

VERIFICATION BULLETIN

MARCH - APRIL - MAY 2024

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Introduction : Objective

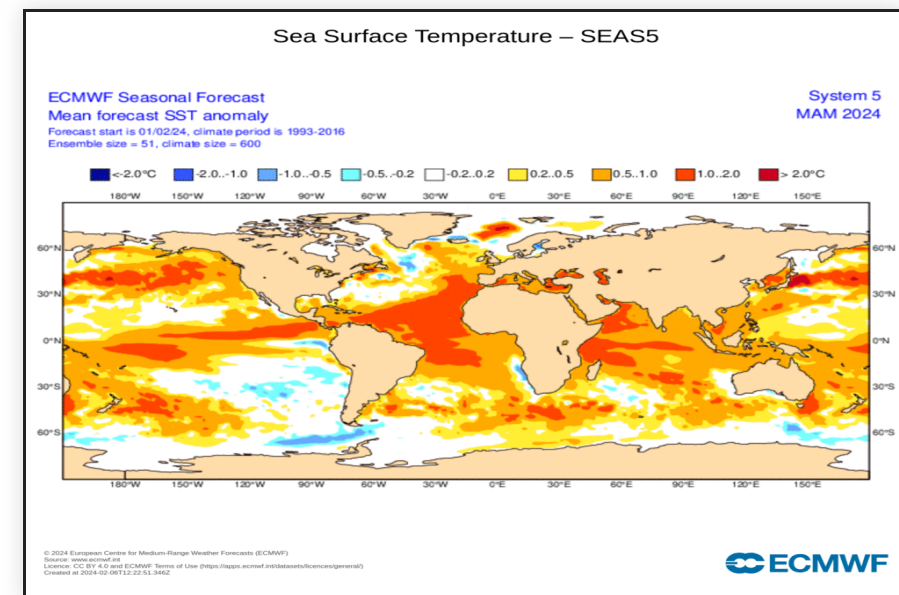
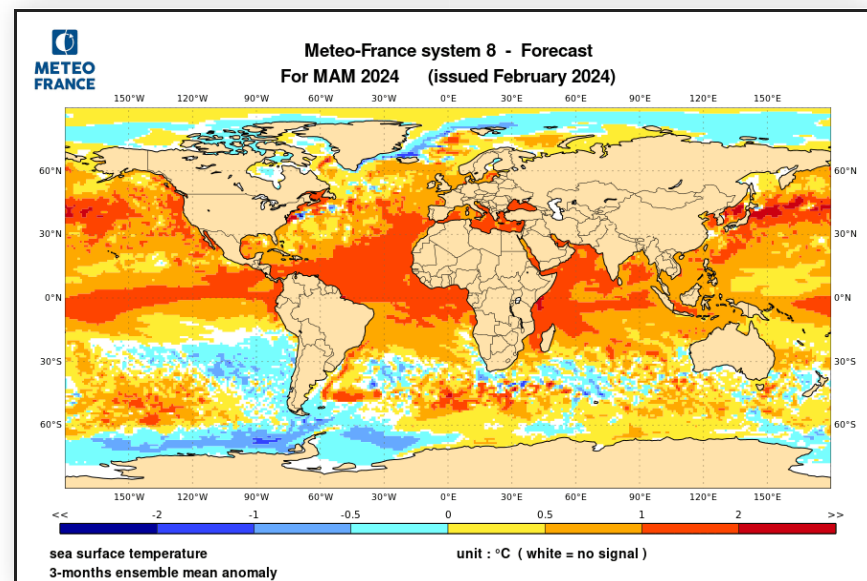
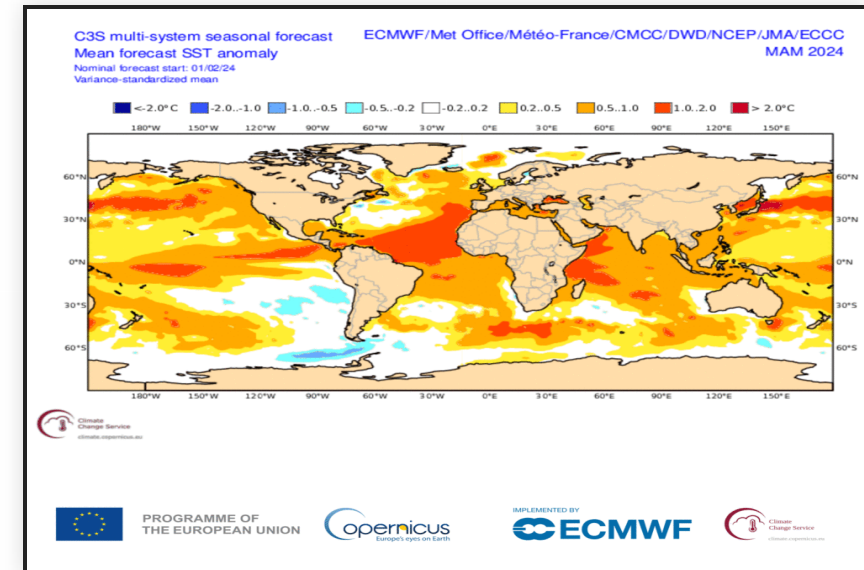
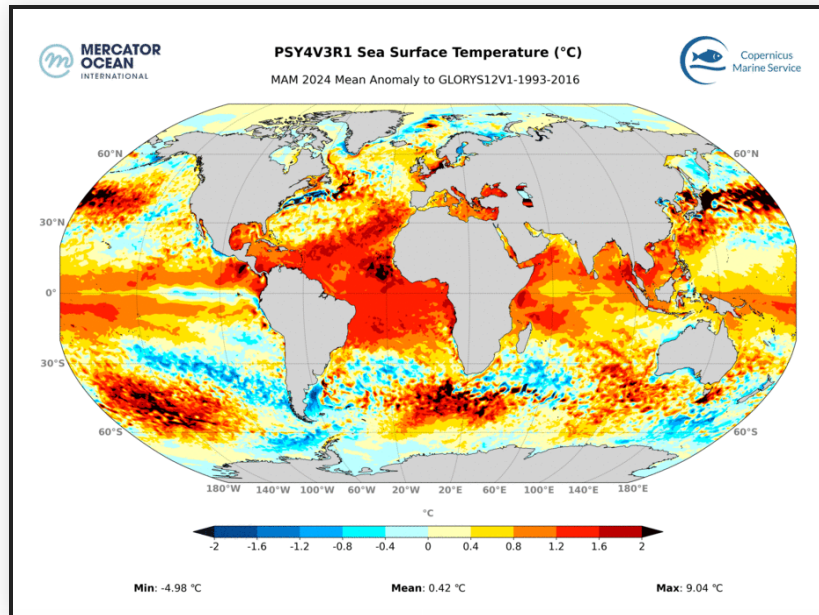
- The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean 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 were well predicted by both models: residual warm anomaly in the equatorial zone (El Niño), PDO- pattern in the Northern Hemisphere and cold anomaly in the Southern Hemisphere.

In the Indian Ocean, the predicted patterns and the reanalysis are very close (warm anomaly more marked in the west of basin)

In the Atlantic Ocean the extent of warm anomaly is well forecasted by models but the intensity is underestimated particularly in south Atlantic.

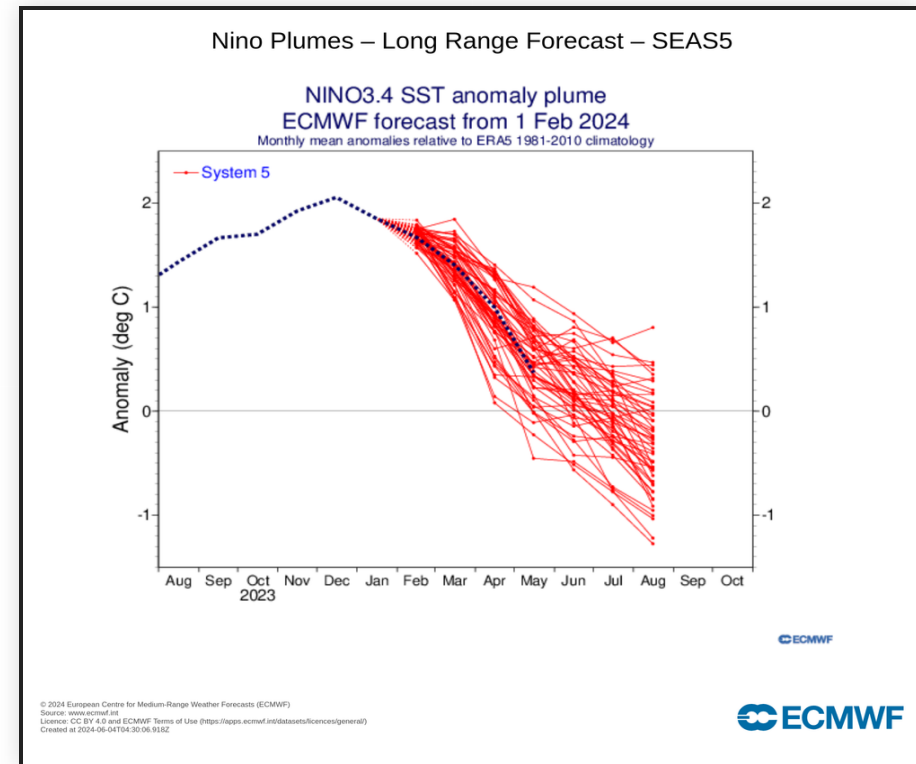
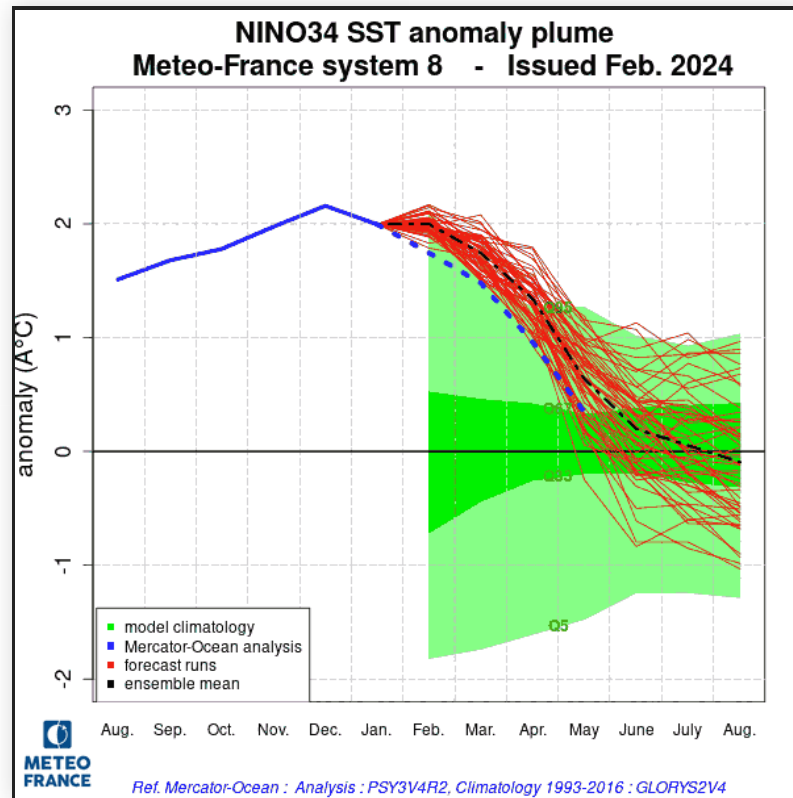


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

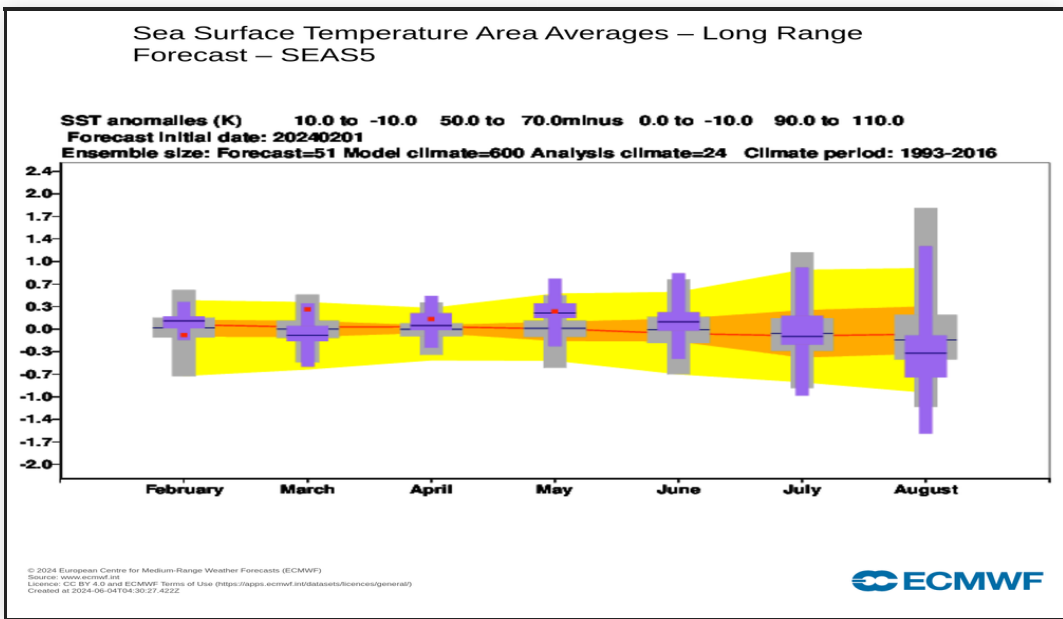
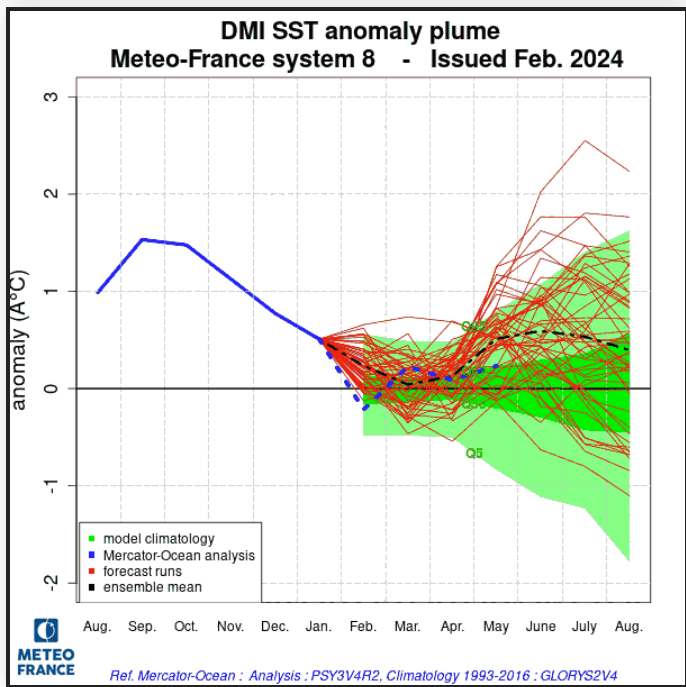
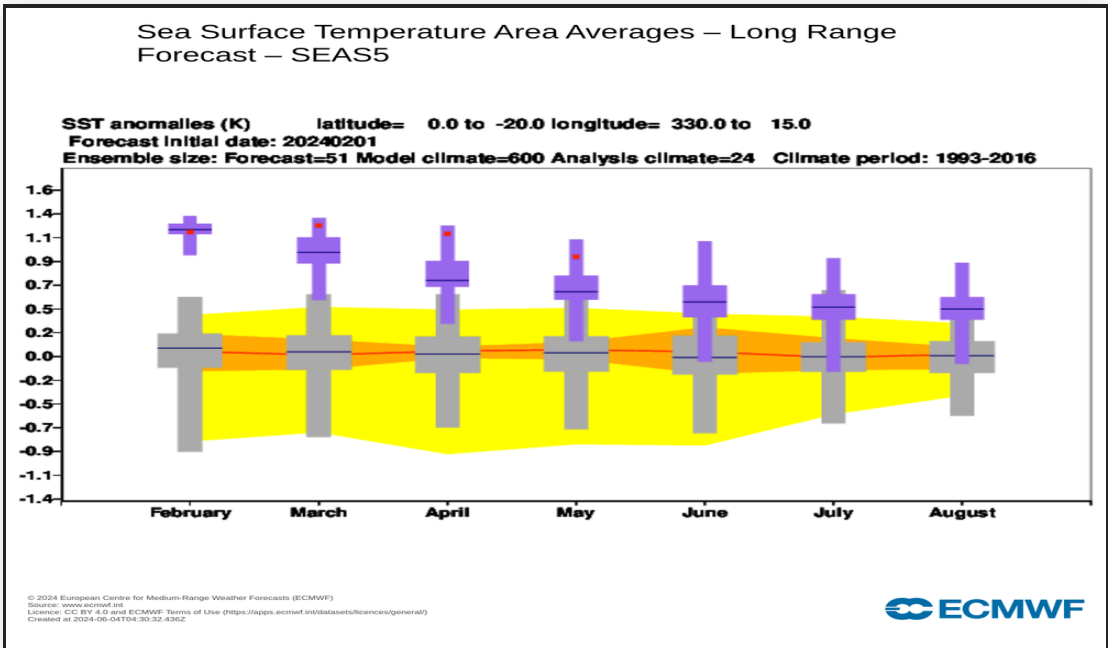
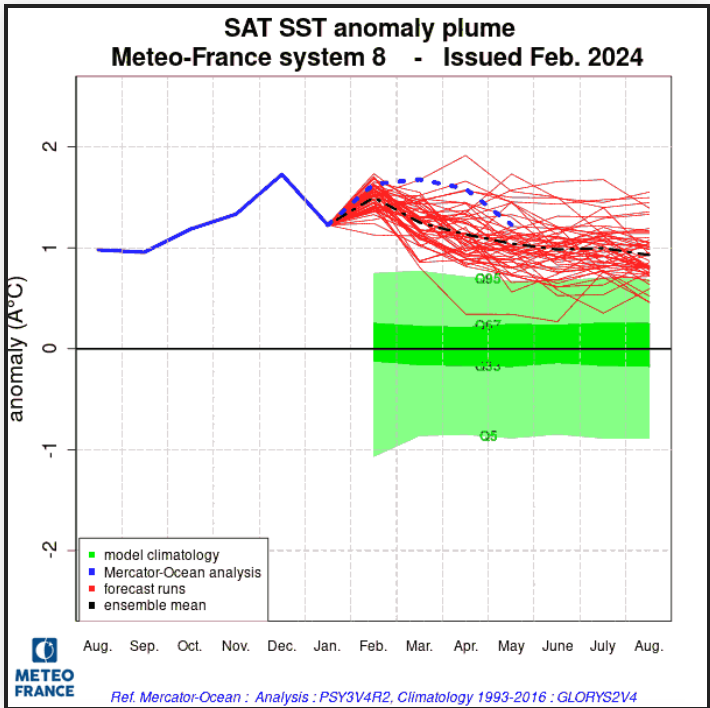
MF8 is too hot, and start decreasing too late. ECMWF is close to analysis.



Oceans : tropical Atlantic and Indian Ocean index

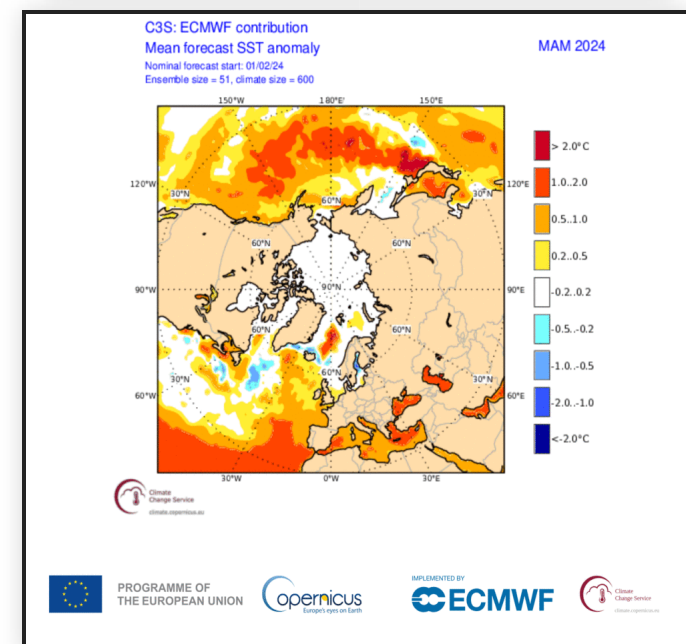
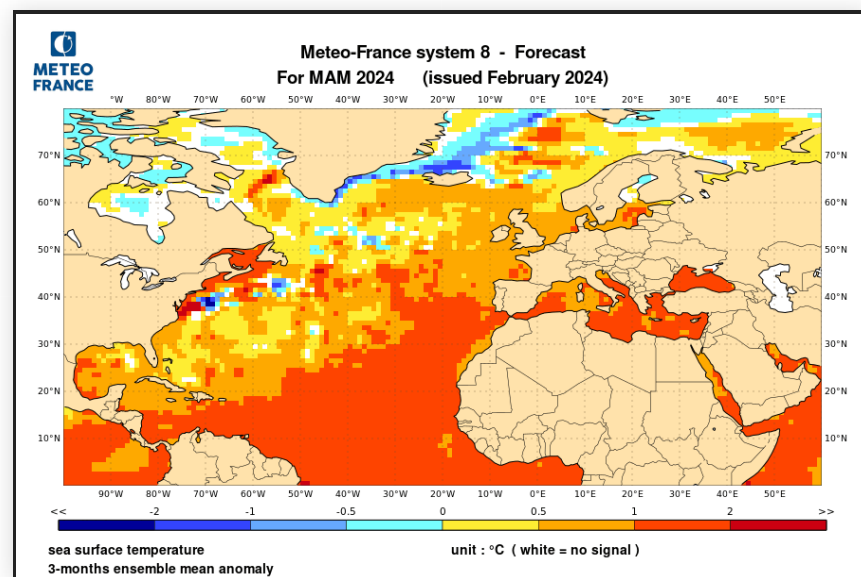
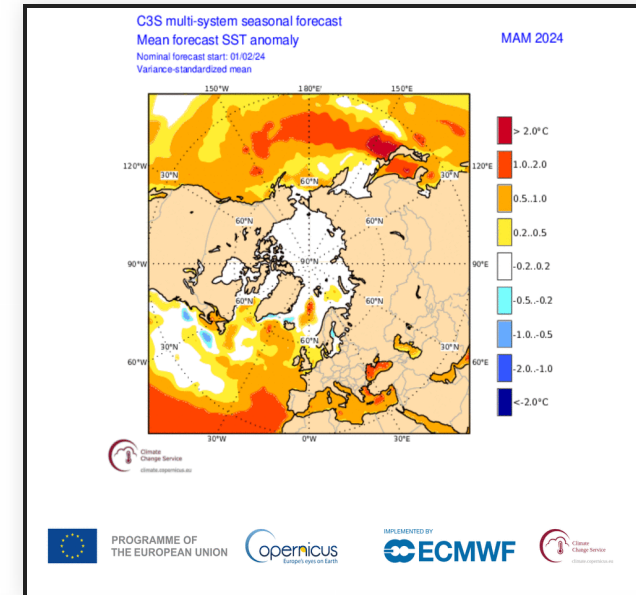
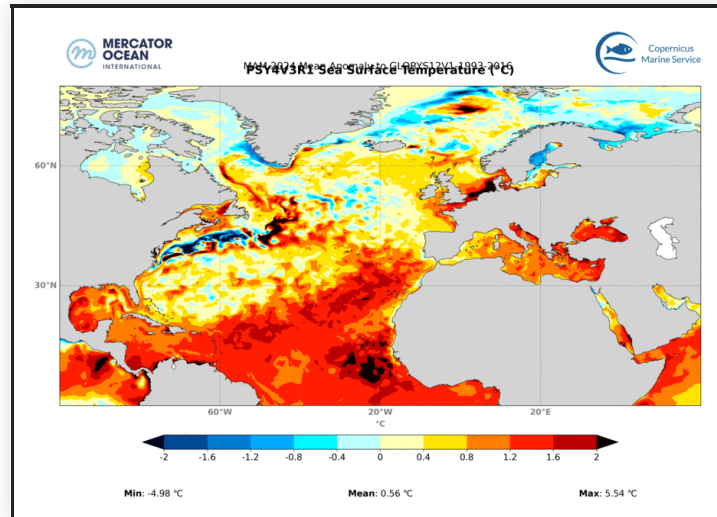
SAT : Both models predicted a very high anomaly. Yet the reanalysis reveals an even stronger one.

DMI : Neutral DMI index is well anticipated by the models.



Oceans : North Atlantic SST

In the northern intertropical zone and all the way to Europe, the warm anomaly is anticipated by the models. In Mediterranean sea both have a good accordance with reanalysis.

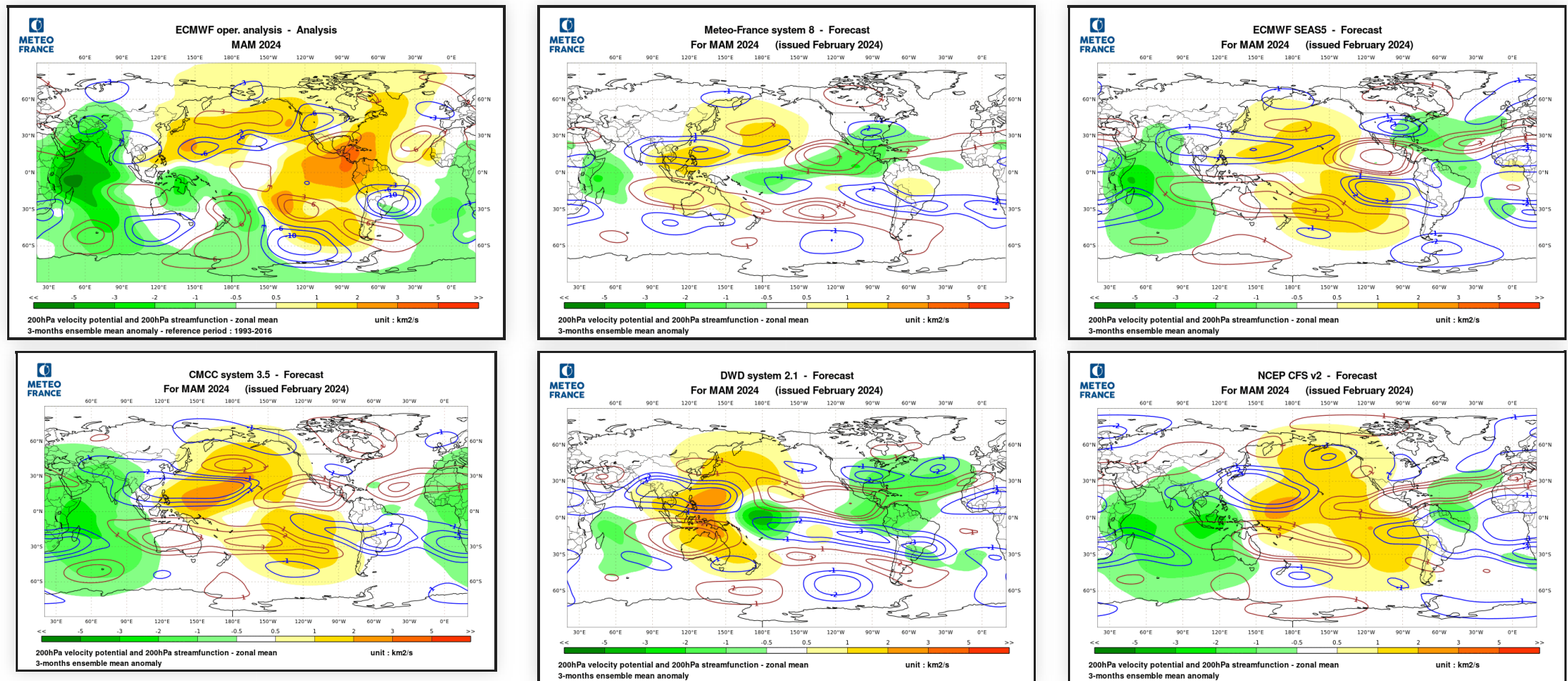


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : upward motions over west of Indian basin was predicted by all models. Elsewhere there is no real correlation. Subsidences are expected around the maritim continent and upwards around the Caraibbean while the opposite was observed.

SF : The dipole on the maritime continent well seen by the models, are less remarquables on the reanalisis than on the models. No visible teleconnection to the northern hemisphere. Suggested teleconnection on the southern hemisphere, from Australia aw well as South America. The reanalysis also shows a dipole one on the Atlantic Ocean off North Africa and the other on Western Europe. This is suggested by most models. The circulation over Europe may be linked to this dipole.

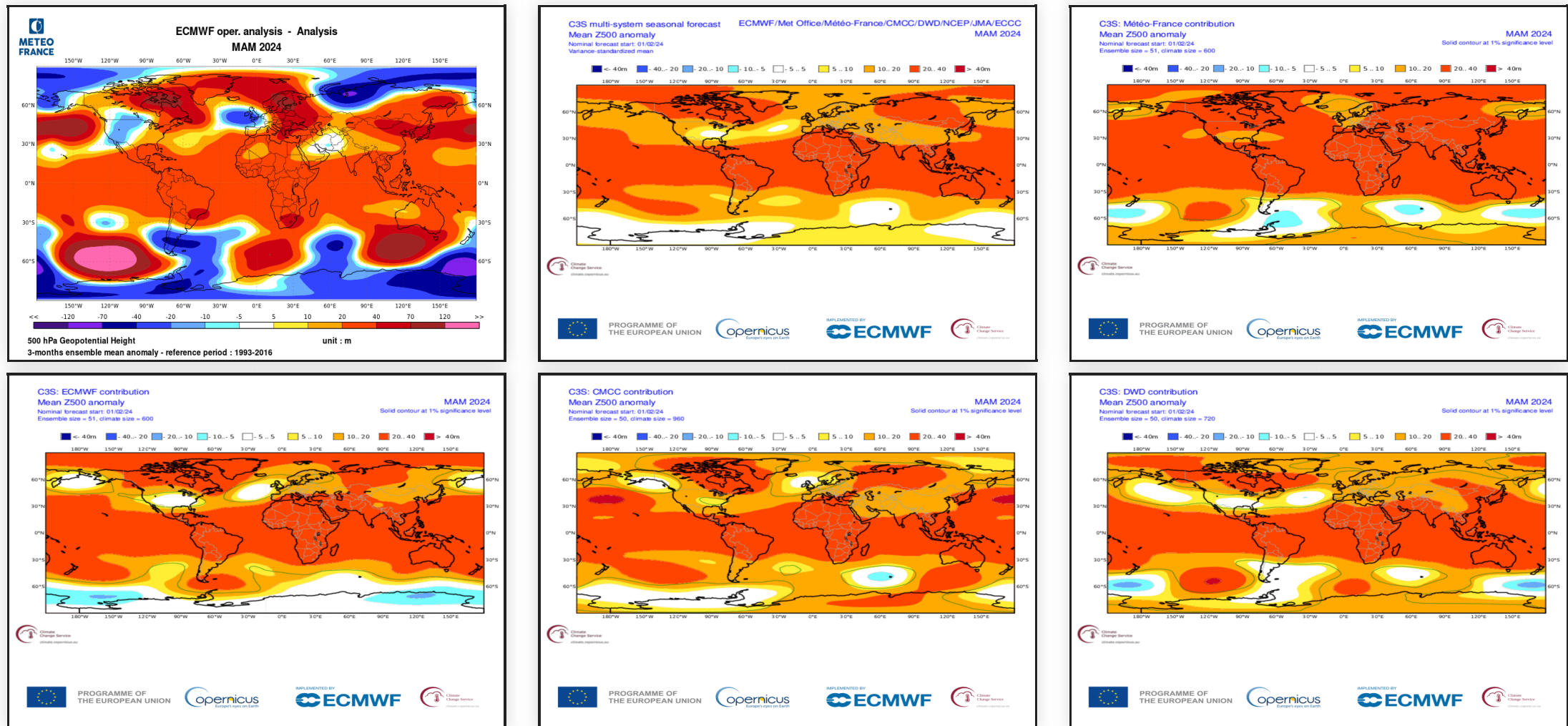


ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation : 500hPa Geopotential height

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

Northern Hemisphere : Positive anomalies over Canada and Groenland were well forecasted by all models as well as the band of negative anomalies from the USA to Sandinavia. However, there were discrepancies between models and reanalysis regarding their location. Bad forecast from North Pacific to Russia



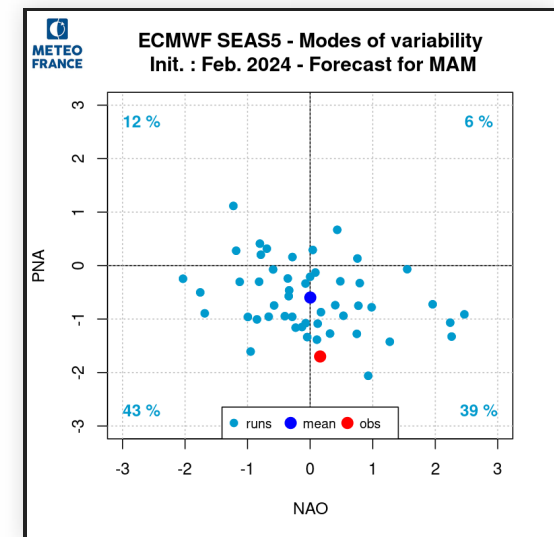
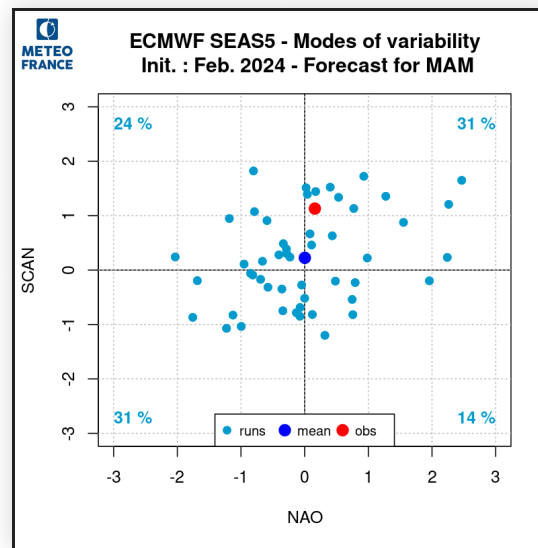
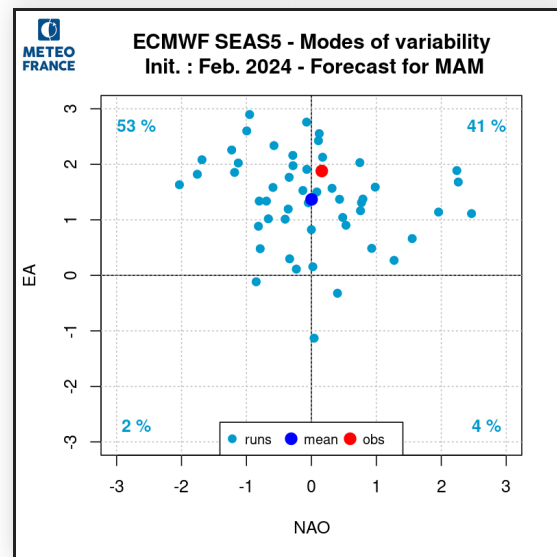
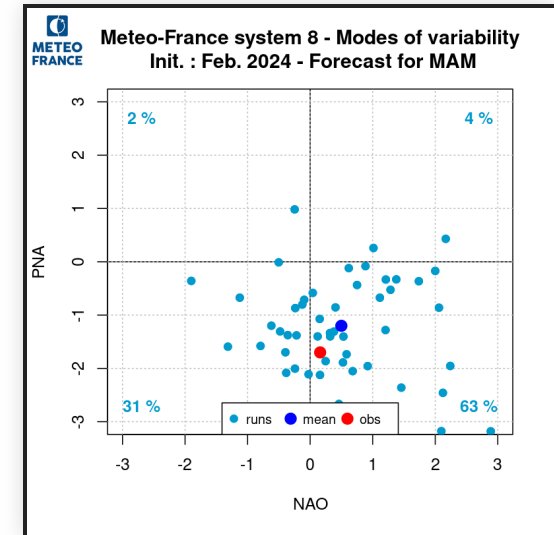
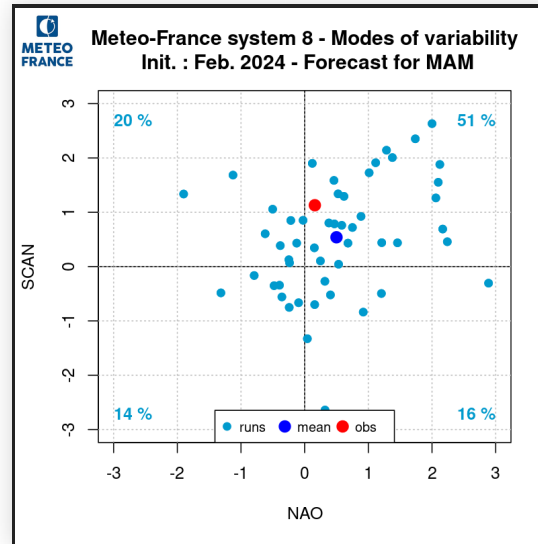
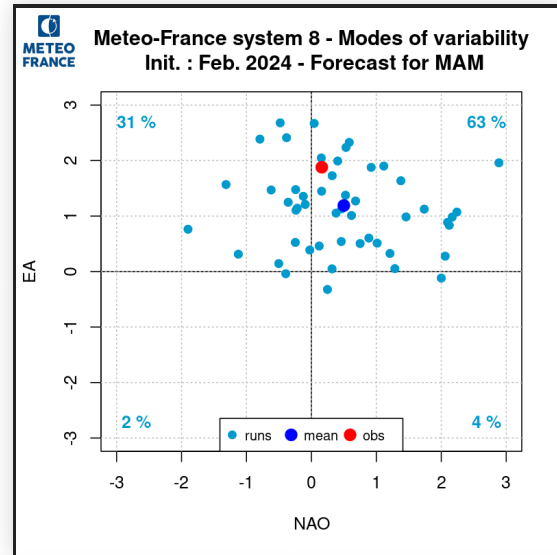
ECMWF analysis, C3S multi-system, MF-S8, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

Atmospheric circulation : Modes of variability

The domination of EA+ mode and PNA- mode were well anticipated, but underestimated.

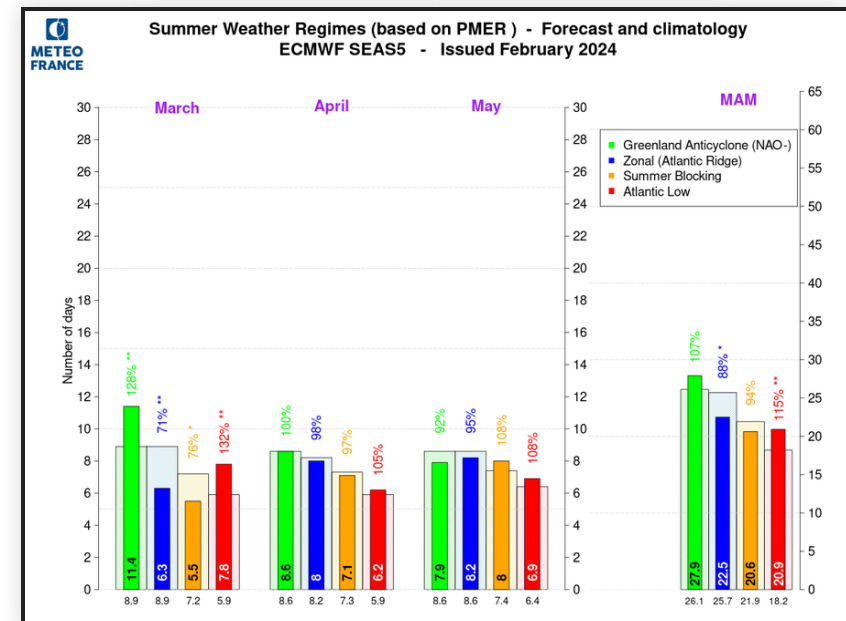
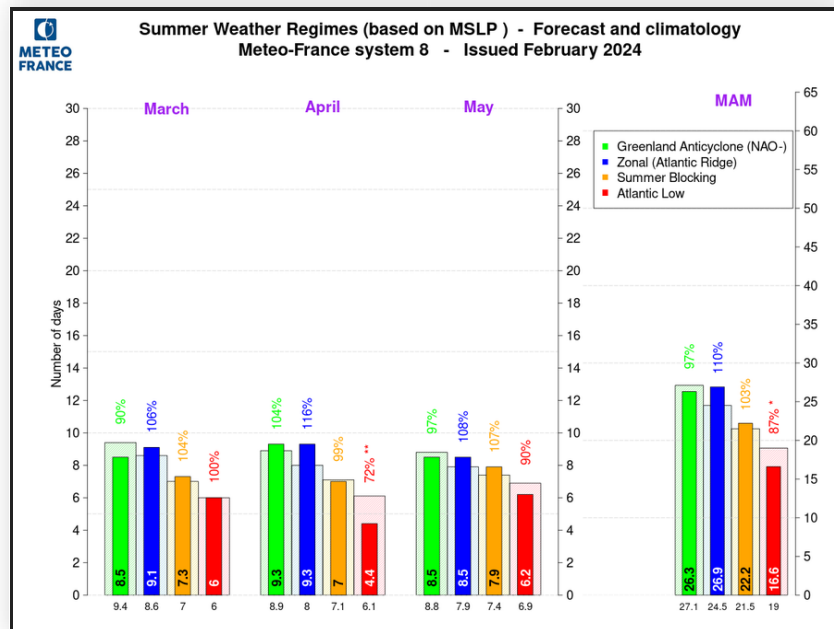
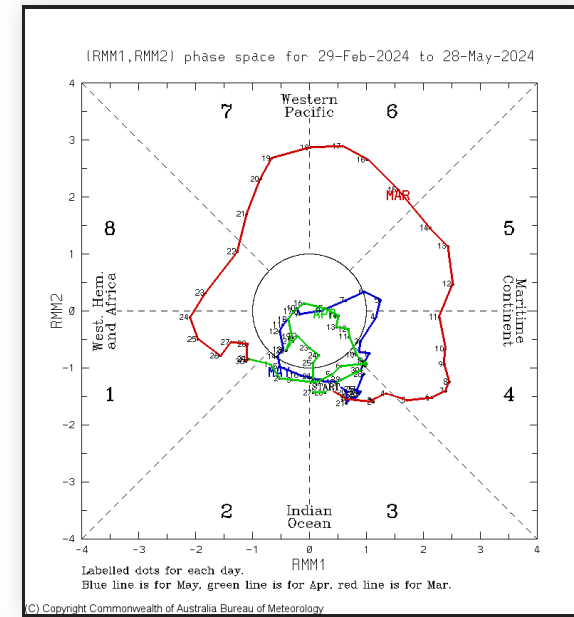
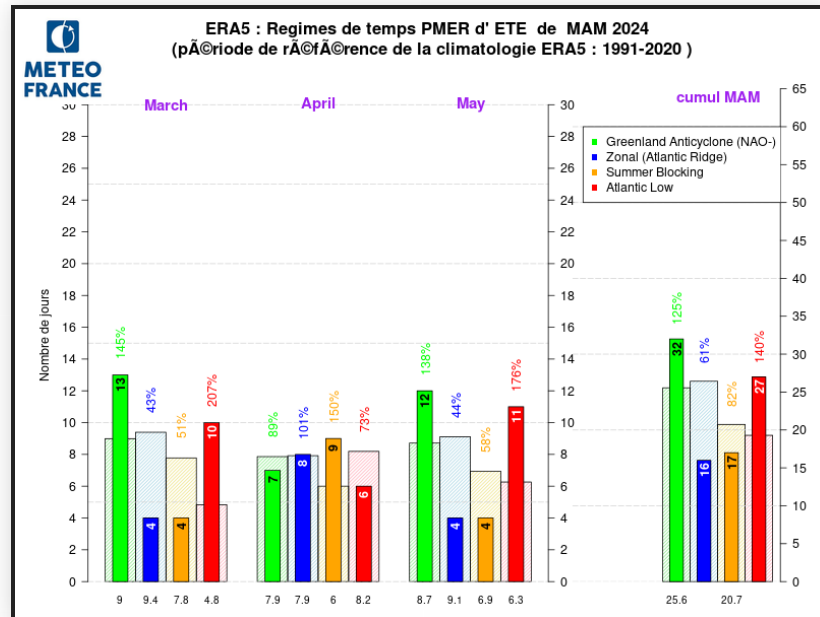
MF8 favors a positive phase of SCAN mode correlated with reanalysis while SEAS5 remains neutral.

MF8 favors a positive phase of NAO mode while the analysis is neutral like SEAS5



Atmospheric circulation : Summer SLP weather regimes

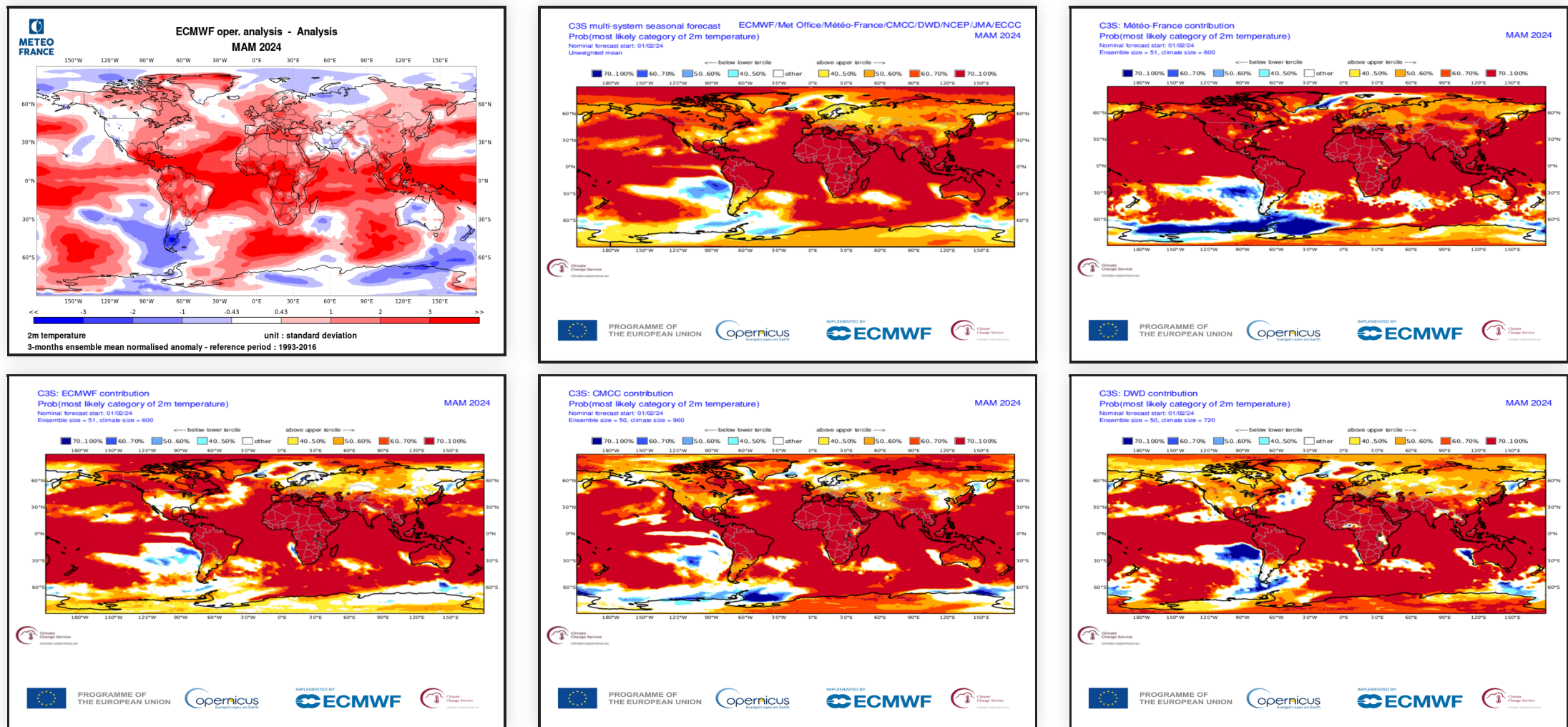
Atlantic Low and greenland anticyclone are dominant as predicted by SEAS5.



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

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, regions where anomalies are weak or even negative (western North America, northern Russia, around Pakistan) were not predicted by the models.

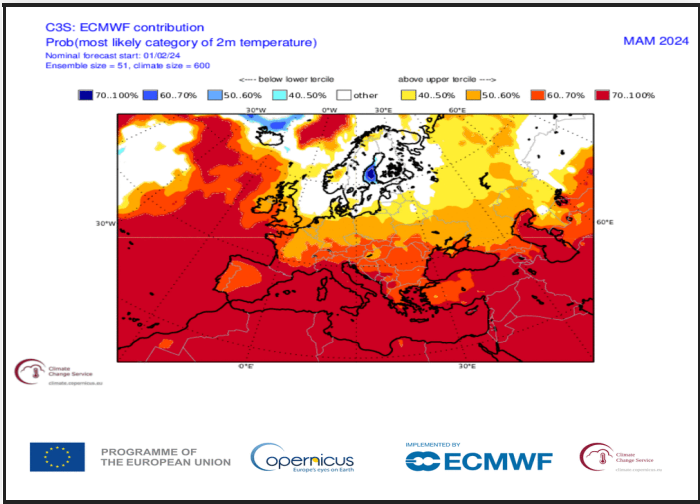
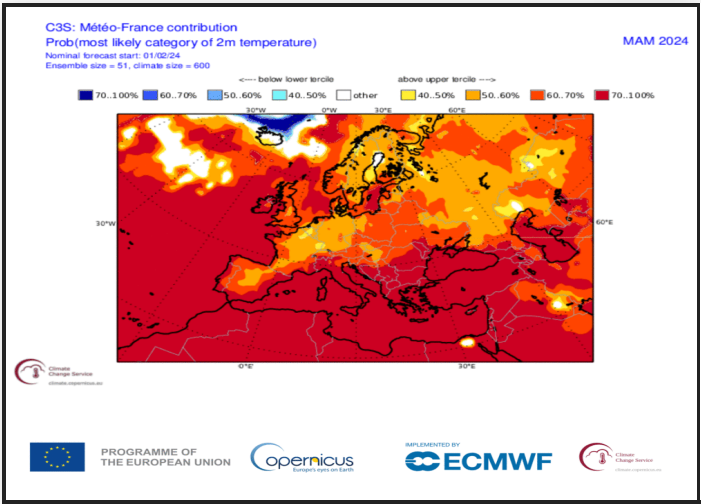
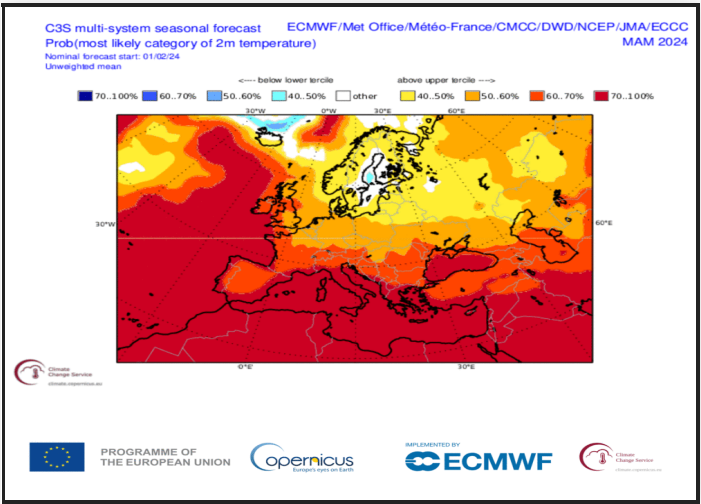
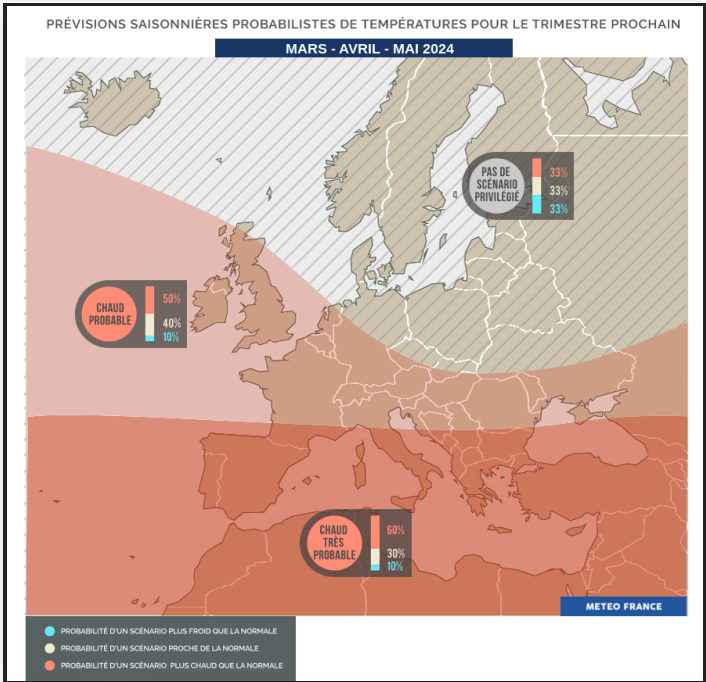
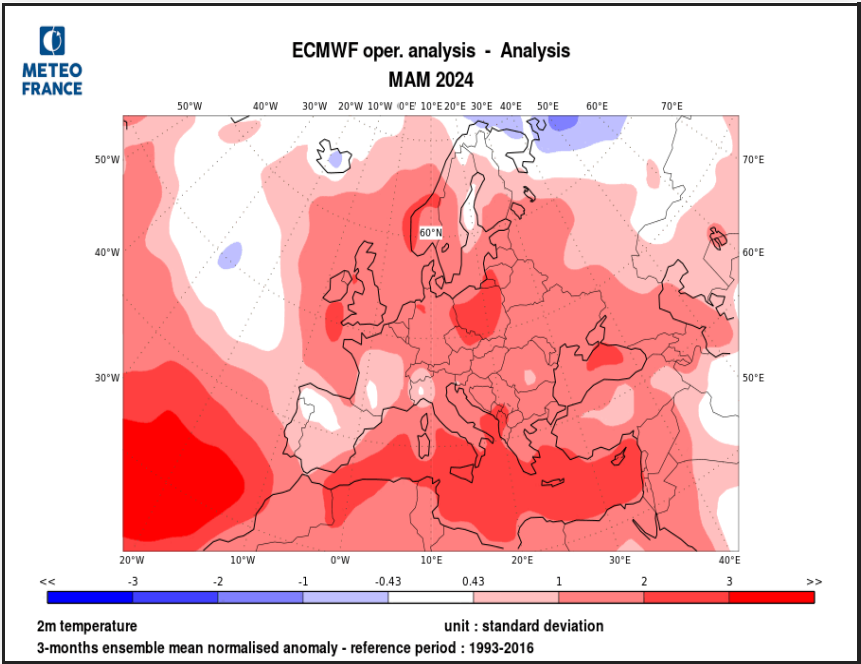


ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S8 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

Climatic parameters : temperature over Europe

The warmer-than-normal scenario for western and southern Europe and the Mediterranean basin, is validated by the analysis.

Further north no scenario was chosen while the conditions were warmer than normal.

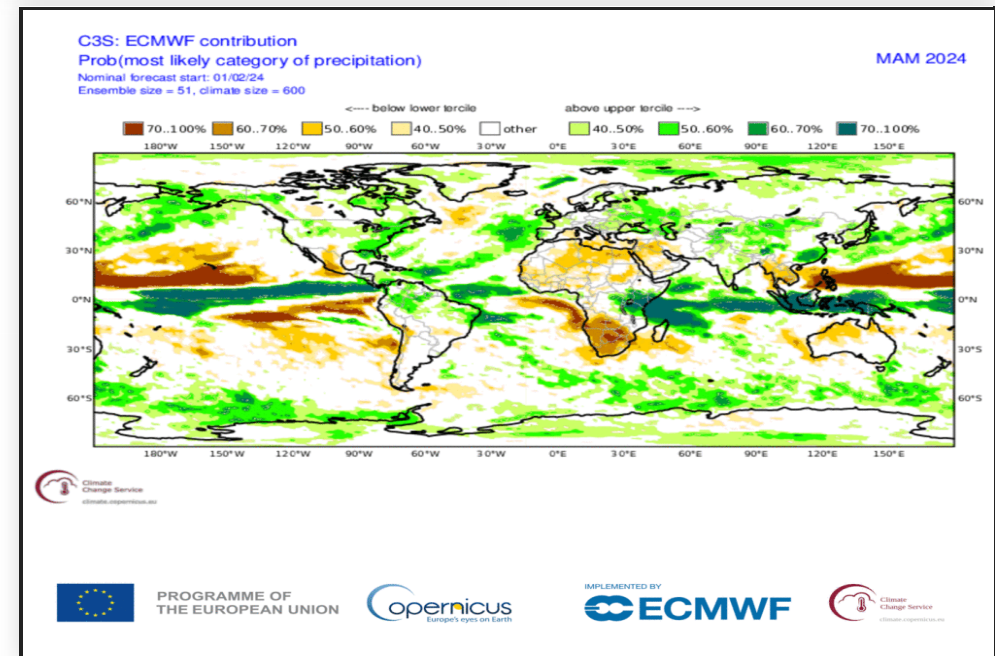
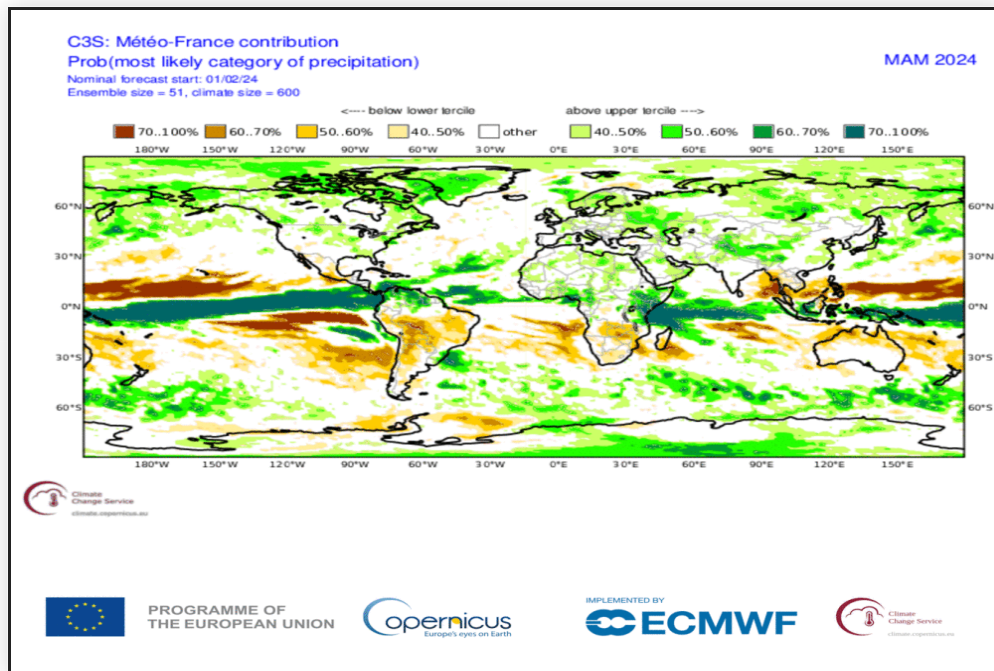
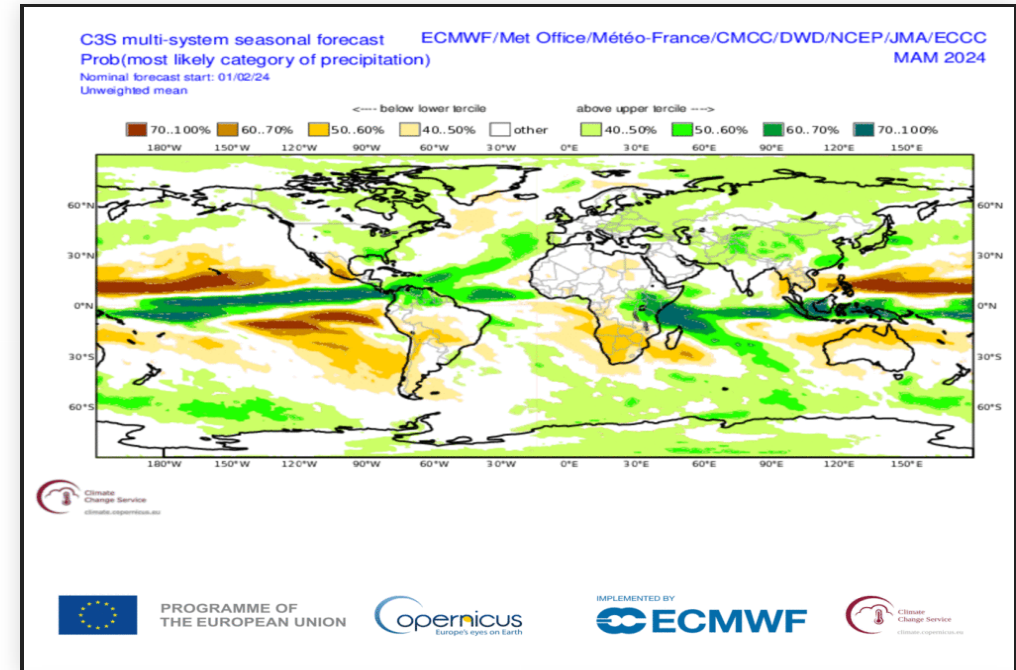
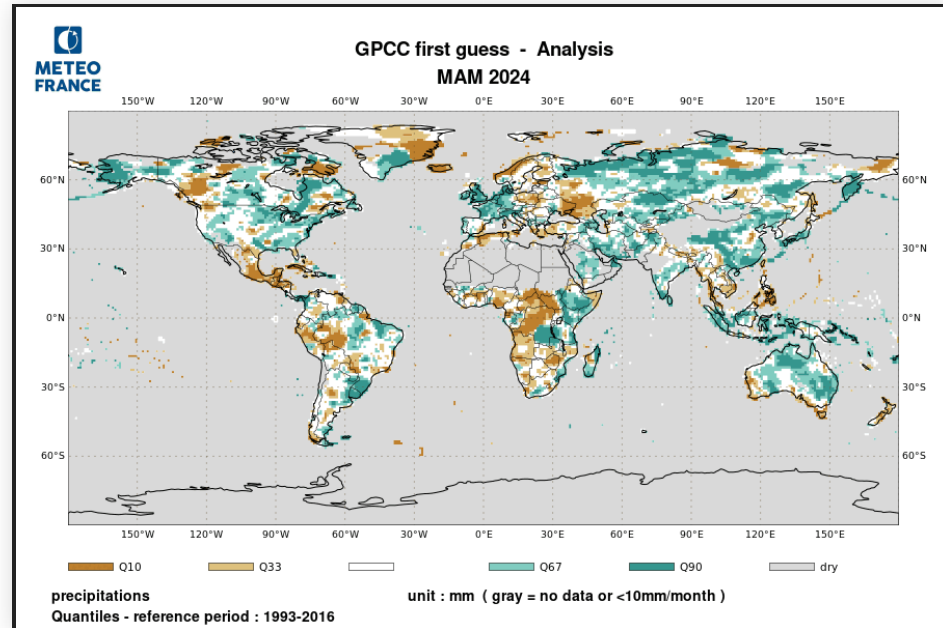


ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S8 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over the globe

In the inter-tropical zone, the impacts predicted by the models are confirmed by analysis on maritime continent (wet), southeast asia (dry) and the horn of Africa (dry). Over South America the forecasted dry/wet pattern is not observed.

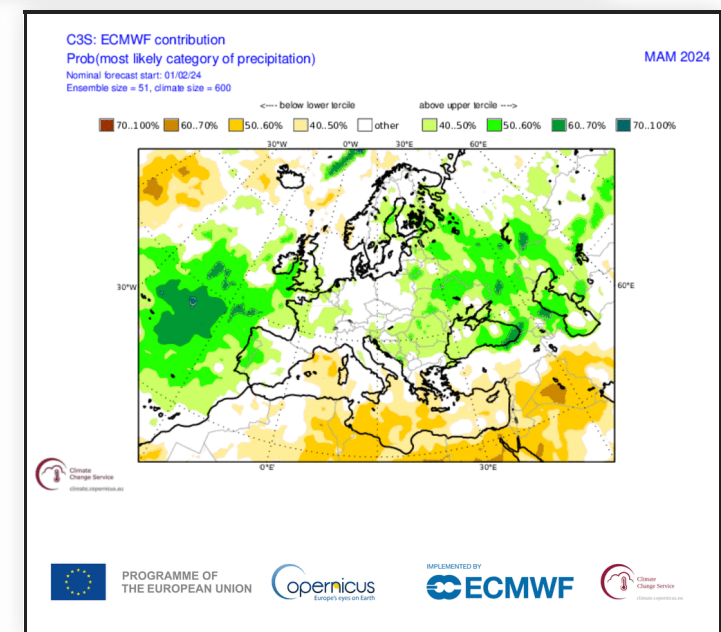
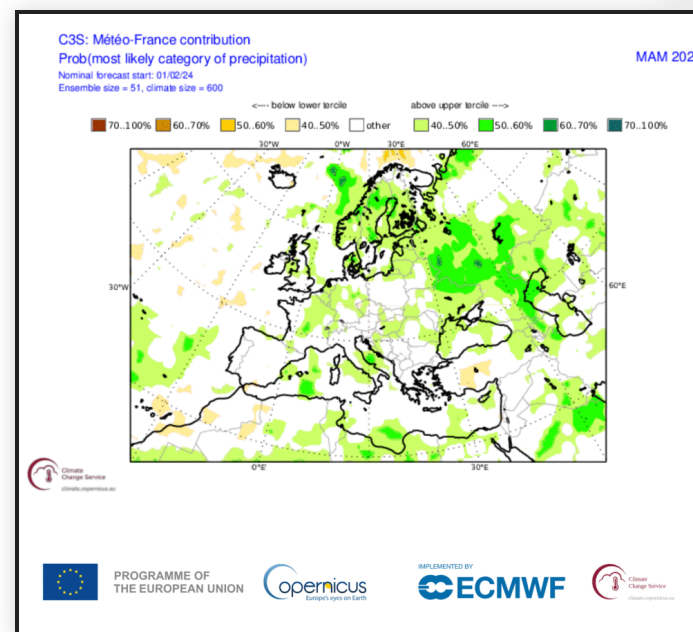
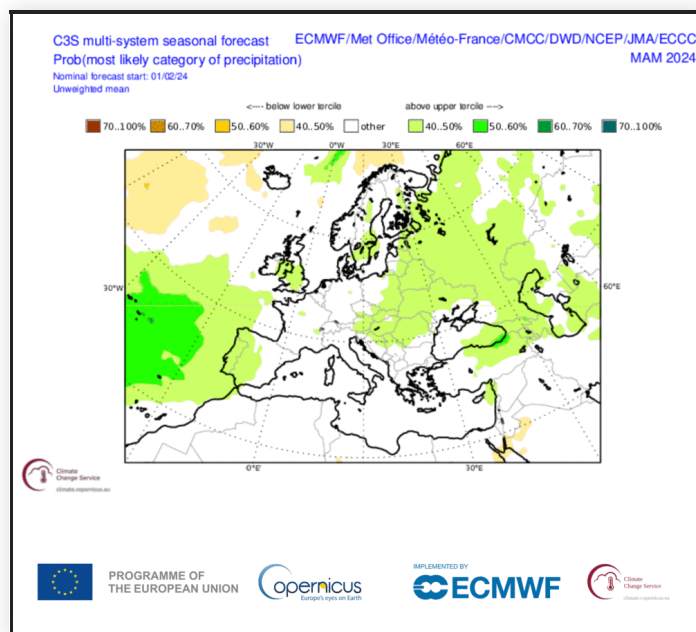
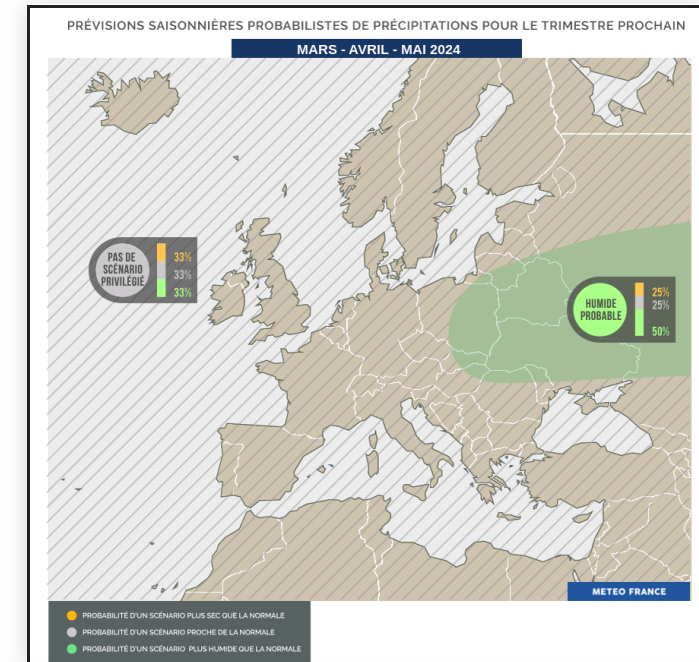
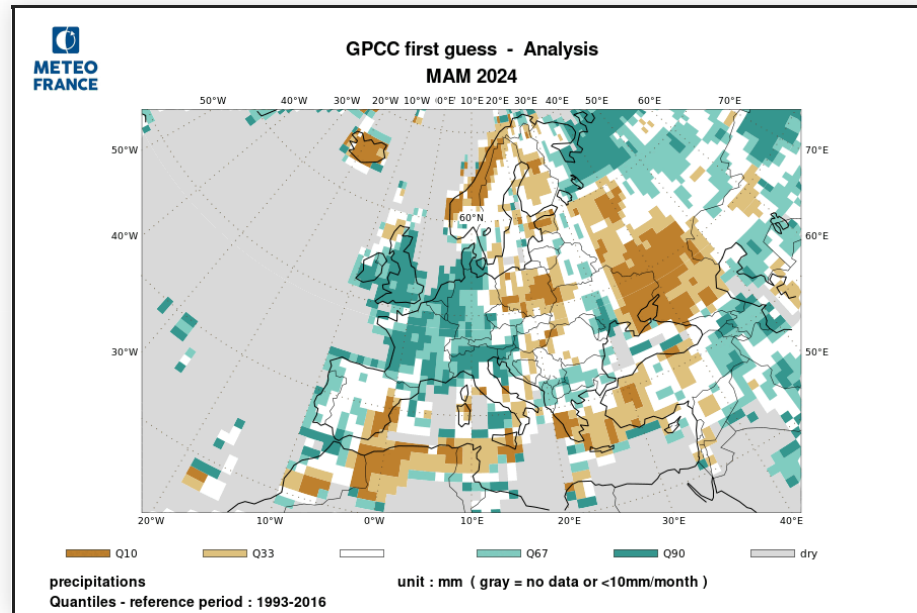
In North Hemisphere good forecast of dry conditions in Mexico and wet on the east of the united stated as weel as on Russia. Elsewhere there is little similarity between forecast and observation.



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

There are significant difference in forecasting and 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 MAM 2024

1) Oceans :

The main SST anomalies predicted by the two models are well represented in the analysis.

2) Large scale atmospheric circulation :

VP 200 hPa : Areas of lifts over the western Indian Ocean were generally well anticipated by the models, Elsewhere, no real agreement between forecast and analysis.

SF 200 hPa : No teleconnexion on the northern hemisphere. All the models shows an anticyclonic anomaly over Mediterranean sea.

Z500 : Models suggested a weakness in geopotentials off the coast of Western Europe which was well observed. On the other hand the strong positive anomaly in eastern Europe was not predicted.

3) Climatic parameters over Europe :

Temperatures : The warm anomalies were well anticipated over a large part of southern Europe but not anticipated further north.

Precipitations : There are significant difference in forecasting and analysis