

VERIFICATION BULLETIN

SEPTEMBER - OCTOBER - NOVEMBER 2023

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Introduction : Objective

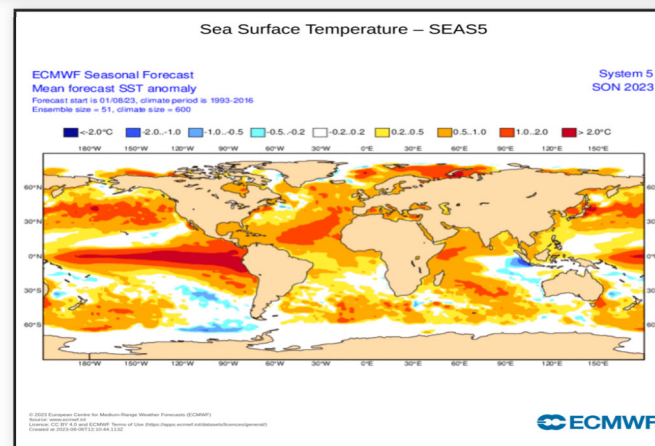
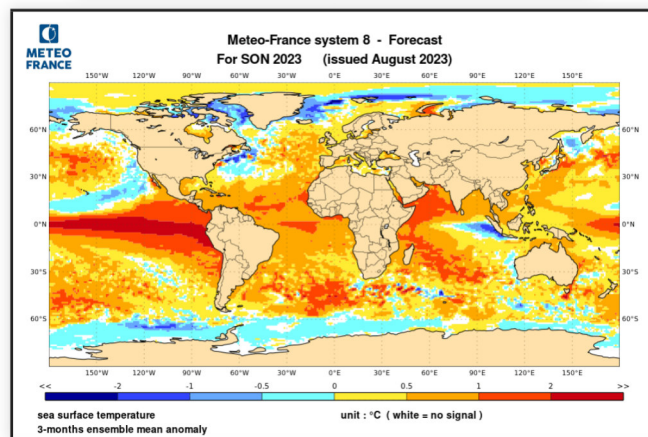
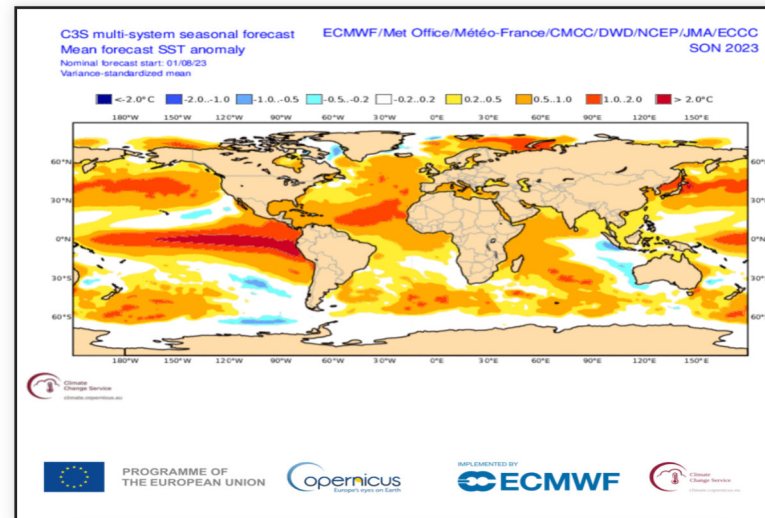
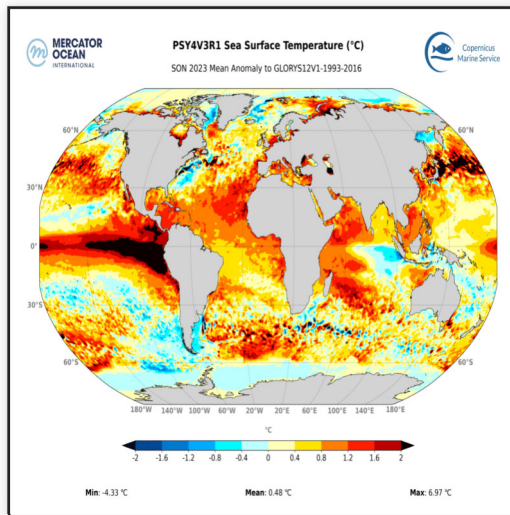
- The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean 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 strong positive anomaly over the eastern equatorial basin and the PDO- pattern over the northern hemisphere are well seen by the model.

In the Indian Ocean, the east-west gradient (cold anomaly near Indonesia and strong warm anomaly to the west) is well anticipated.

In the Atlantic Ocean, the warm anomaly from the equator towards the northern tropic and Europe is well seen by the models, particularly ECMWF.

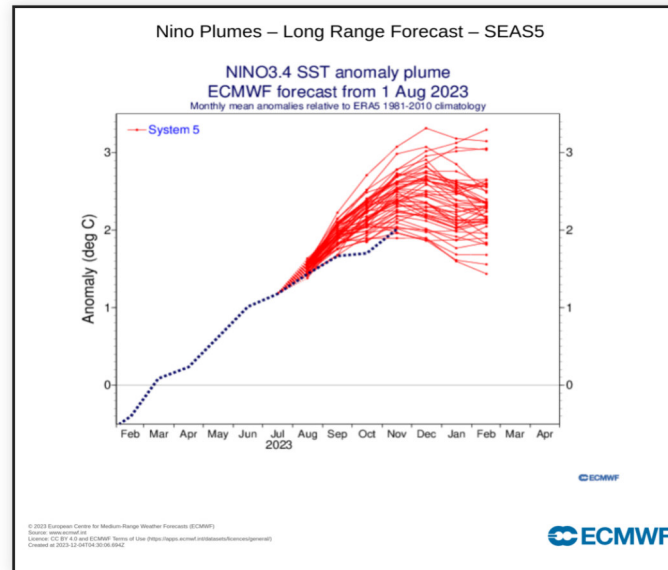
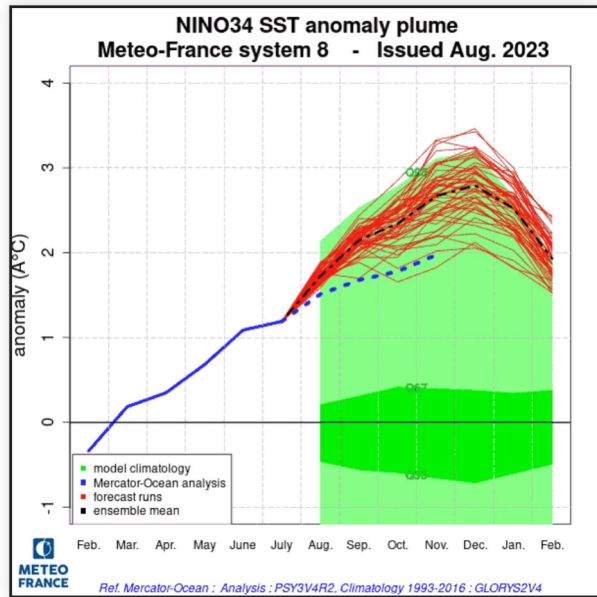


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

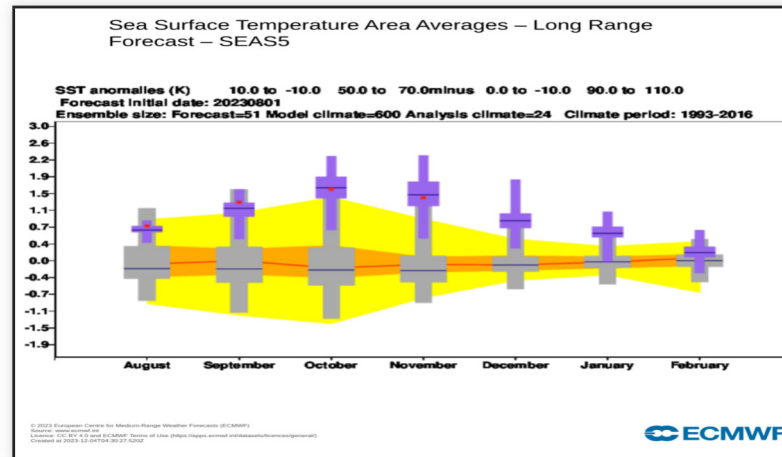
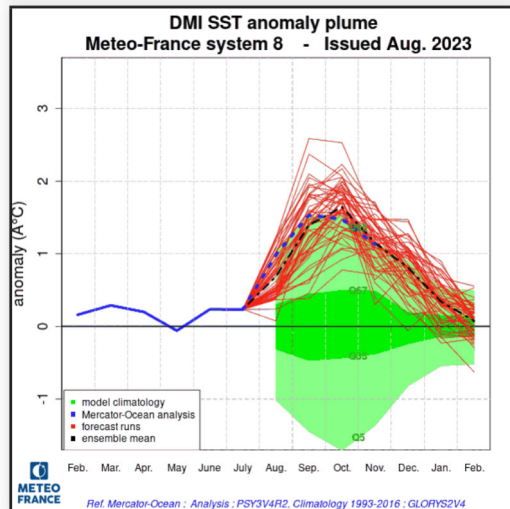
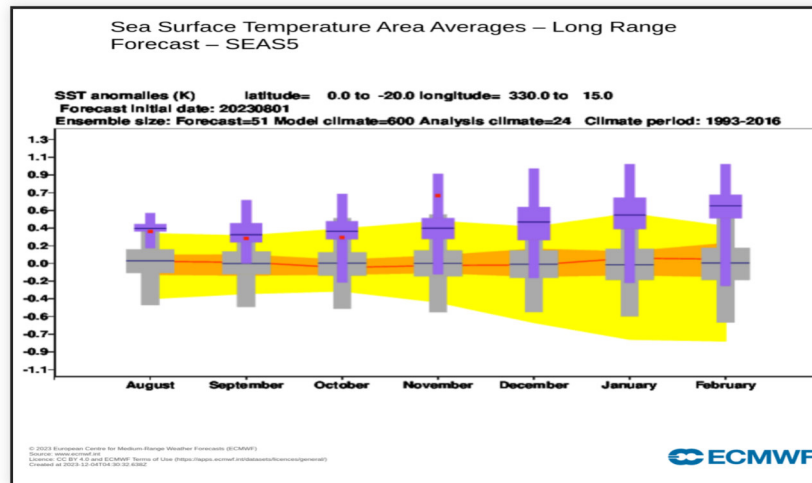
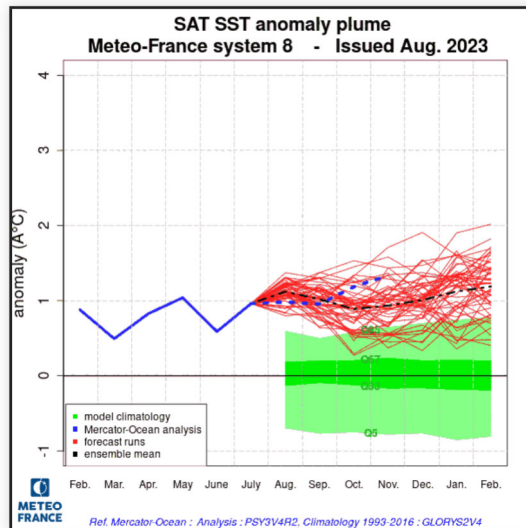
Both models predicted a too rapid increase in the Nino3.4 index.



Oceans : tropical Atlantic and Indian Ocean index

SAT : The trends predicted by both models are généralement correct.

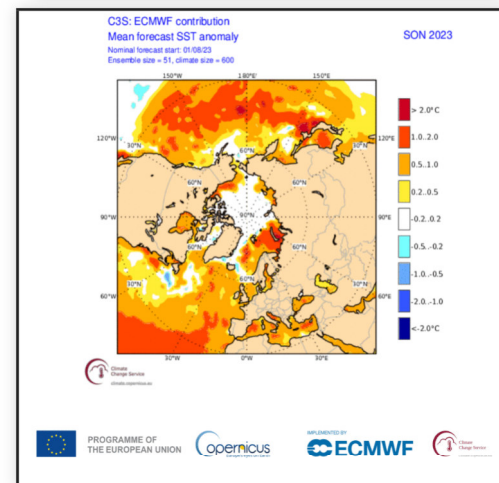
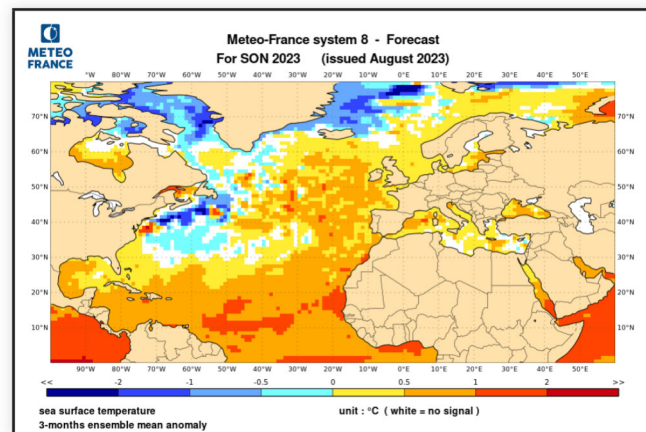
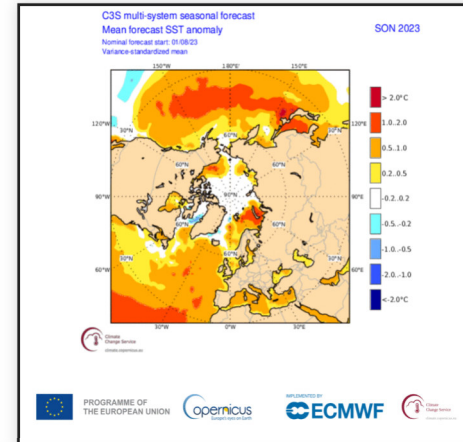
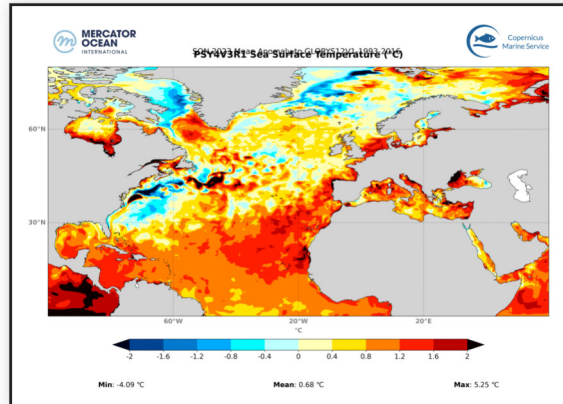
DMI : The evolution of the DMI index is very well estimated by the models (increase then decrease).



Oceans : North Atlantic SST

In the North Atlantic basin, ECMWF is closer to analysis than MF-S8, especially from the Canaries to Europe where MF-S8 is a little too cold.

In the Mediterranean, here too, ECMWF is better because MF-S8 has underestimated the warm anomaly.

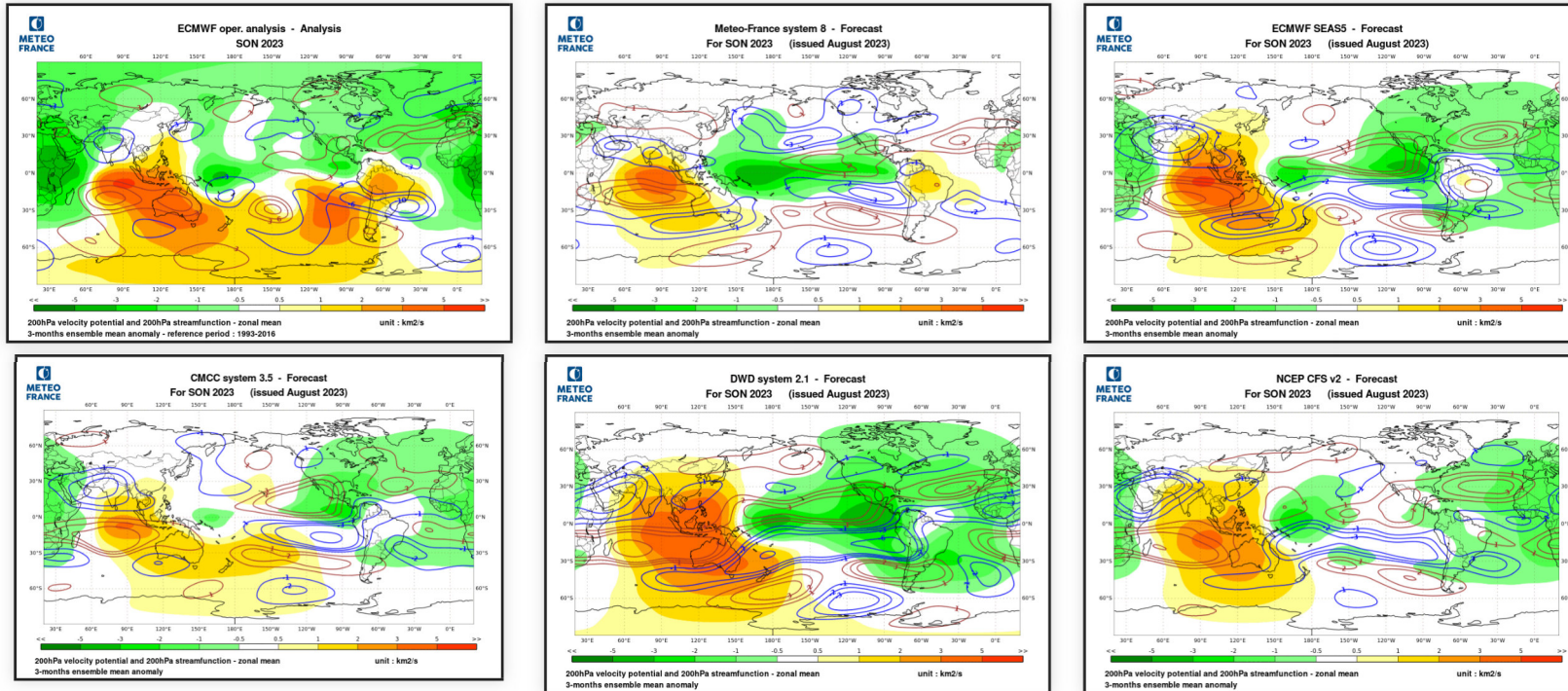


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : The Indian Ocean dipole was well forecast by most models. The pattern over the South Pacific Ocean was not predicted.

SF : Teleconnections to the Northern Hemisphere are very attenuated. Those towards North America outlined by certain models are visible on analysis. Over Europe, the anticyclonic curvature from the Caribbean to the Mediterranean is predicted by the models, albeit underestimated. On the other hand, the cyclonic curvature further north has not been forecast.

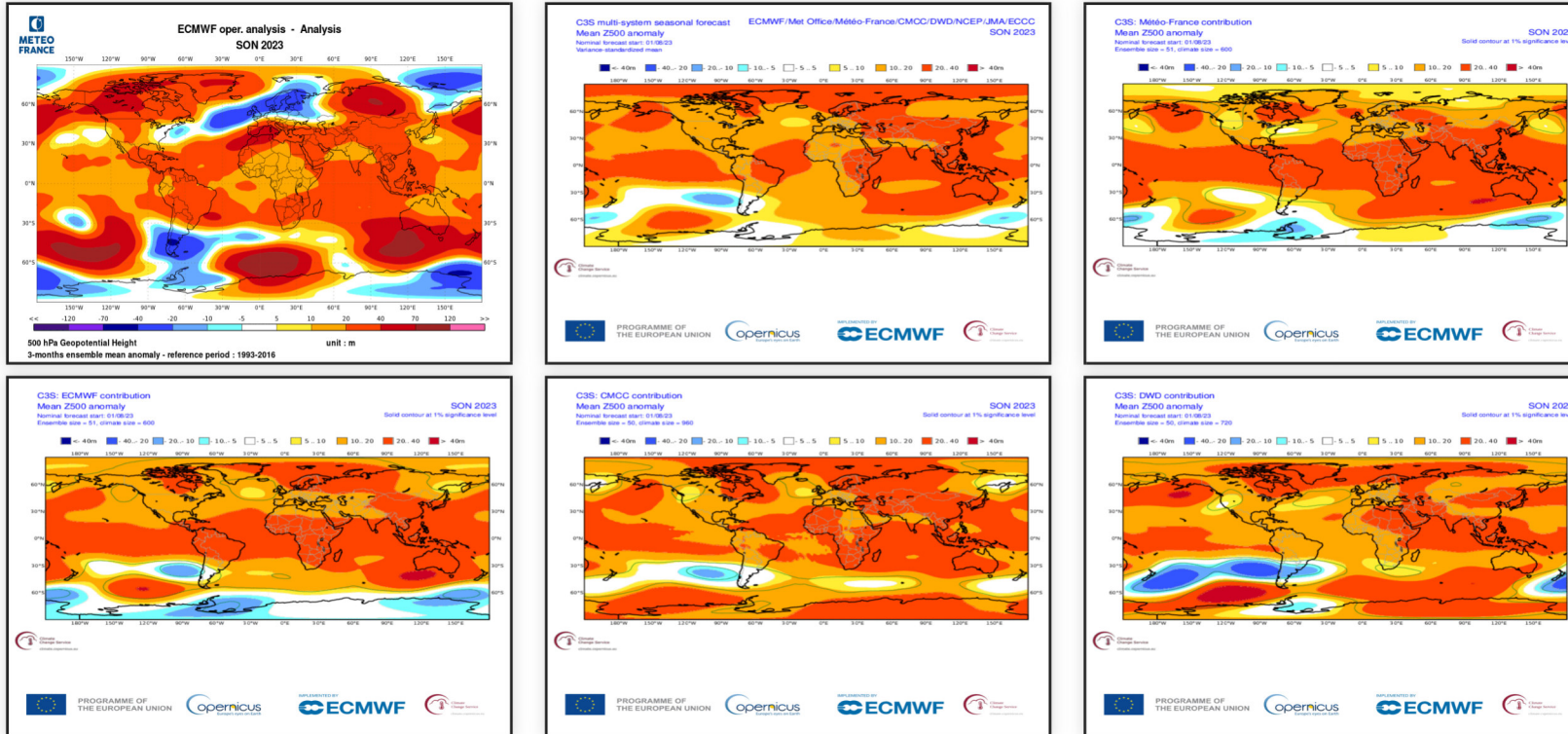


ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange : subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation : 500hPa Geopotential height

Southern Hemisphere : The main patterns are well foreseen.

Northern Hemisphere : In connection with the cyclonic curvature at 200 hPa over northern Europe, a marked negative anomaly in Z500 from eastern Newfoundland to Scandinavia, associated with a positive anomaly over the Mediterranean Basin and another over Russia, a pattern not predicted by the models.



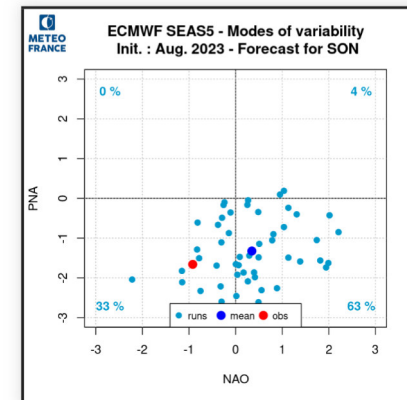
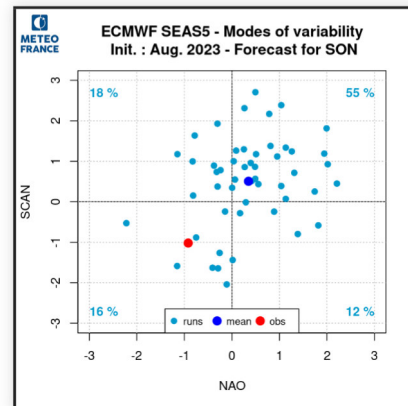
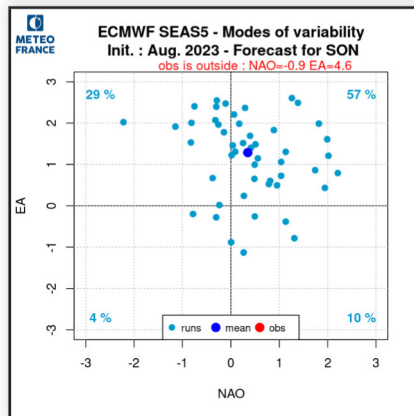
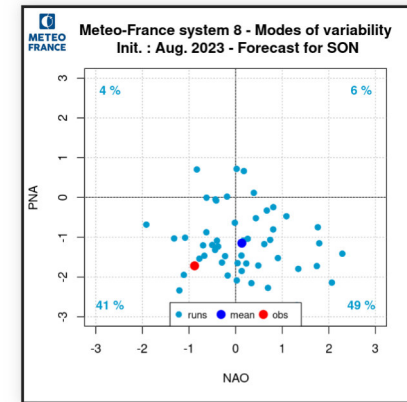
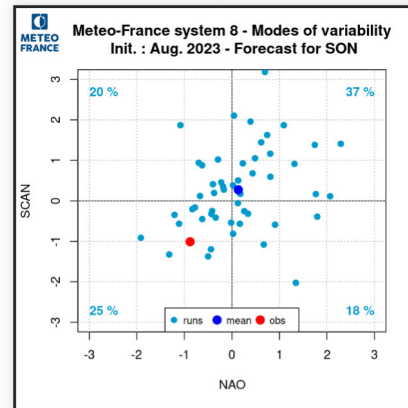
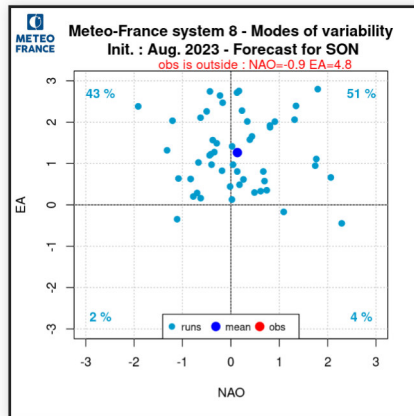
ECMWF analysis, C3S multi-system, MF-S8, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

Atmospheric circulation : Modes of variability

The EA+ modes were foreseen but clearly underestimated with a very high index (+4.8).

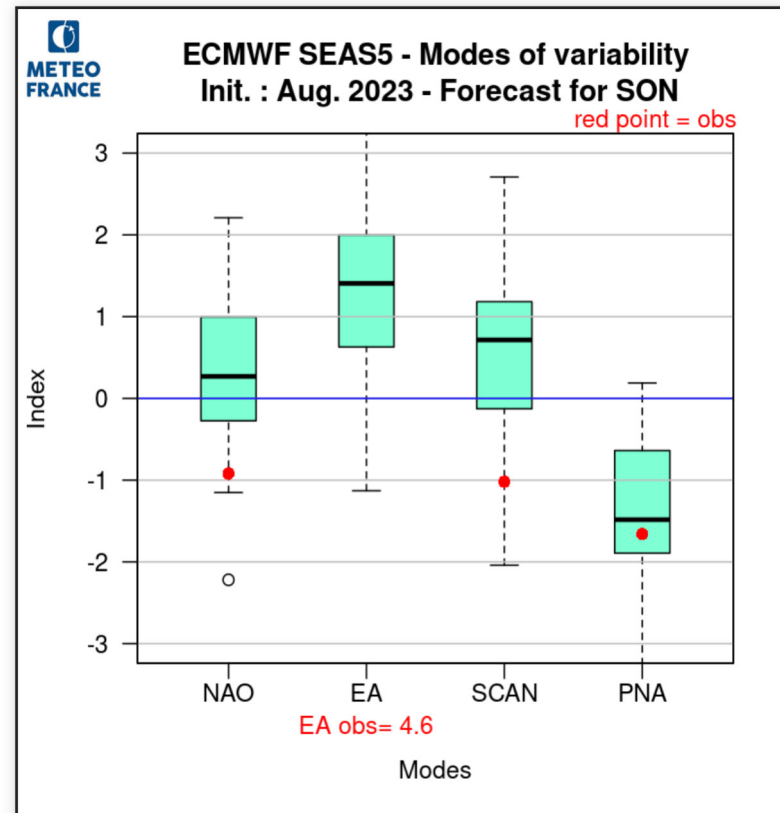
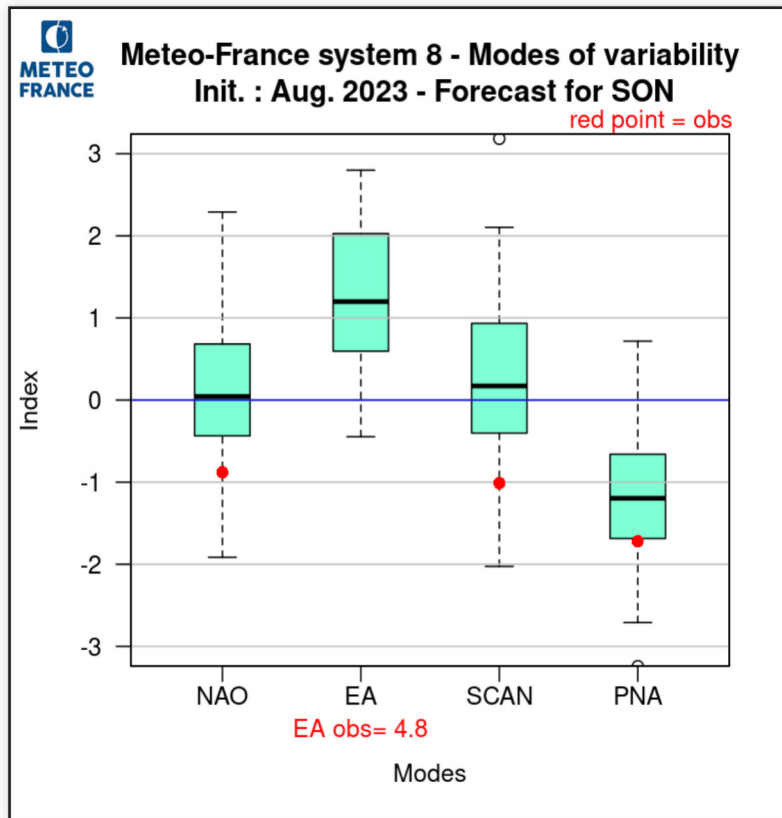
The SCAN and NAO modes, slightly positive for the models, are negative for the analysis.

The PNA mode is well forecast.



Atmospheric circulation : Modes verification

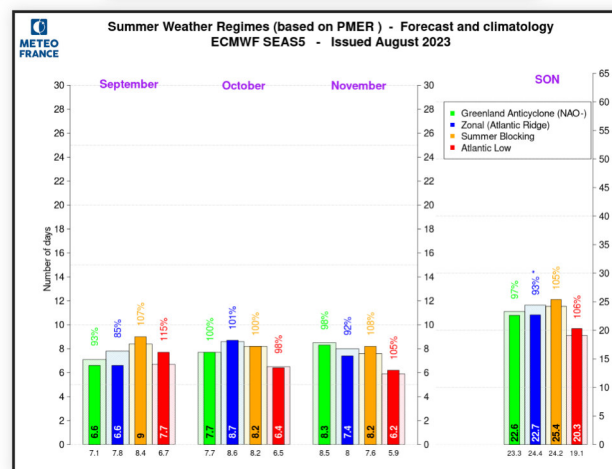
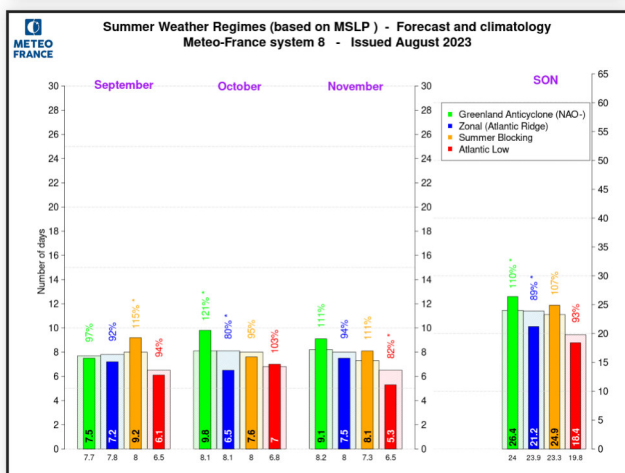
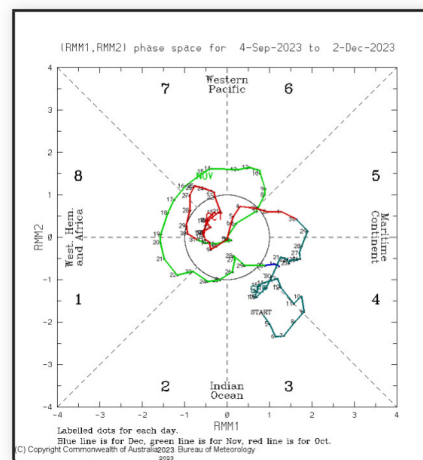
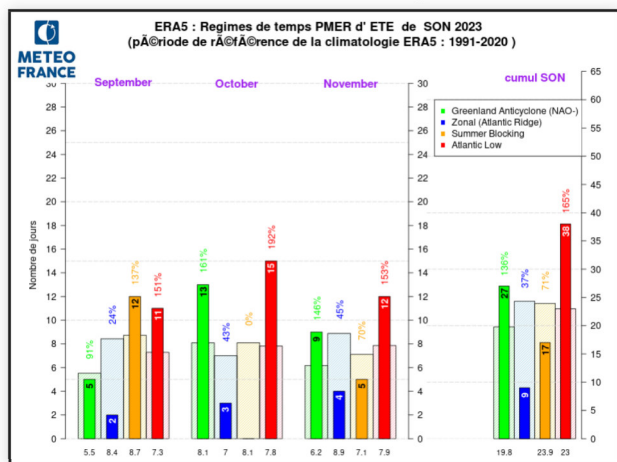
Same observation as for the previous slide



Atmospheric circulation : Summer SLP weather regimes

The Atlantic Low regime dominates every month, followed by the NAO- one in October and November. Over the quarter, these two regimes dominate by far, to the detriment in particular of the Summer Blocking regime.

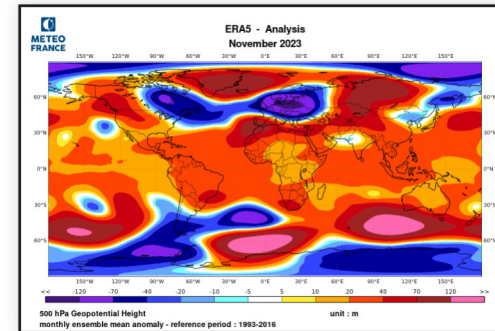
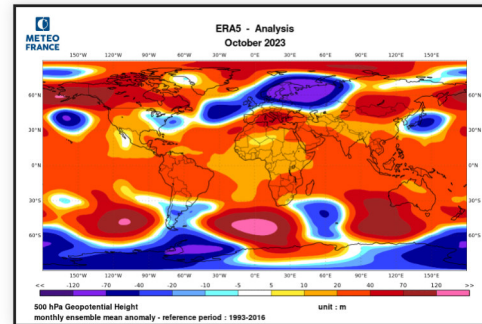
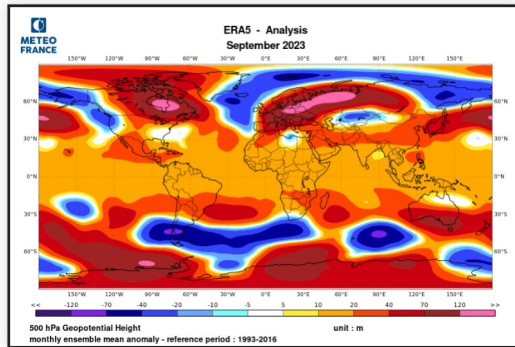
This under-representation of the latter regime is the only characteristic seen by the models.



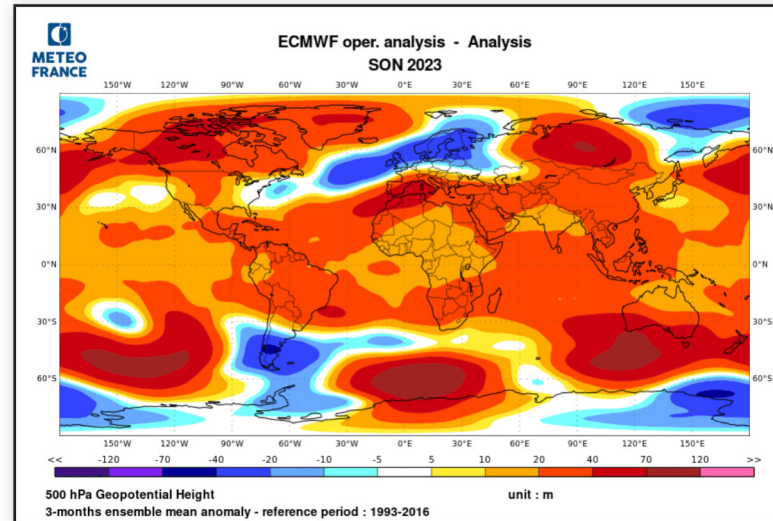
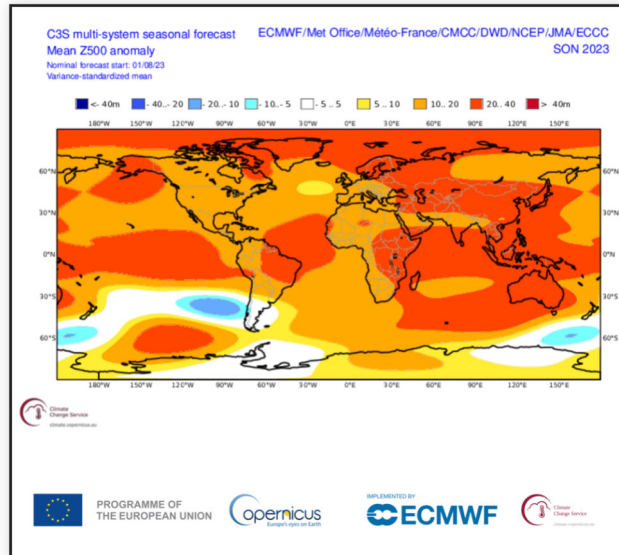
weather regime : ECMWF analysis top left, MF8 and ECMWF forecasts at the bottom. MJO phase top right

Atmospheric circulation : Variability within the quarter

The monthly analysis of atmospheric circulation shows the change in circulation that took place in October, particularly over Europe.



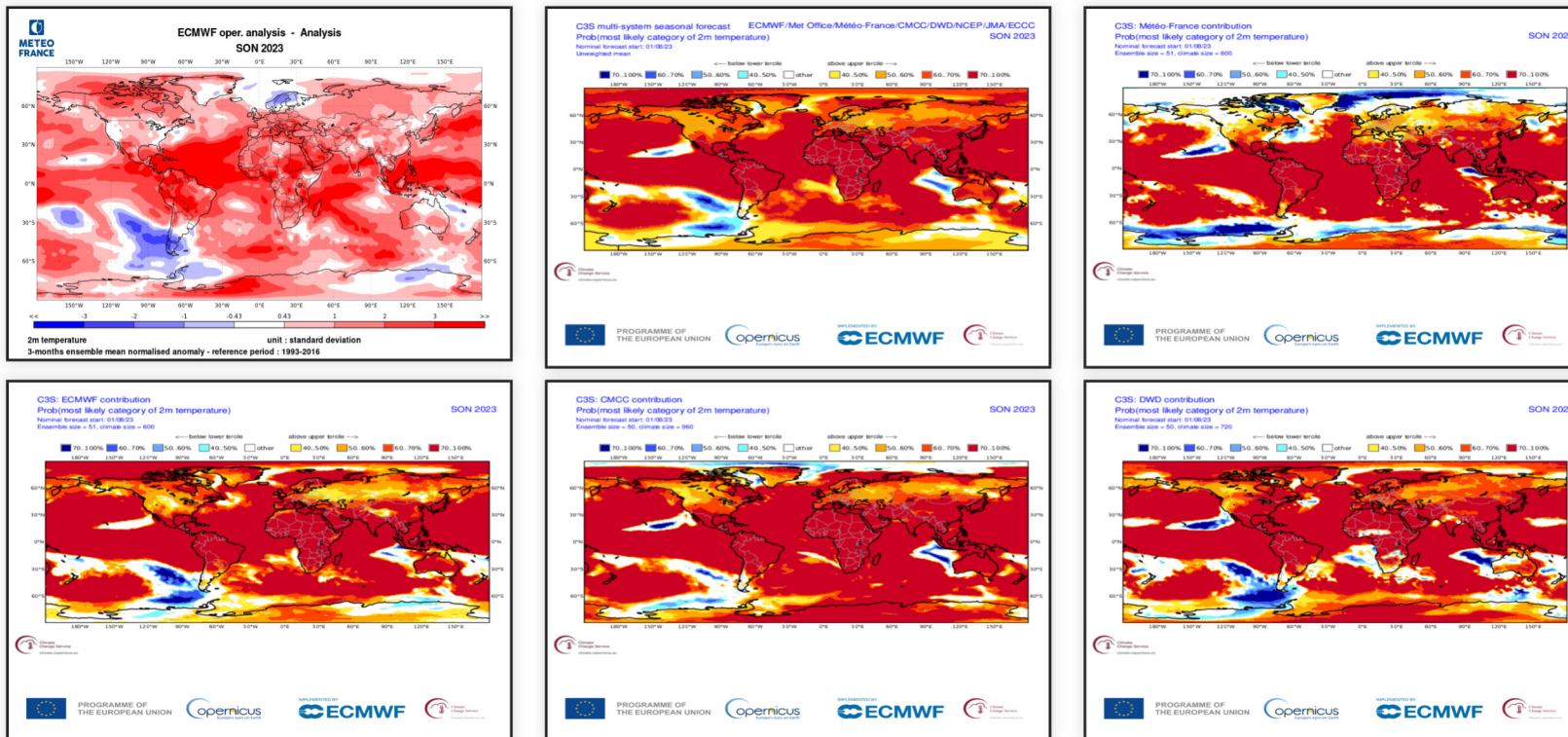
ECMWF analysis : September, octobre and novembre 500 geopotential height anomalies



C3S multi-sytem forecast and ECMWF analysis 500 geopotential height anomalies for SON

Climatic parameters : temperature on the globe

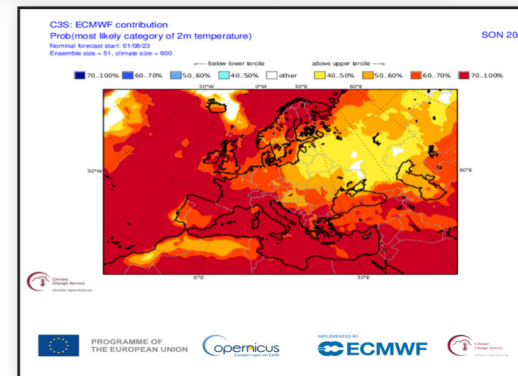
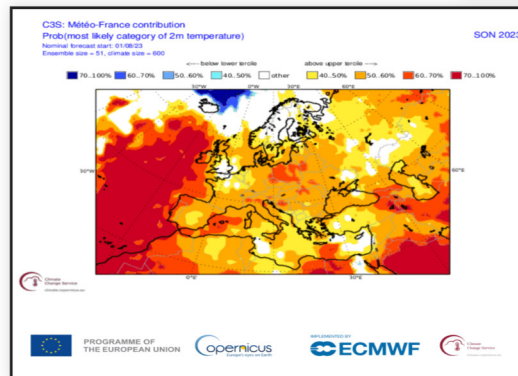
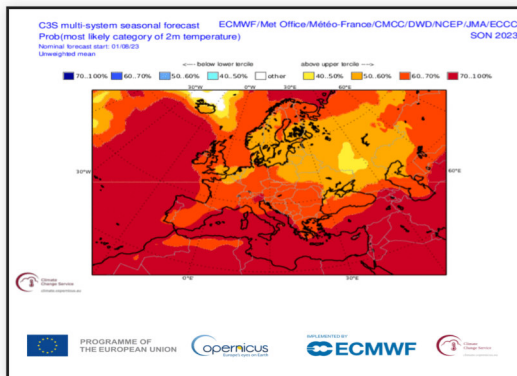
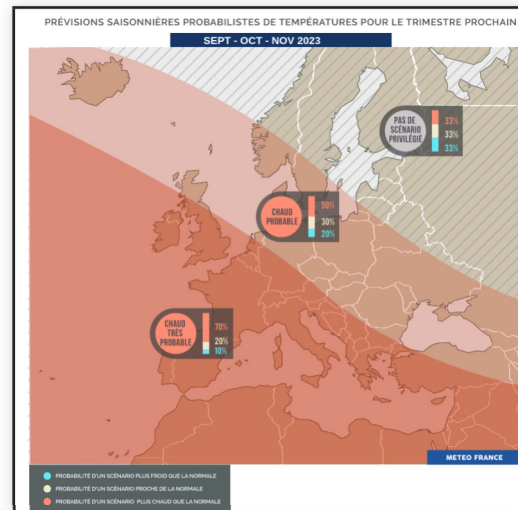
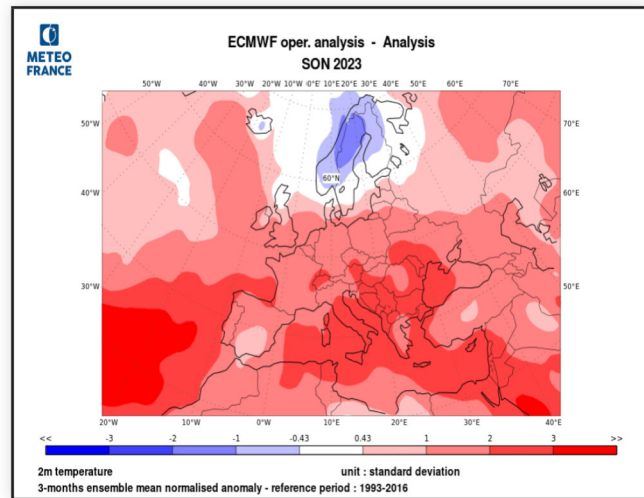
The main cold anomalies (southern South America, around Australia and off Mexico) are seen by the models. The only exception is the cold anomaly over Scandinavia, which was not forecast.



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

Despite the differences between the analysis and the atmospheric circulation models for Europe, the warmer-than-normal scenario from Western Europe to the Mediterranean Basin is confirmed. Only the cold anomaly over Scandinavia is not anticipated (no preferred scenario).

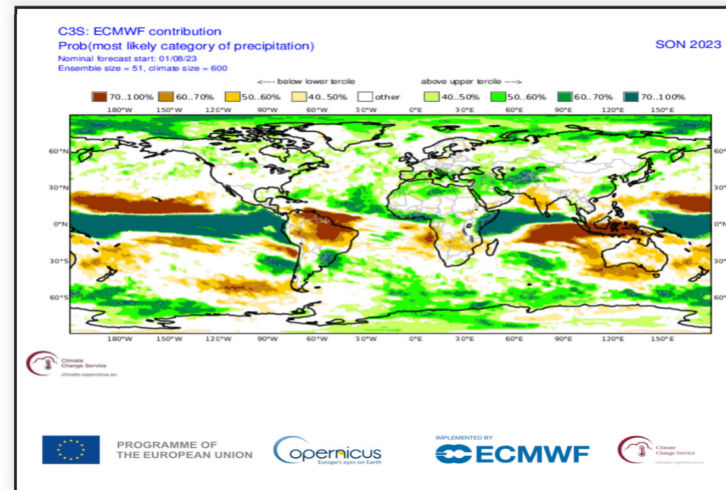
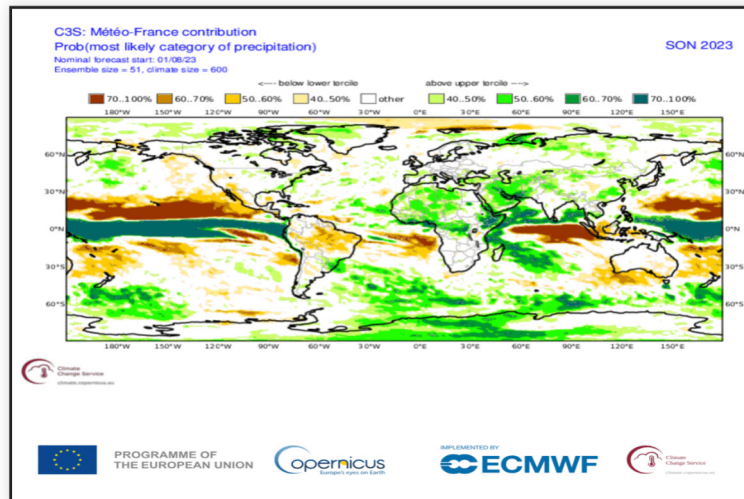
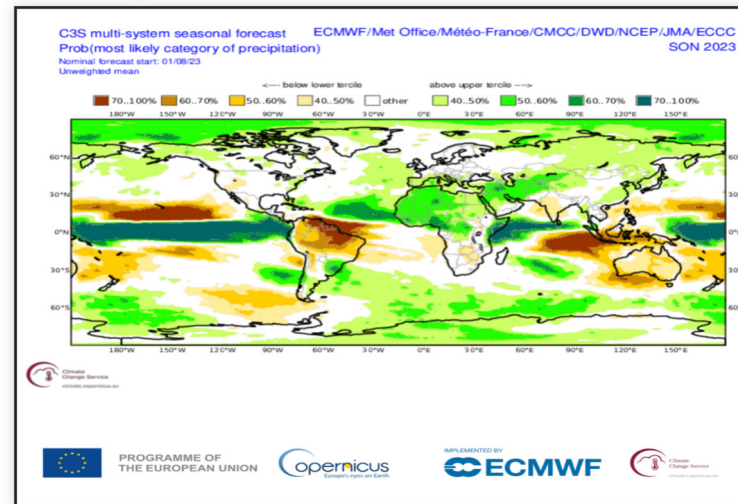
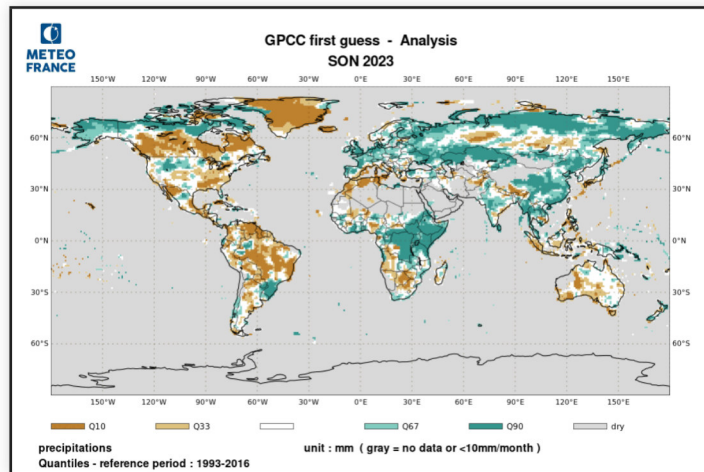


ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system, MF-S8 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over the globe

In equatorial regions, the classic El Nino impacts predicted by the models are reflected in the analysis (dry anomalies over Brazil and the Maritime Continent, and wet anomalies over the Horn of Africa).

In Northern America, the anomalies visible on analysis contrast with the lack of signal from the models.

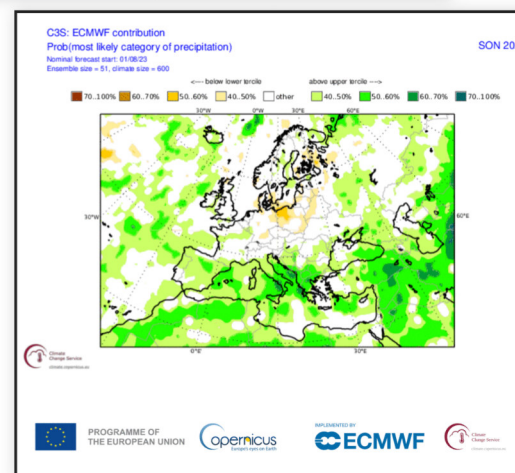
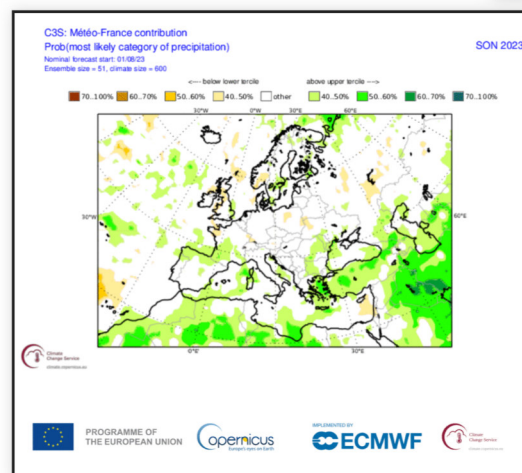
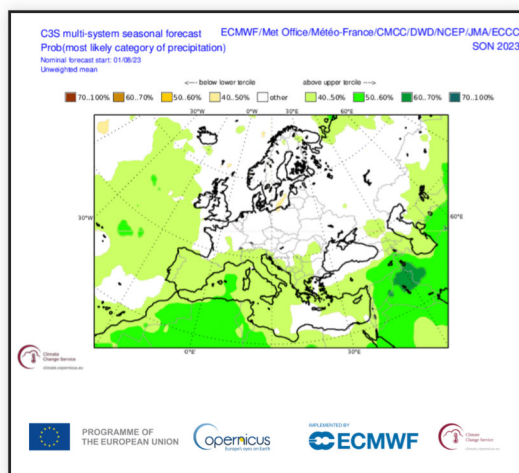
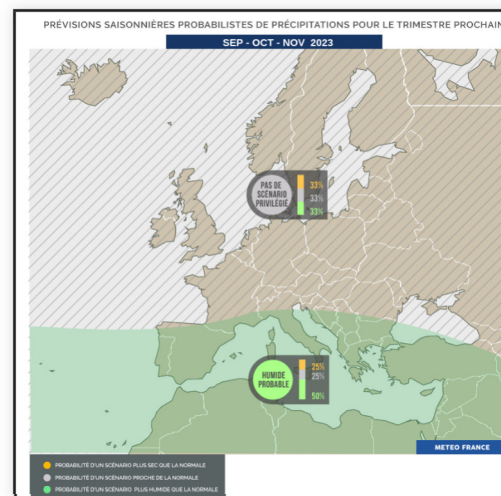
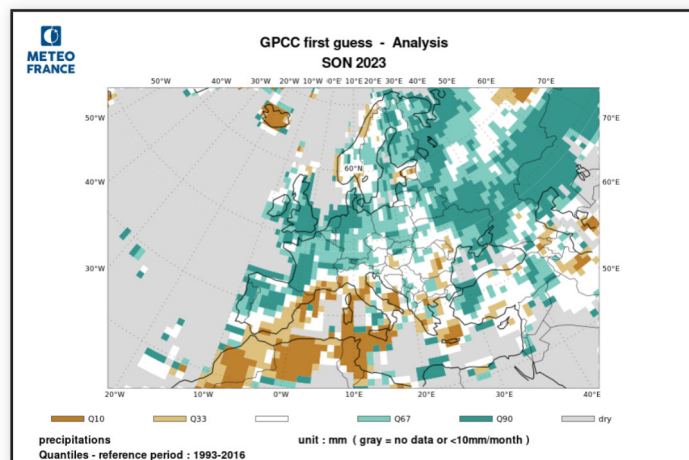


Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S8 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over Europe

The differences observed in atmospheric circulation between analysis and model forecasts have major impacts on precipitation. The marked wet signal over a large part of Europe is linked to the very strong EA+ mode, not forecast by the models.

The scenario proposed by the models and shown on the summary map is therefore far removed from the analysis.



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 SON 2023

1) Oceans :

The main positive and negative SST anomalies predicted by the models are confirmed by the analysis.

2) Large scale atmospheric circulation :

VP 200 hPa : Good forecast for the Indian Ocean, but not so good for the Pacific.

SF 200 hPa : Teleconnections to North America are provided by most models. However, over Europe, the cyclonic curvature was not predicted and the anticyclonic curvature was underestimated.

Z500 : In connection with the above, the negative anomaly from eastern Newfoundland to Scandinavia was not anticipated.

3) Climatic parameters over Europe :

Temperatures : The warm anomaly over much of Europe was well forecast.

Precipitations : The analysis, with a wet signal over most of Europe and a dry signal over the western Mediterranean, is very different from the scenario adopted.