

VERIFICATION BULLETIN

APRIL - MAY - JUNE 2024

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Introduction : Objective

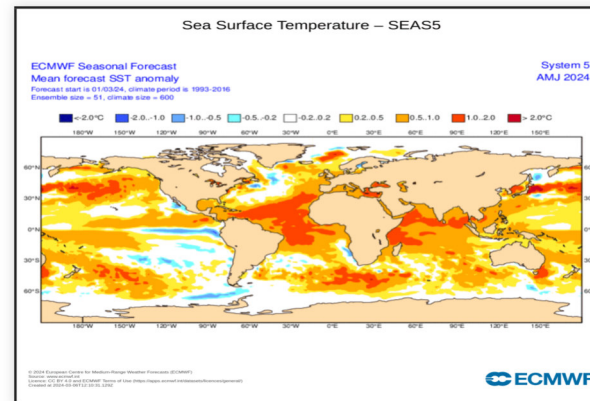
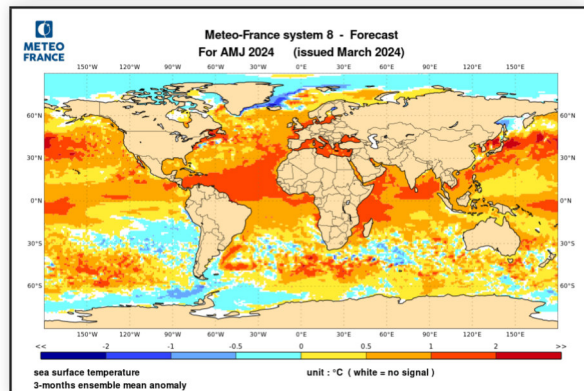
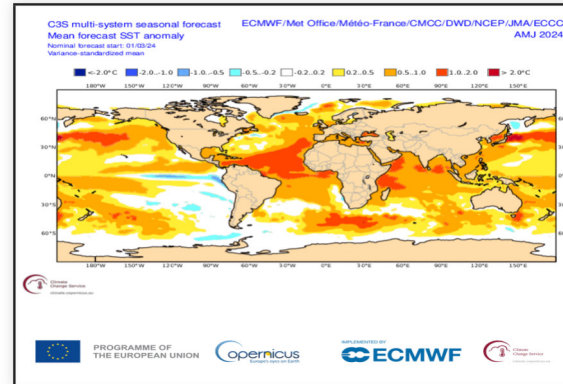
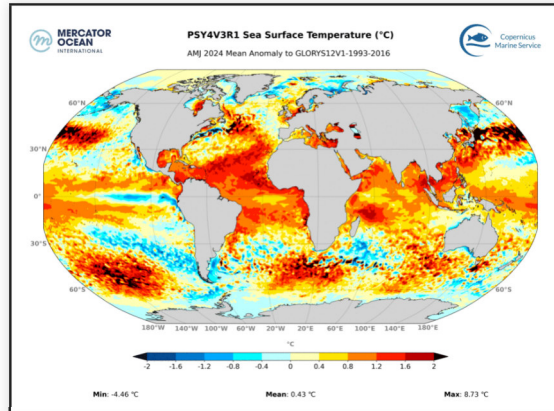
- The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean 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 observed were seen by most models (cf. multi-models and ECMWF): small negative anomaly over the eastern equatorial zone, PDO- pattern and anomaly in the South Pacific. MF-S8 is a little warm over the equator and shows a less marked PDO- pattern.

In the Indian Ocean, the main structures are well seen by the models.

In the Atlantic Ocean, the zone of positive anomalies is generally well forecast by the models.

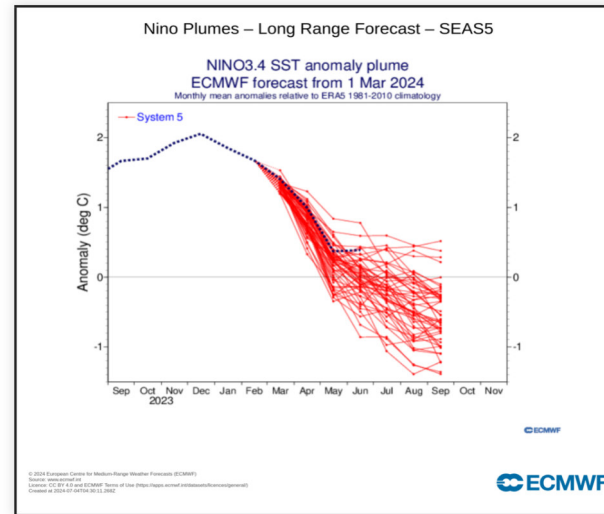
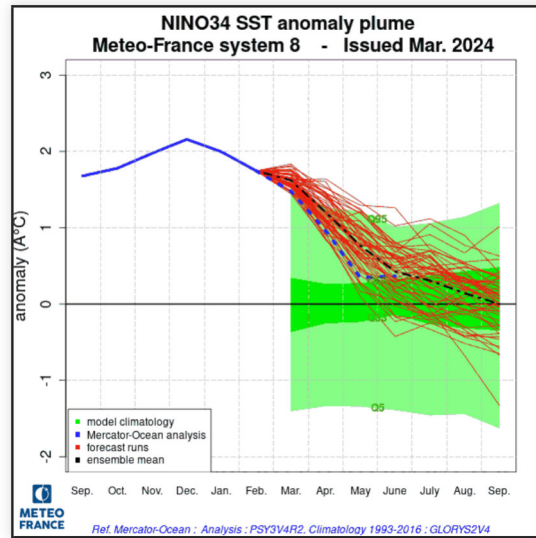


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

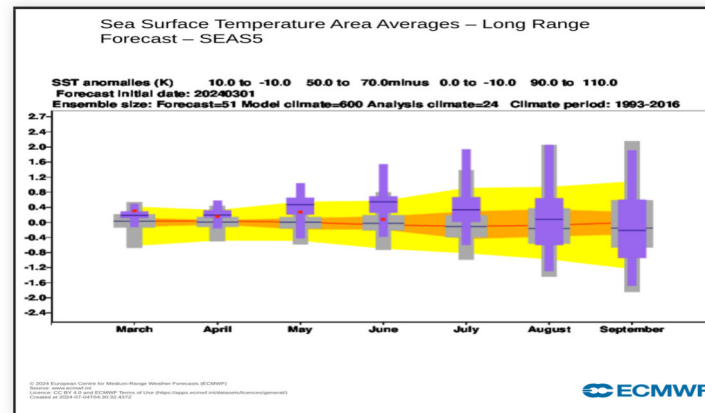
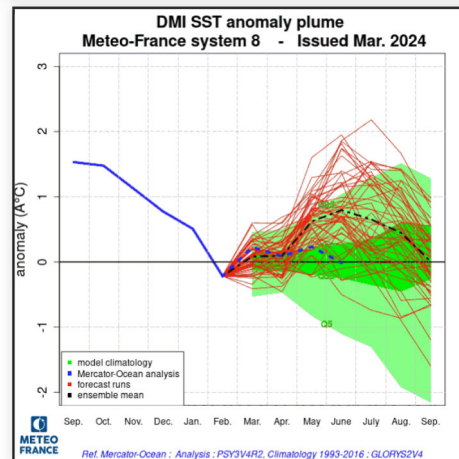
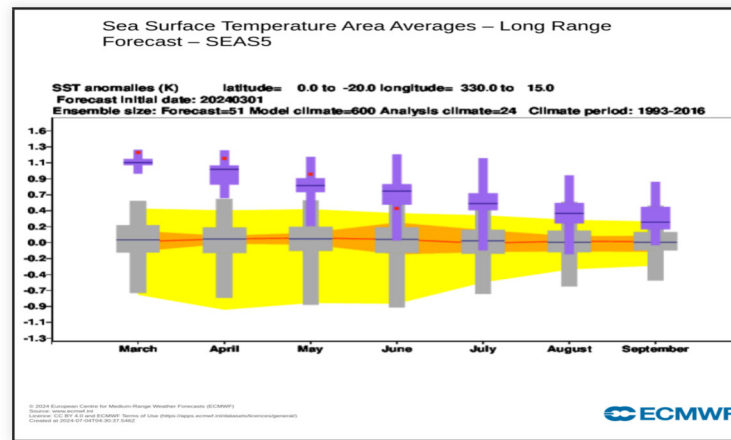
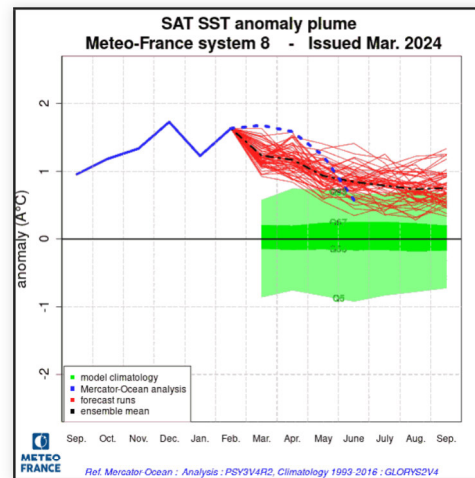
MF8 was slow to fall, but was finally at the right value in June. ECMWF forecasts are close to an analysis except for the last month.



Oceans : tropical Atlantic and Indian Ocean index

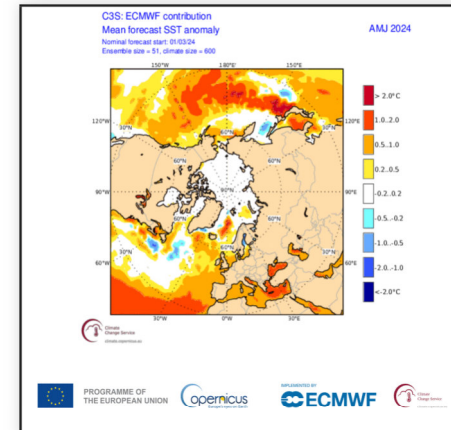
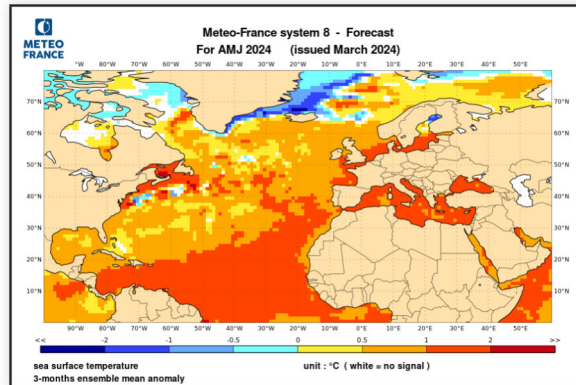
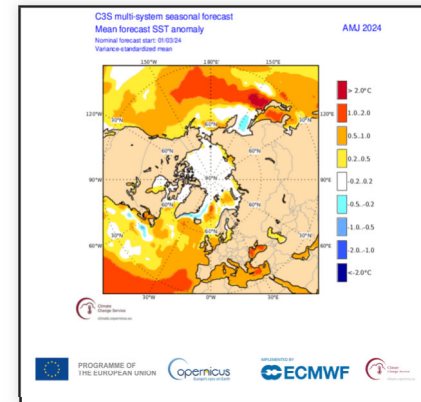
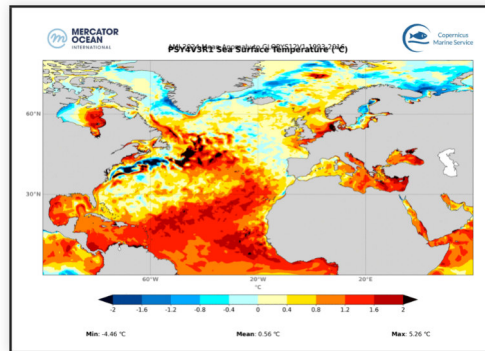
SAT : Both models predicted a very strong positive anomaly, confirmed by the reanalysis.

DMI : Both models failed to maintain a neutral DMI.



Oceans : North Atlantic SST

From the equator to the North Tropic, both models correctly anticipated the strong positive anomaly. Further north, SST conditions are less well predicted, particularly the neutral to slightly negative zone from Spain to Greenland, as well as in the Mediterranean.

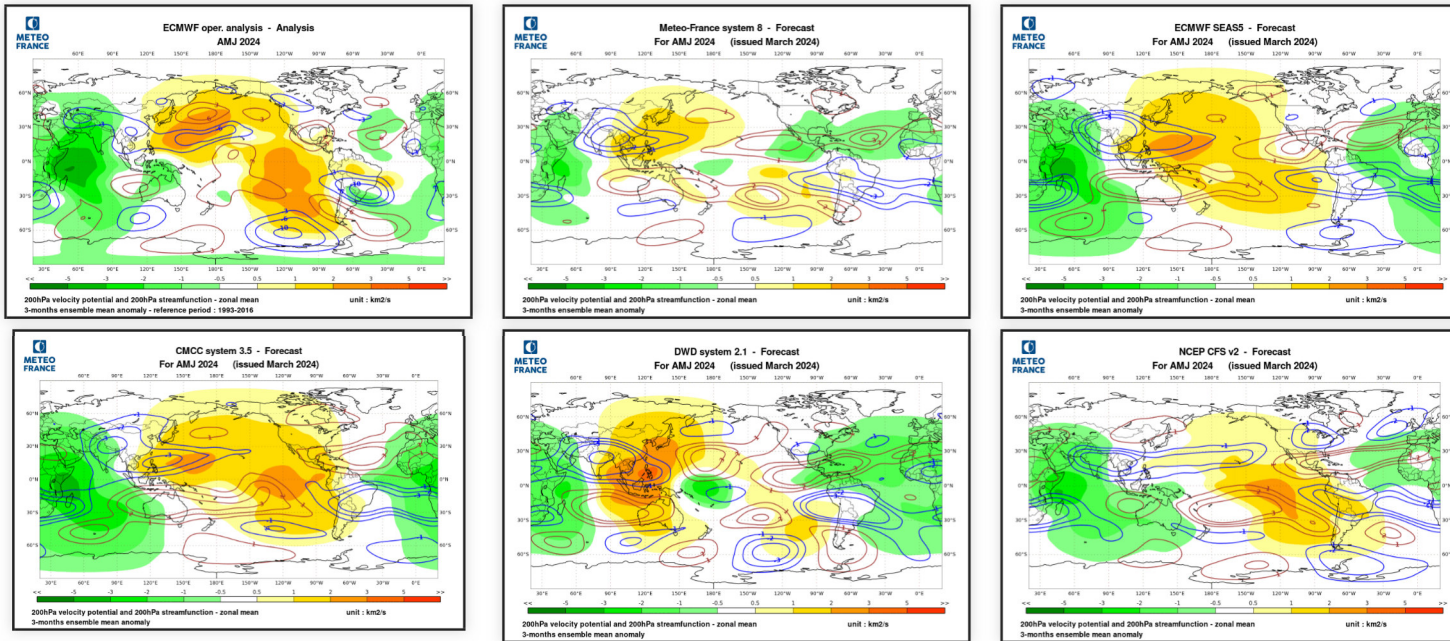


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : The zone of strong upwad motions over the western Indian Ocean, and its extension to Africa, Europe and part of the Atlantic basin, were well forecast by the models. Most of the models also anticipated subsidence zones over the Pacific.

SF : The two dipoles, over the Maritime Continent and South America, are well seen by the models. A few teleconnections are visible to the south, but not to the north. In the vicinity of Europe, the models did not agree. The analysis suggests small-scale circulations that are difficult to predict.

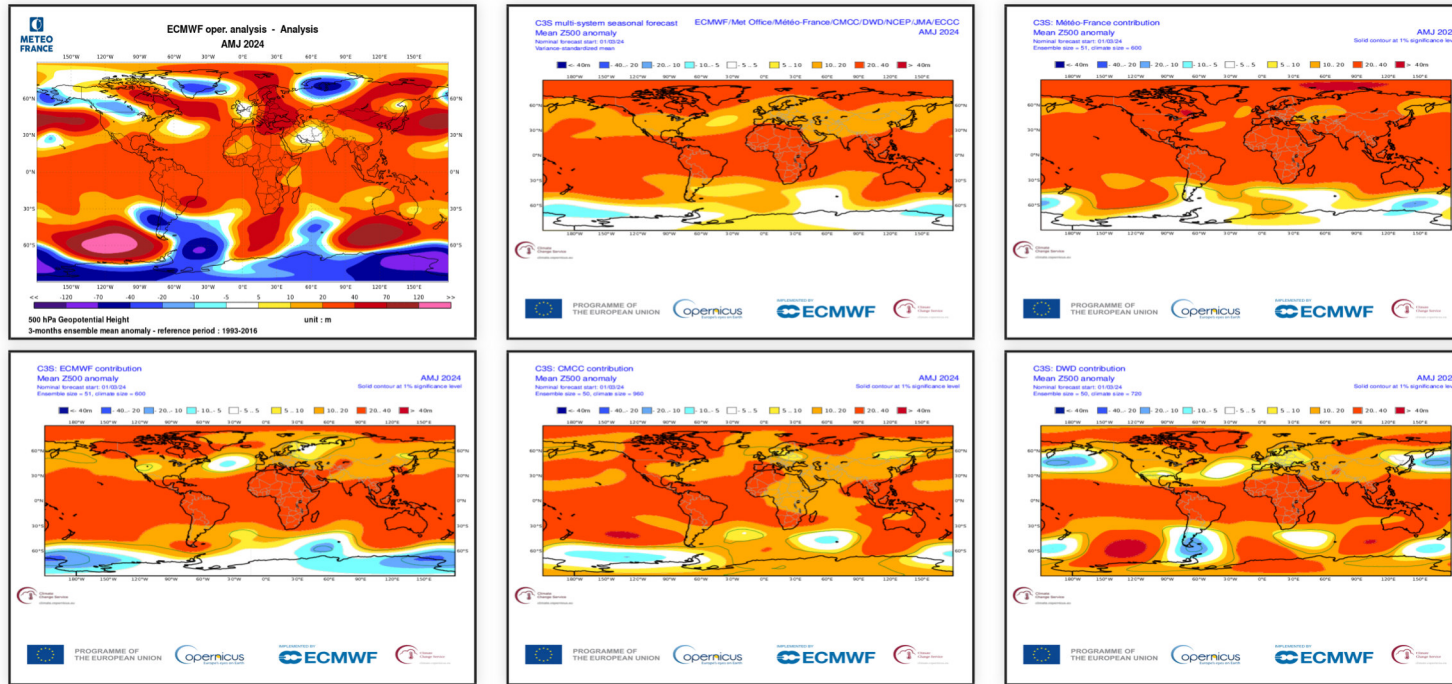


ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation : 500hPa Geopotential height

Southern Hemisphere : Main anomalies are suggested by multi-system but there are under-estimated.

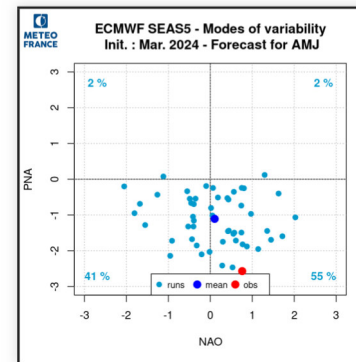
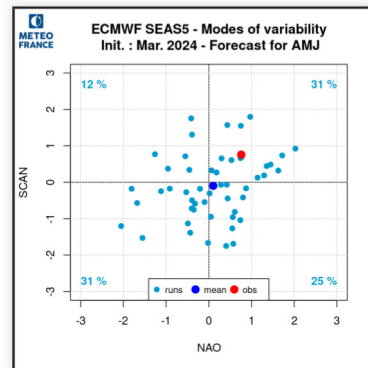
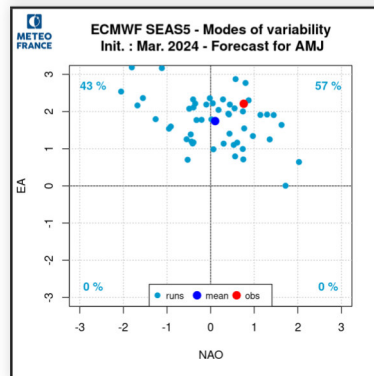
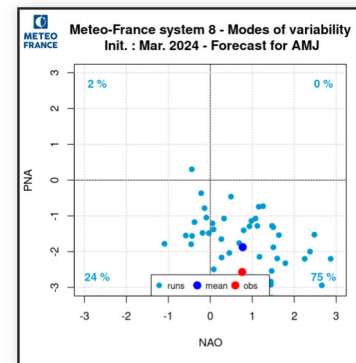
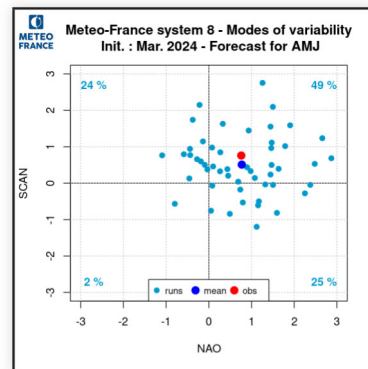
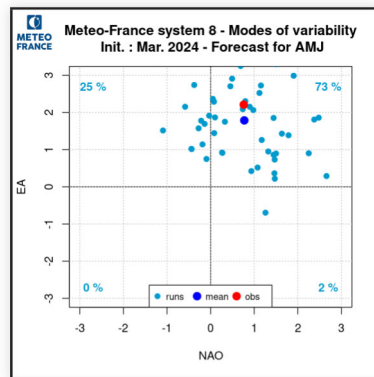
Northern Hemisphere : The analysis shows a large number of small areas with positive or negative anomalies throughout the northern hemisphere, which are very difficult to predict.



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

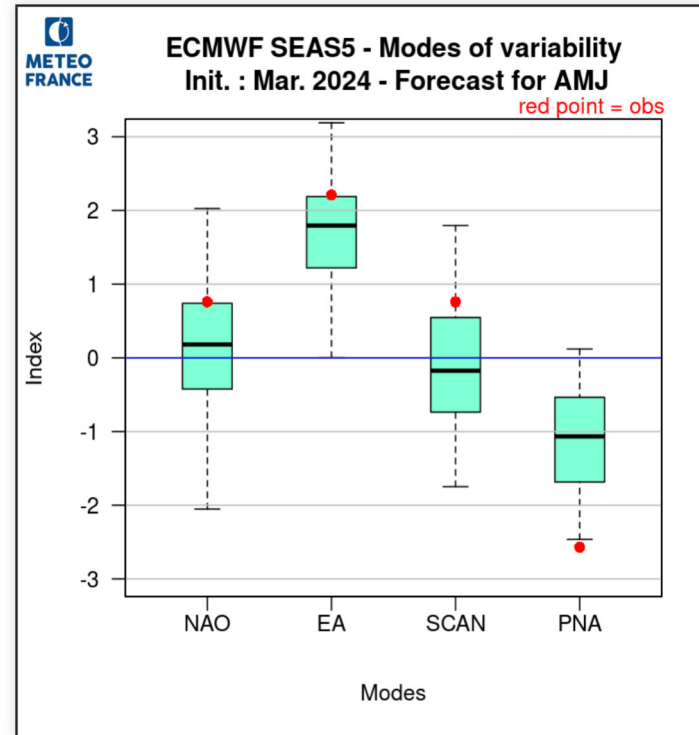
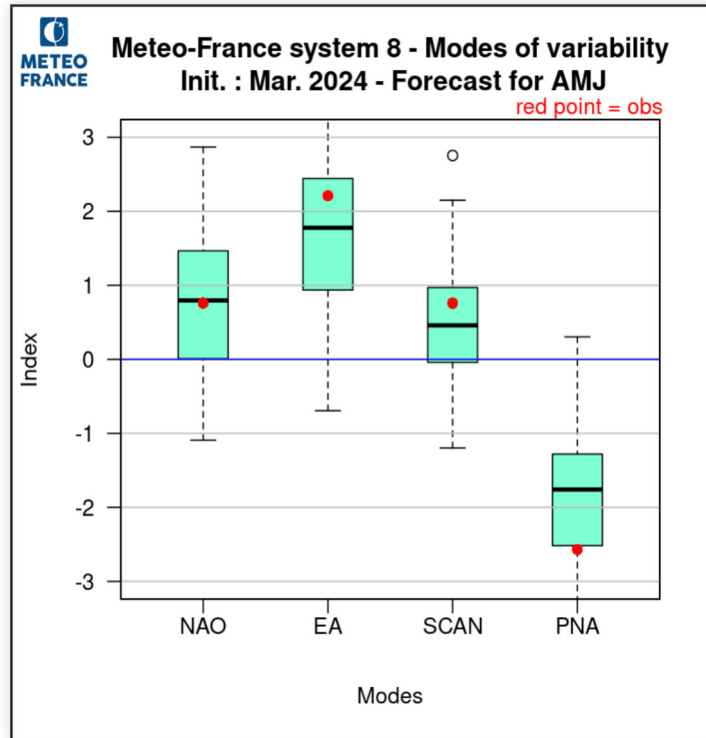
Atmospheric circulation : Modes of variability

MF-S8 is very well matched to the analysis, not only for the PNA- and EA+ modes, but also for the other two modes, NAO+ and SCAN+. ECMWF is less good, anticipating only the EA+ mode.



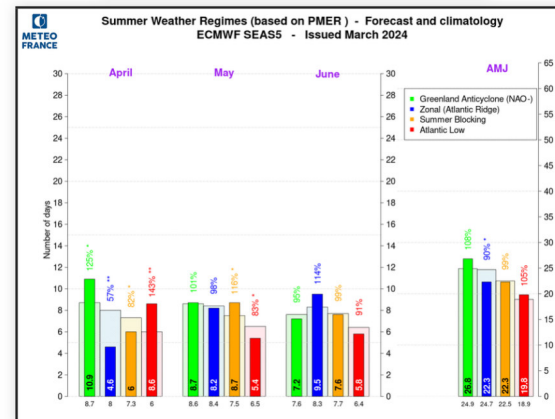
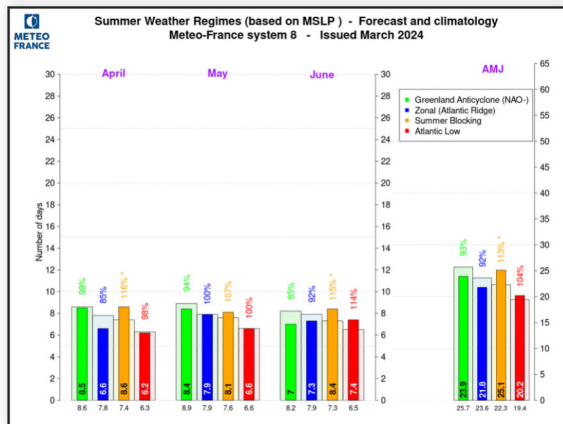
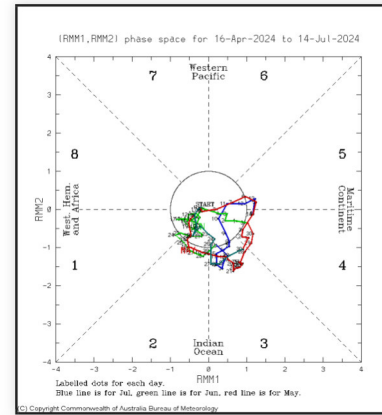
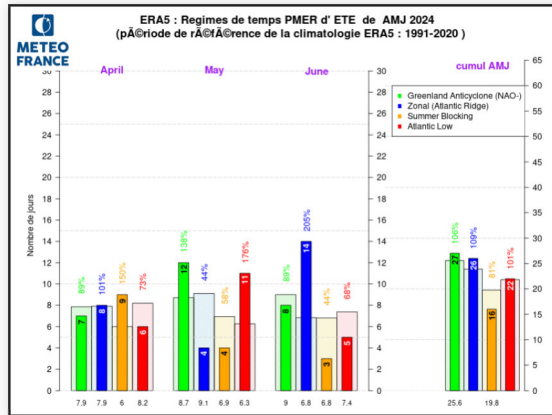
Atmospheric circulation : Modes verification

Same observation as for the previous slide



Atmospheric circulation : Summer SLP weather regimes

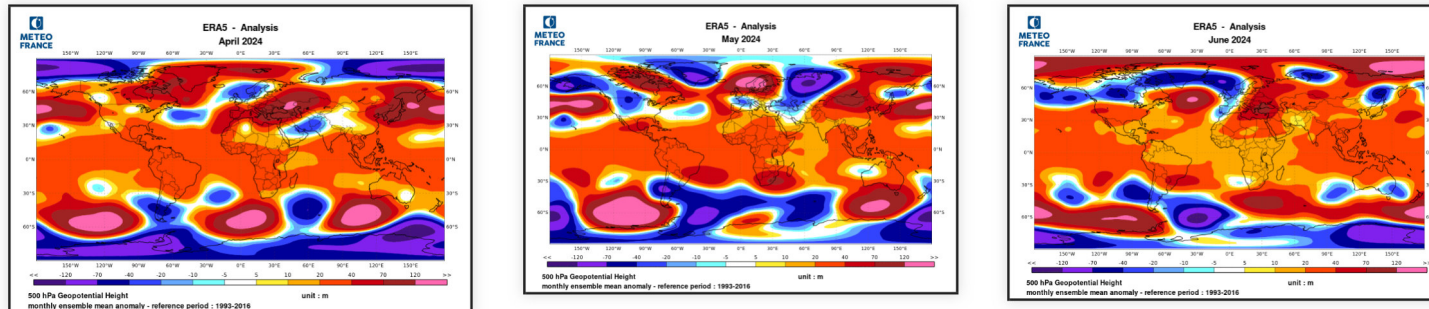
The three months are very different, with the Summer Blockage regime dominating in April, the NAO- and Atlantic Low regimes in May, and finally the Zonal regime in June. Over the quarter, it is the under-representation of the Summer Blocking regime that stands out. Both models failed to anticipate these distributions.



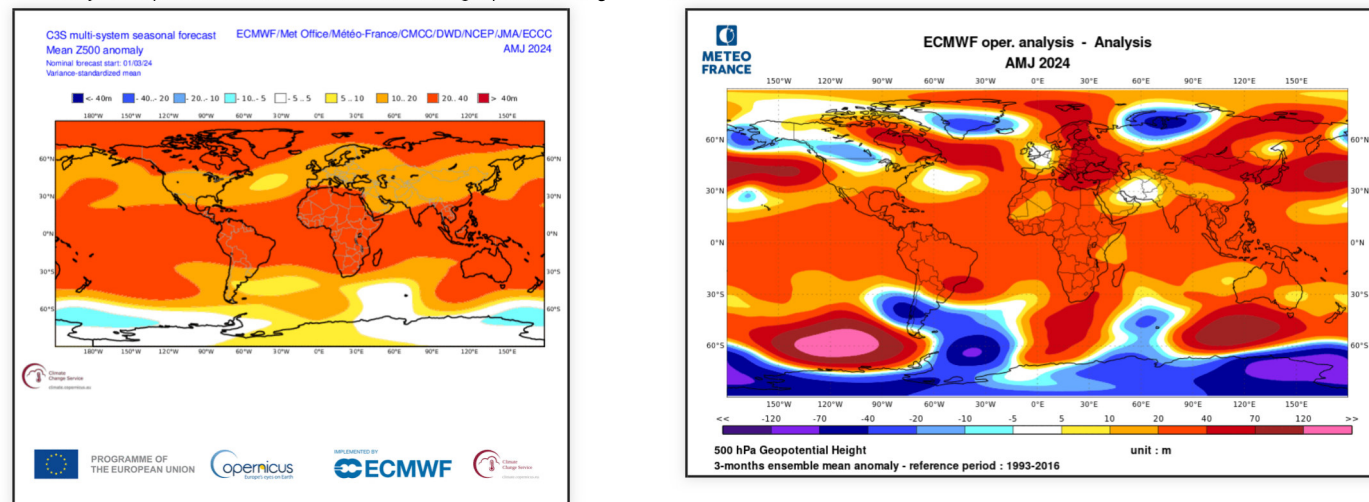
weather regime : ECMWF analysis top left, MF8 and ECMWF forecasts at the bottom. MJO phase top right

Atmospheric circulation : Variability within the quarter

A month-by-month analysis confirms very different circulations from one month to the next.



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

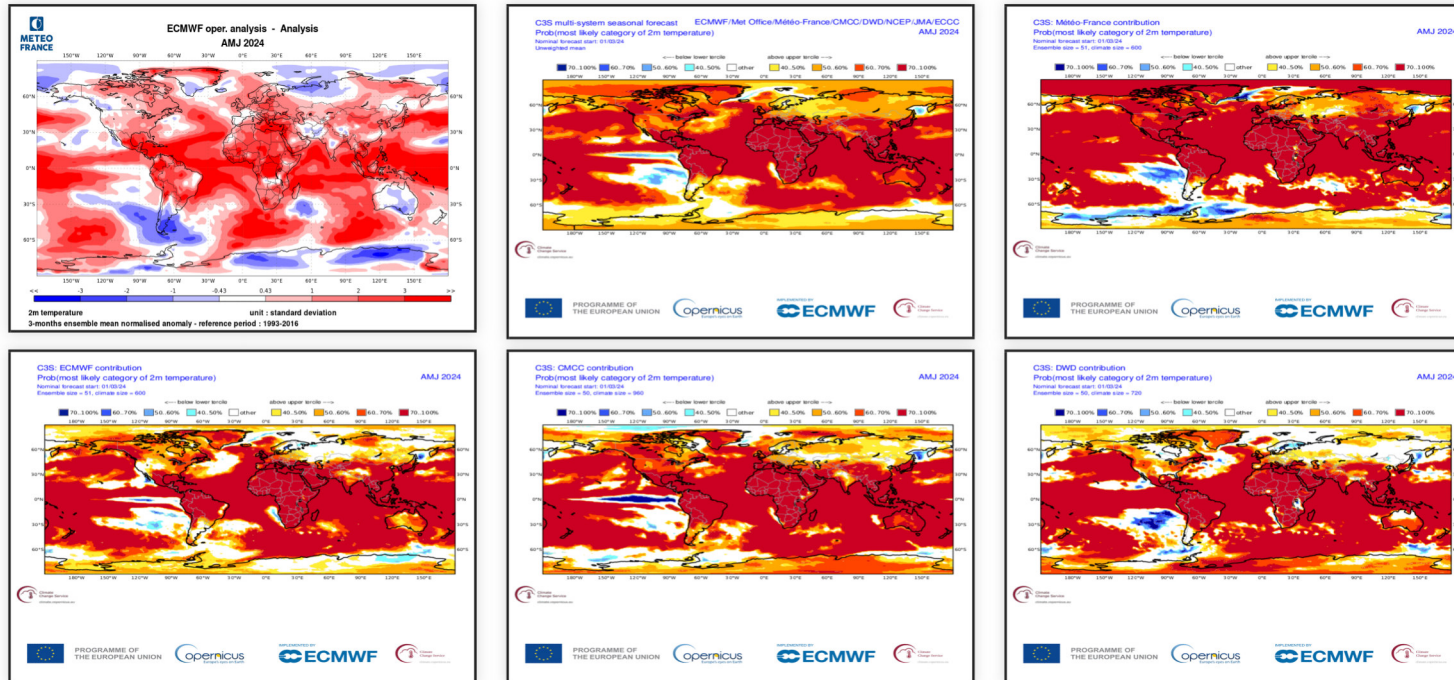


C3S multi-sytem forecast and ECMWF analysis 500 geopotential height anomalies for SON

Climatic parameters : temperature on the globe

In the southern hemisphere, the main cold anomalies are more or less forecasted and are linked to oceanic anomalies.

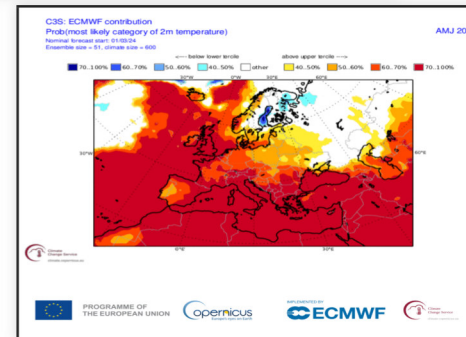
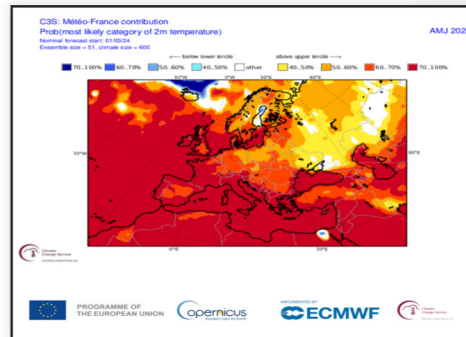
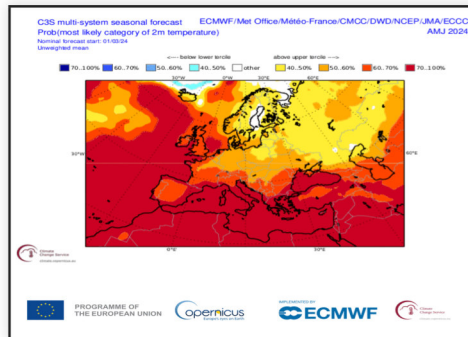
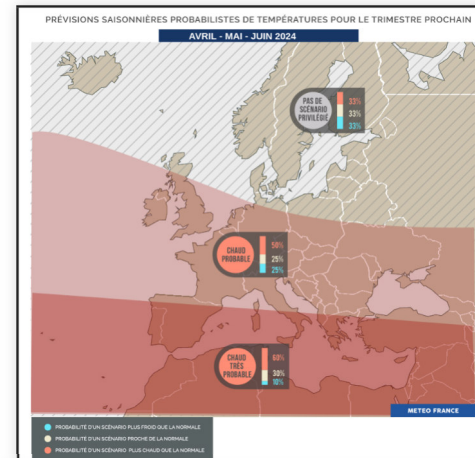
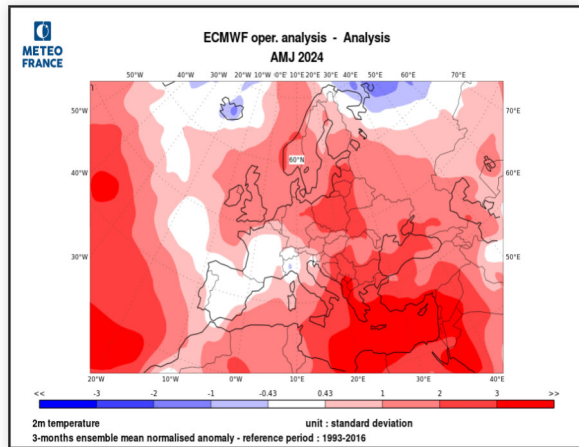
In the Northern Hemisphere, negative temperature anomalies are correlated with negative Z500 anomalies, and have therefore not been correctly forecast.



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

For the eastern Mediterranean Basin and Central Europe, conditions were indeed warmer than normal. In Western Europe, near-normal conditions were not forecast.

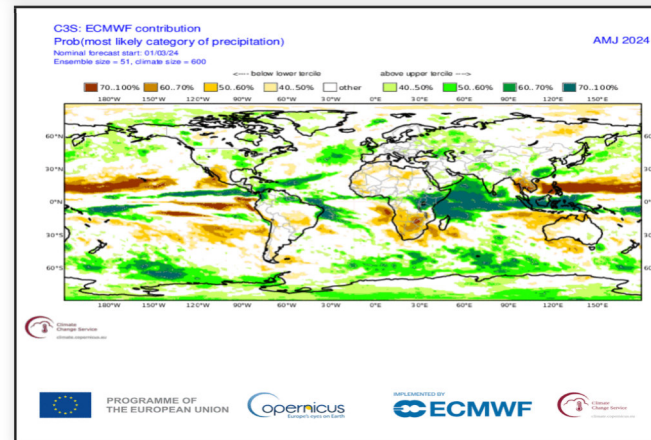
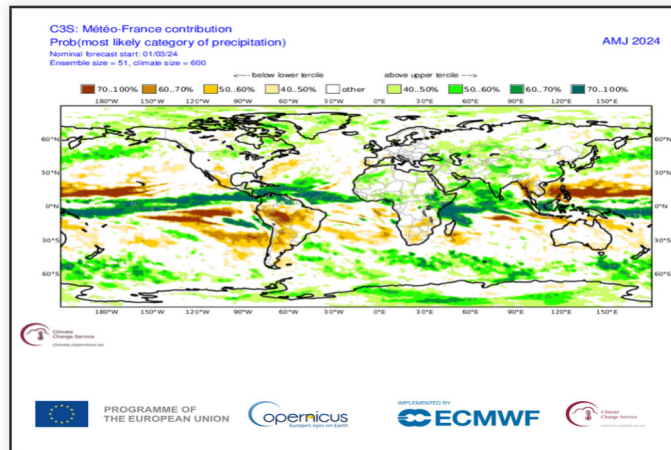
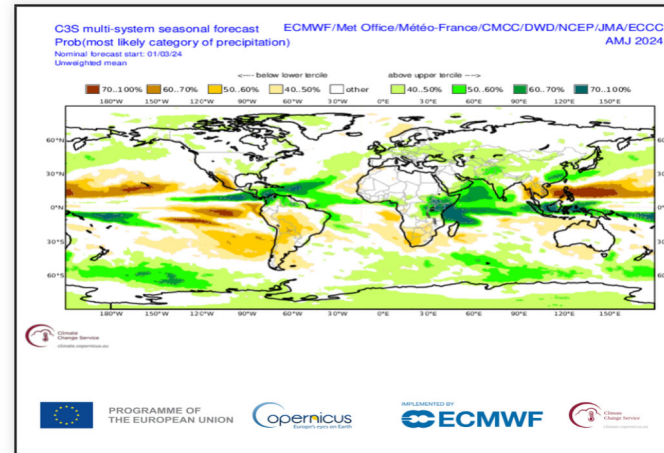
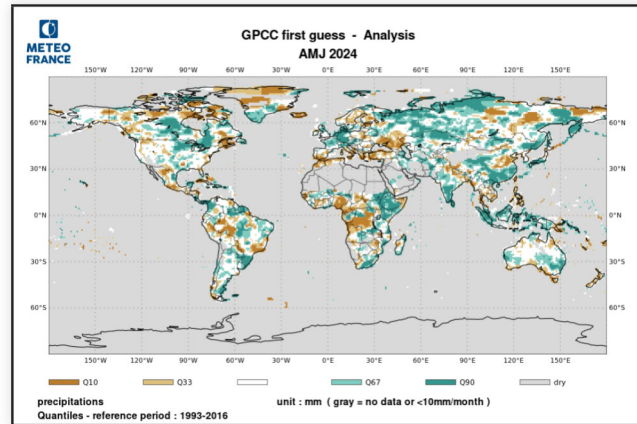


ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system, MF-S8 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over the globe

In the equatorial zone, the predicted wet anomalies from the Horn of Africa to India and over the Maritime Continent are confirmed on analysis. Conversely, the dry anomaly over South America is not visible on analysis.

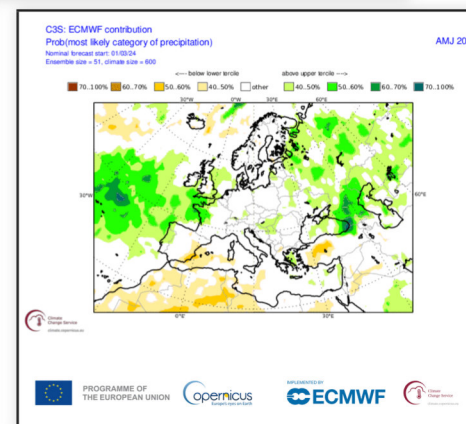
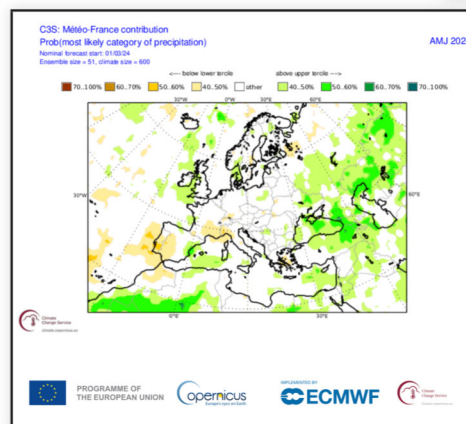
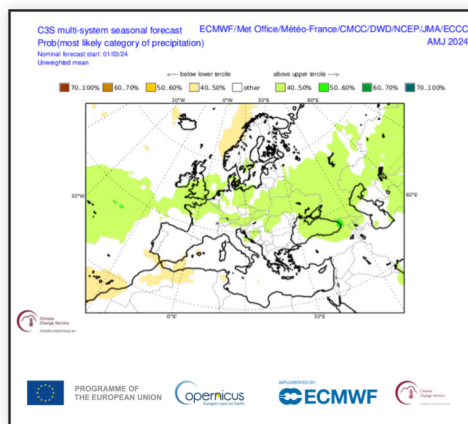
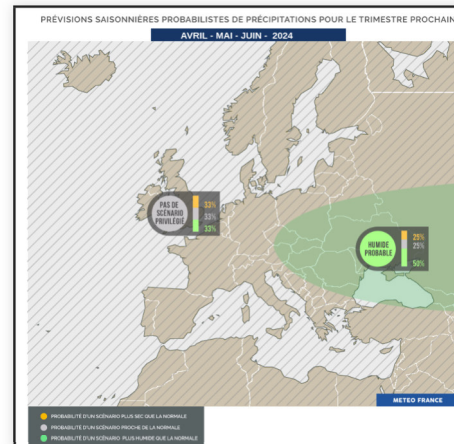
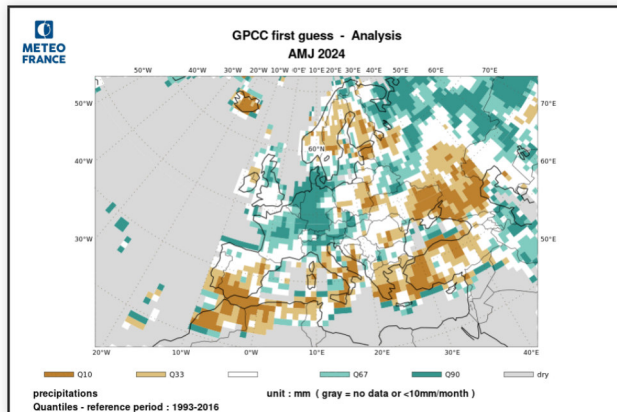
in the Northern Hemisphere, no large-scale convergence between models and analysis.



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

With the minimum over France not forecast, the analysis and precipitation forecasts are widely divergent.



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 MAM 2024

1) Oceans :

The main anomalies visible in the analysis were well predicted by the models.

2) Large scale atmospheric circulation :

VP 200 hPa : The upward motion areas (Indian Ocean and Africa) and the downward motion areas (Pacific Ocean) are globally seen by the models.

SF 200 hPa : The two dipoles around the equator are seen by my models. Around Europe, the analysis suggests smaller-scale circulations which are difficult for the models to anticipate.

Z500 : The quarterly analysis reveals several anomalies, both positive and negative, in the northern hemisphere, which are generally poorly seen by the models (Alaska, Greenland, etc.). This is particularly true of the small negative anomaly over France in the analysis.

3) Climatic parameters over Europe :

Temperatures : The warm anomalies were well anticipated over eastern Europe but not anticipated further west.

Precipitations : There are significant difference between forecast and analysis.