analysis, C3S multi-system, MF-S8, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

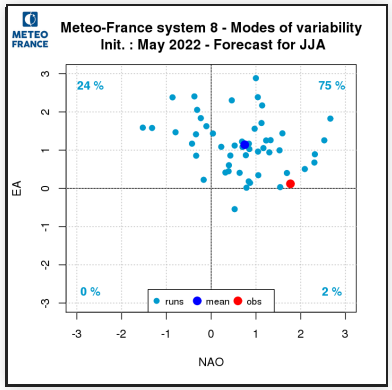
1 - Look like PNA -

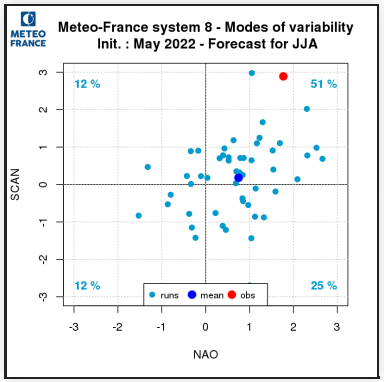
Atmospheric circulation : Modes of variability

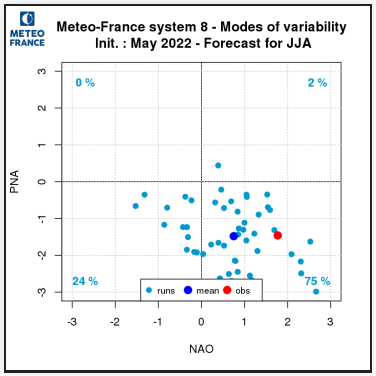
Both models predicted a positive NAO and a negative PNA (in link with La Nina) with a good confidence, this is what happened.

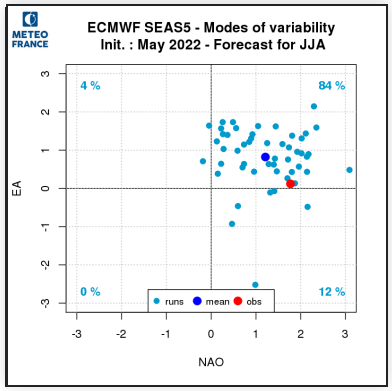
There wasn't a clear signal for SCAN (high uncertainty) while the observation has a very high value (index close to 3)

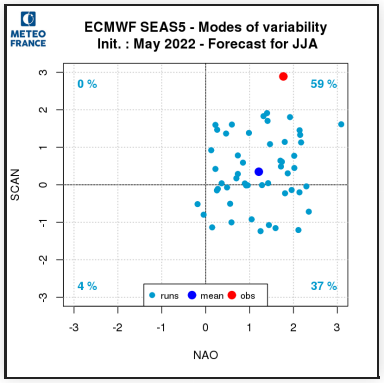
Concerning EA, the analysis is close to 0, whereas models predicted a positive EA.

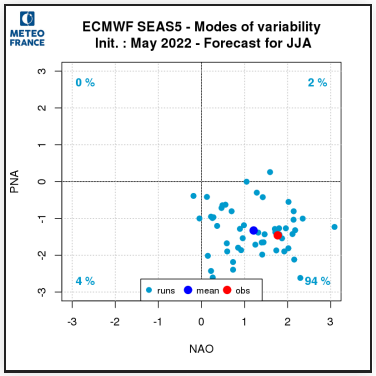






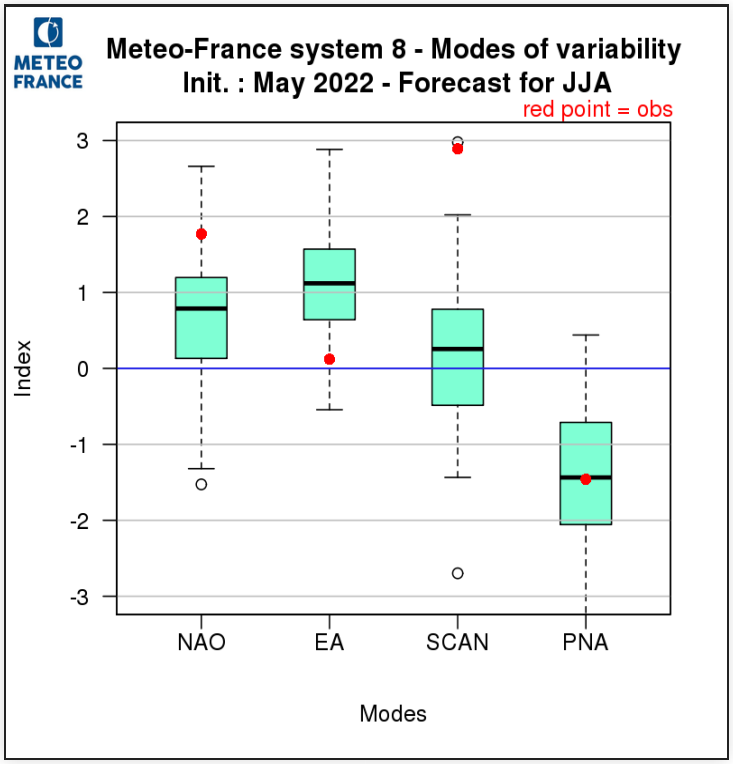


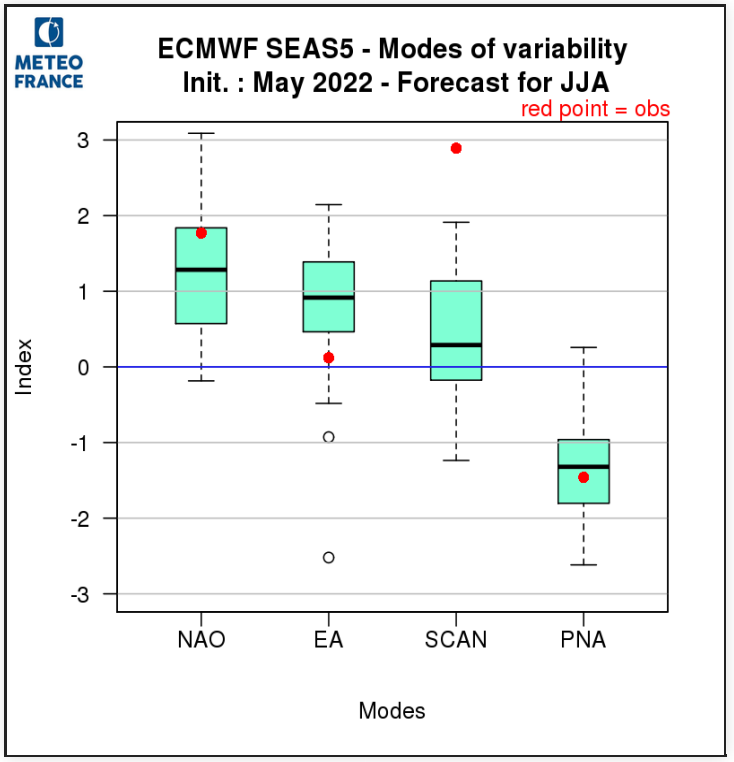




Atmospheric circulation : Modes verification

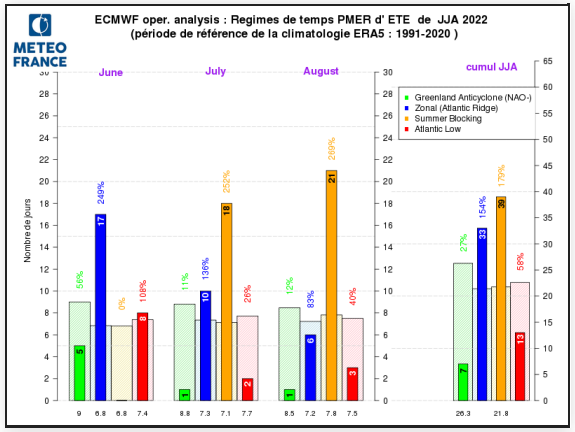
Same observation as for the previous slide

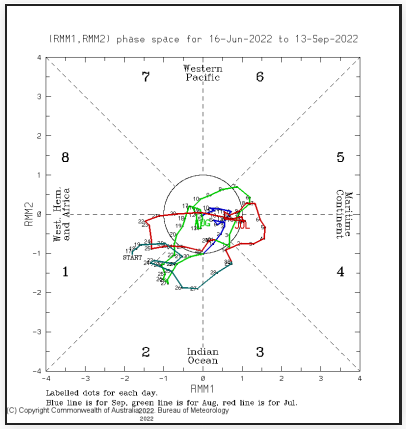


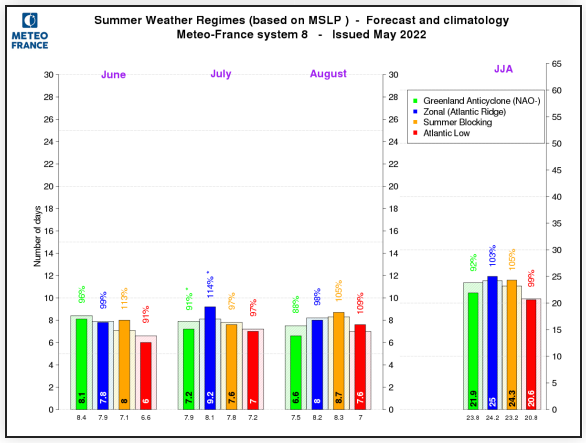


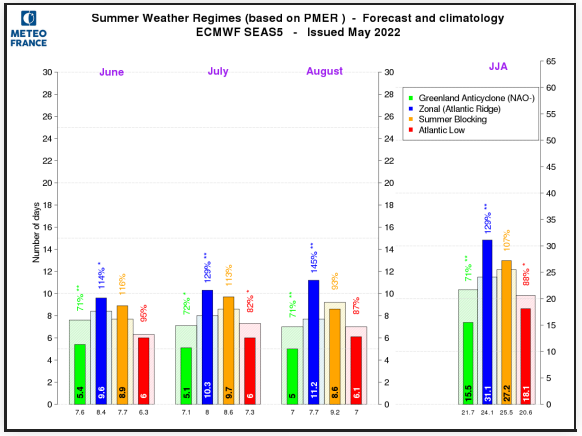
Atmospheric circulation : Summer SLP weather regimes

The Zonal regime and Summer Blocking are largely dominant, which was suggested qualitatively by both models, even if the difference in climatology was not always significant.







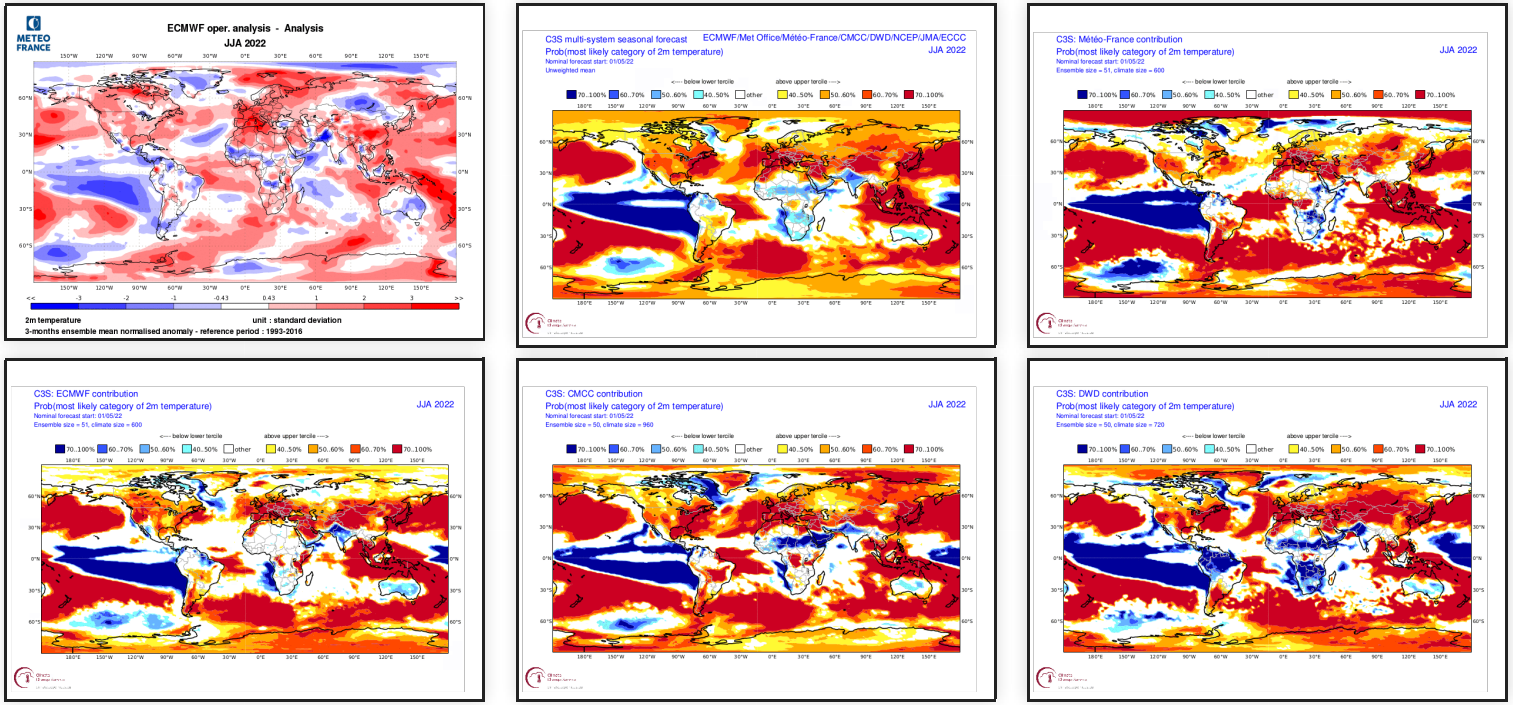


weather regime : ECMWF analysis top left, MF8 and ECMWF forecasts at the bottom. MJO phase top right

Climatic parameters : temperature on the globe

In North America, the pattern of warm anomaly was well predicted.

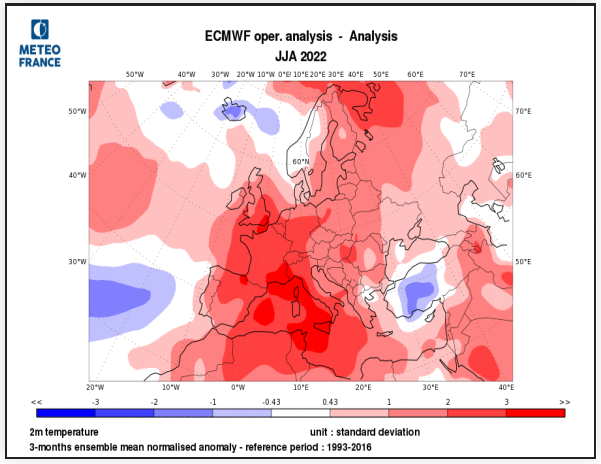
Over Europe and Asia, most of the models forecasted high probabilities (>60%) for the warm tercile over many region : this was a good forecast for many countries, except Central Russia who registered negative anomalies.

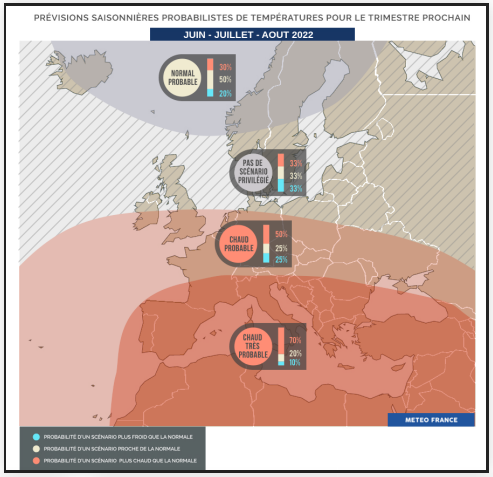


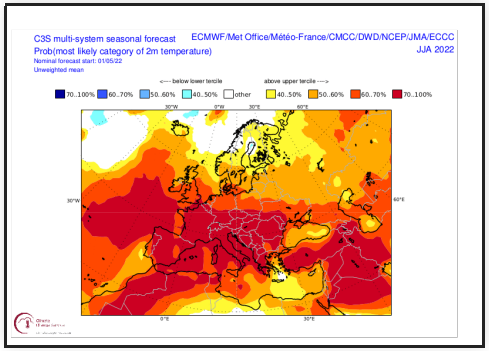
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S8 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

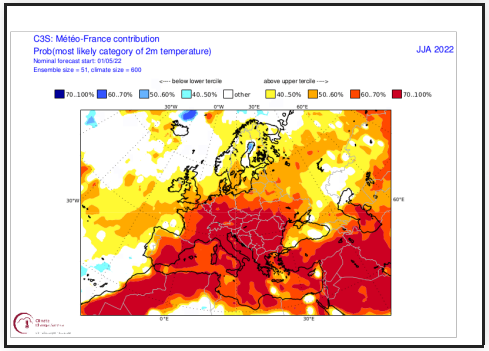
Climatic parameters : temperature over Europe

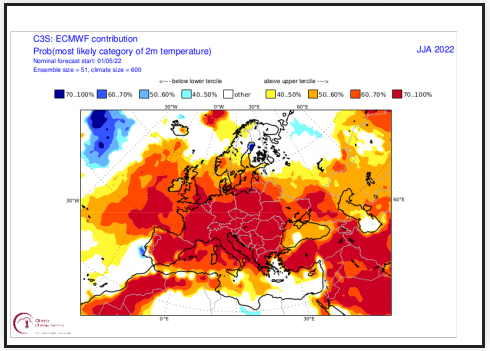
The warmer-than-normal scenario effectively occured on almost all European countries while the forecast favors a warm scenario over a large southern part of the continent.







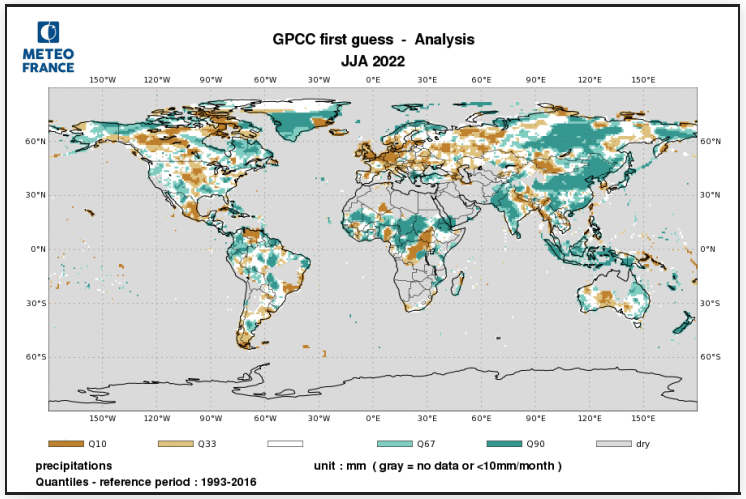


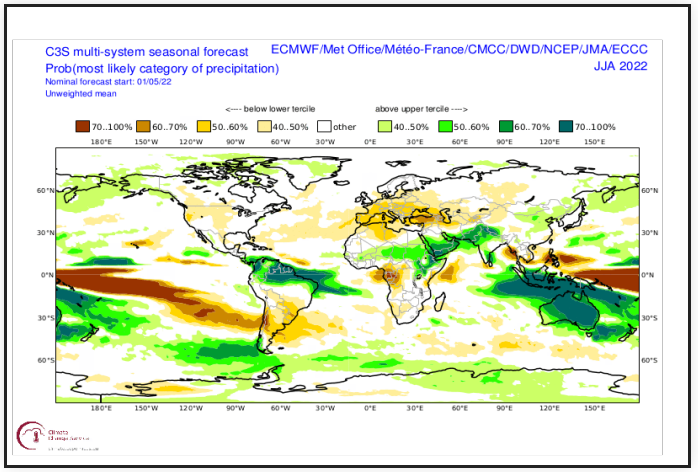


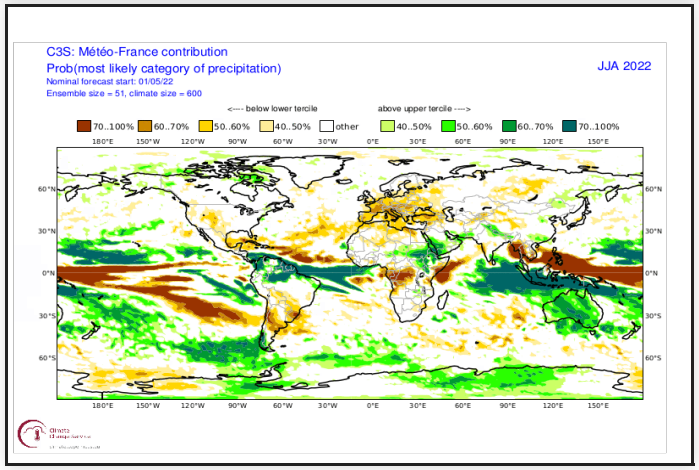
ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S8 and SEAS5 on the bottom line.

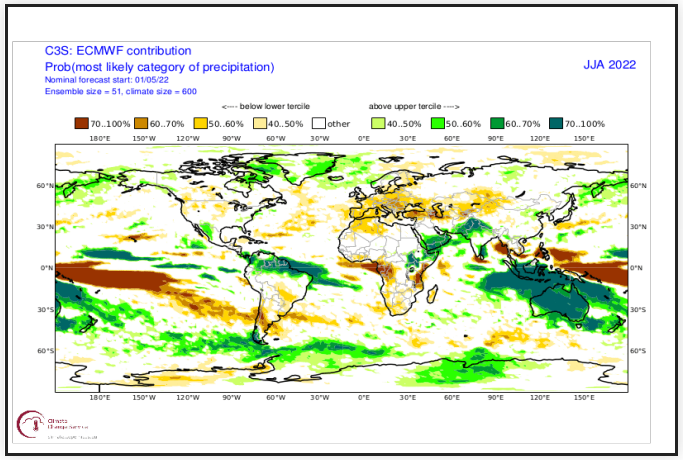
Climatic parameters : Precipitations over the globe

The forecasts were quite good for the Maritime Continent, Asia and Europe.









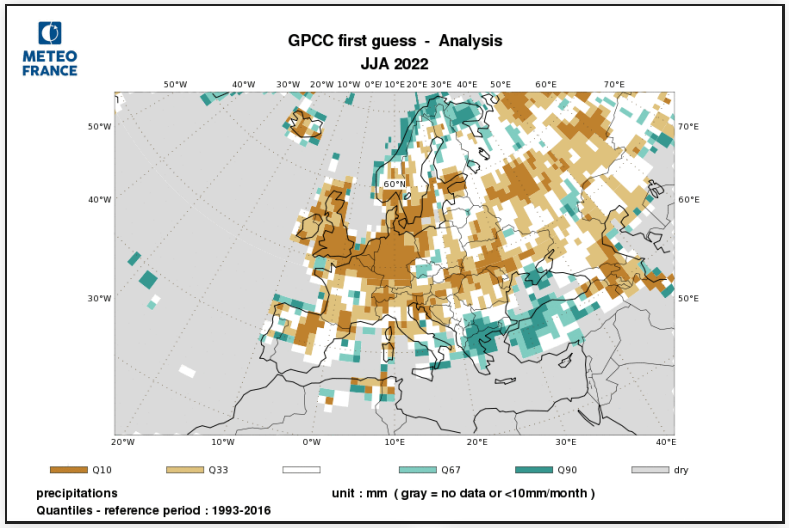
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S8 and SEAS5 on the bottom line.

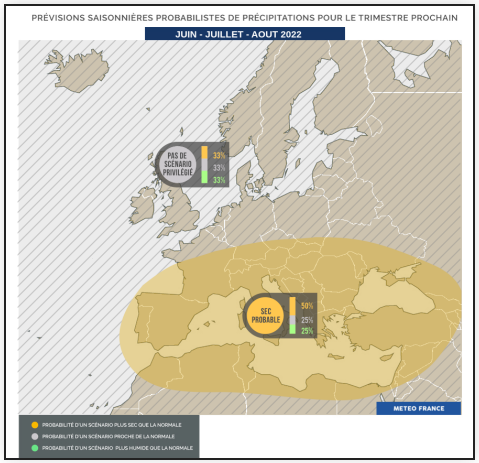
Climatic parameters : Precipitations over Europe

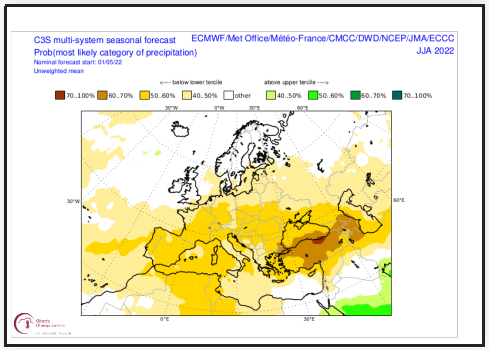
The drier-than-normal area was centred over Europe, whereas wet conditions were observed from Greece to Turkey.

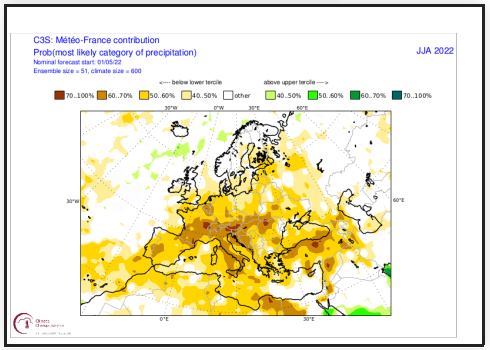
In the models, the stronger dry signal extended along the Mediterranean Sea, so there was a significant shift.

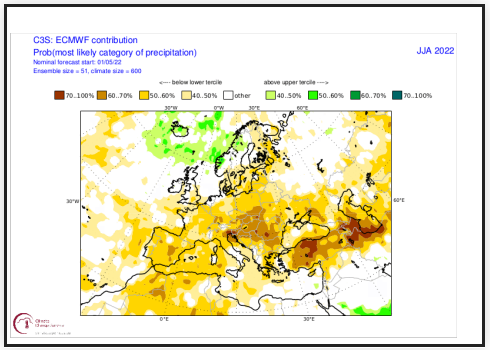
Anyway, the information presented in the synthesis map was globally correct, except around Turkey.











Precipitation anomalies analysed by IRI (top left). Synthetic forecast map for precipitation (top right) and forecast for multi-model,MF-S8 and SEAS5 (on the bottom line).

General summary : for the period JJA 2022

1) **Oceans :**

The main SST anomalies were well predicted by the models, in the Pacific Ocean (linked to "La Niña" and PDO-) but also in the Atlantic and Indian Oceans.

The forecast of the evolution of the different ocean indexes is correct overall.

2) **Large scale atmospheric circulation :**

VP 200 hPa : very good forecast for the Pacific and Indian Oceans. In the Equatorial Atlantic, there were different scenarios in the models.

SF 200 hPa : The equatorial dipoles were correctly forecasted. No clear teleconnexion visible in the analysis.

Z500 : The forecasts are globally correct in the North Hemisphere, although the negative anomaly over Eastern Europe was not really anticipated (only relative low in Z500 anomaly fields)

3) **Climatic parameters over Europe :**

Temperatures :They were warmer than normal over almost all of Europe while forecasts favored warm scenario over a large half southern half of Europe

Precipitations : The drier scenario expected over most of Europe is well forecast. As for temperature, the forecast around Turkey was not correct.