

VERIFICATION BULLETIN

MAY - JUNE - JULY 2023

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Introduction : Objective

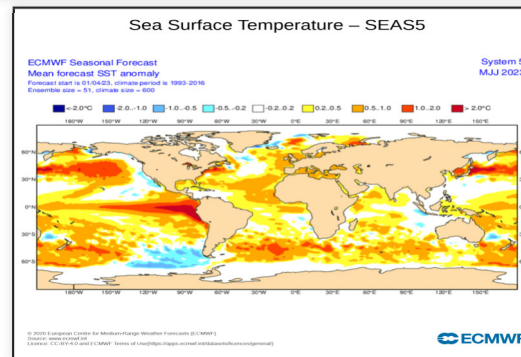
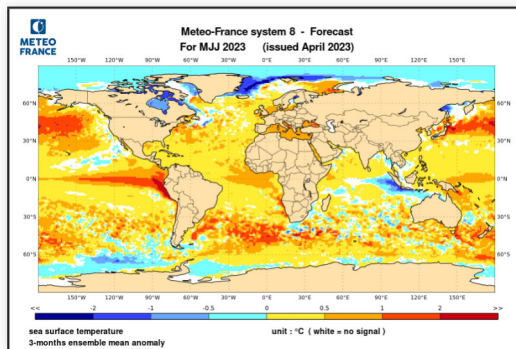
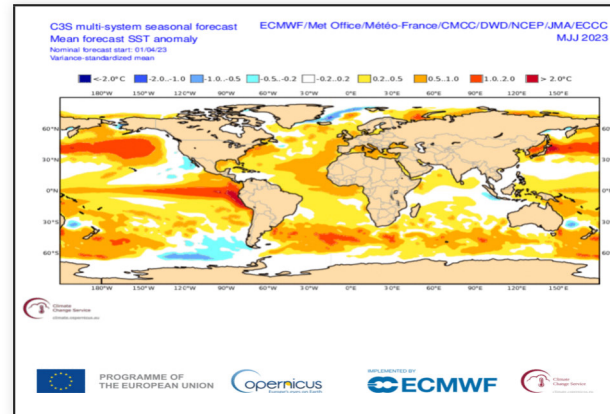
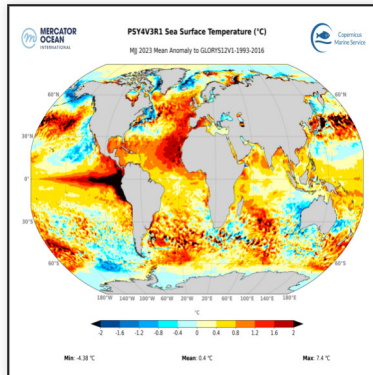
- The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean 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 near the Peruvian coast, stretching westwards along the equator, is seen by the models but underestimated. The PDO- pattern has been well forecast.

In the Indian Ocean, the east/west SST gradient is still weak on analysis.

In the Atlantic Ocean, the anomaly over the equator is well predicted by the models. However, the strong positive anomaly over the eastern North Atlantic basin was not predicted by MF8 and underestimated by others models.

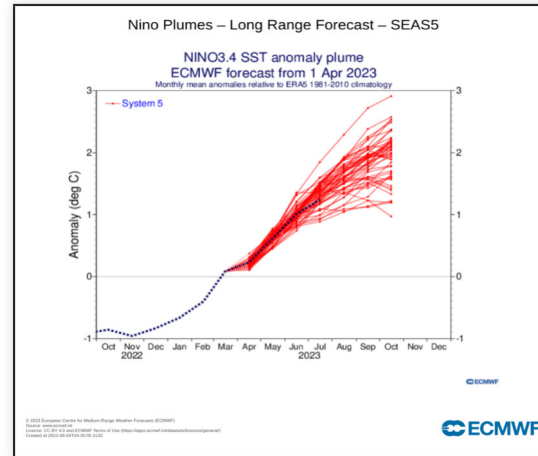
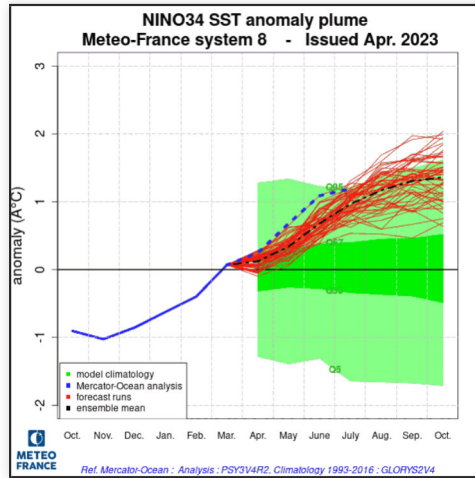


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

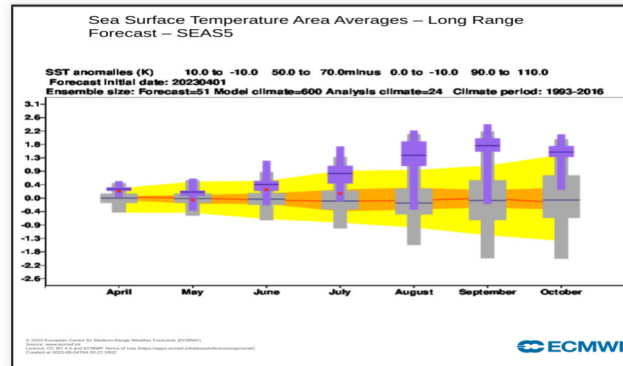
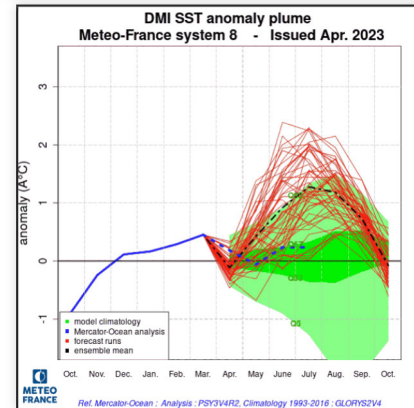
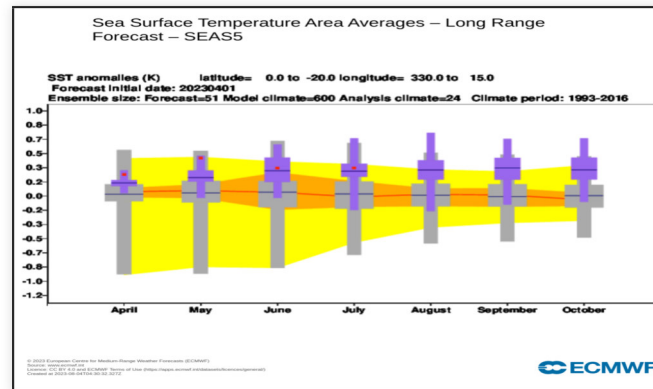
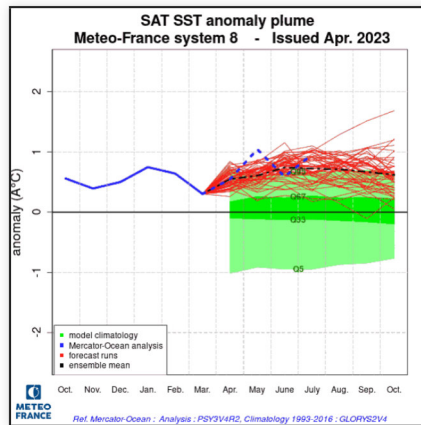
The trend is good for both models. MF8 underestimates the value while SEAS5 is very close to the observation



Oceans : tropical Atlantic and Indian Ocean index

SAT : The anomaly is well located in the upper tercile by both models.

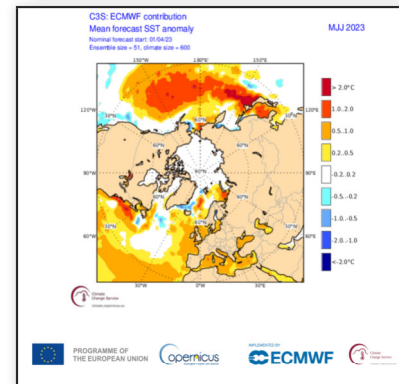
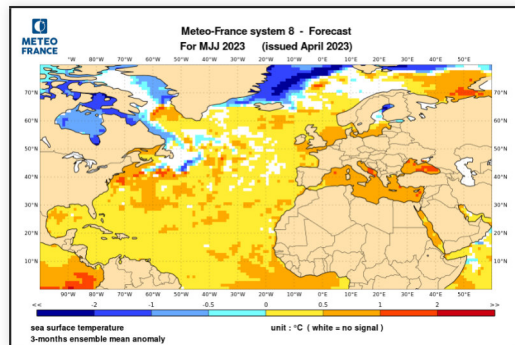
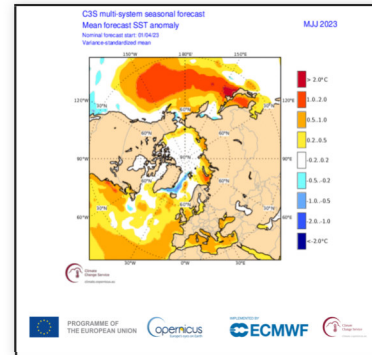
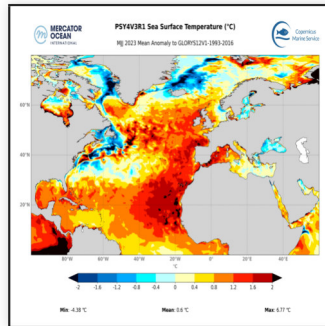
DMI : The DMI value predicted at the end of the quatern is too high.



Oceans : North Atlantic SST

The anomalies in the North Atlantic (negative anomaly near the American coast and positive anomaly to the east) are not correctly seen by MF8 and was underestimated by others models.

In the Mediterranean, the east/west SST gradient was not predicted by both models.

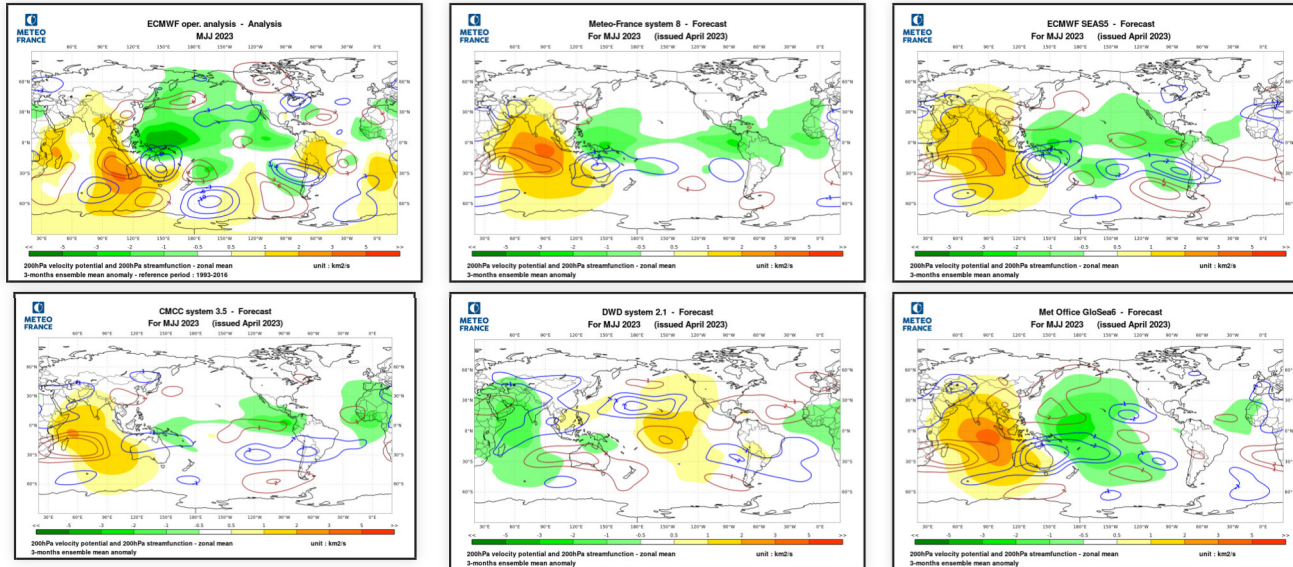


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : The dipole around the Maritime Continent is more or less well seen by models with downwards shifted too far west. The DWD model still retains a "La Niña" pattern. On analysis the updraft zone over west Africa was predicted by most models unlike subsidence over south America.

SF :The negative SF cores close to martim continent is well positioned by the models while the positive core observed west of Australia is predicted too far west (west of indian ocean). No teleconnection forecasted or observed in the northern hemisphere. In the southern hemisphere some teleconnection seems to be observed from the south east of the Indian Ocean to the south of the Pacific, but not forecasted by models

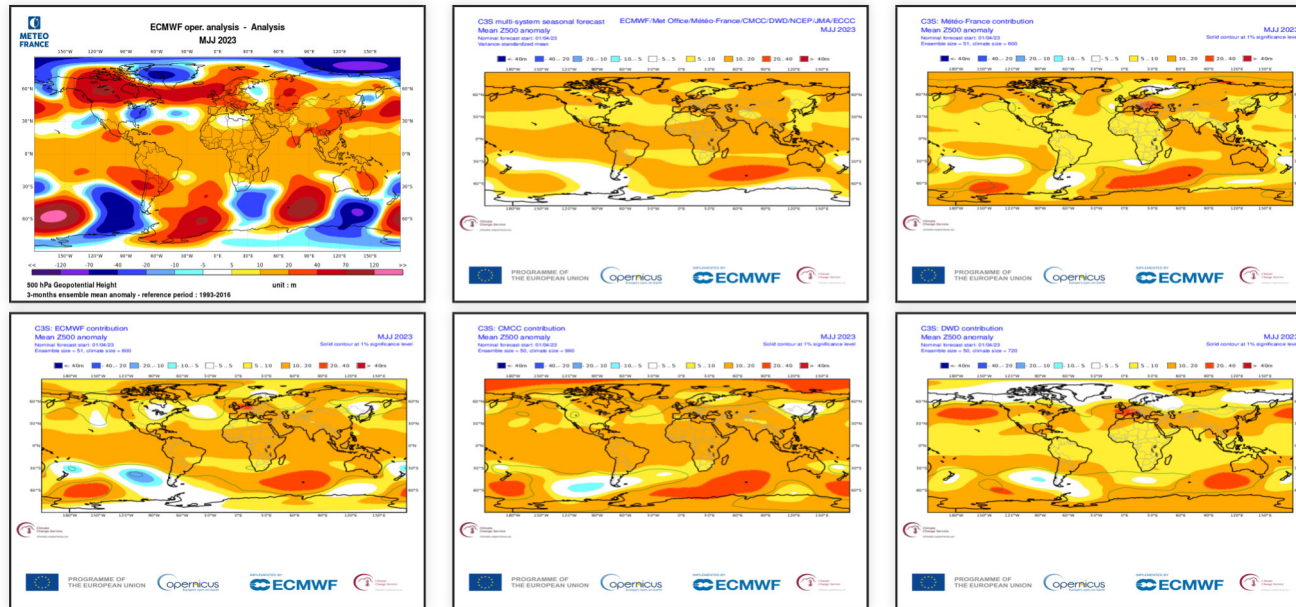


ECMWF analysis, MF-S8, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation : 500hPa Geopotential height

Southern Hemisphere : Synoptic structures weren't forecasted by the models.

Northern Hemisphere : Multi-model highlights a weakness around the 30th N from Pacific to Africa, also visible on analysis. Further north the strong anomalies observed weren't predicted by models.



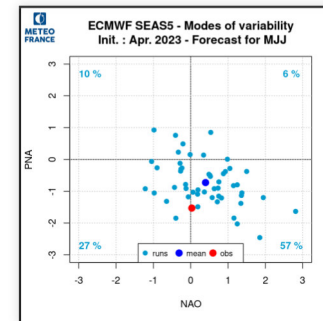
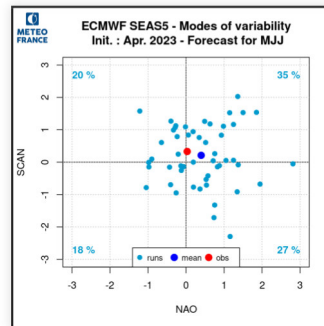
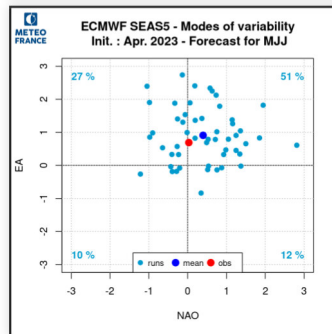
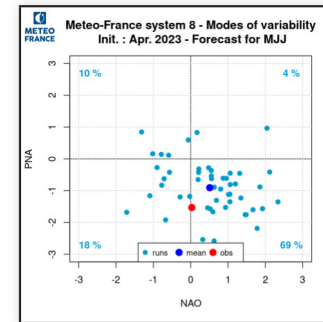
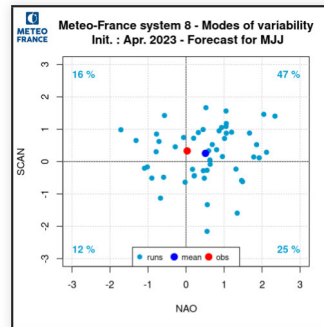
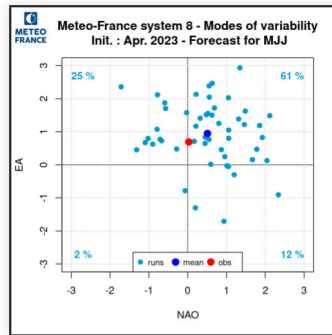
ECMWF analysis, C3S multi-system, MF-S8, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

Atmospheric circulation : Modes of variability

The negative PNA mode and positive EA mode are well seen by both models.

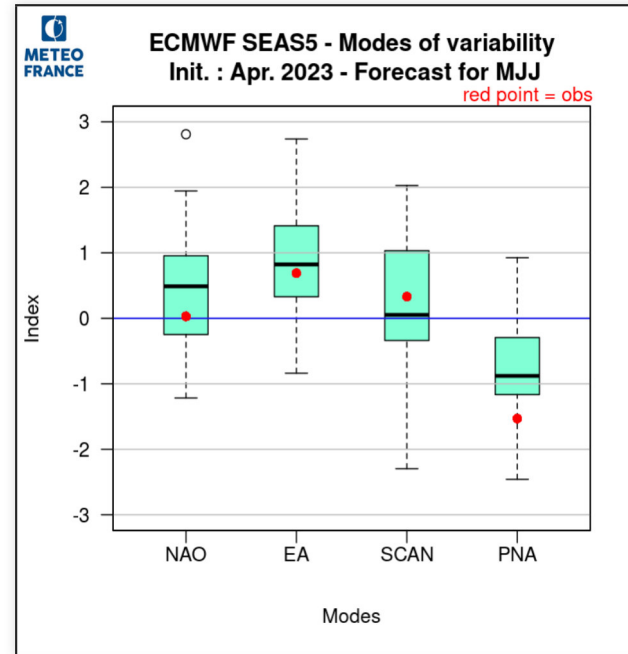
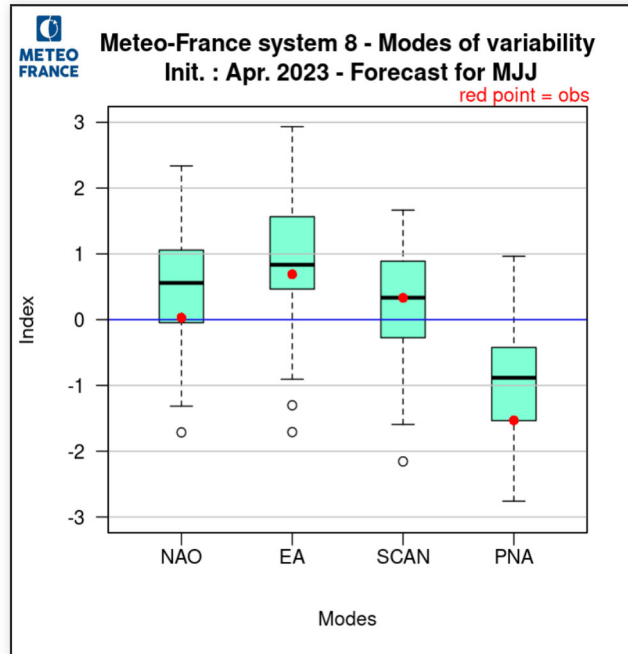
The slightly positive SCAN mode is well anticipated by models.

The expected phase of the NAO mode was slightly positive, whereas the neutral phase is observed.



Atmospheric circulation : Modes verification

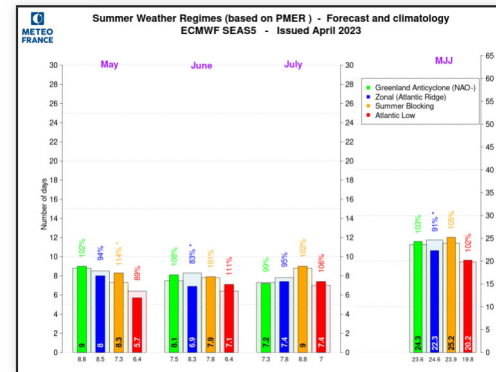
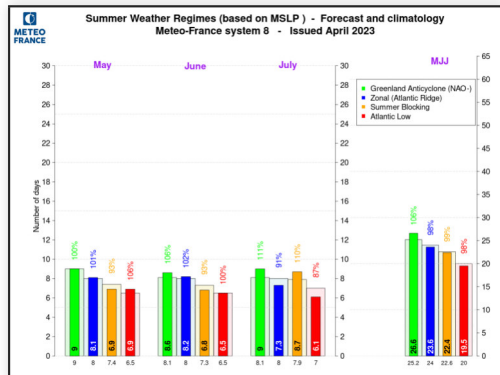
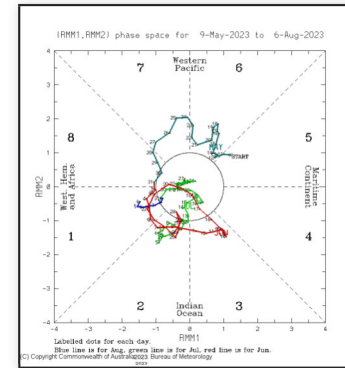
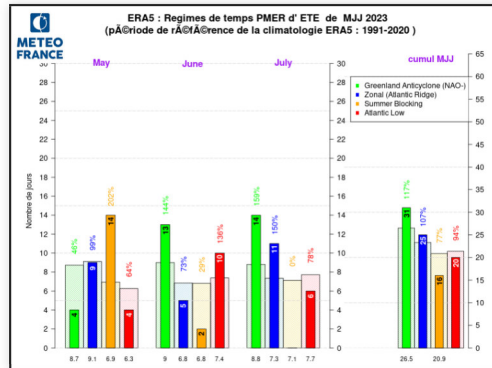
Same observation as for the previous slide



Atmospheric circulation : Summer SLP weather regimes

The classification into weather regimes is different between the three months. Over the quarter the NAO- (Greenland Anticyclone) regime dominates and the Blocking regime is under-represented.

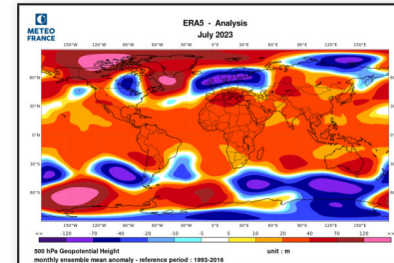
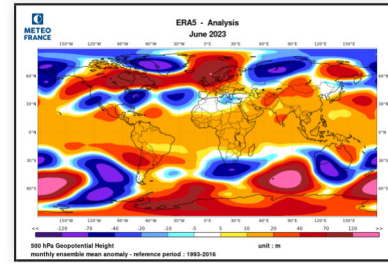
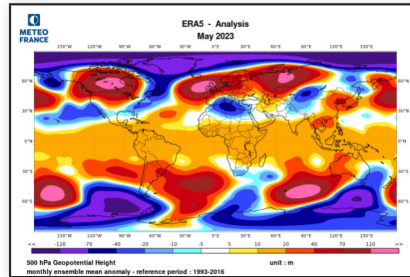
Both models didn't anticipate these anomalies.



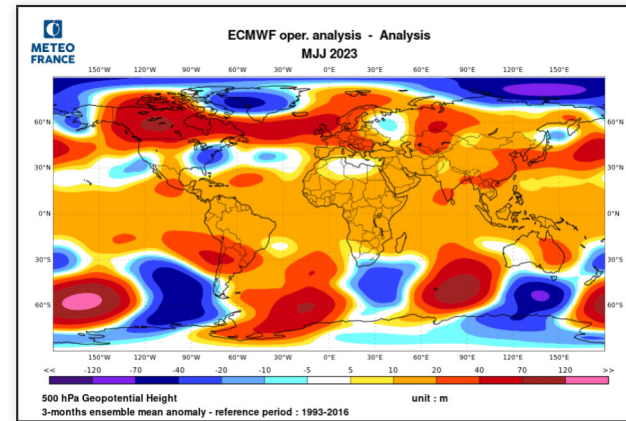
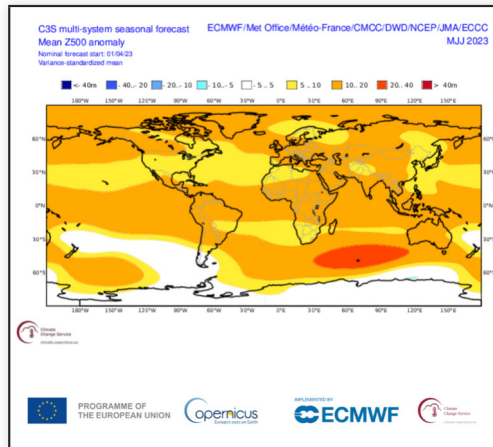
weather regime : ECMWF analysis top left, MF8 and ECMWF forecasts at the bottom. MJO phase top right

Atmospheric circulation : Variability within the quarter

A monthly analysis of atmospheric circulation clearly shows the succession of very different months.



ECMWF analysis : March, April and May 500 geopotential height anomalies

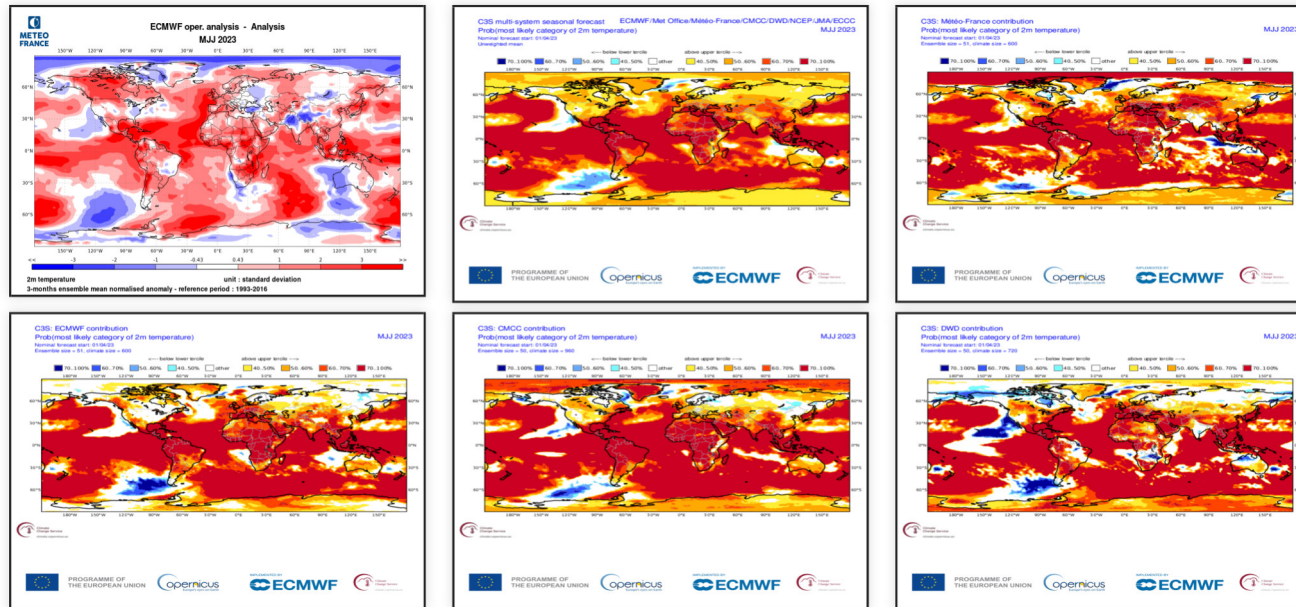


C3S multi-sytem forecast and ECMWF analysis 500 geopotential height anomalies for MJJ

Climatic parameters : temperature on the globe

In the tropics the main cold anomalies (around australia, India, South America and India) are suggested by models (lower probability of warm scenario)

In Europe and the North Atlantic, there are differences.

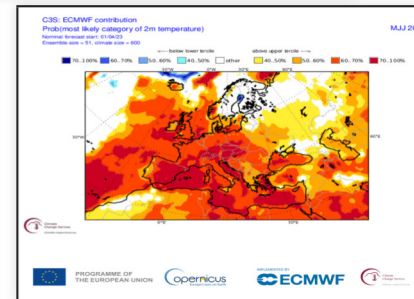
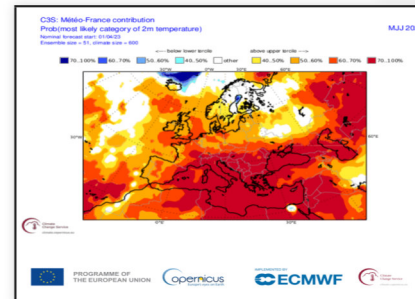
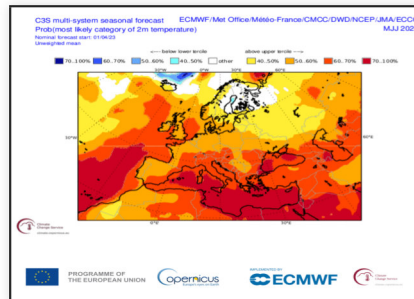
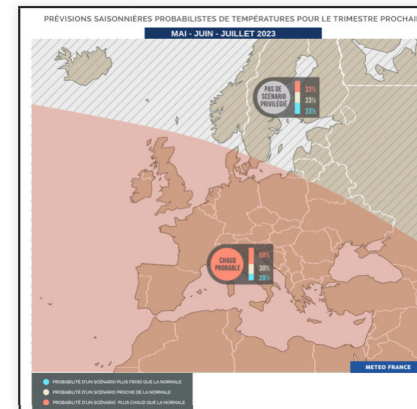
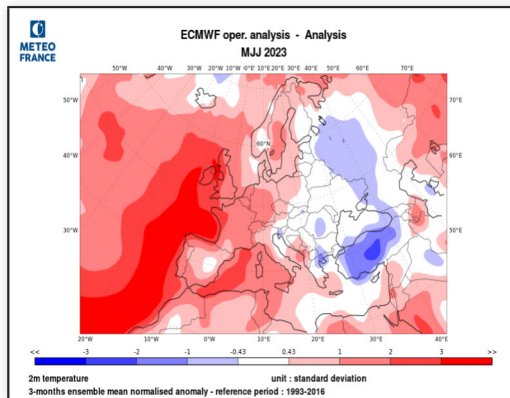


ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S8 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

Climatic parameters : temperature over Europe

The main Z500 anomalies in Europe have not been foreseen, in particular the negative geopotential anomaly on the west of Russia.

Consequently, the expected warm anomalie over large part of Europe concerned only the west part.

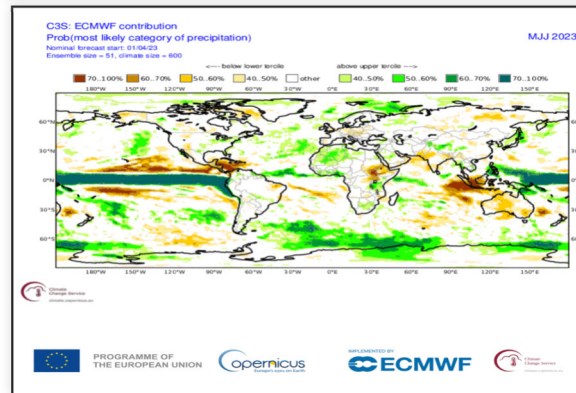
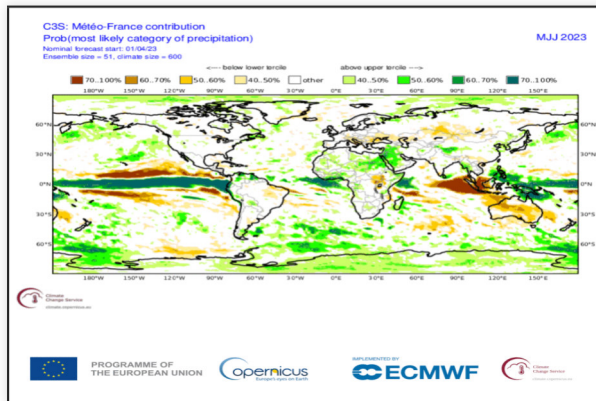
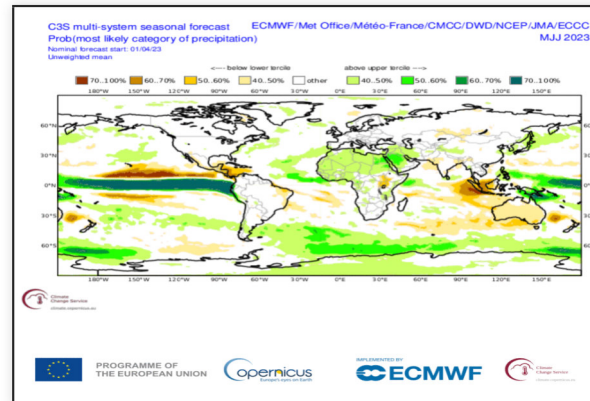
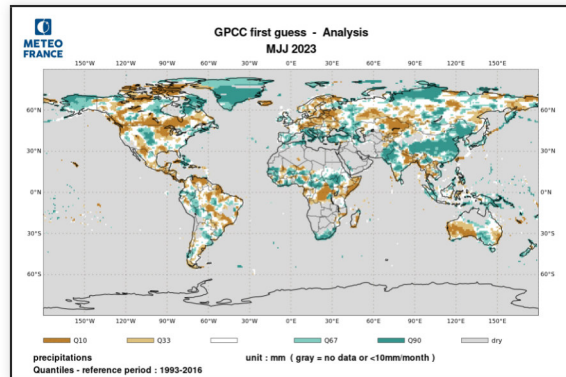


ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system, MF-S8 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over the globe

In the intertropics, the models did not show very strong signals except over Australia (dry signal contradicted by analysis). and over maritime continent where the wet signal on the east and dry signal on the west forecasted by models wasn't observed.

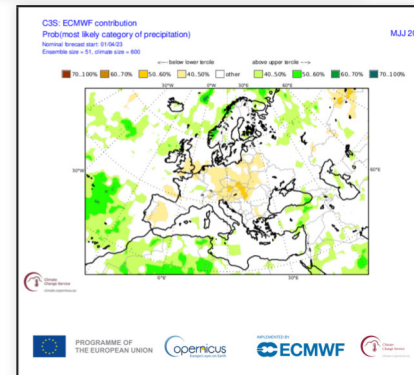
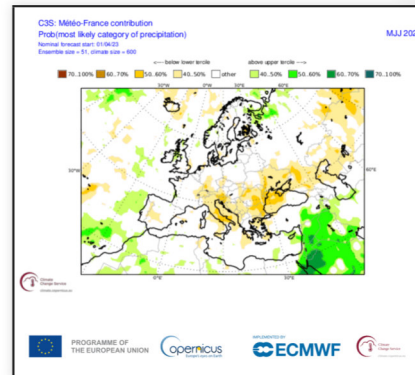
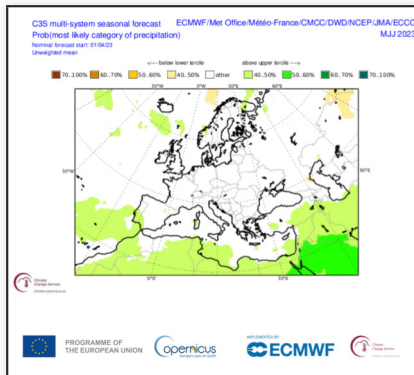
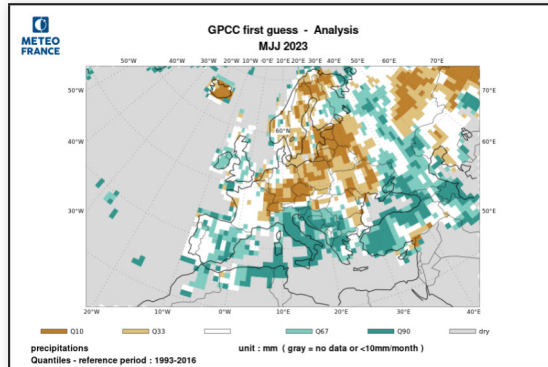
In the northern hemisphere's mid-latitudes, the forecast signals were very weak. They turned out to be stronger in North America, Europe and Asia.



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 C3S multi-model didn't show any significant signals for Europe. No scenario was therefore favored. However, the atmospheric circulation observed (positive Z500 anomaly over Western and Northern Europe, and negative one over the Eastern Mediterranean) produced a highly contrasting precipitation situation : a dry signal in the north and a wet one in the southeast.



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 MJJ 2023

1) Oceans :

The main SST anomalies were well predicted by the models.

2) Large scale atmospheric circulation :

VP 200 hPa : The upward motions around the Maritime Continent was well predicted by the models while the downward motions was forecasted too far to the west.

SF 200 hPa : Signals are limited, The dipole near the Maritime Continent is more or less correctly forecasted while teleconnection on the southern hemisphere are poorly anticipated.

Z500 : The differences between analysis and models are confirmed over Europe, with major impacts on climatic parameters.

3) Climatic parameters over Europe :

Temperatures : The expected warm anomalie over large part of Europe concerned only the west part

Precipitations : poor forecasts