

VERIFICATION BULLETIN

FEBRUARY - MARCH - APRIL 2021

Table of Content

1. Introduction	
1. Objective	3
2. Oceans	
1. surface temperature anomalies	4
2. ENSO	5
3. tropical Atlantic and Indian Ocean index	6
4. North Atlantic SST	7
3. Atmospheric circulation	
1. Global teleconnection	8
2. 500hPa Geopotential height	9
3. Modes of variability	10
4. Modes verification	11
5. Winter SLP weather regimes	12
4. Climatic parameters	
1. temperature on the globe	13
2. temperature over Europe	14
3. Precipitations over the globe	15
4. Precipitations over Europe	16
5. General summary	
1. for the period JFM 2021	17

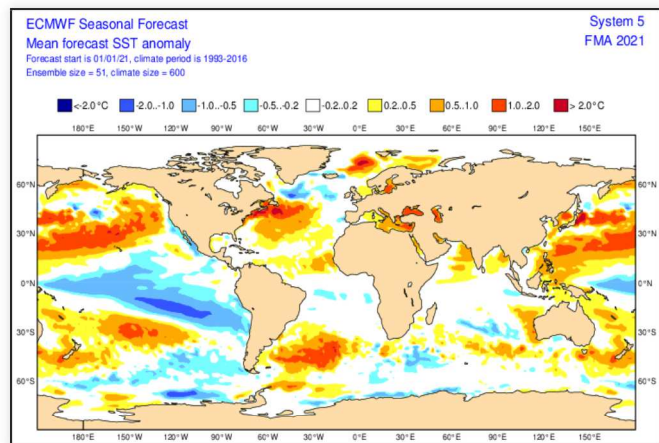
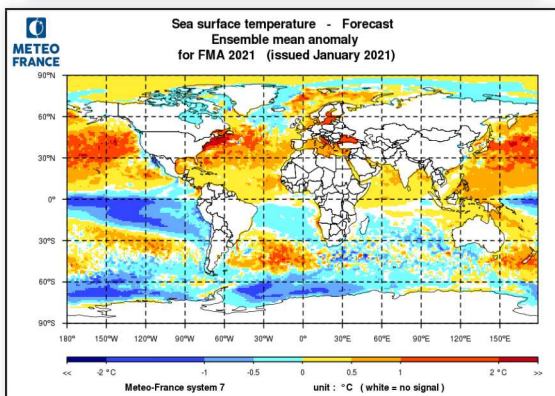
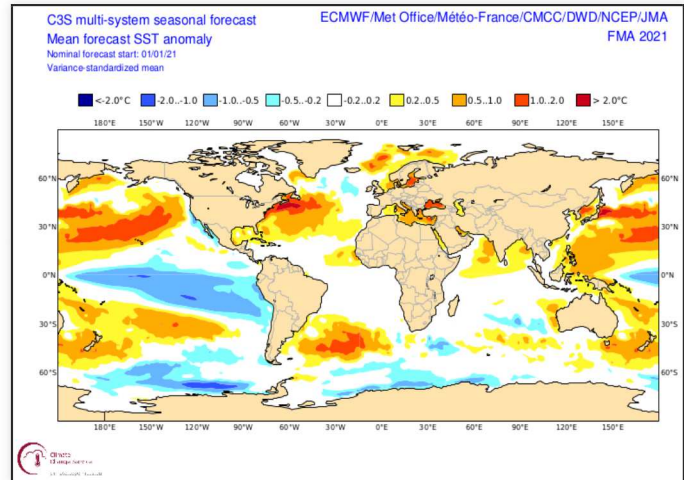
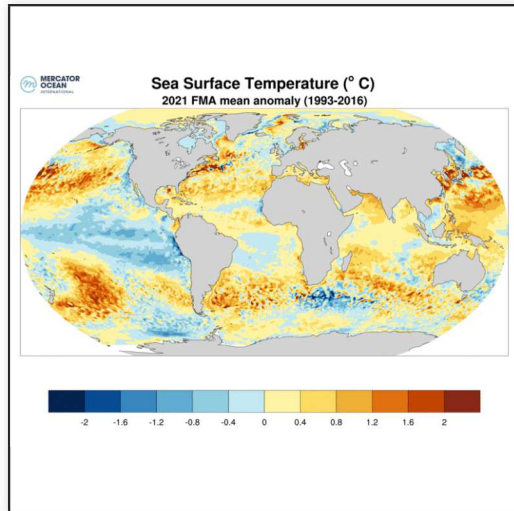
Introduction : Objective

- 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

Good SST anomaly forecast in tropical areas. In the Pacific Ocean, North-East tropics (up to Mexico coasts), the cold anomaly was not correctly forecasted by MF-S7. The weak cold anomaly in North Atlantic tropics was not correctly forecasted by C3S models.

At mid-latitudes, the main patterns were well forecasted. MF-S7 forecast was globally too warm in North Atlantic Ocean, and too cold in South Indian Ocean.

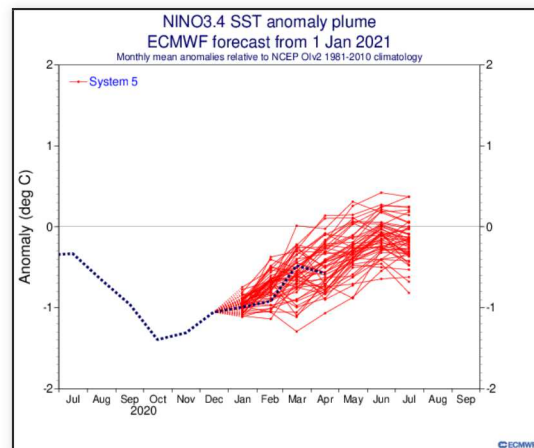
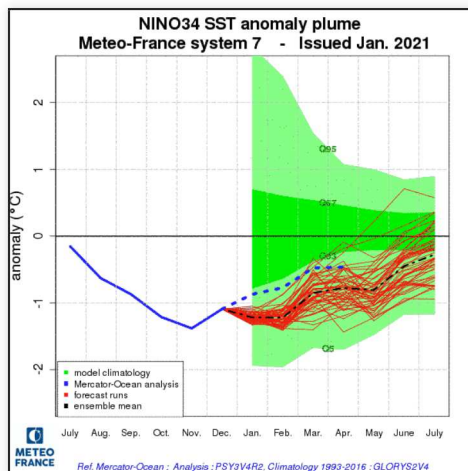


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

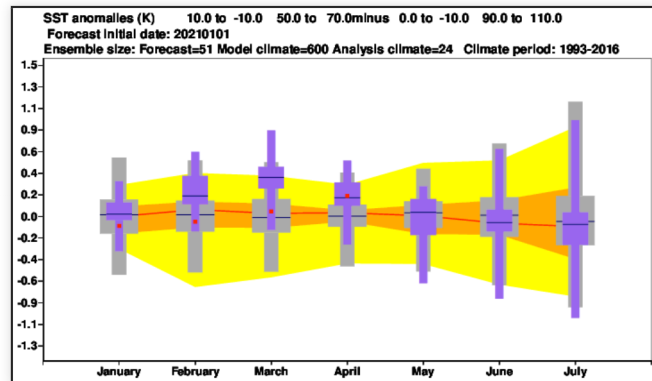
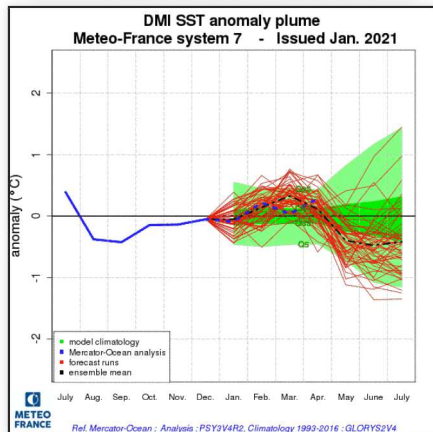
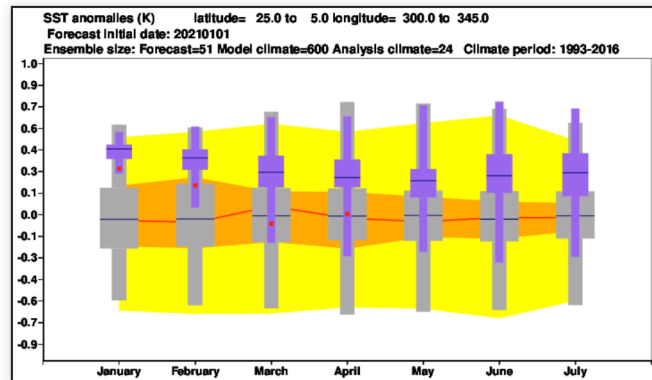
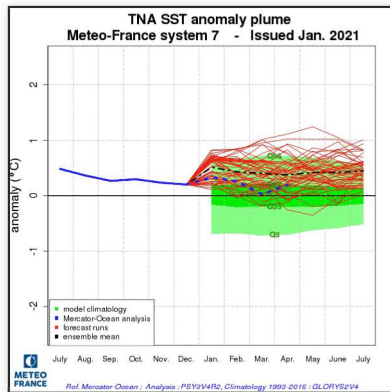
CAUTION : reference analyses differ between MF-S7 (Mercator-Ocean 1993-2016) and ECMWF-SEAS5 (NCEP 1981-2010).

MF-S7 forecast was too cold from the 1st month of simulations (mean error around 0.5°C), but the trend was correct. Good forecast for ECMWF-SEAS5.



Oceans : tropical Atlantic and Indian Ocean index

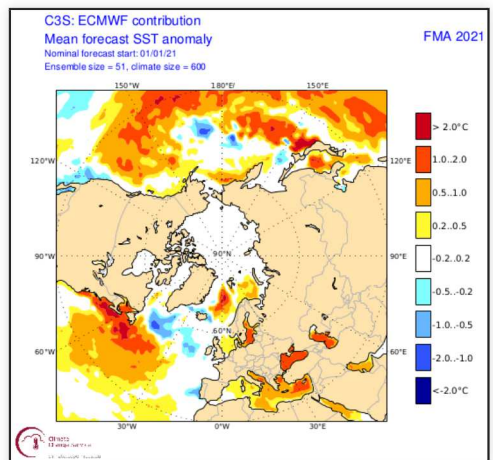
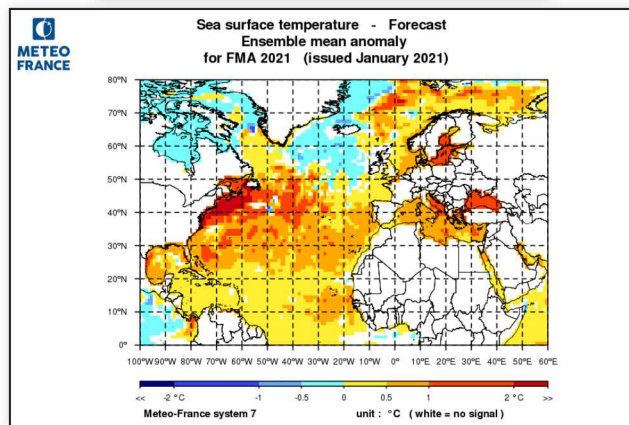
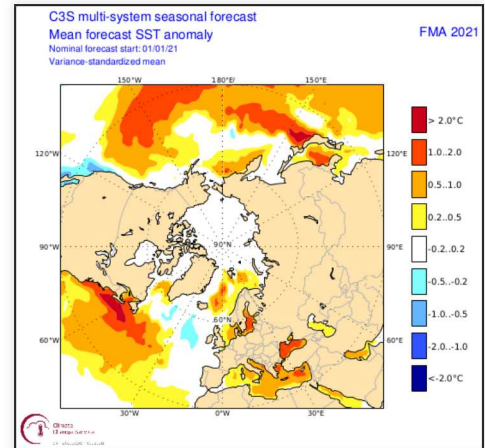
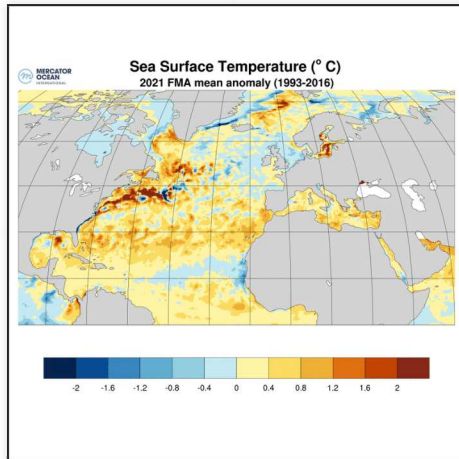
TNA and DMI : almost all the runs of the two models were wrongly forecasting "above normal". The two have remained quite neutral.



Oceans : North Atlantic SST

The strong positive anomaly in the western part of the Ocean (close to North America) and globally the positive anomaly between 20°N and 40°N are correct, as well as the negative anomaly pattern between Greenland and Ireland.

Near Europe, models were too warm in general (especially MF-S7). The relatively strong positive anomaly in the Eastern Mediterranean Sea and the Black Sea were exaggerated.

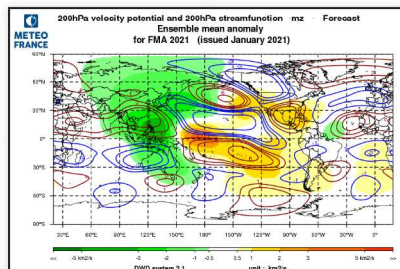
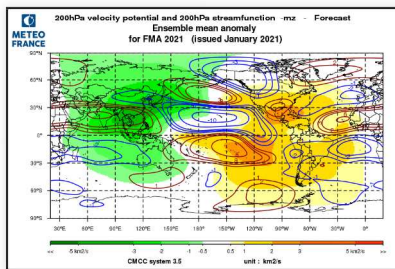
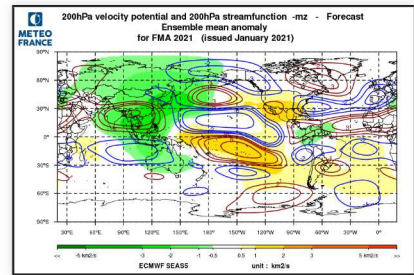
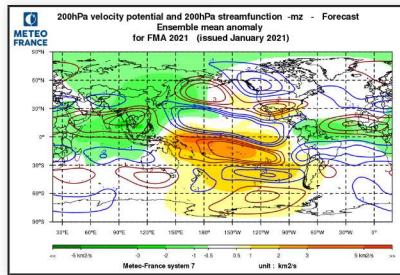
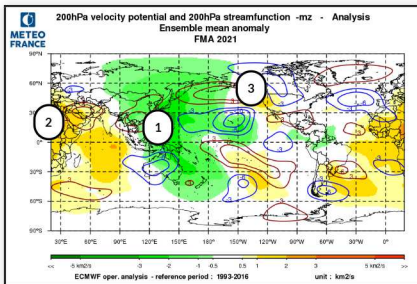


SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and ECMWF SEAS5 (bottom right)

Atmospheric circulation : Global teleconnection

VP : average forecast. The upward anomaly over western Pacific, associated to La Niña, was well predicted, even if it was centred over the Maritime Continent (so westward compared to analysis). The strongest downward anomaly was located over Africa, and not over Central Pacific as forecasted by all the models. The MJO, very active during the period, probably influenced VP anomaly field.

SF : the PNA- teleconnection to North America was correctly forecasted by models. Over North Atlantic, the South-North dipole was rather well anticipated (especially by CMCC and DWD models). Some strong tropical anomalies, even though present in all the models (Indian Ocean and Atlantic Ocean) are not visible in the analysis, or very attenuated (Middle East)



ECMWF analysis, MF-S7, ECMWF-SEASS, 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).

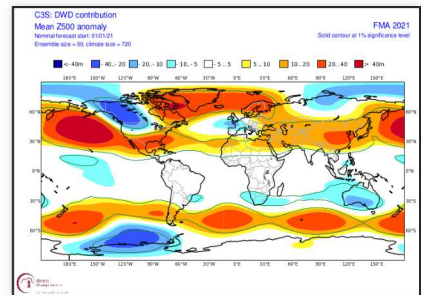
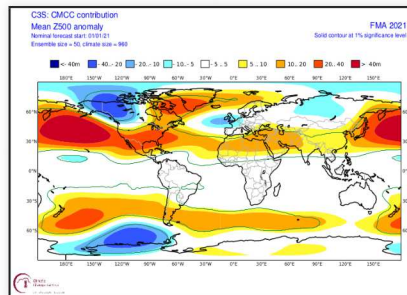
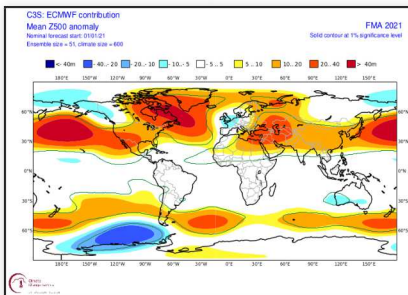
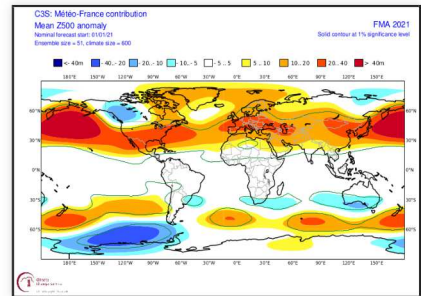
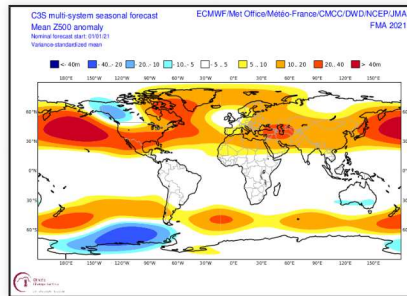
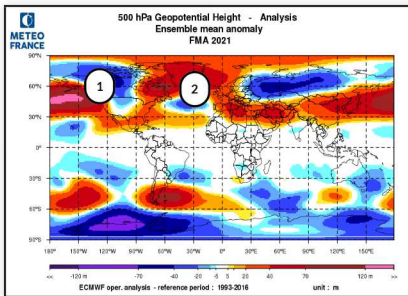
- 1 - strong upward motion anomaly, main response to La Niña
- 2 - Main downward anomaly
- 3 - Good PNA teleconnection in the analysis

Atmospheric circulation : 500hPa Geopotential height

The PNA- pattern is very well forecasted by all the models.

On the North Atlantic the exact pattern is not correctly forecasted, but the main signal (positive anomaly north of Iceland, negative pole around 45°N and positive anomaly around 30°N) was forecasted by most of the models.

The strong negative anomaly over Russia was underestimated, but present in most of the models, as well as the positive anomaly from the Mediterranean Sea to Asia.



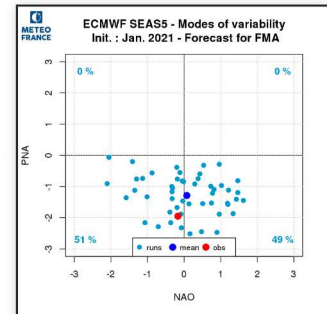
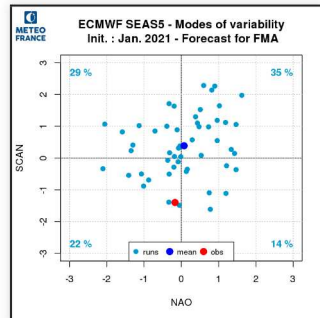
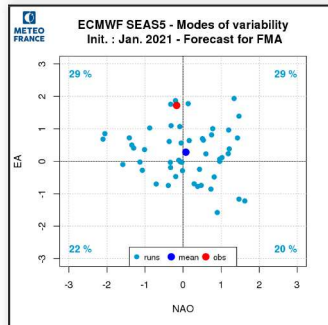
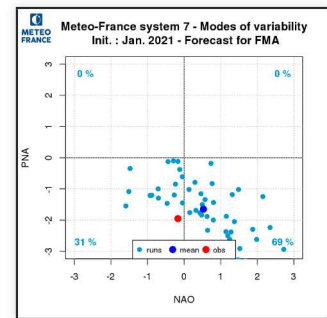
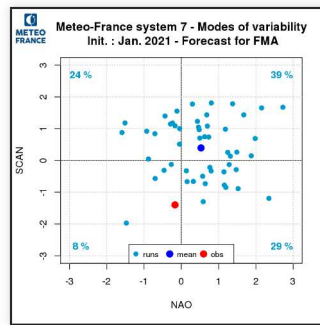
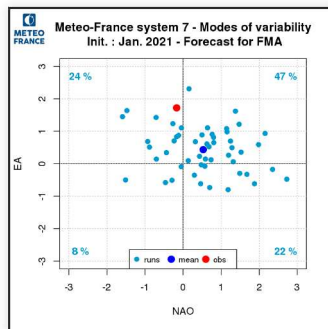
ECMWF analysis, C3S multi-system, MF-S7, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

- 1 - Beautiful PNA-
- 2 - Positive EA pattern

Atmospheric circulation : Modes of variability

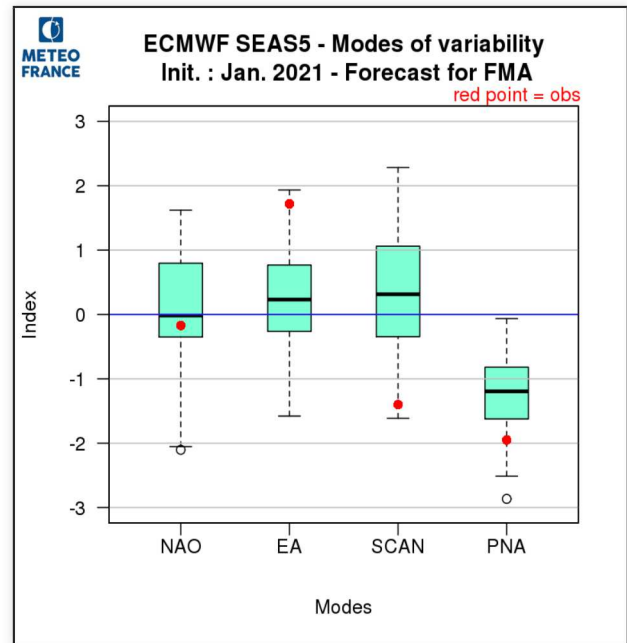
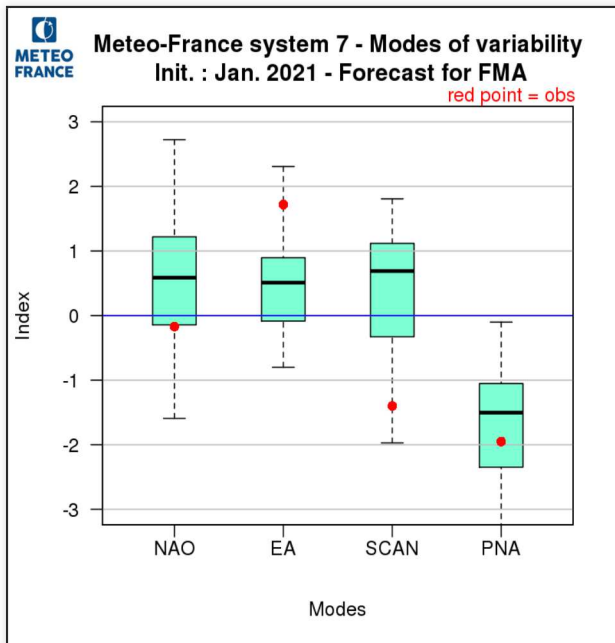
Good forecast of the sign of EA mode. The forecast of NAO was different between MF-S7 and ECMWF-SEAS5, ECMWF-SEAS5 was correct. The negative SCAN was not predicted.

Good PNA forecast.



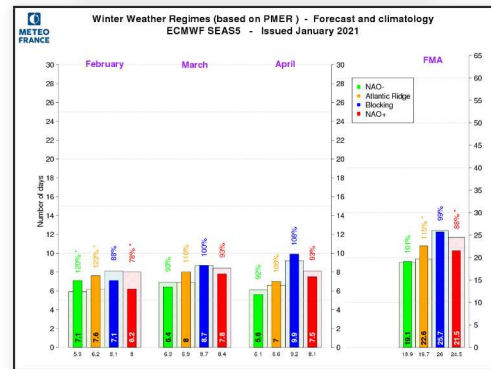
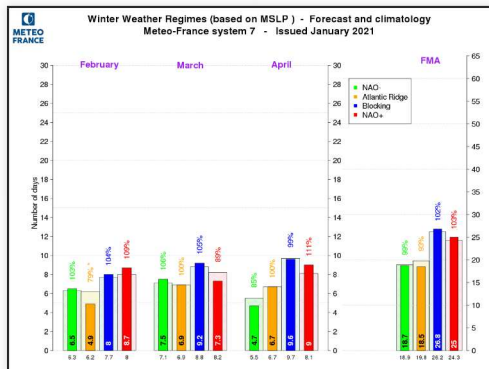
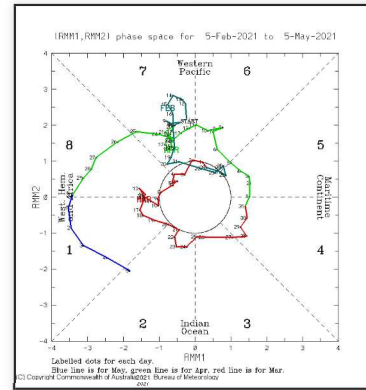
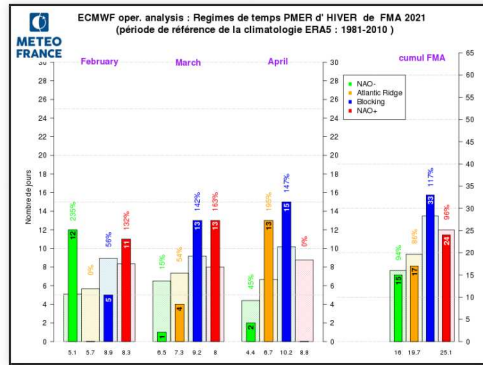
Atmospheric circulation : Modes verification

Same observation as for the previous slide



Atmospheric circulation : Winter SLP weather regimes

The excess of Blocking regime was more forecasted. One can note the high variability of regime frequencies within the period.



weather regime : ECMWF analysis top left, MF7 and ECMWF forecasts at the bottom. MJO phase top right

Climatic parameters : temperature on the globe

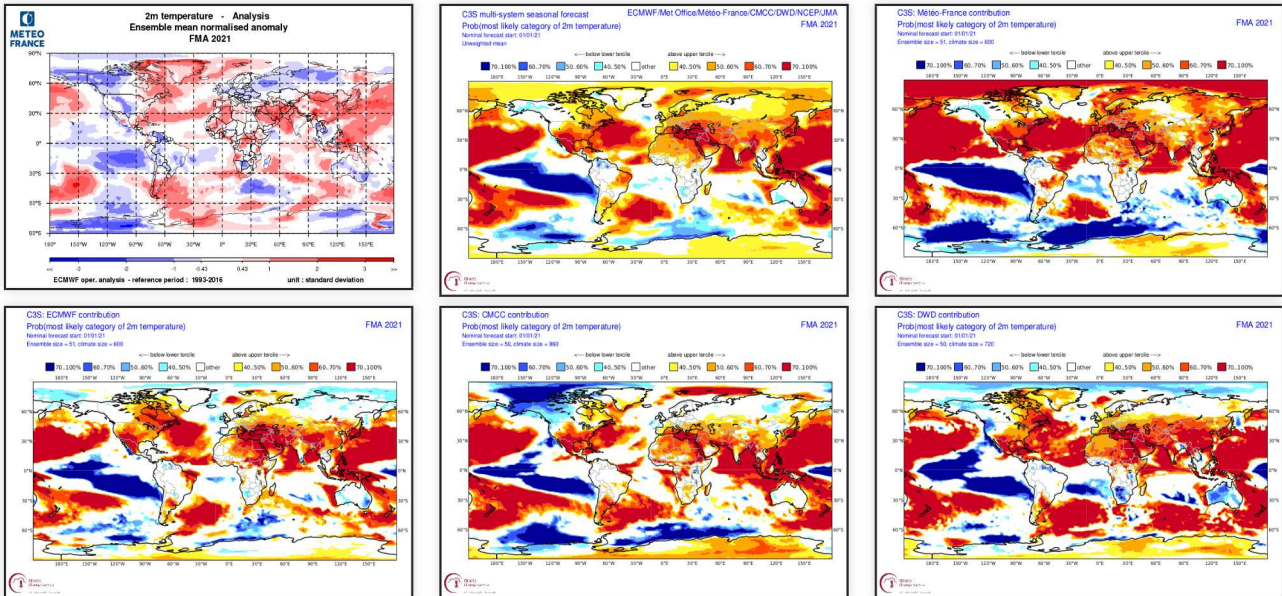
South America : good forecast except North-Eastern Brazil

North America : very good forecast over Alsaka and Canada (PNA-), but wrong signal over USA

Africa : rather good forecast, despite complex patterns in the Northern part

Eurasia : rather good forecast of North-South dipole between Russia and Asia/Middle East

Oceania : good forecast



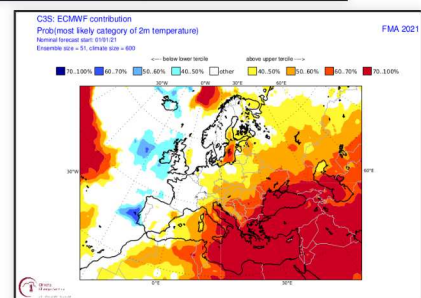
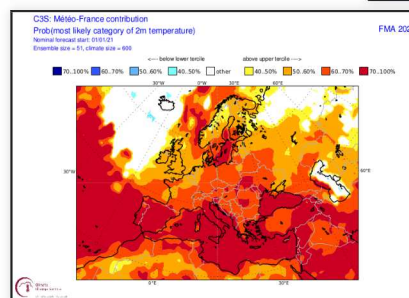
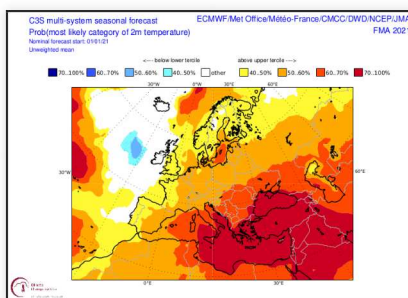
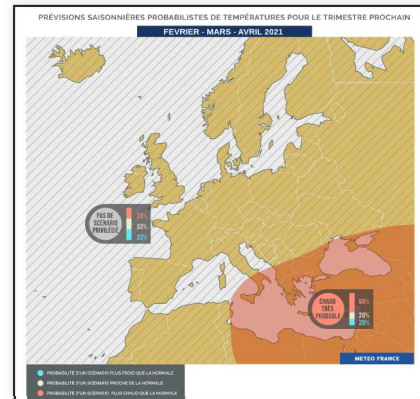
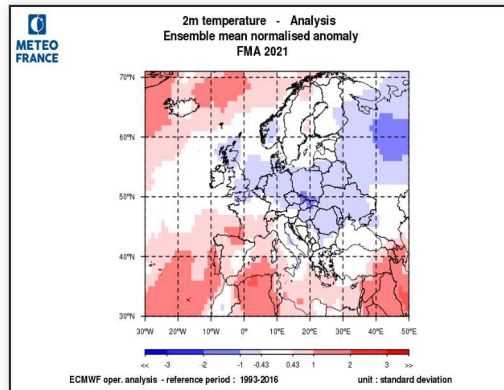
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S7 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

Climatic parameters : temperature over Europe

Quite cold conditions over Central Europe, Ussia and the British Isles, and warm anomalies over the Southern Mediterranean basin, Iberian peninsula and Middle East.

Not a good agreement between models, with globally a warm signal that was not relevant.

The "no signal" was largely privileged on the synthesis map, it allowed to attenuate this wrong trend..



ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system, MF-S7 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over the globe

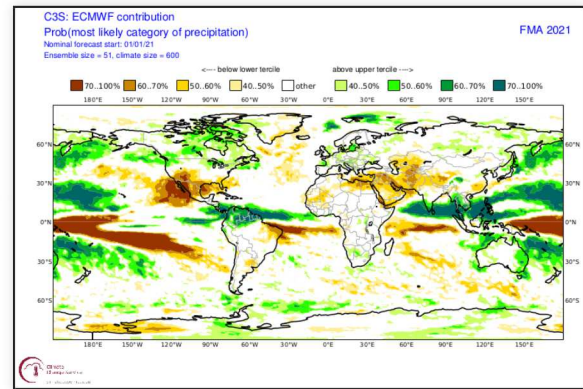
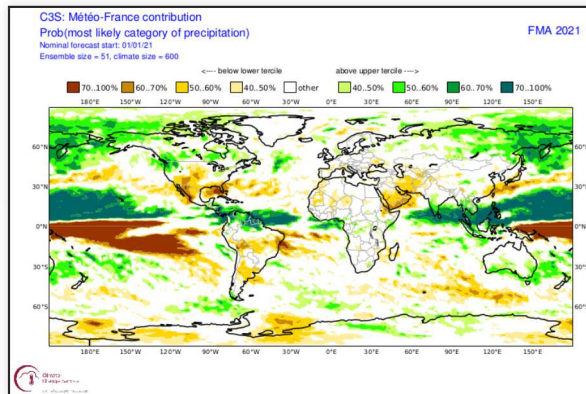
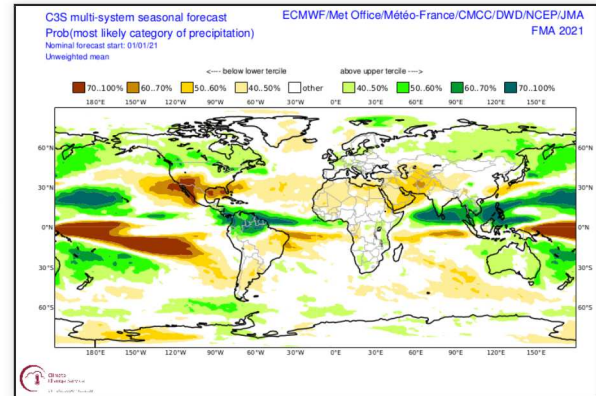
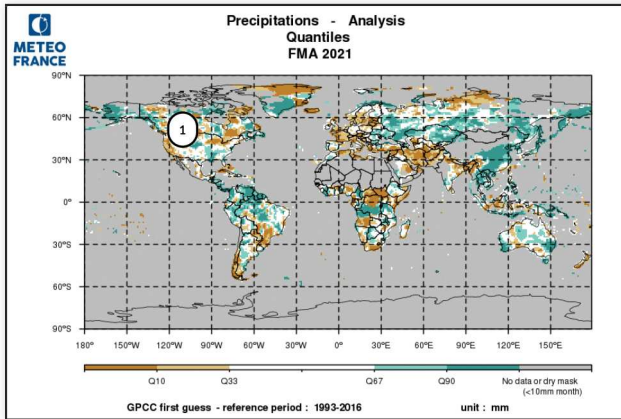
South America : good forecast of the strong wet anomaly on the North

North America : complex patterns. A good forecast over Alaska.

Africa : complex patterns, no signal in the forecasts.

Eurasia : rather good forecast of North-South dipole between Russia and Middle East

Oceania : dominant wet anomaly, quite well predicted



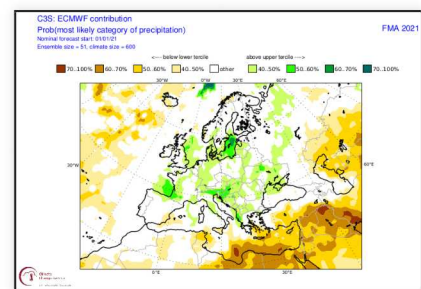
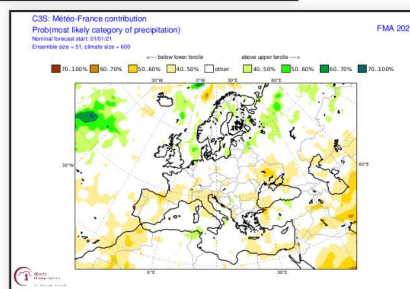
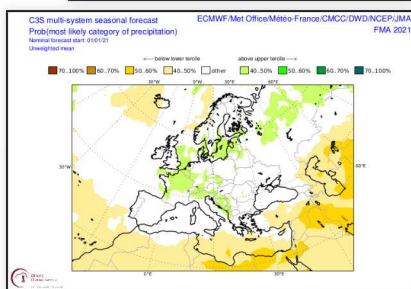
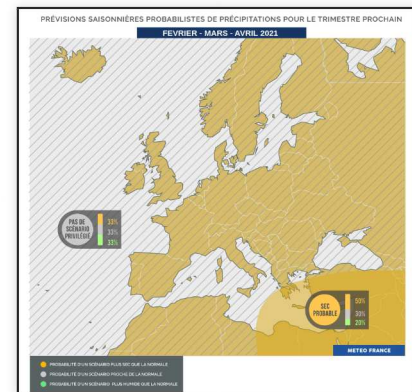
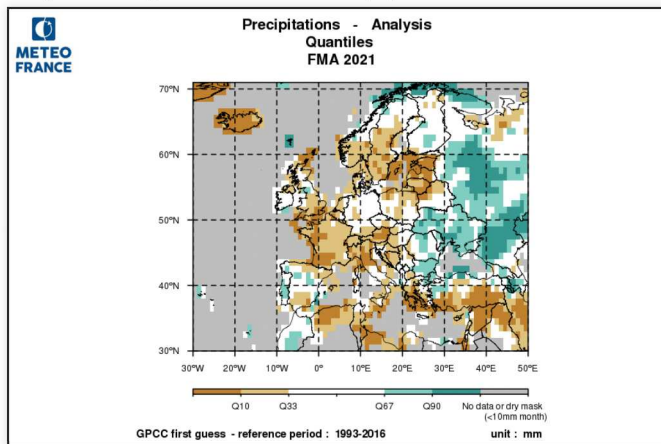
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S7 and SEAS5 on the bottom line.

1 - Unusual precipitation forecast for a La Niña situation, due too a shift in the main circulation patterns.

Climatic parameters : Precipitations over Europe

Strong East-West dipole of anomaly over the continent, and globally dry conditions observed over the Mediterranean Basin.

On the synthesis map, the only signal indicated was relevant. Elsewhere, the decision of not following the models was the good one (especially the wet signal over Western Europe)



Precipitation anomalies analysed by IRI (top left). Synthetic forecast map for precipitation (top right) and forecast for multi-model, MF-S7 and SEAS5 (on the bottom line).

General summary : for the period JFM 2021

1) Oceans :

The main patterns were reasonably well predicted, despite some noticeable differences near Europe. Good forecast of ENSO evolution.

2) Large scale atmospheric circulation :

VP 200 hPa : average forecast. The patterns linked to La Niña were not clearly visible in the analysis, probably due to perturbations caused by the active MJO.

SF 200 hPa : good forecast of the PNA- and globally on the main patterns over North Atlantic.

Z500 : The PNA- pattern was well predicted. The main anomalies over Northern Atlantic and Eurasia were present but shifted.

3) Climatic parameters over Europe :

Poor forecast, due mainly to the bad position of the main circulation anomaly.

The synthesis map, with most of the areas in "no signal", was probably the most reasonable choice.