

VERIFICATION BULLETIN

FEBRUARY - MARCH - APRIL 2023

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Introduction : Objective

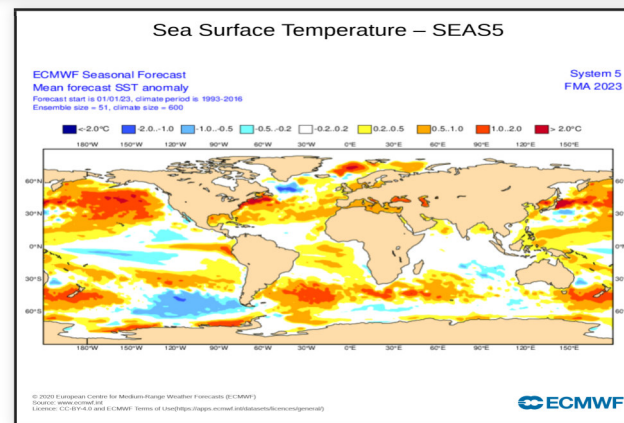
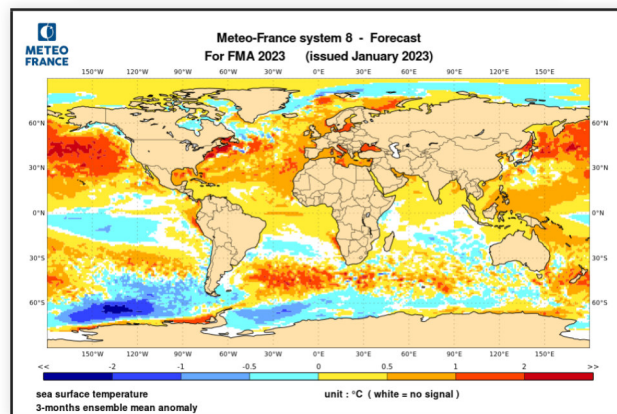
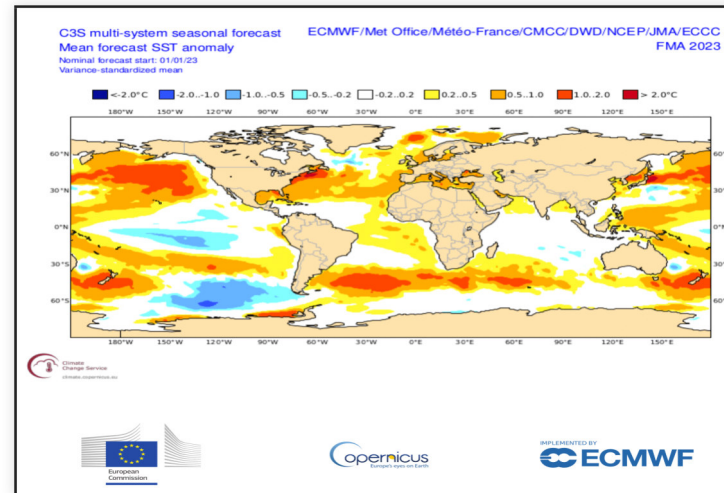
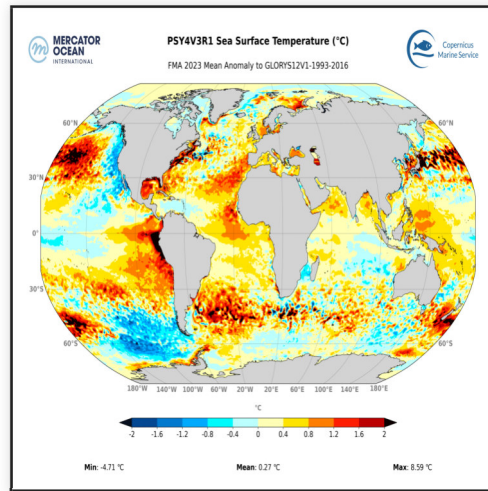
- The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean 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 traces of "la Niña" pattern are still visible on the center of the basin while warm anomalies are present off the coasts of South America. This is well seen by the models, even if they were too cold near the South American coast. The PDO- pattern was also well predicted by the models in the Northern Hemisphere.

In the Indian Ocean, the cold signal on the south-east and the warm signal in the northern part of the basin were suggested by the models.

Elsewhere in the South Pacific or the Atlantic, the main anomalies were well anticipated.

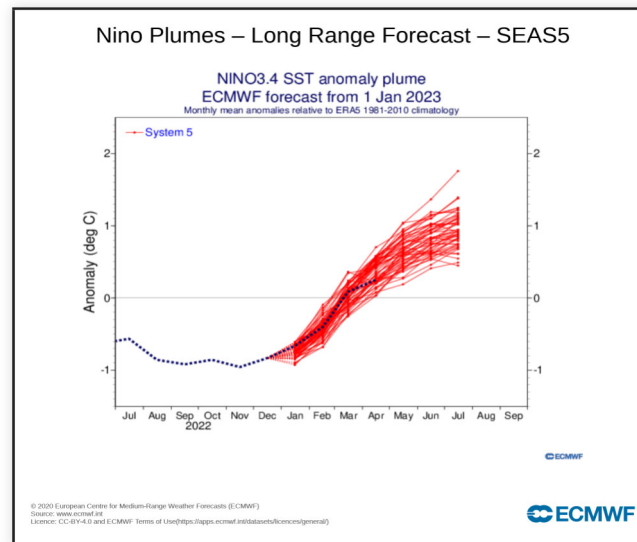
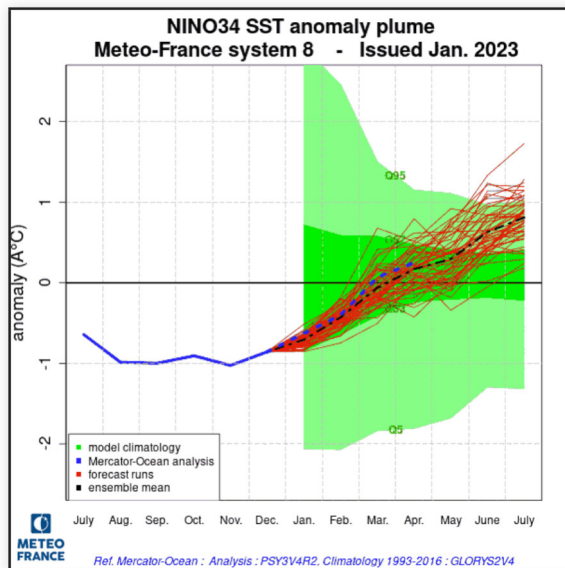


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

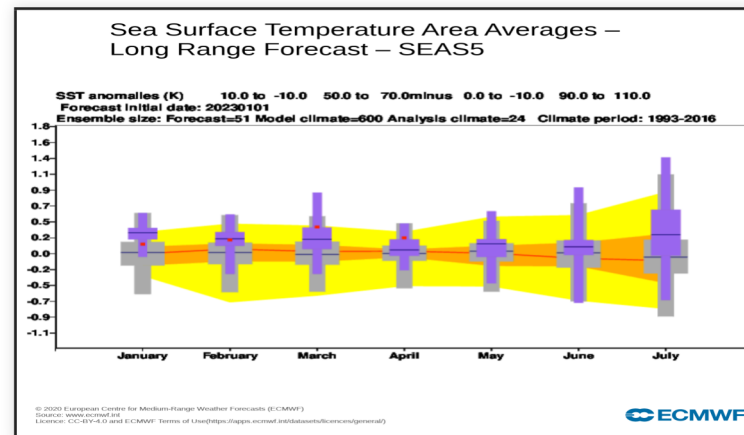
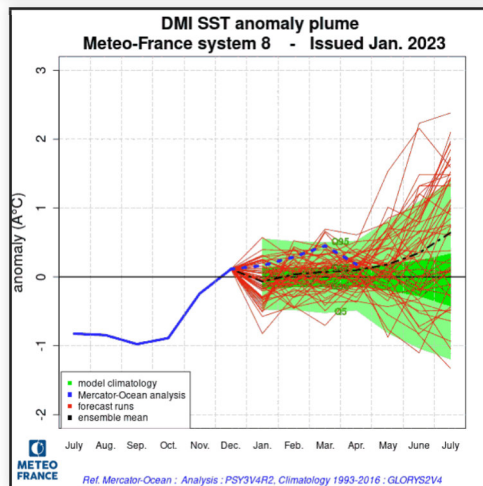
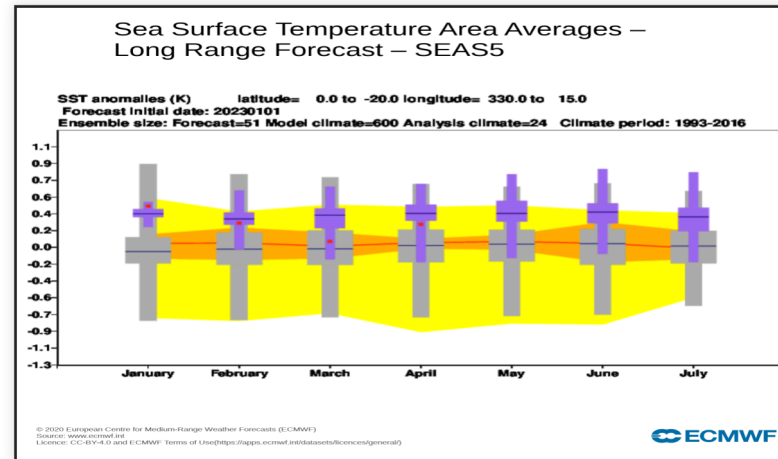
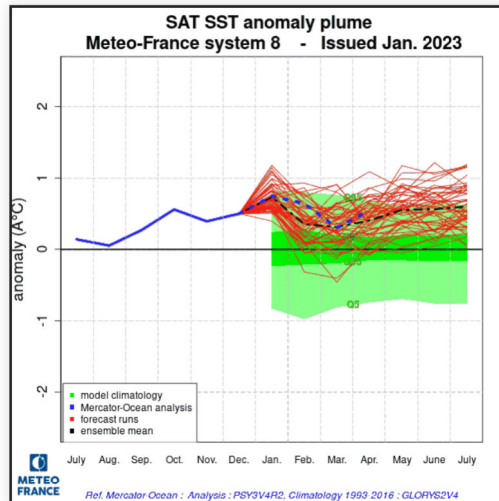
Very good forecast for both models.



Oceans : tropical Atlantic and Indian Ocean index

SAT : Slightly positive anomaly expected fairly well.

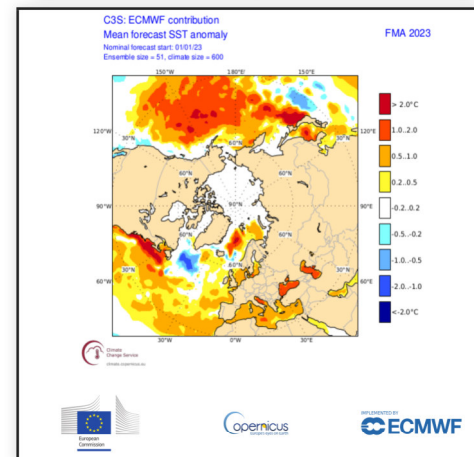
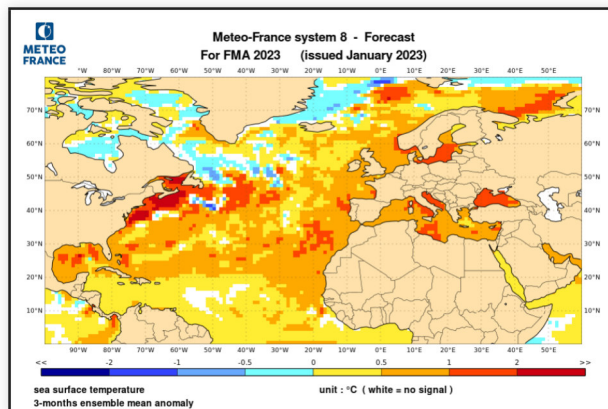
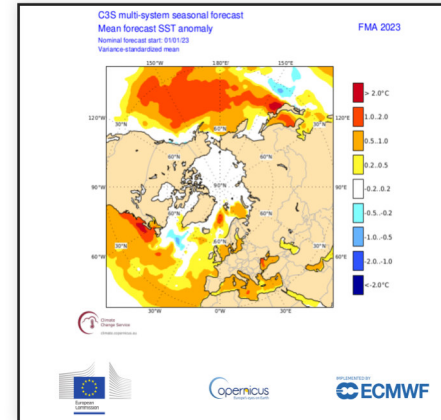
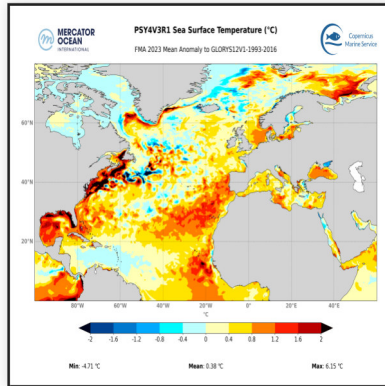
DMI : The positive trends observed wasn't forecasted by models.



Oceans : North Atlantic SST

The main anomalies have been well anticipated.

The warm anomaly off the US coast was surestimated by the models.

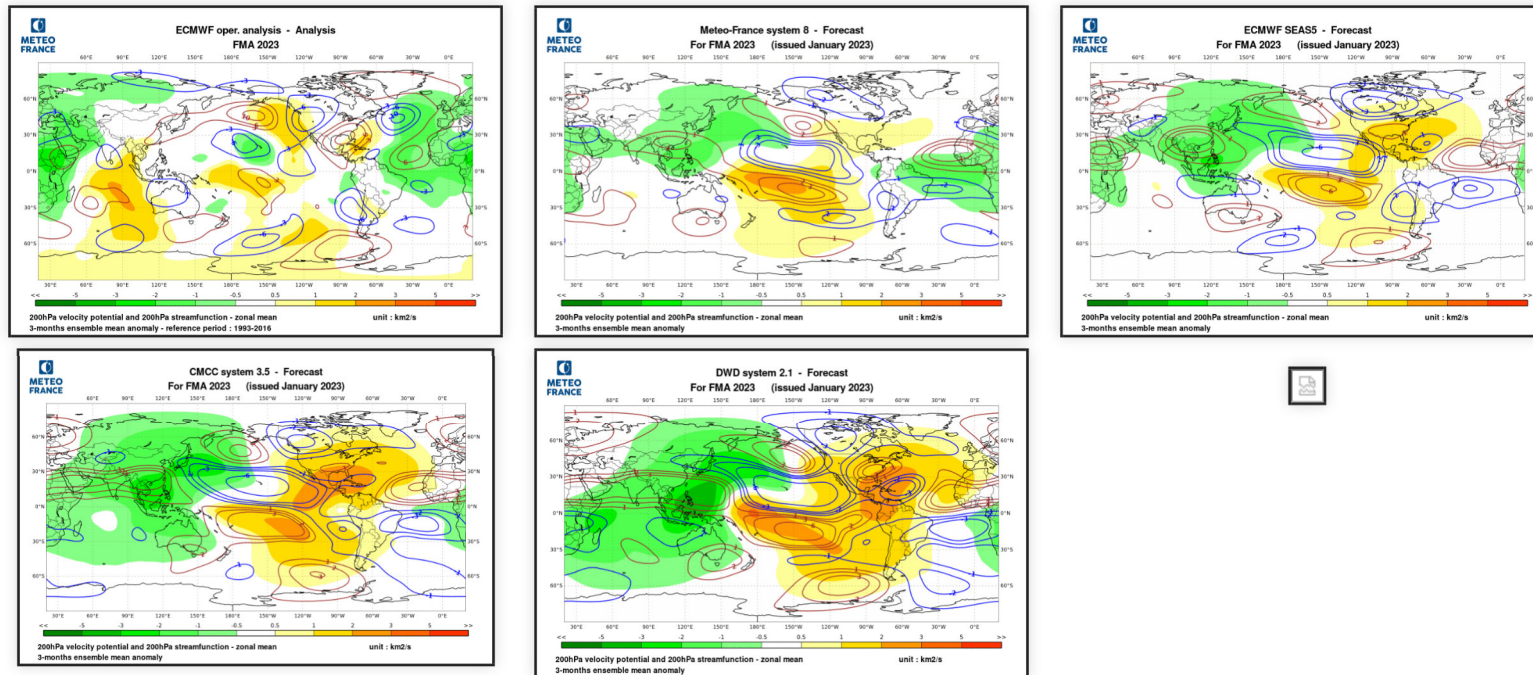


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : Some elements have been well forecasted such downward motion on the central Pacific (link to La Niña) or upward motion on Africa. Others haven't been forecasted as downward motion on the east of the Indian Ocean. MF8 is closest to analysis than others models because of Atlantic upward motion and neutral signal on the Indian Ocean.

SF : The dipoles on the Pacific and Atlantic Oceans are seen by the models. On the other hand, the teleconnections towards North America, well marked for all models, are much less visible in the analysis. Over Europe, the anticyclonic curve centered on Northern Europe doesn't exist on analysis.

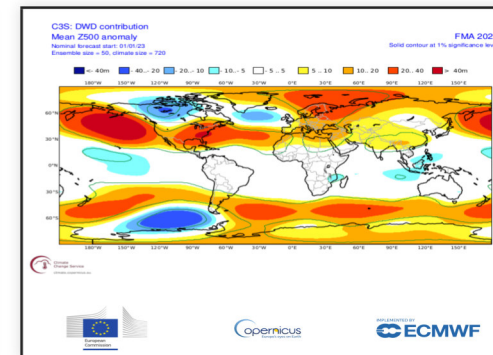
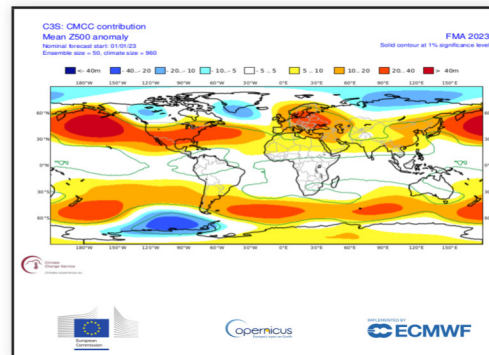
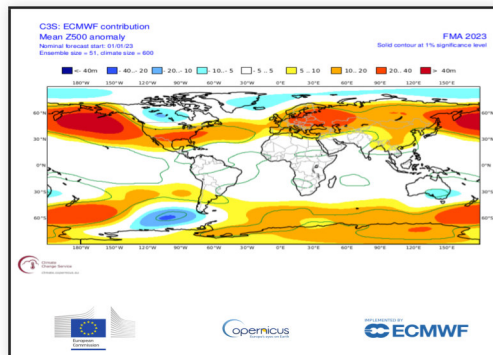
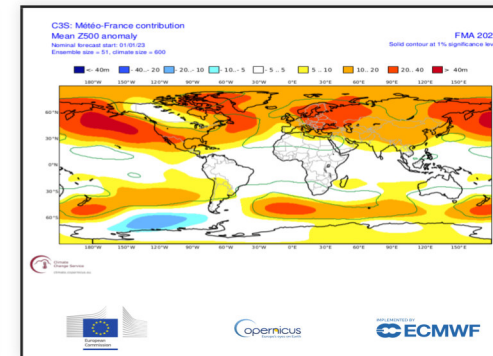
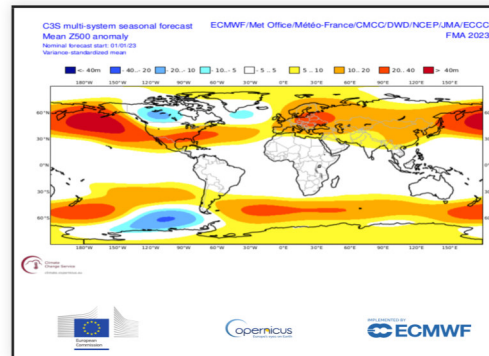
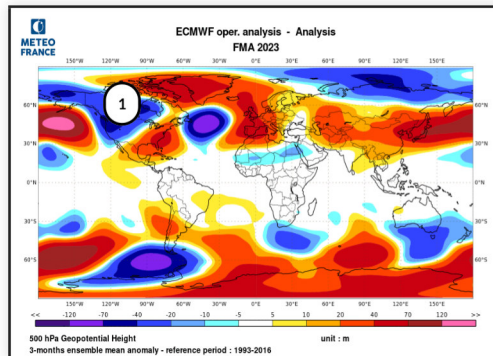


ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation : 500hPa Geopotential height

South hemisphere : the main structures are well predicted in the Pacific

North hemisphere : Analysis and models agree on a PNA-type pattern. Over the North Atlantic, the models predicted a positive anomaly from the North America coasts (extension of the PNA - pattern) while a rather negative anomaly was observed. NAO+ pattern was forecasted while NAO- was observed. Over Europe, the strongest positive anomaly forecasted in the eastern part of the continent was observed over the western part while a negative anomaly affected the extreme north. Over Asia the dipole positive in the south and negative in the north, was anticipated by models.



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

1 - Look like PNA -

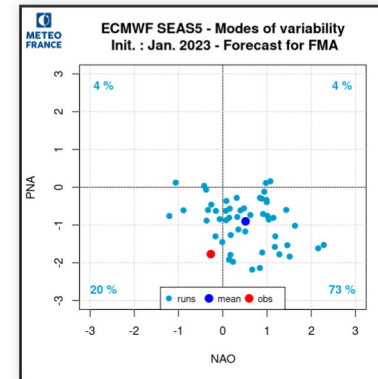
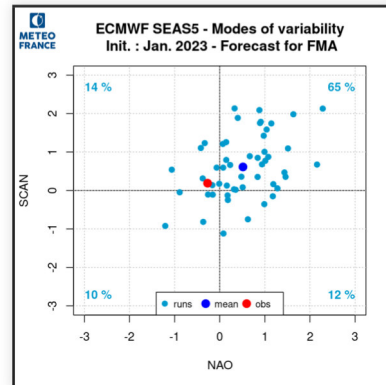
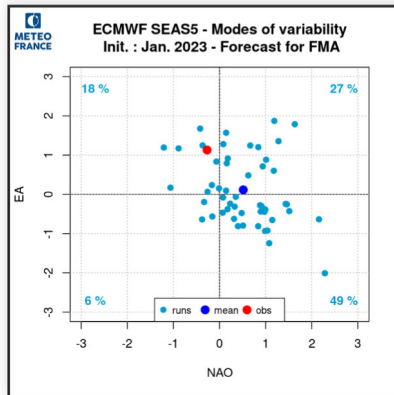
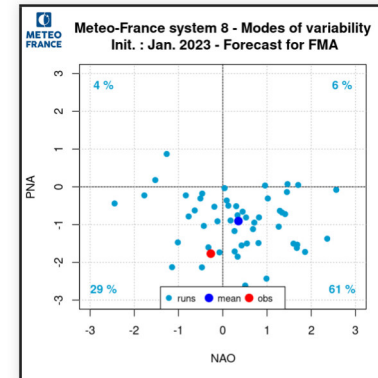
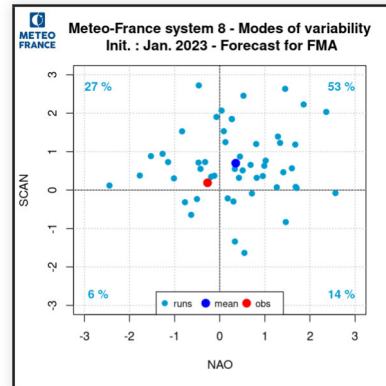
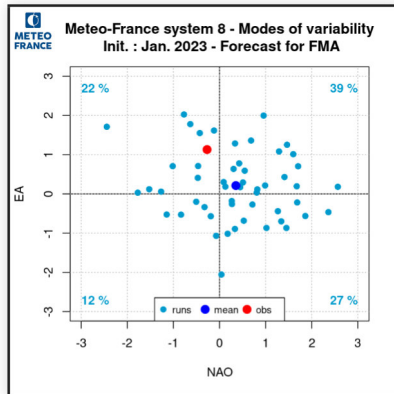
Atmospheric circulation : Modes of variability

The PNA- modes is well seen by both models.

The SCAN+ mode was predicted while it is close to neutral in the analysis.

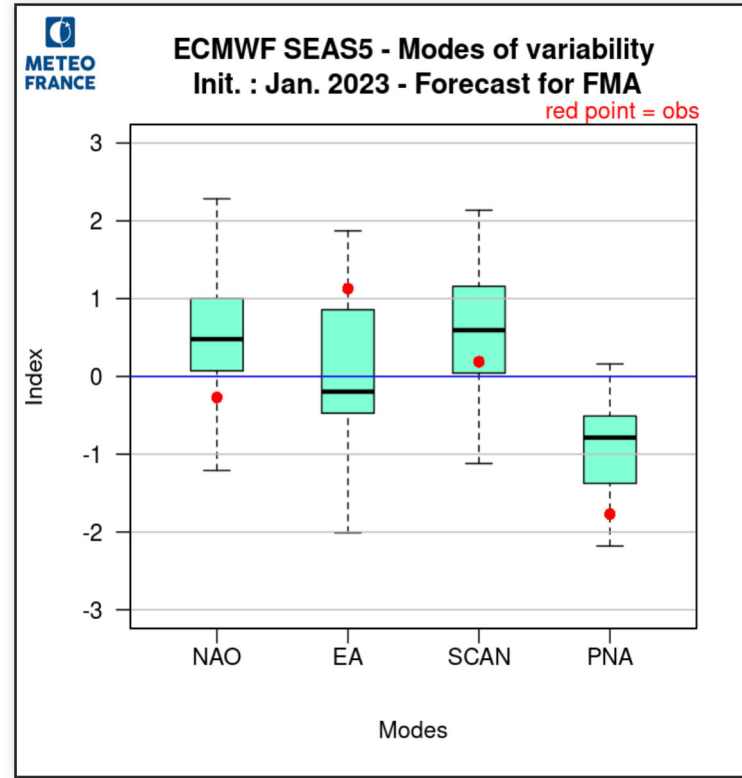
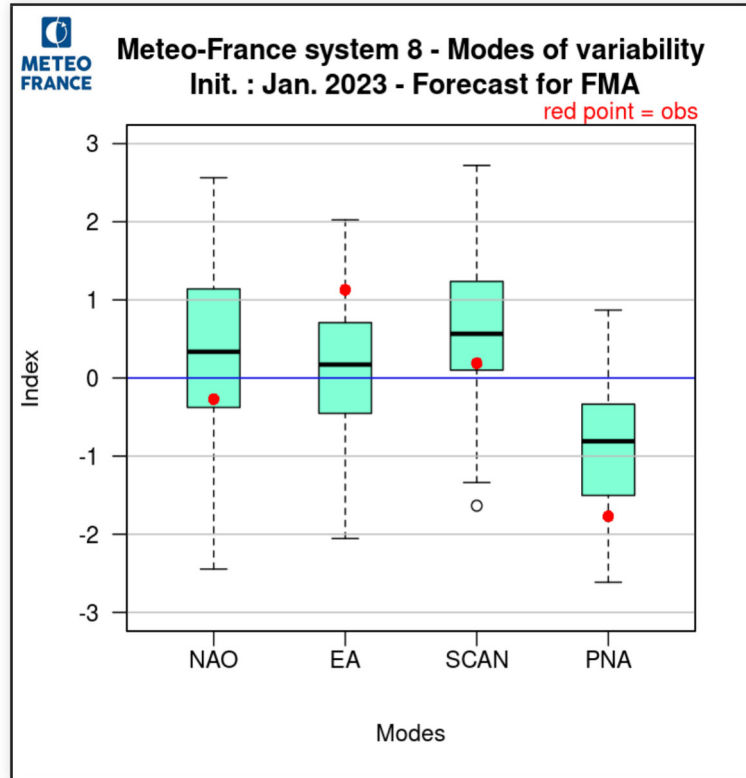
Neutral EA was forecasted while EA+ is observed.

The positive phase of NAO was forecasted while the negative phase is observed.



Atmospheric circulation : Modes verification

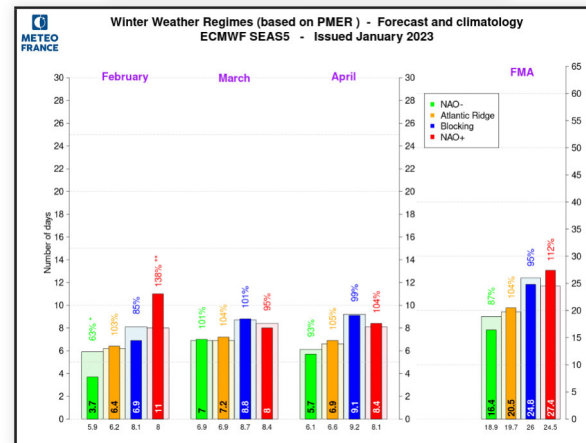
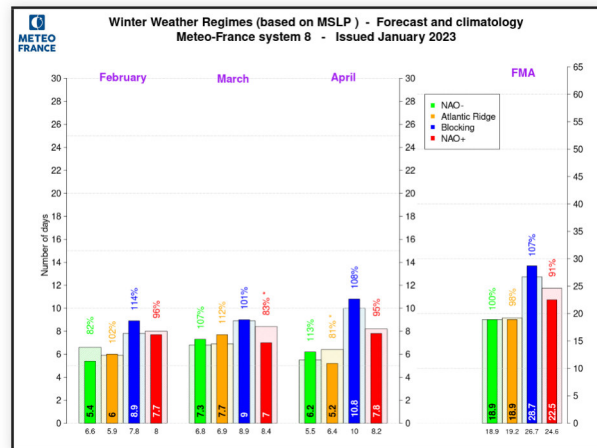
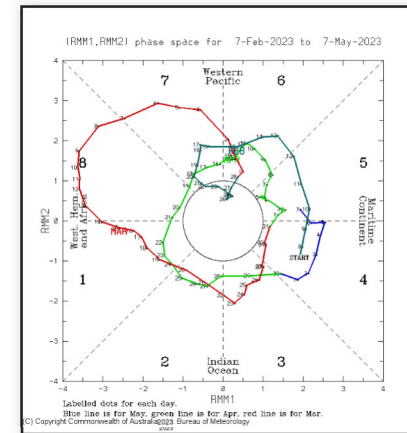
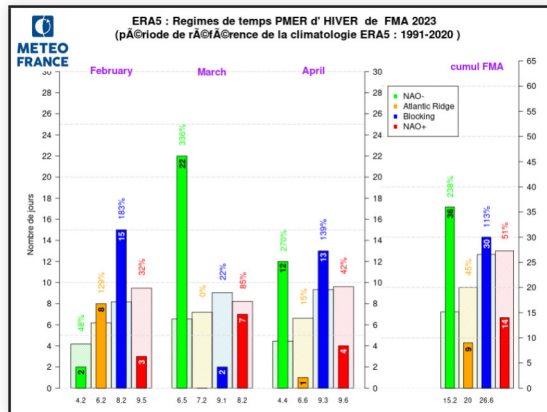
Same observation as for the previous slide



Atmospheric circulation : Winter SLP weather regimes

The three months have very different regime distributions. The MJO, which was very active in February/March, favored the Blocking regime in February and the NAO- regime in March.

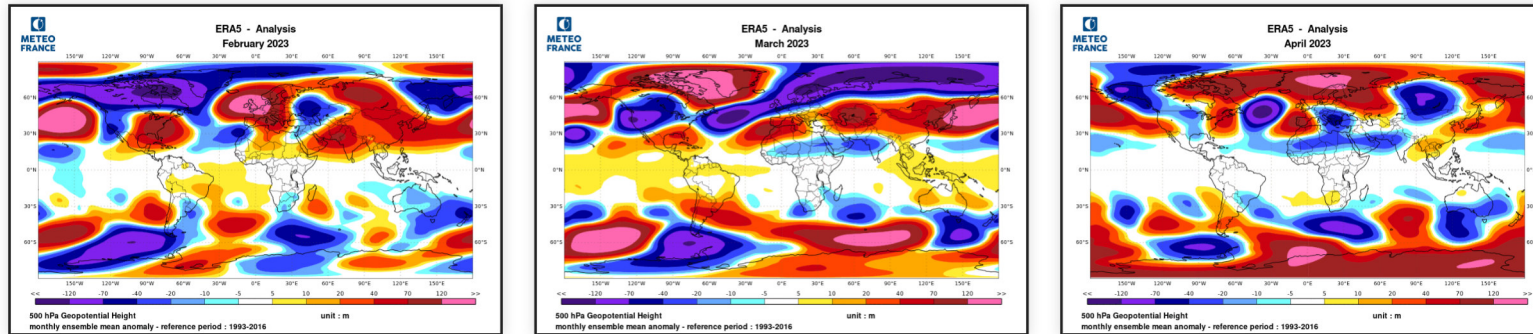
The forecasts didn't favour any of the schemes.



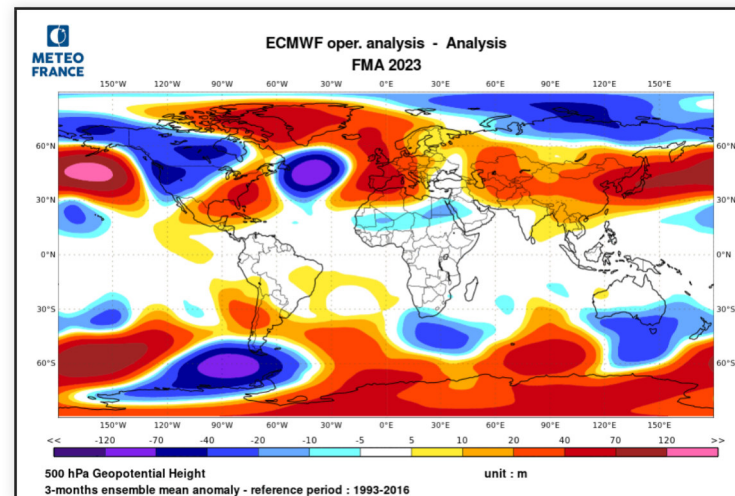
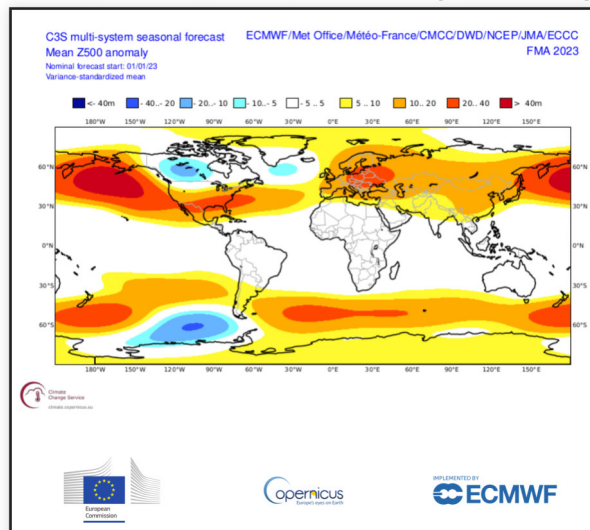
weather regime : ECMWF analysis top left, MF8 and ECMWF forecasts at the bottom. MJO phase top right

Atmospheric circulation : Variability within the quarter

The atmospheric circulation is indeed very changeable from month to month during this quarter, especially from the North Atlantic to Europe.



ECMWF analysis : January, February and March 500 geopotential height anomalies

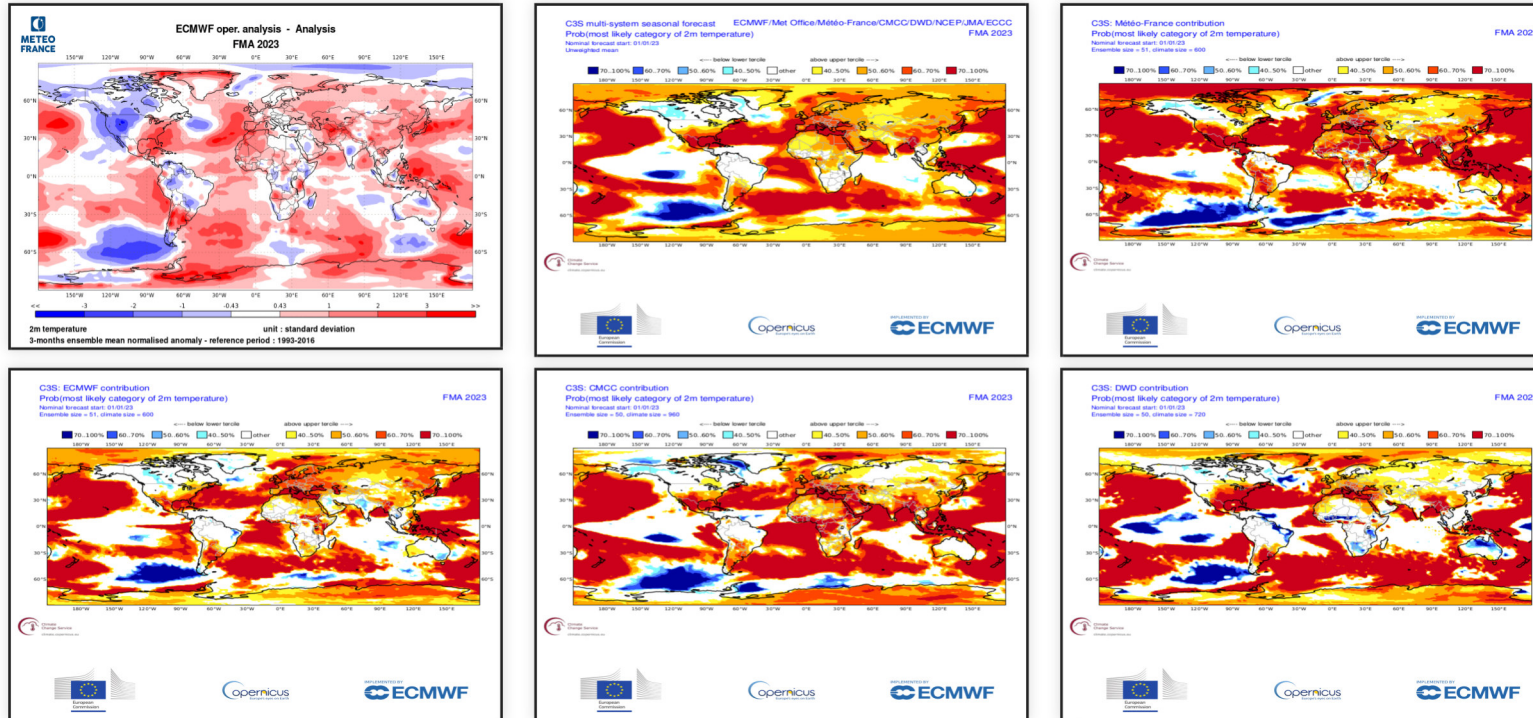


C3S multi-sytem forecast and ECMWF analysis 500 geopotential height anomalies for JFM

Climatic parameters : temperature on the globe

The cold anomaly in South America is more marked than expected. The predicted cold anomaly in Alaska is shifted southward.

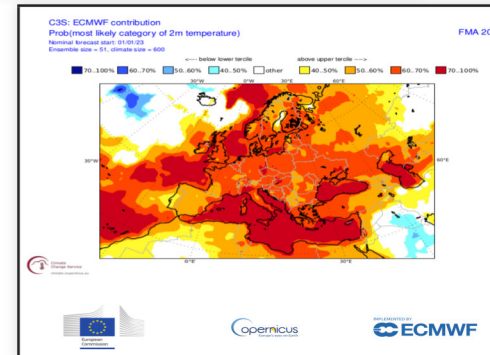
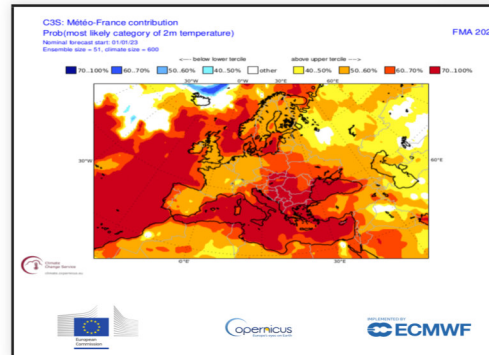
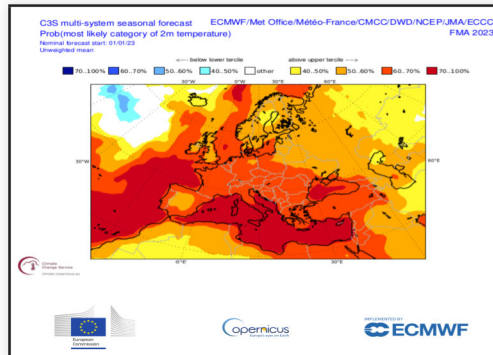
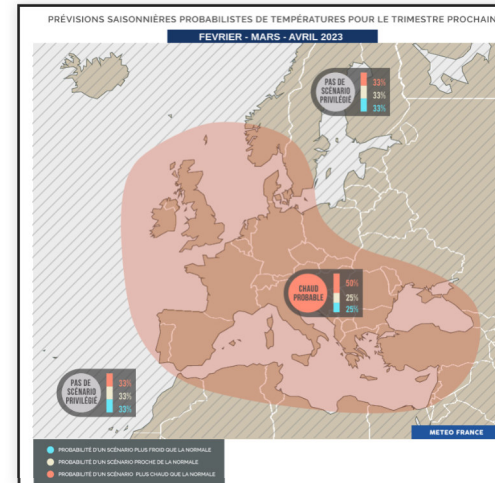
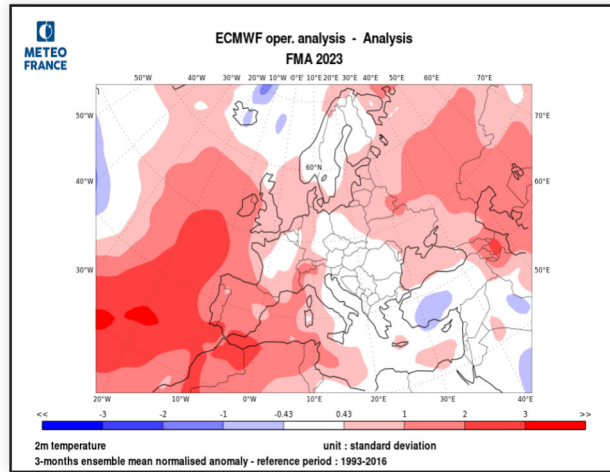
Differences are also visible in Europe.



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

A more probable warm scenario was expected over a large part of southwestern Europe while a warm anomaly is observed on countries close to the Atlantic as well as on the east of Europe.

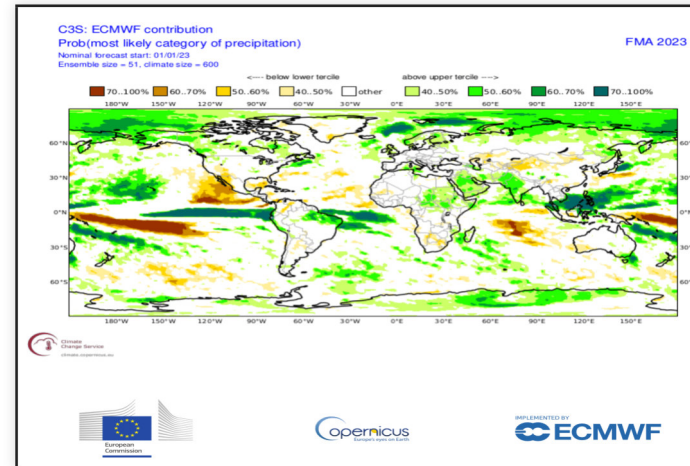
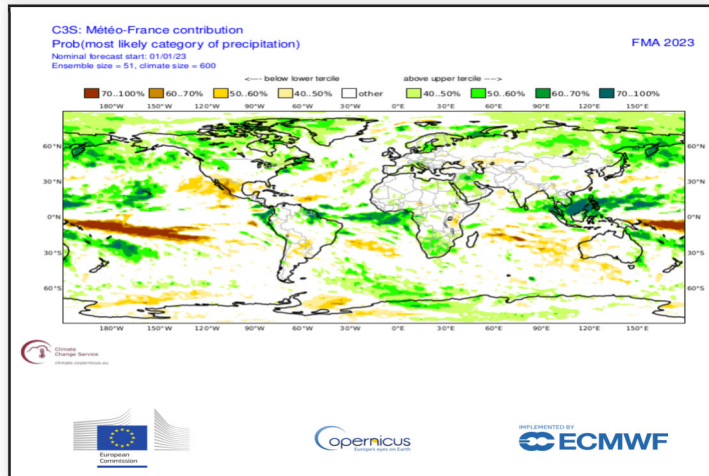
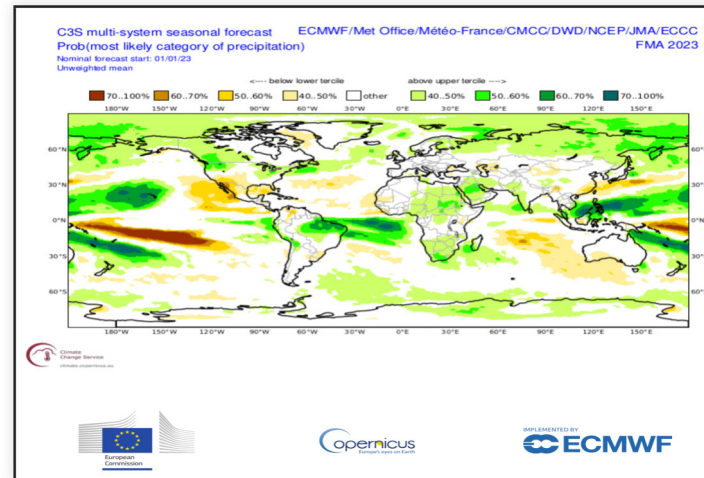
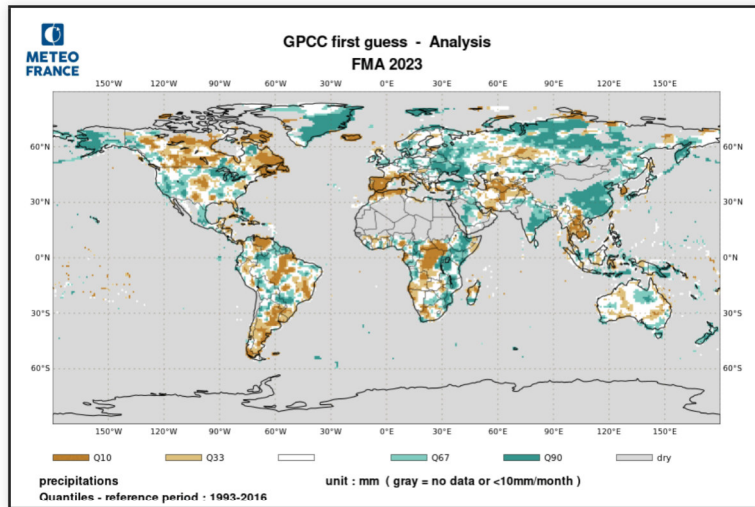


ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system, MF-S8 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over the globe

In the intertropical area ,no anomalies expected or observed on a large scale on the continent.

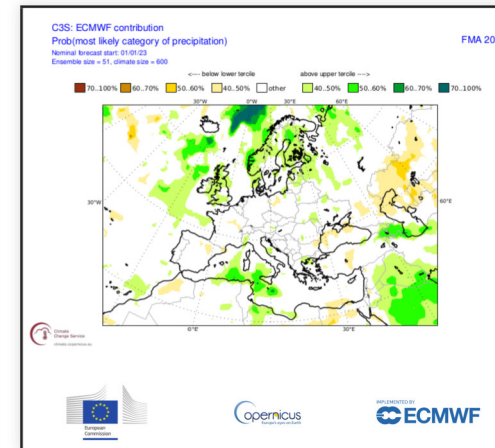
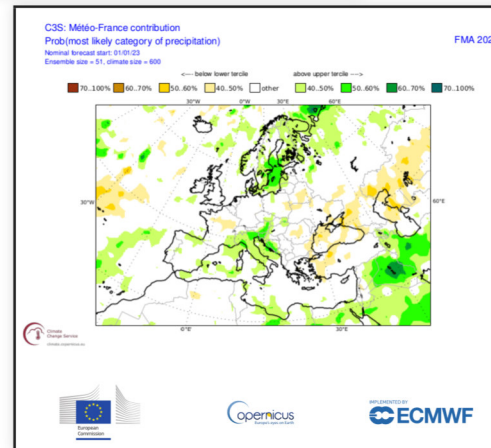
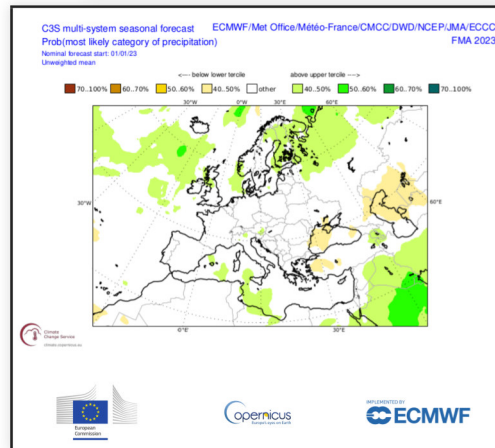
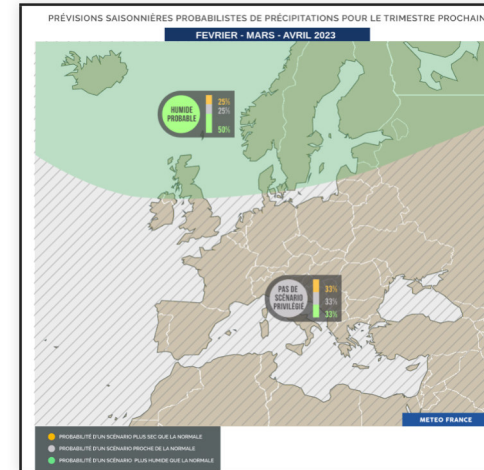
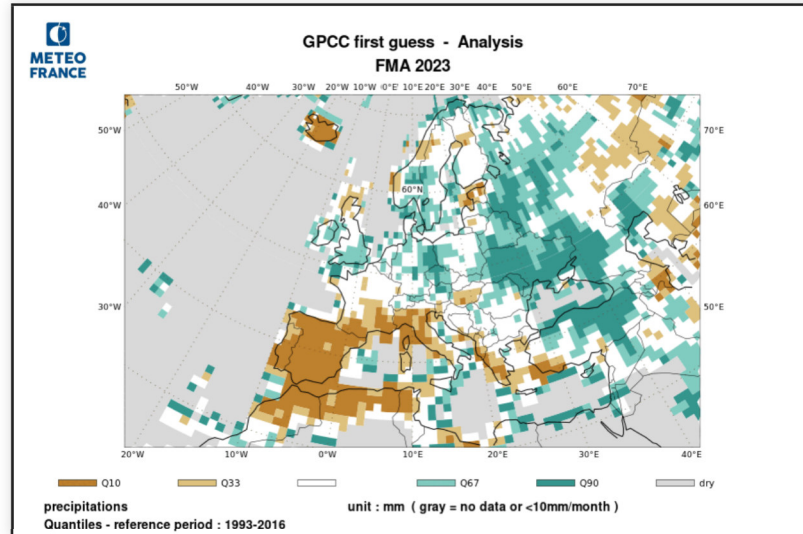
Over North America, the differences between the analysis and the models on the PNA- pattern are found in the location of precipitation anomalies.



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 an observed atmospheric circulation far from the forecasts, the dry and wet anomalies forecast are badly positioned.



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 FMA 2023

1) Oceans :

The main SST anomalies are well predicted, except in the Indian Ocean (negative anomaly in the East).

2) Large scale atmospheric circulation :

VP 200 hPa : Dipole linked to La Niña is too strong with some models. Upwards motion over Atlantic and Africa are well anticipated by MF8.

SF 200 hPa : The dipoles in the equatorial zones are well planned. On the other hand, the teleconnections, well marked by the models, are much less so in the analysis. As a consequence, significant differences are visible over Europe.

Z500 : The circulation at 500 hPa predicted by the models lacks precision over North America and is not good over Europe. Active MJO likely influenced atmospheric circulation in the North Atlantic.

3) Climatic parameters over Europe :

Temperatures : The warmer-than-normal scenario forecasted in most European countries has not been observed in Central Europe.

Precipitations : The forecasts are quite far from the observation.