VERIFICATION BULLETIN

NOVEMBER - DECEMBER -JANUARY 2022-23

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Introduction : Objective

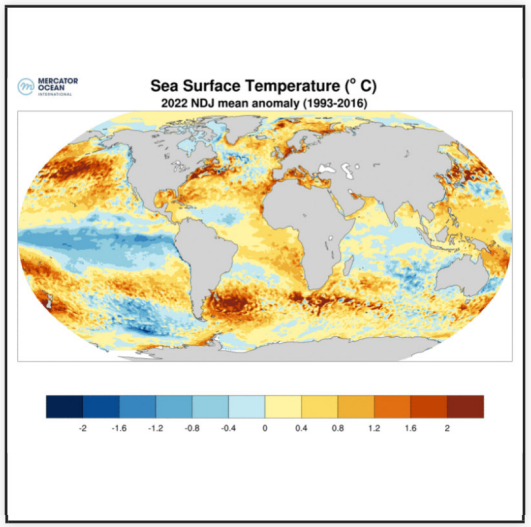
- **The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean 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.**

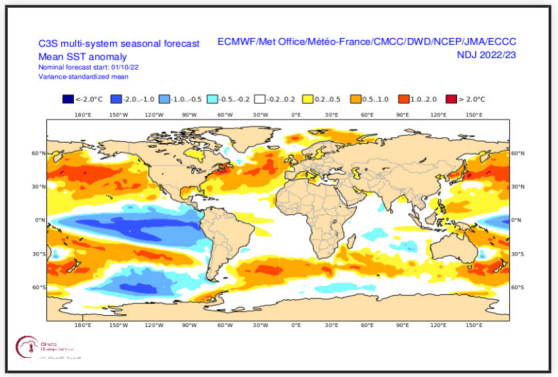
Oceans : surface temperature anomalies

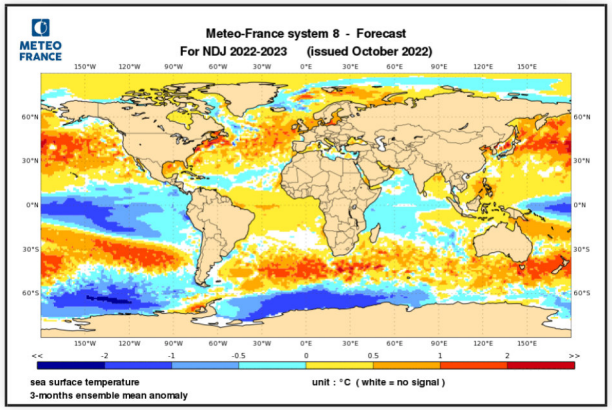
In the Pacific Ocean, the "La Niña" pattern has been well predicted by the models. Similarly, the PDO- pattern is also seen by the models.

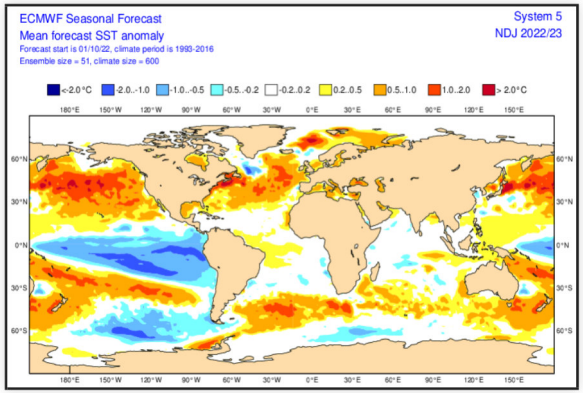
In the Indian Ocean, near normal values also seen by both models.

In the Atlantic, MF8 closer to the reanalysis in the tropical zone. In the northern hemisphere, some differences in the positions of the anomalies.







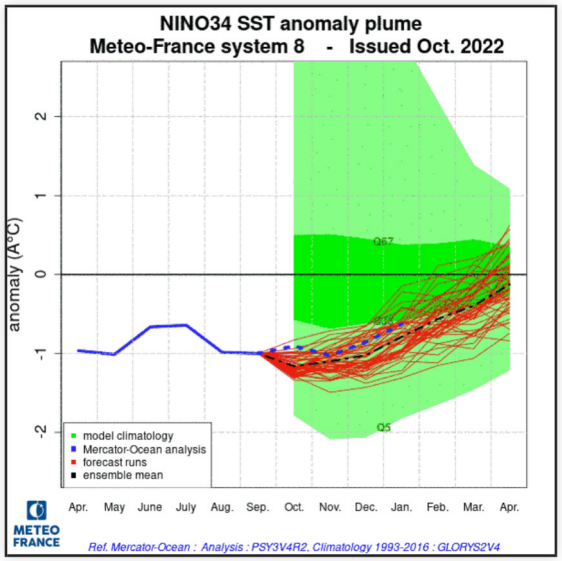


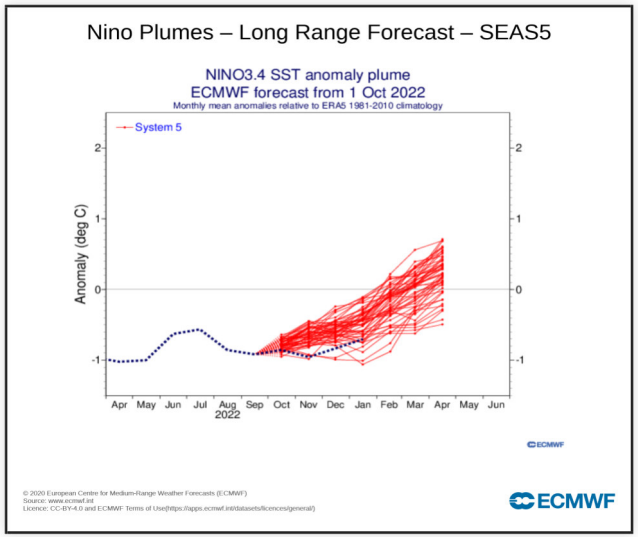
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

Very good forecast for MF8, while ECMWF is a bit too hot.

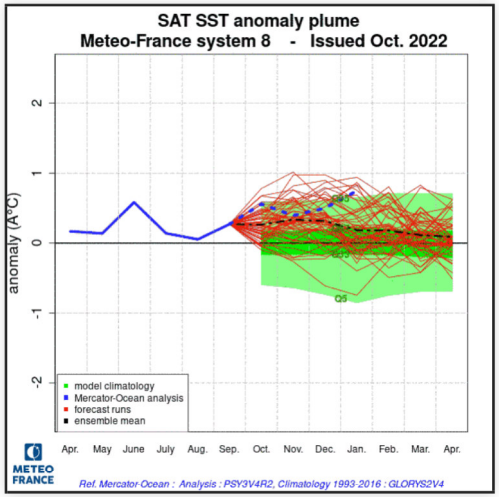


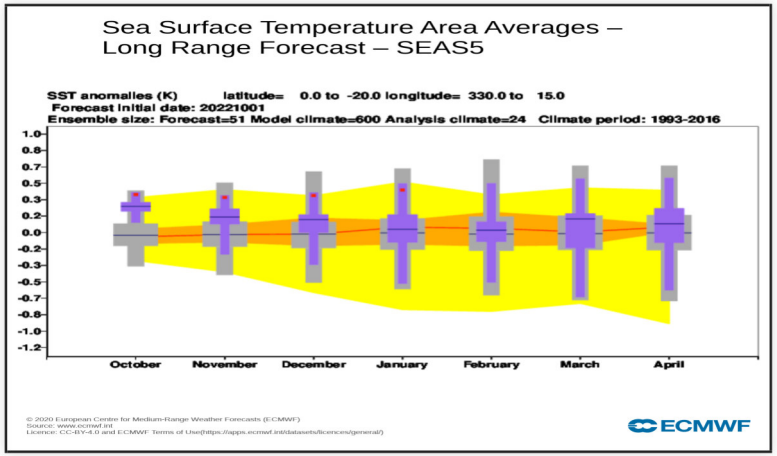


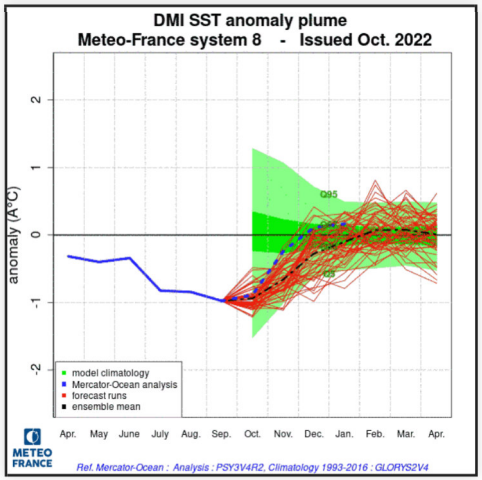
Oceans : tropical Atlantic and Indian Ocean index

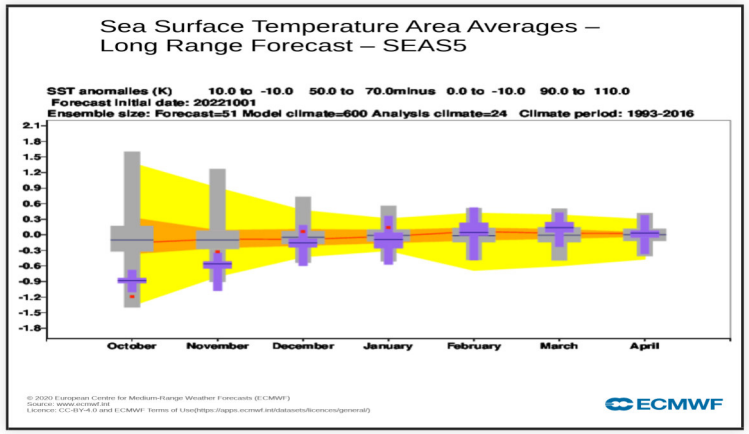
SAT : Both MF8 and ECMWF are too cold for the analysis.

DMI : MF8 returned to neutrality too slowly. ECMWF is better, especially in intensity.



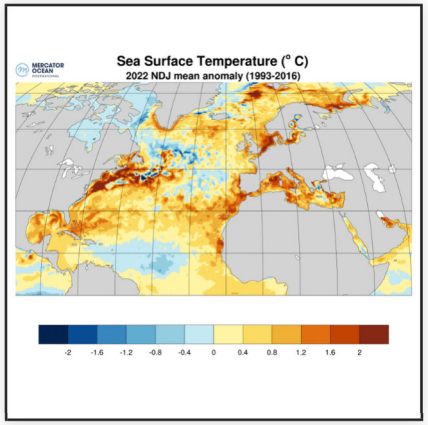


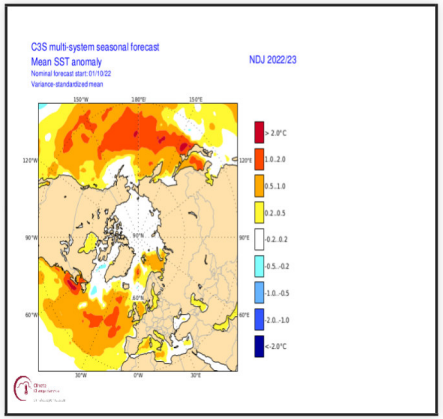


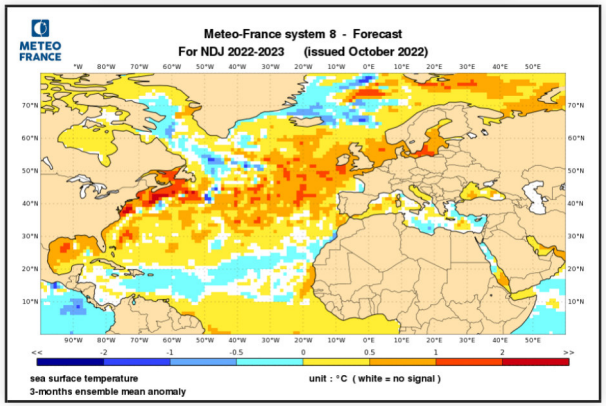


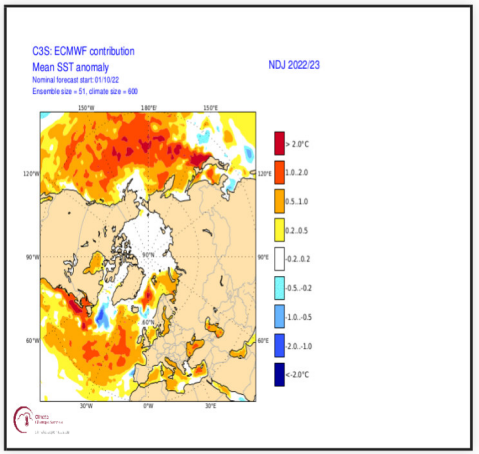
Oceans : North Atlantic SST

The forecast hot anomaliy from the American coasts to the British Isles is shifted south in reality by extending to the Moroccan coasts and Mediterranean basin.







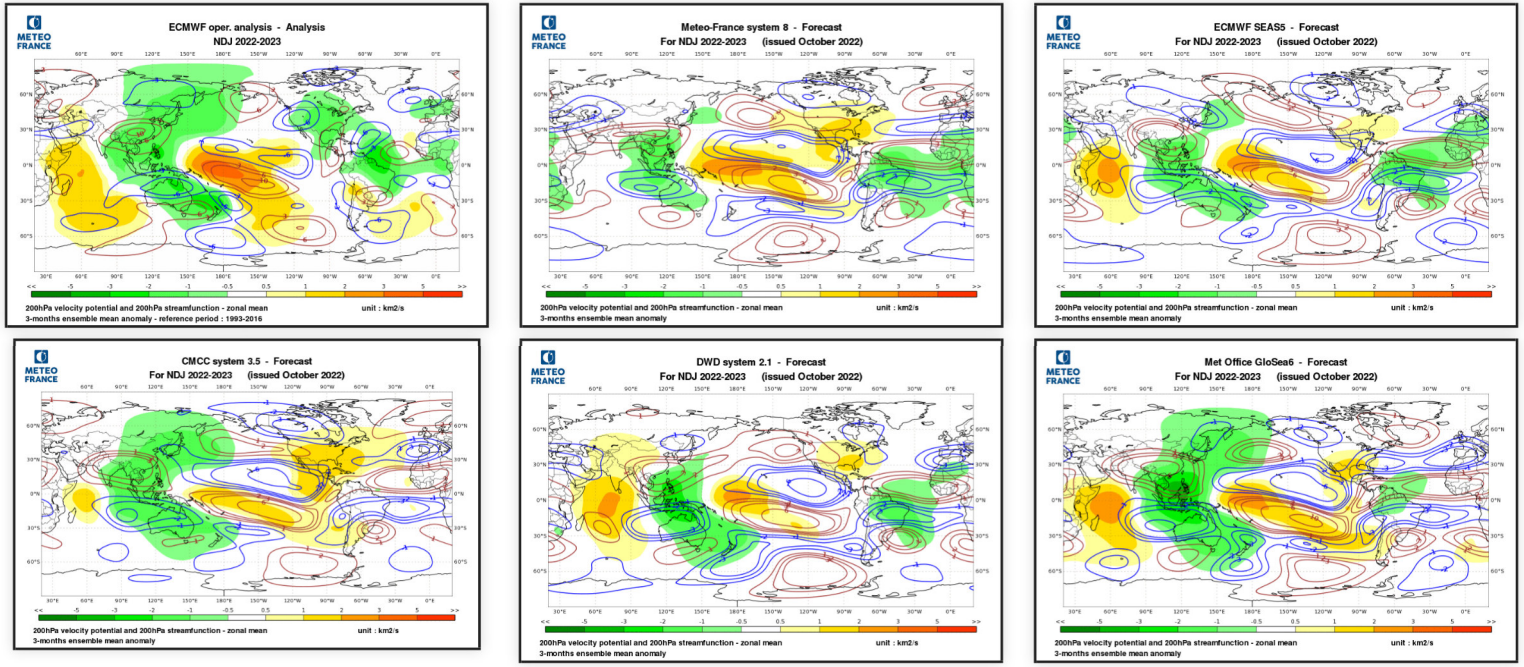


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : The analysis shows a large-scale tripole: downward motion anomaly over the Pacific/upward motion anomaly over the Maritime Continent, related to "la Niña", and upward motion anomaly over the Maritime Continent/downward motion anomaly over the western Indian Ocean, related to the negative phase of the IOD. The models globally reproduce these patterns.

SF : The dipoles on the Pacific and Atlantic Oceans as well as on the Maritime Continent are well seen. Teleconnections are generally well planned in the southern hemisphere. On the other hand, those suggested by the models towards North America and Europe were not observed.

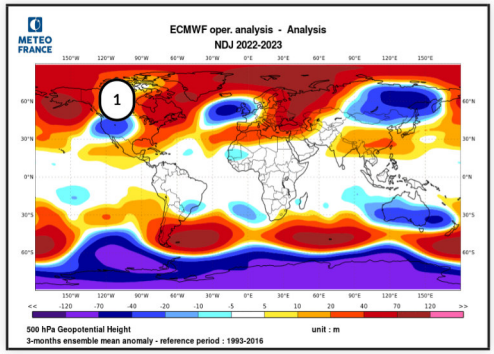


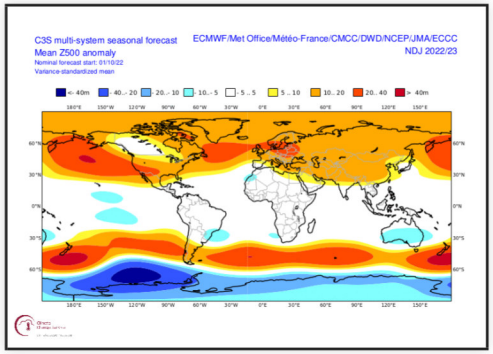
ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

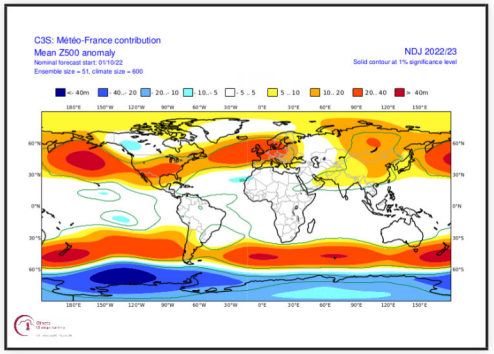
Atmospheric circulation : 500hPa Geopotential height

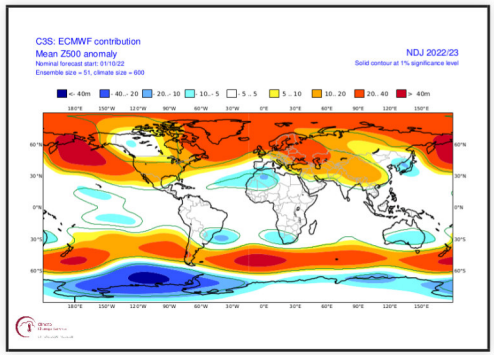
South hemisphere : the main structures are well predicted

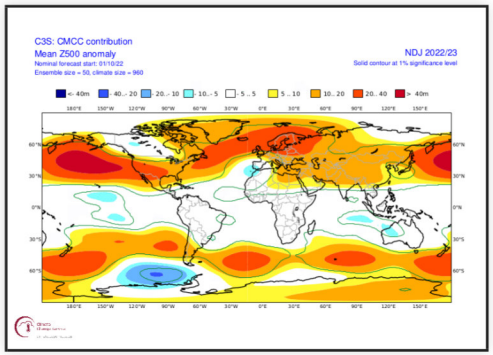
North hemisphere : similar to the PNA- pattern both for analysis and forecasting. In the North Atlantic, the very strong negative anomaly in Z500 is not expected at all.

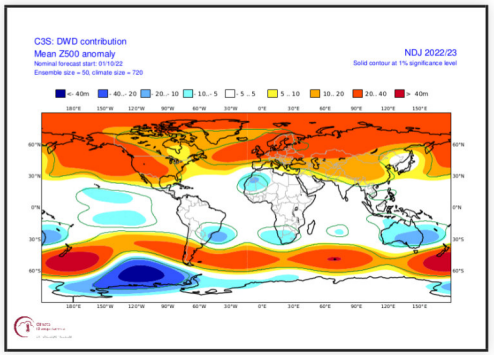










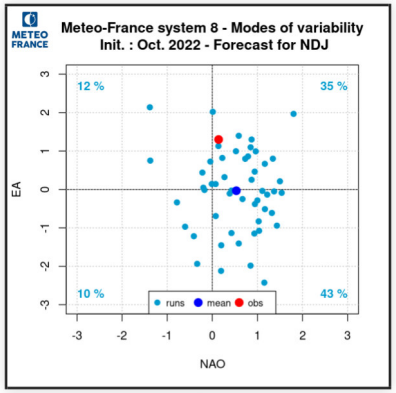


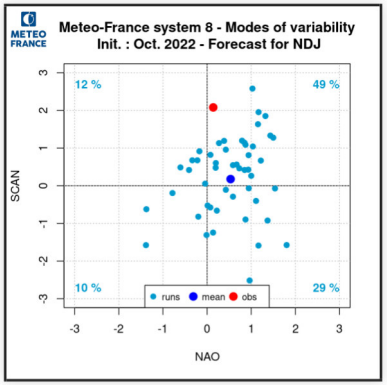
ECMWF analysis, C3S multi-system, MF-S8, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

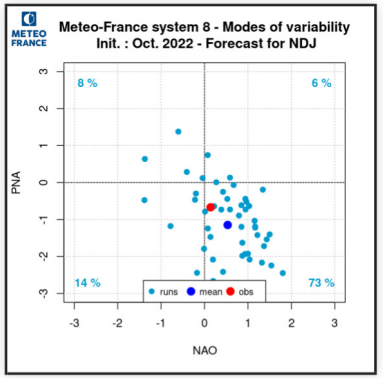
1 - Look like PNA -

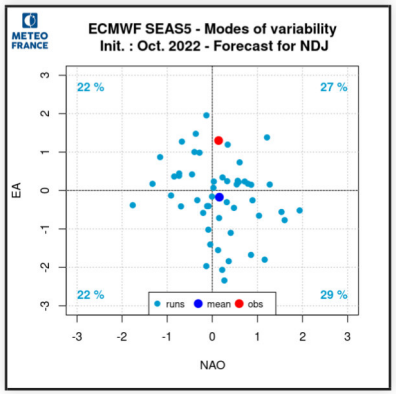
Atmospheric circulation : Modes of variability

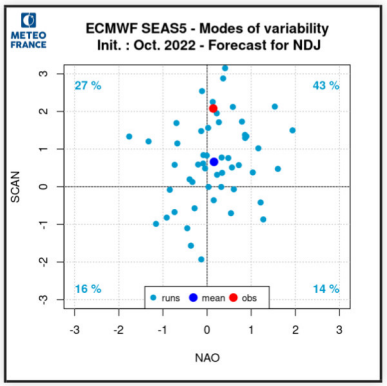
Forecasts for NAO and PNA are close to the analysis.
The positive phase of the SCAN mode was anticipated by SEAS5 contrary to MF8.
On the other hand, the positive value of EA is not at all anticipated by the models.

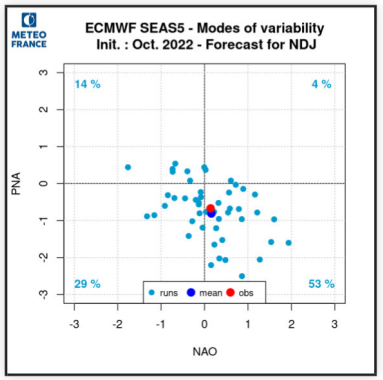






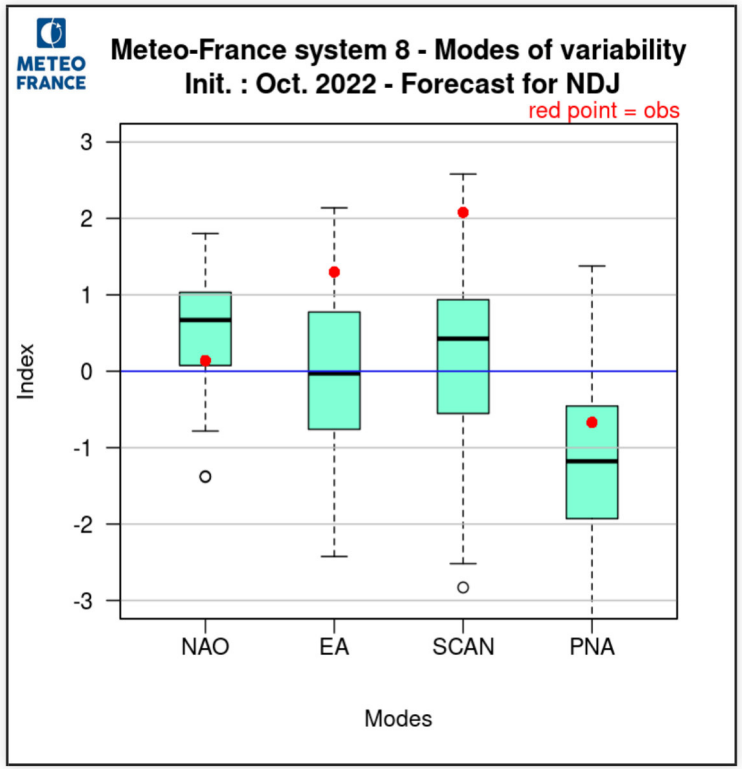


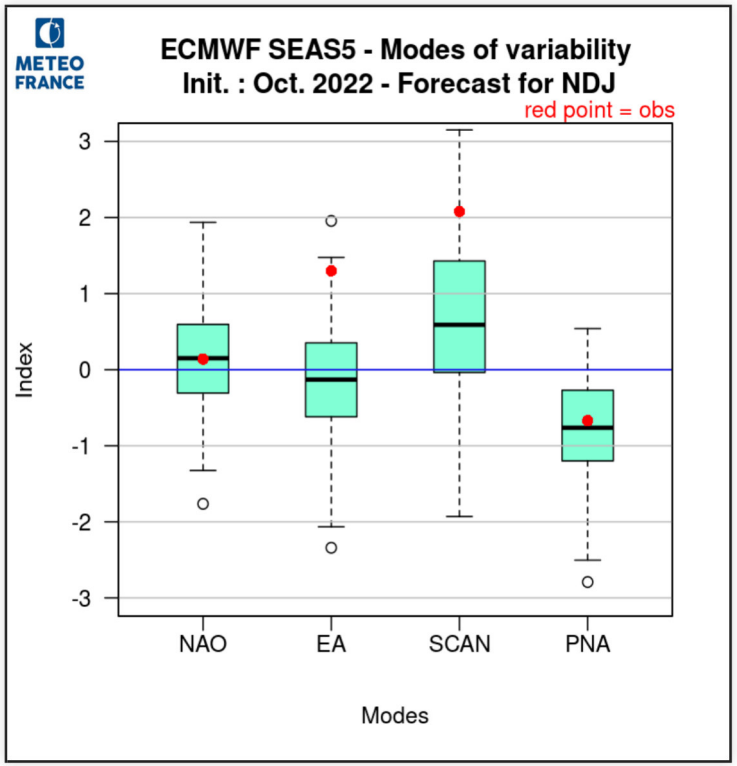




Atmospheric circulation : Modes verification

Same observation as for the previous slide

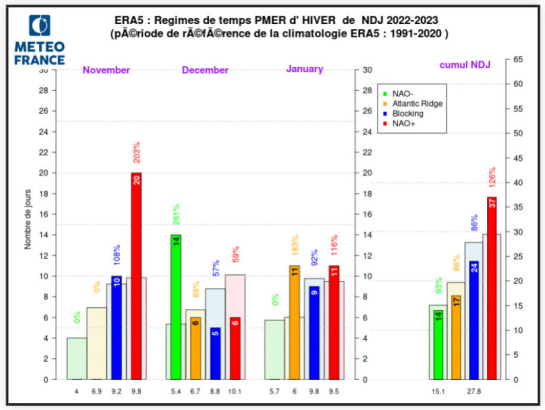


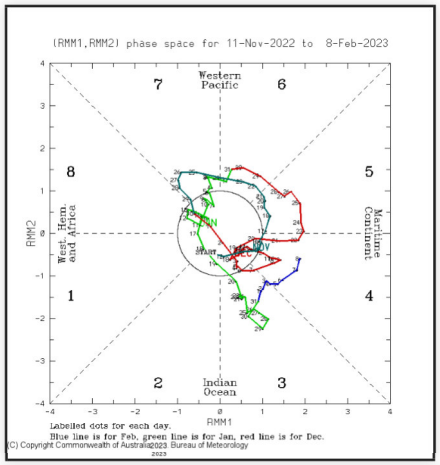


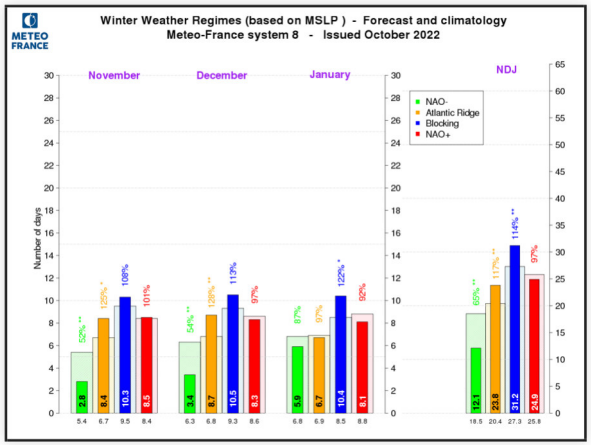
Atmospheric circulation : Winter SLP weather regimes

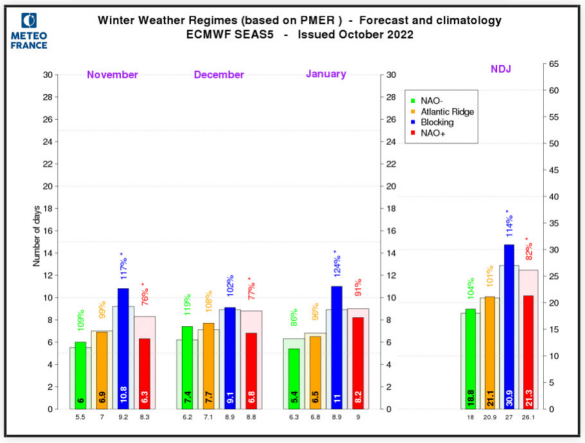
Strong sub-seasonal variation.

On the quarter NAO + is the dominant observed regime while blocking régime is the most frequently expected by models .





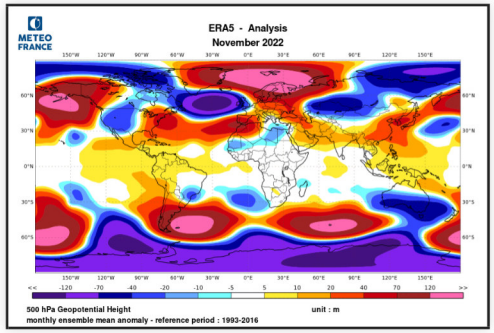


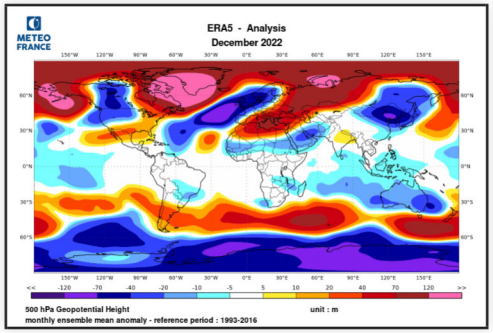


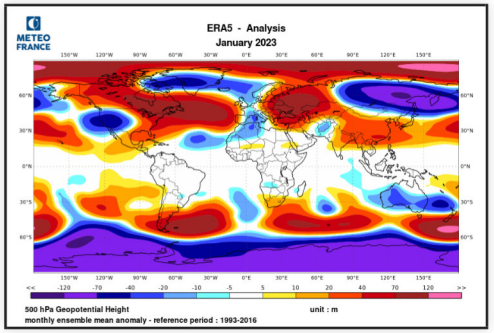
weather regime : ECMWF analysis top left, MF8 and ECMWF forecasts at the bottom. MJO phase top right

Atmospheric circulation : Variability within the quarter

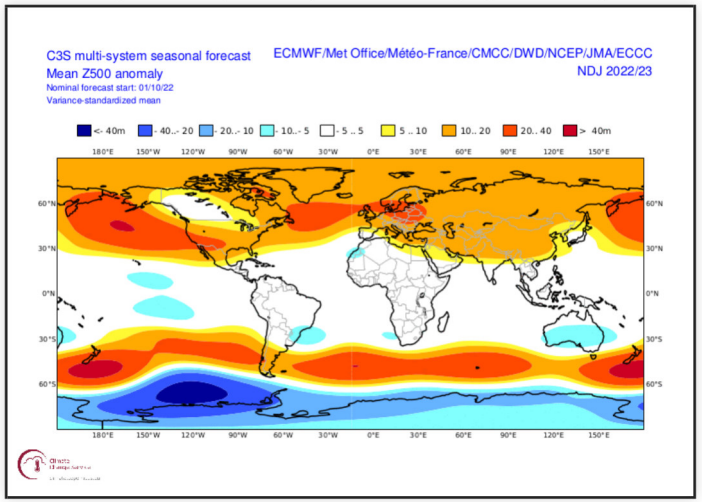
As suggested by the regime analysis, significant inter-monthly variability exists this quarter. On north Atlantic January is different from the other months and quarter.

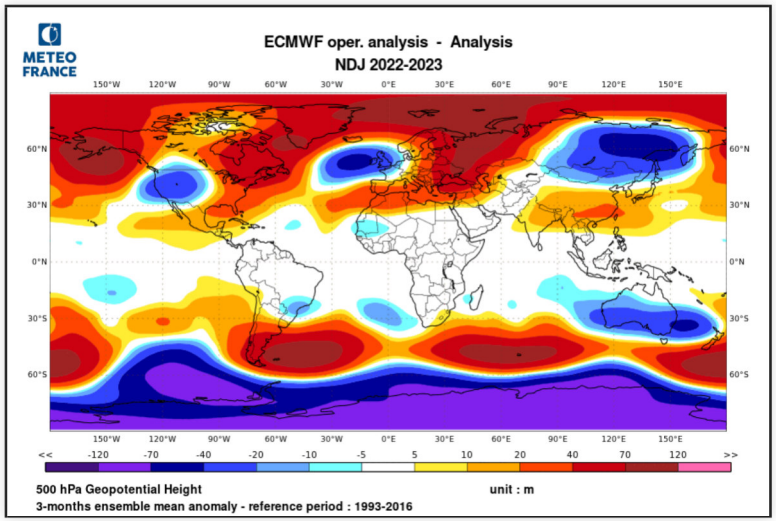






ECMWF analysis : January, February and March 500 geopotential height anomalies





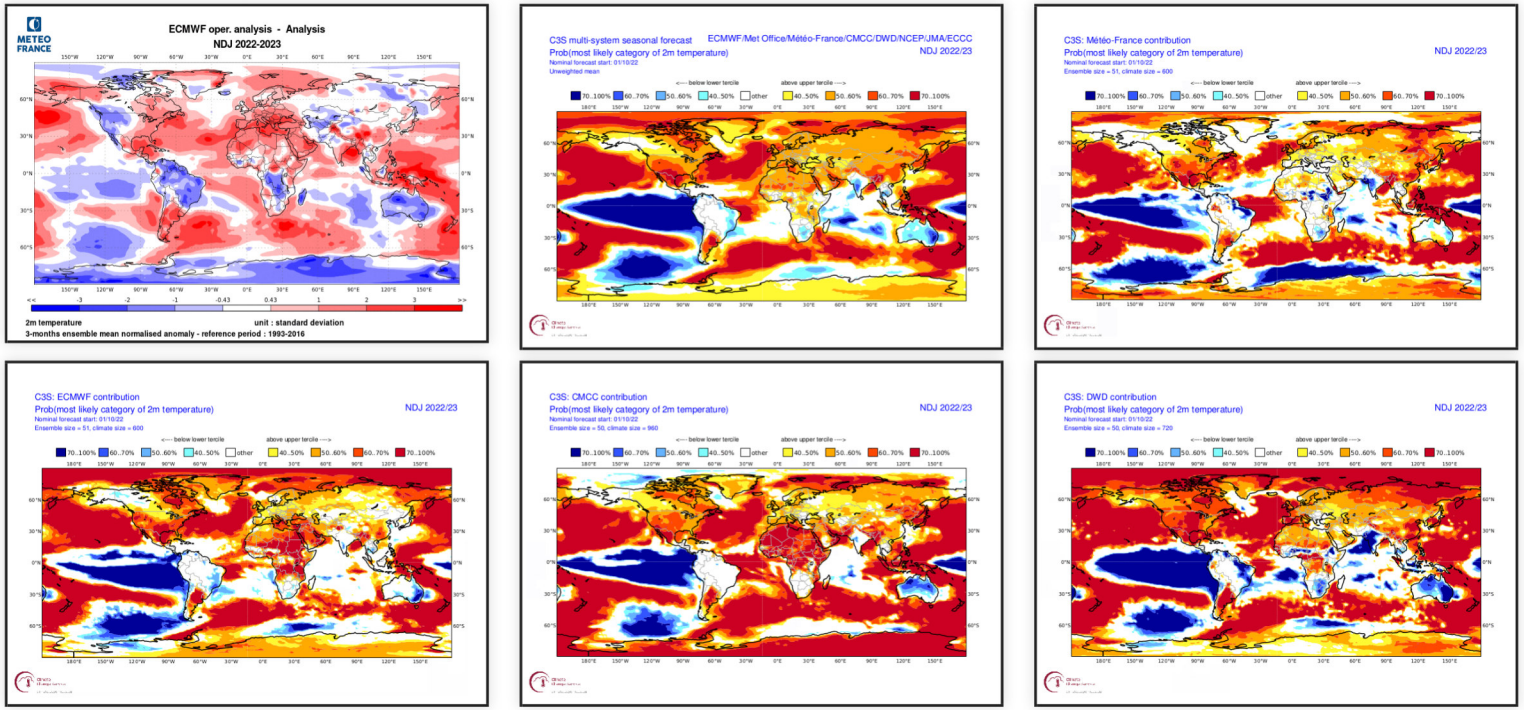
C3S multi-sytem forecast and ECMWF analysis 500 geopotential height anomalies for JFM

Climatic parameters : temperature on the globe

In North America, the expected relative cold anomalie forecasted around Alaska is shifted southwesterly in the analysis.

In South America, the cold anomaly is not well predicted.

On Eurasia it is a warm signal that dominates in the forecasts while the analysis is in general close to the climatology

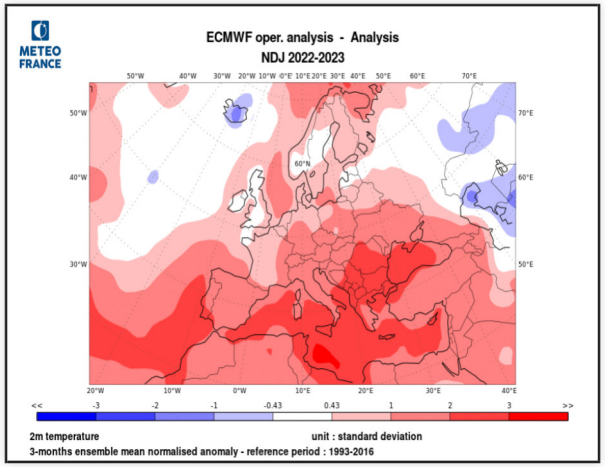


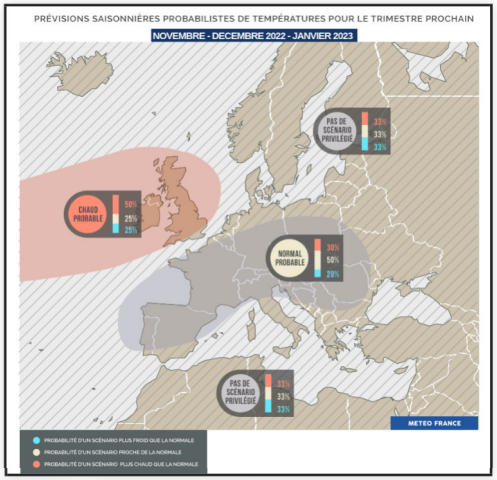
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S8 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

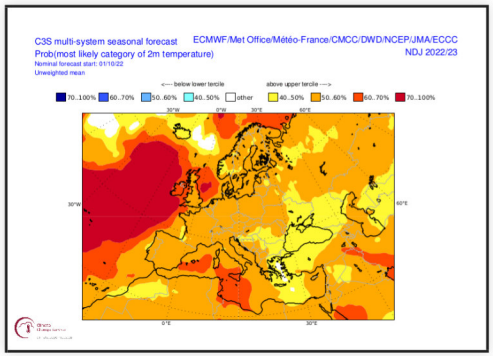
Climatic parameters : temperature over Europe

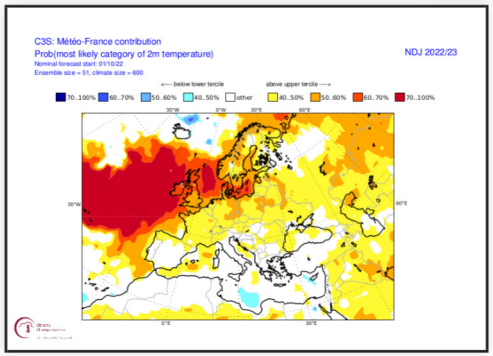
Warm anomalie observed isn't anticipated by synthetic map or MF forecast.

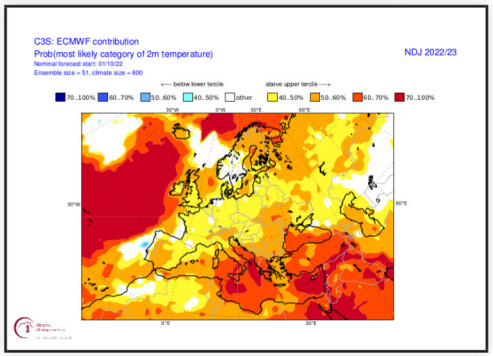
The warm anomalie from the eastern Mediterranean to Black Sea is well anticipated by ECMWF contrary to the multi-system.









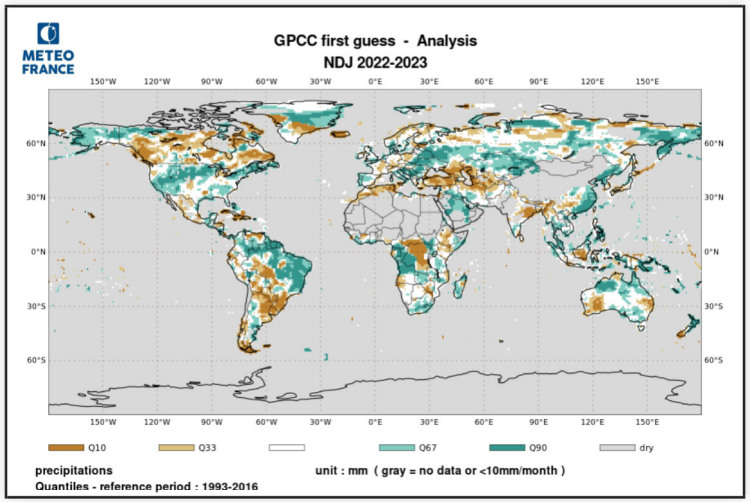


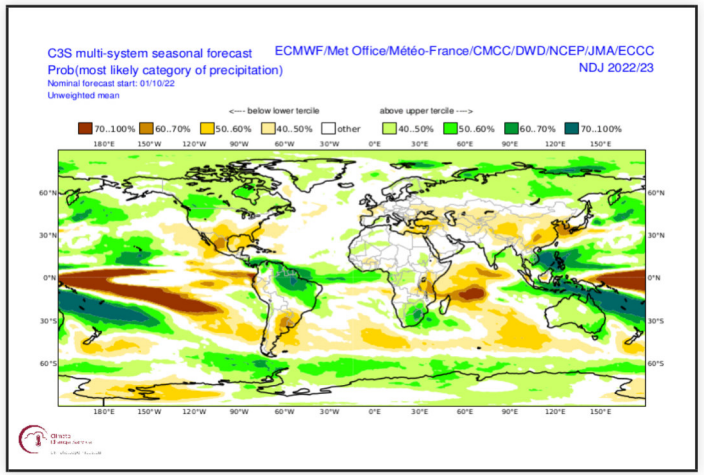
ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S8 and SEAS5 on the bottom line.

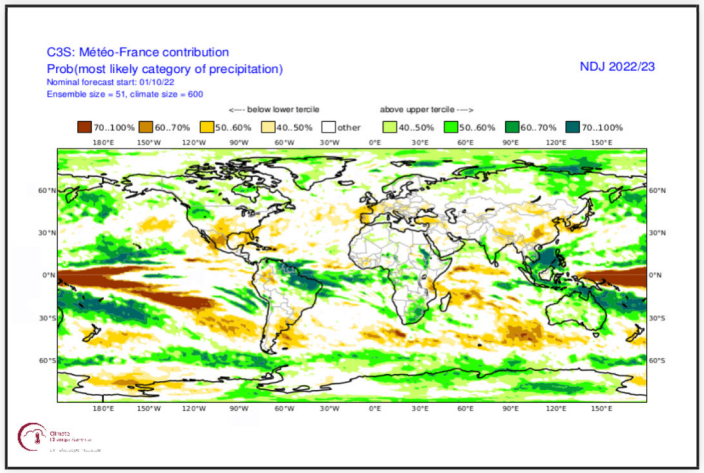
Climatic parameters : Precipitations over the globe

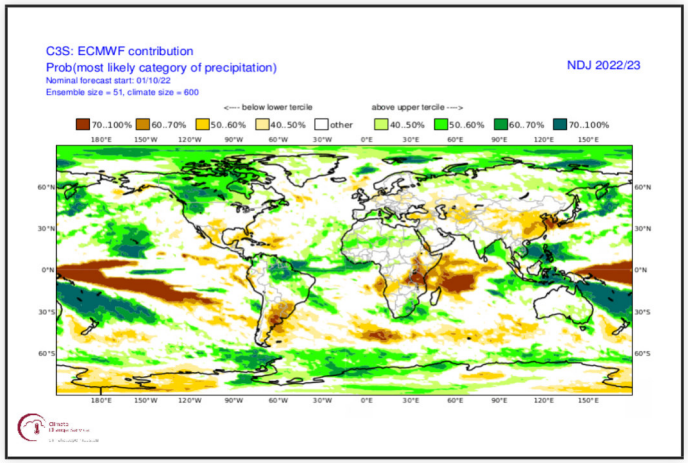
In the tropics, the analysis is consistent with the effects of La Niña.
In North America, the problems with the positioning of the geopotential anomalies are reflected in the position of the precipitation anomalies.

Over Eurasia we note wet anomalie from eastern Europe to western Russia and a drier conditions than normal from Turkey to Afghanistan.





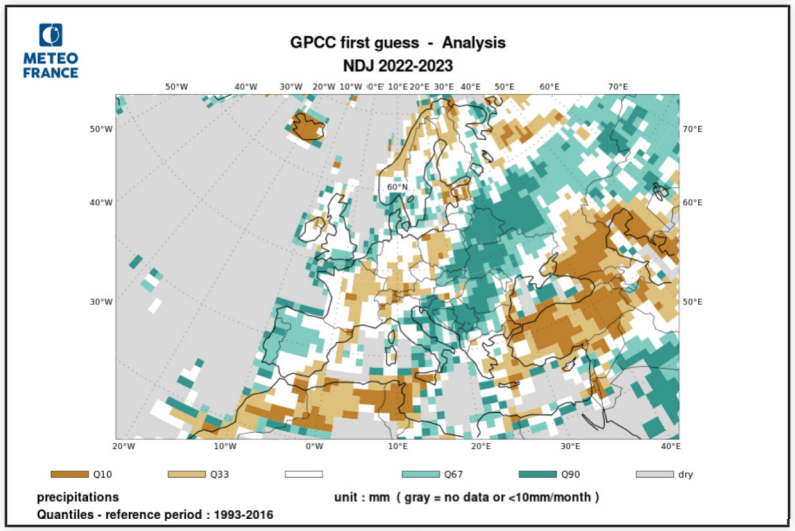


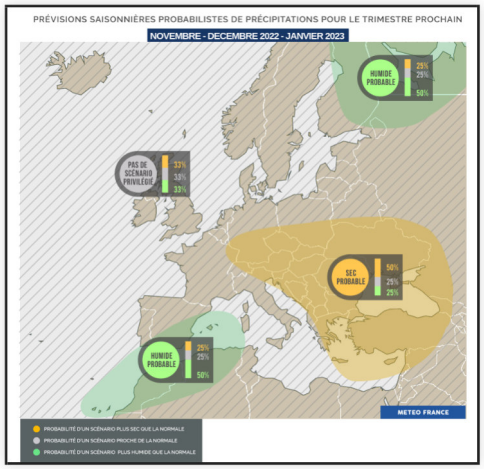


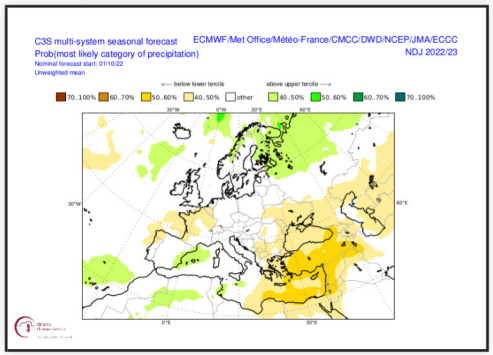
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S8 and SEAS5 on the bottom line.

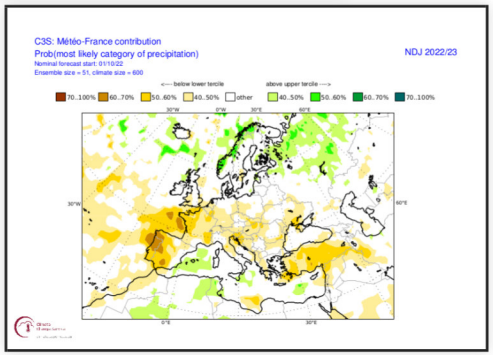
Climatic parameters : Precipitations over Europe

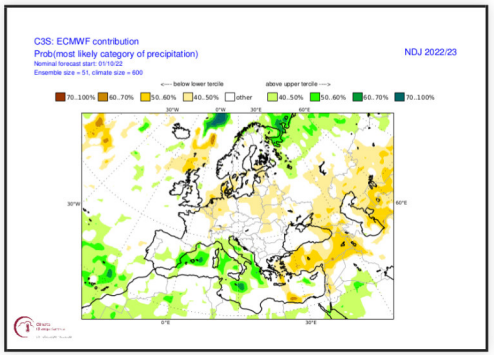
The dry conditions from Turkey to the Caspian Sea were well forecasted. On teh other hand the wet conditions from Italy to Russia wern't favored by the models and even less by the synthetic forecast map which favored dry conditions.











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 NDJ 2022-2023

1) **Oceans :**

The main SST anomalies were well predicted by the models, except for the North Atlantic, in connection with the observed atmospheric circulation in this area.

2) **Large scale atmospheric circulation :**

VP 200 hPa : Good forecast

SF 200 hPa : In the equatorial zones, the dipoles have been well predicted. Teleconnections to mid-latitudes are correctly seen, except north Atlantic where the models anticipate cyclonic anomaly near marocco while it was observed between Iceland and British Isles.

Z500 : The forecast is not very good over North America, and bad off the European coast

3) **Climatic parameters over Europe :**

Temperatures : The warmer-than-normal scenario over a large southern part of Europe isn't anticapated by models.

Precipitations : The forecasts are quite far from the observation, with the exception of Turkey.