VERIFICATION BULLETIN

JULY - AUGUST - SEPTEMBER 2020

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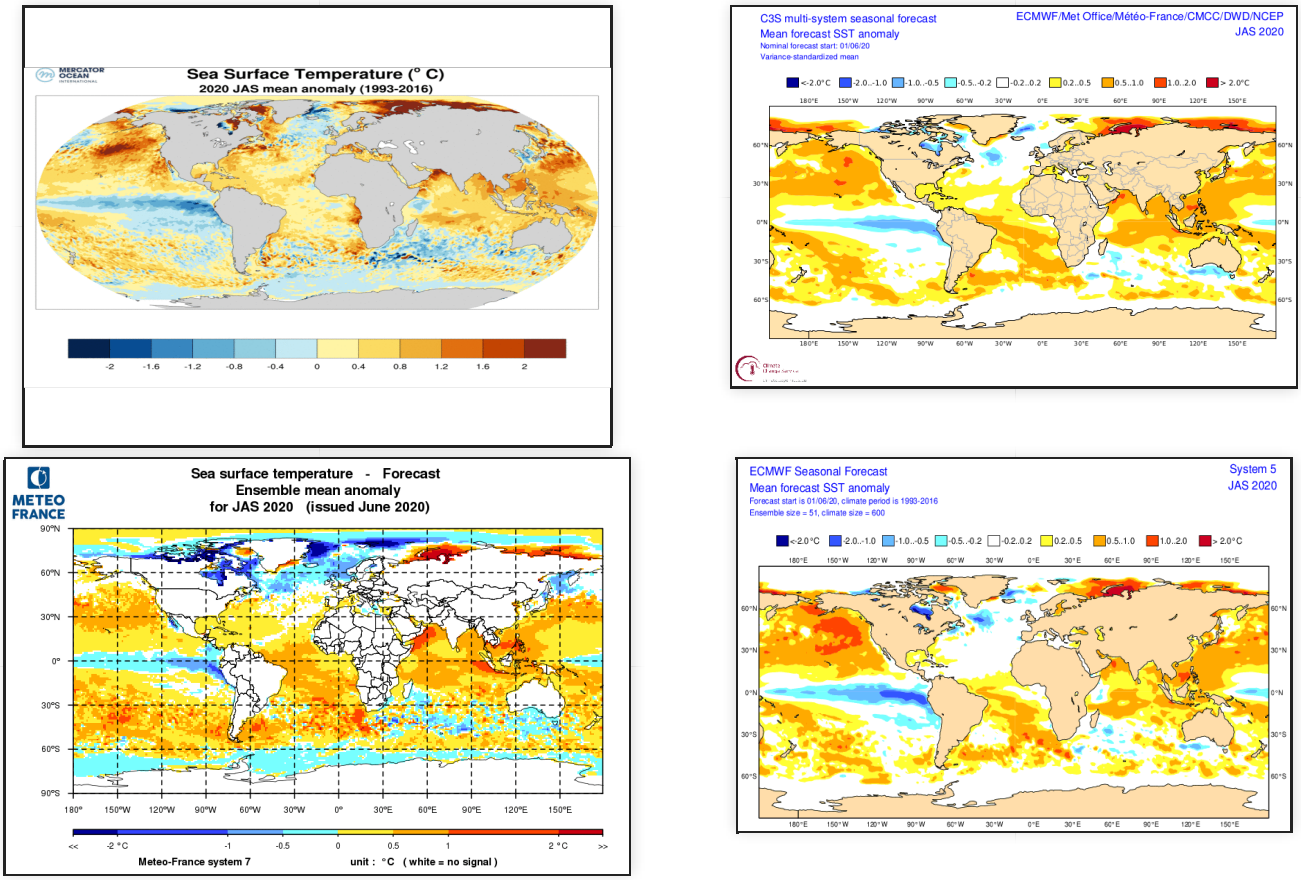
Introduction : Objective

- **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

The main SST patterns were generally well captured. On the Pacific good dipole forecast (hot north and cold near the equator). On the Indian Ocean the hottest anomalies are well targeted (over the Maritime Continent and Arabian sea) . On the Atlantic the forecast are less good with an overestimation of the warm anomalies in the southern hemisphere and an underestimation of the dipole on the atlantic north.

On the other hand, the forecast was far too cold at high northern latitudes and in particular between Greenland and Canada or in the Barents Sea where very hot anomalies occurred (in connection with the extension of the sea ice).

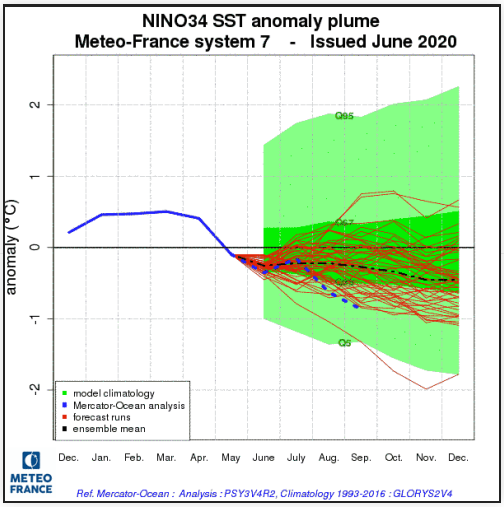


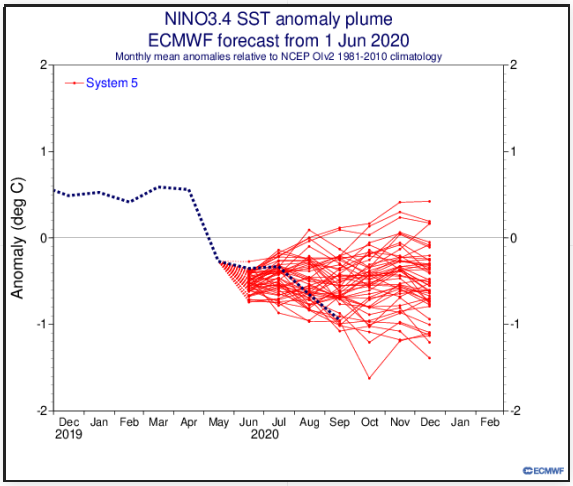
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

The drop in temperature at the end of the period was not anticipated by models.



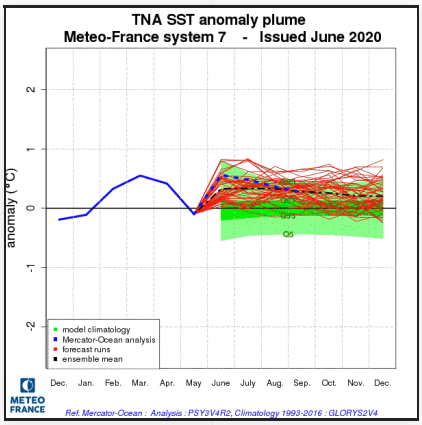


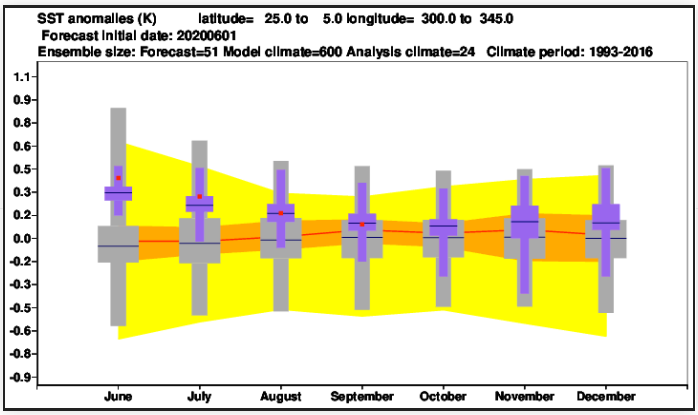
Oceans : tropical Atlantic and Indian Ocean index

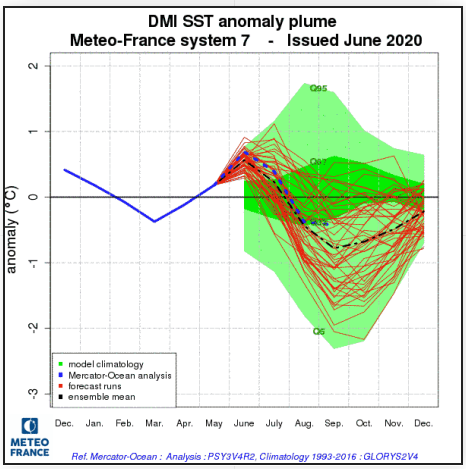
Both models had very similar forecasts :

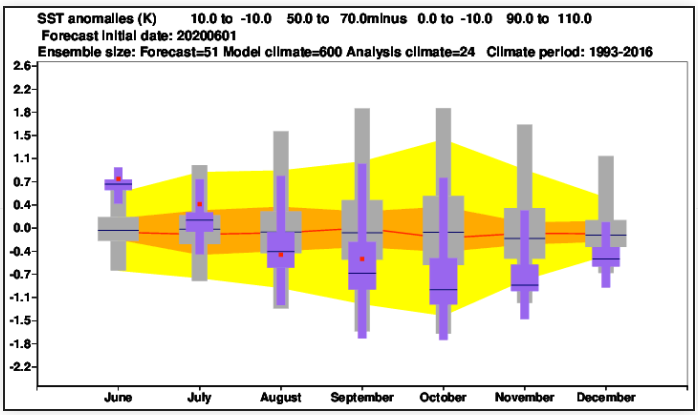
- TNA : Return to the median tercile as predicted by the models

- DMI : The drop in temperatures was well anticipated



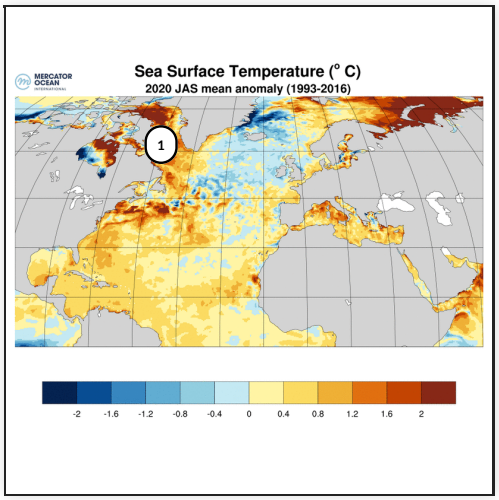


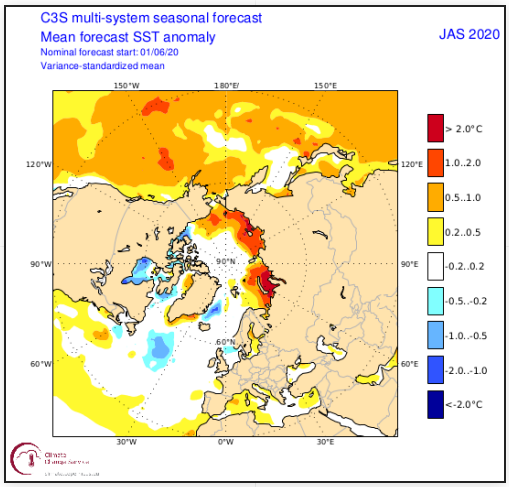


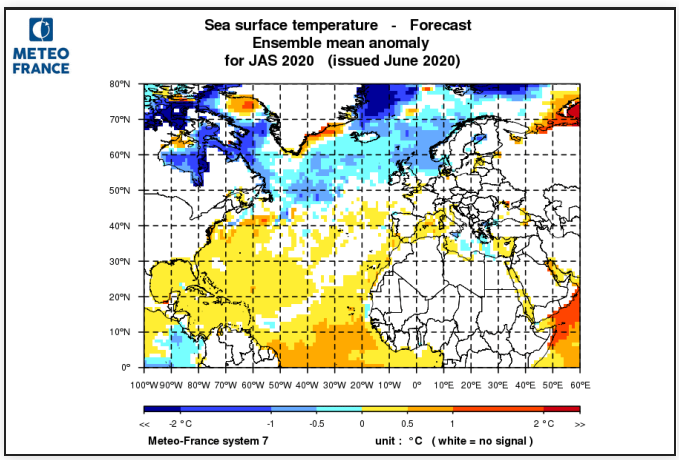


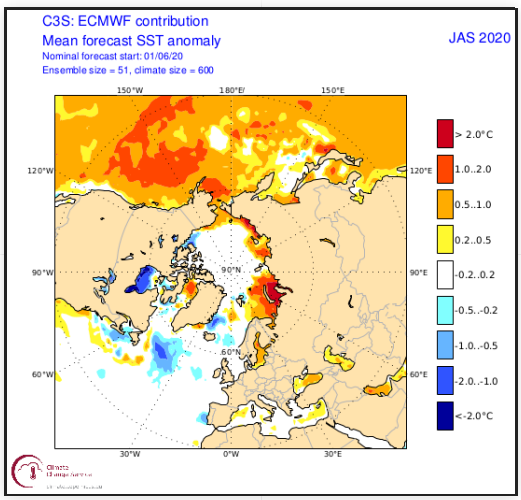
Oceans : North Atlantic SST

The warm anomalies between Greenland and Canada was not forecasted by the models.









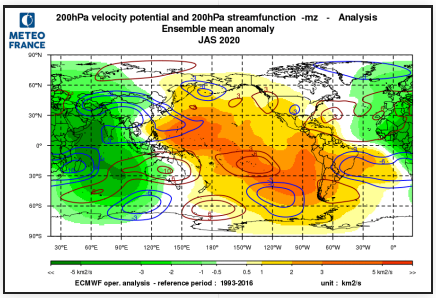
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and ECMWF SEAS5 (bottom right)

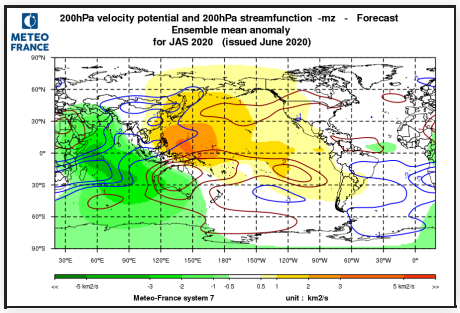
1 - This warm anomaly was not expected

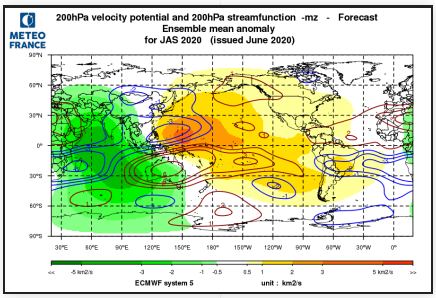
Atmospheric circulation : Global teleconnection

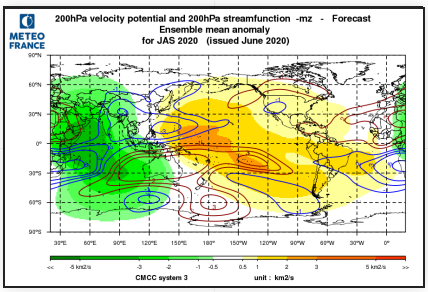
The dipole on each side of the Maritime Continent was very well forecasted as well as the extension of negative PV anomalies to the Amercan continent.

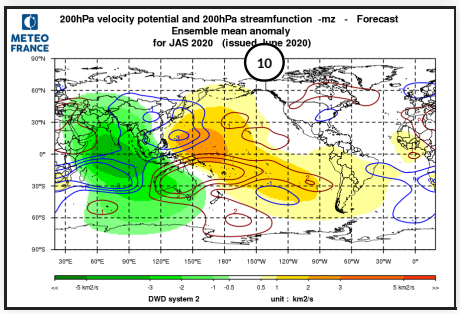
On the other hand, the entension of positive PV over West Africa was not anticipated by the models.

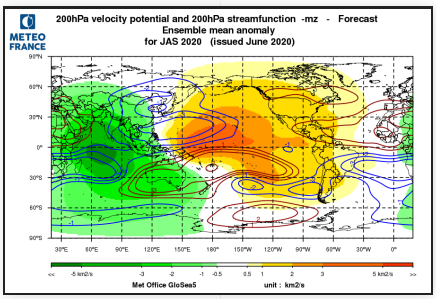










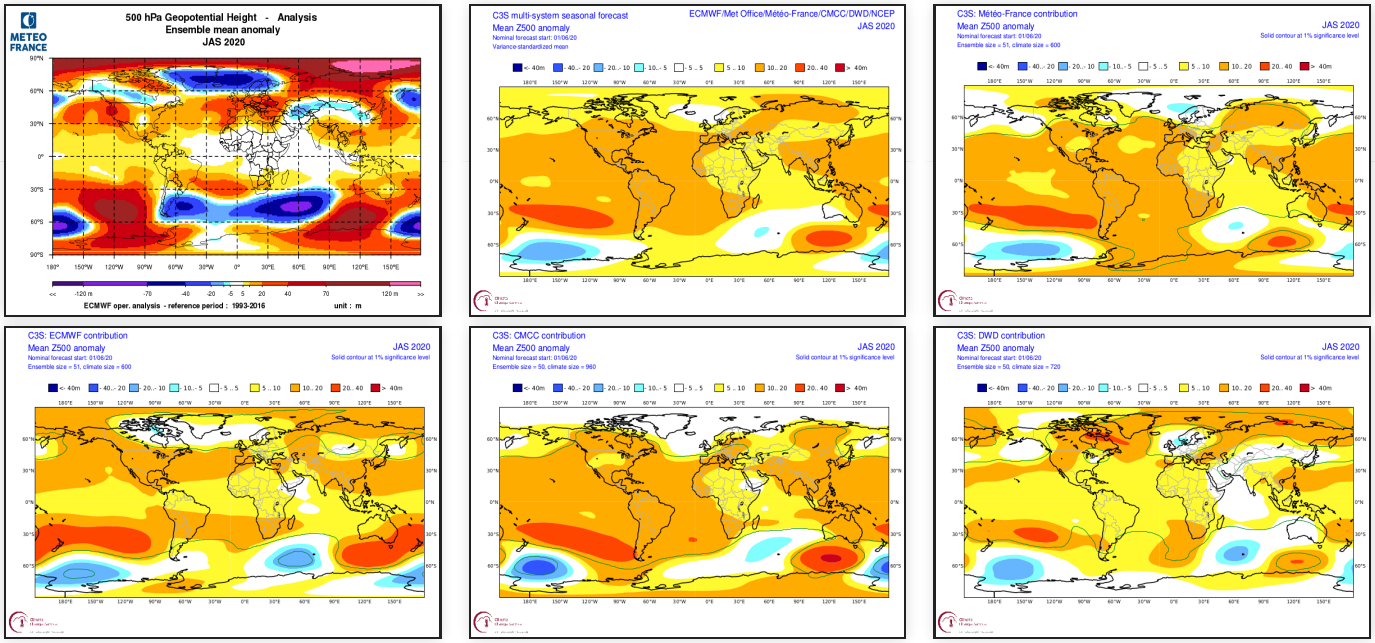


ECMWF analysis, MF-S7, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

10 - Very little signal in the DWD model

Atmospheric circulation : 500hPa Geopotential height

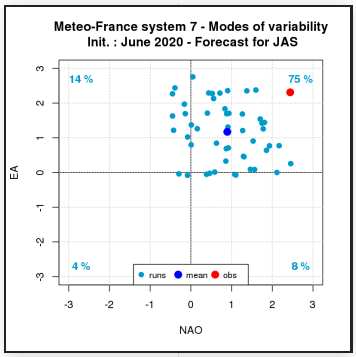
The relative weakness of the field over Central Asia was sensed by most models. The positive phase of the North Atlantic oscillation was anticipated by most of models.

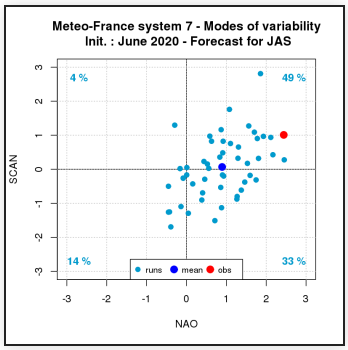


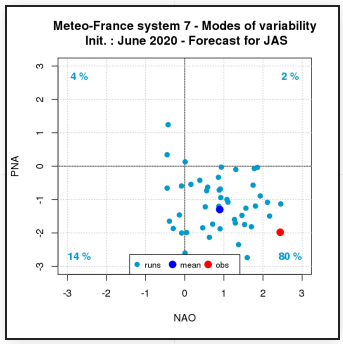
ECMWF analysis, C3S multi-system, MF-S7, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

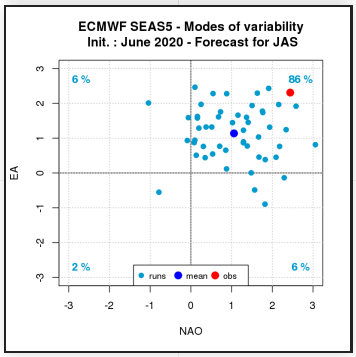
Atmospheric circulation : Modes of variability

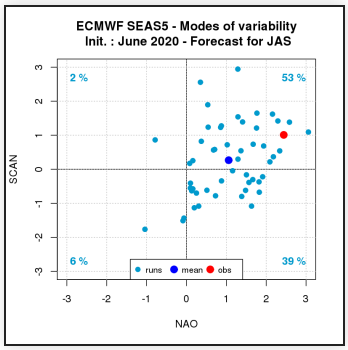
Good qualitative forecast (good sign of each mode).

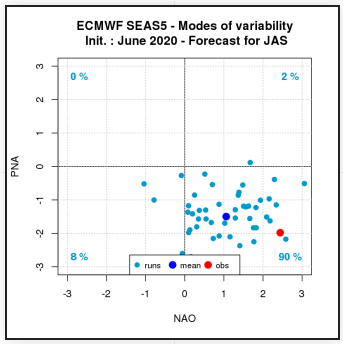






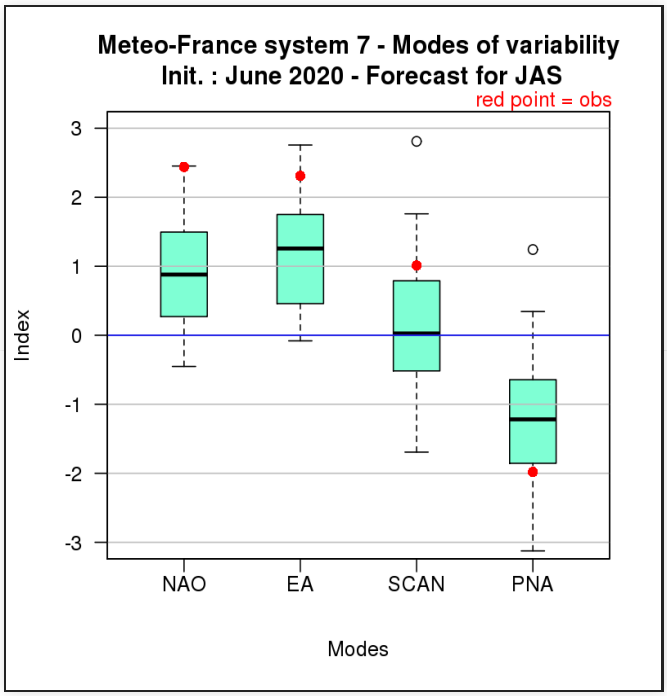


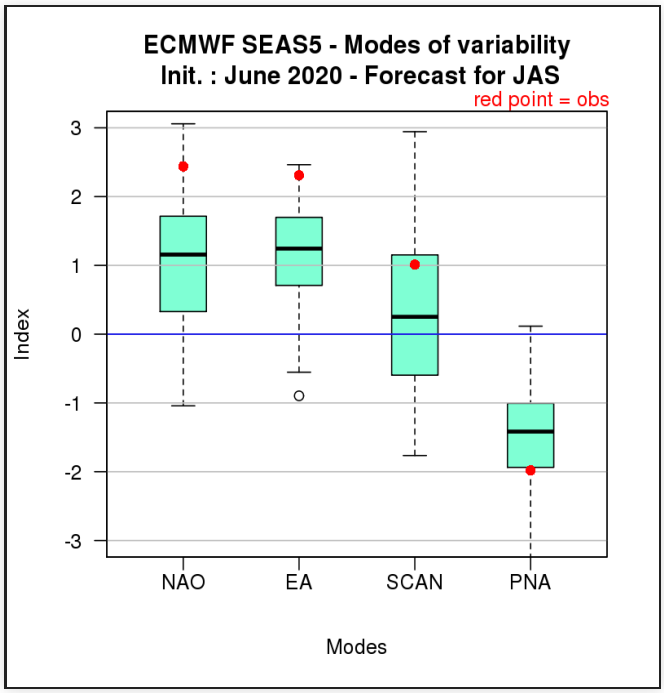




Atmospheric circulation : Modes verification

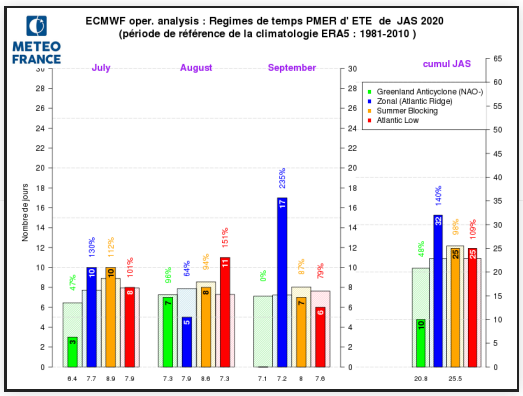
Quantitatively the forecasts are poor (the observations are at the end of the distribution)

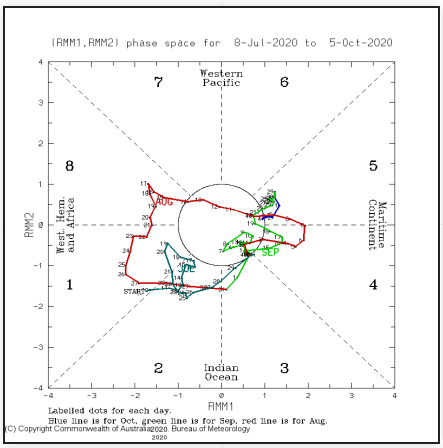


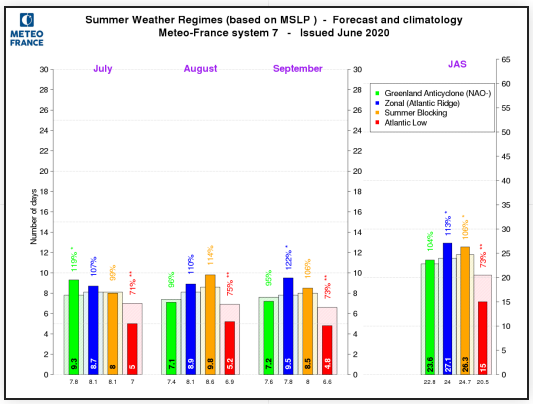


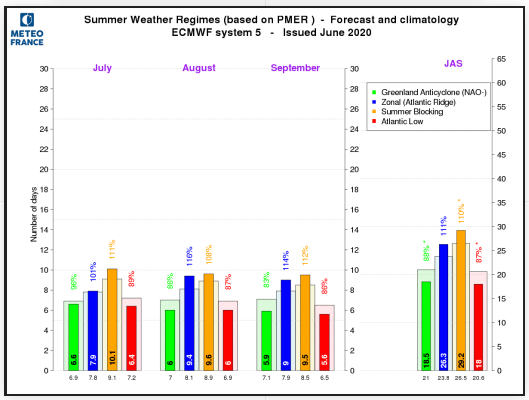
Atmospheric circulation : Summer SLP weather regimes

The predominance of the zonal regime was rather well forecasted by the models. For others regimes the forecasts are not good.





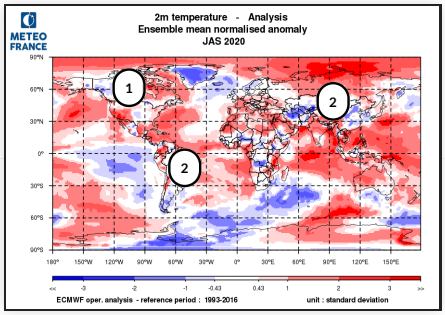


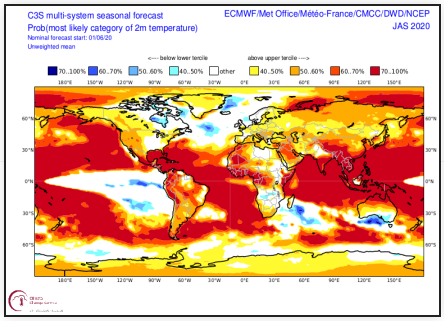


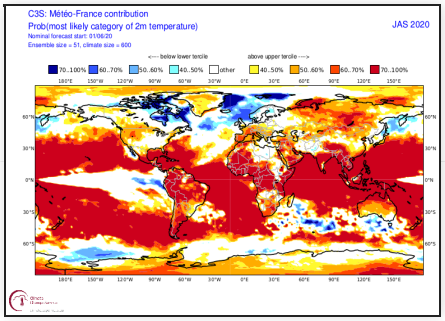
weather regime : ECMWF analysis top left, MF7 and ECMWF forecasts at the bottom. MJO phase top right

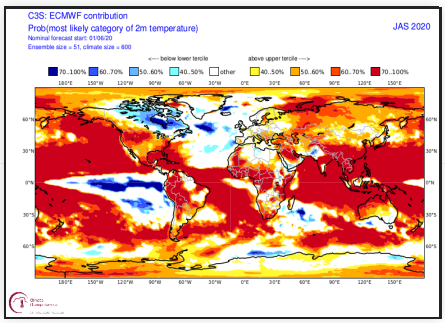
Climatic parameters : temperature on the globe

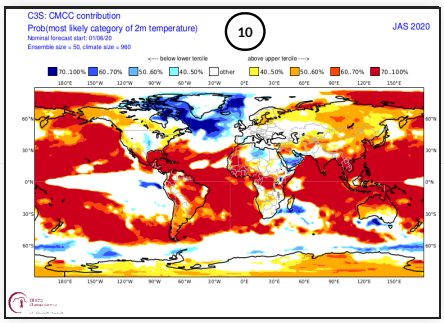
Cold anomalies over the continents were more numerous than expected, especially over Asia, some regions of Africa or South America. The hot anomaly in the Labrador area was not expected since most models predicted cold in this area.

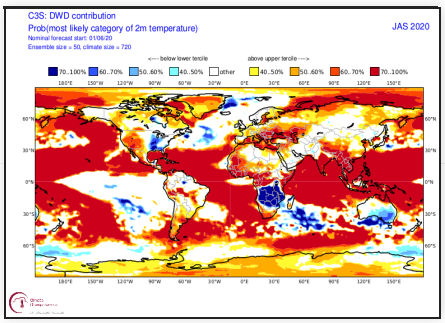










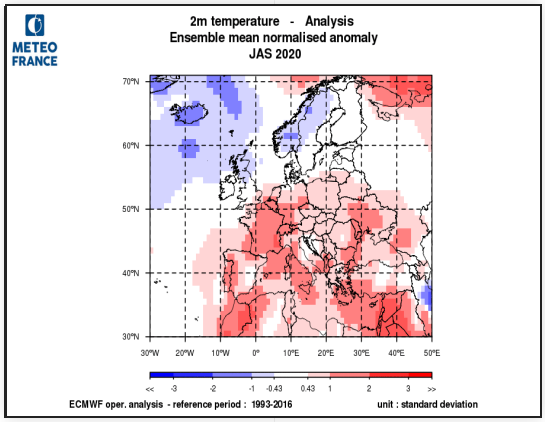


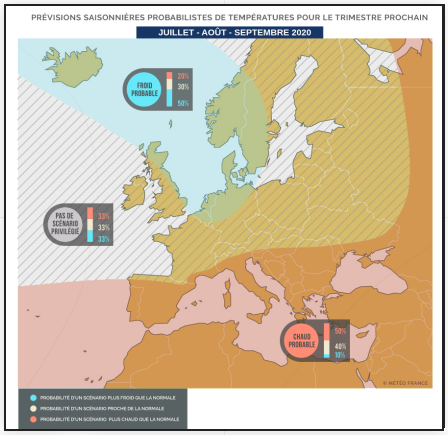
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S7 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

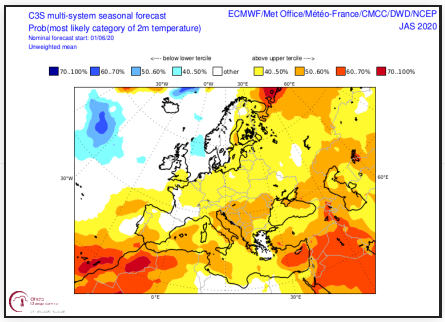
1 - the reverse of the expected dipole occurred
2 - none of the models predicted these cold anomalies.
2 - none of the models predicted these cold anomalies.
10 - The Italian model is generally colder than the others, but the distribution of anomalies is not better.

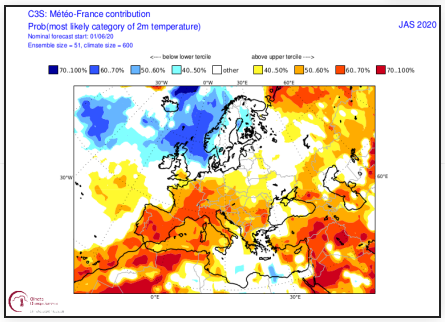
Climatic parameters : temperature over Europe

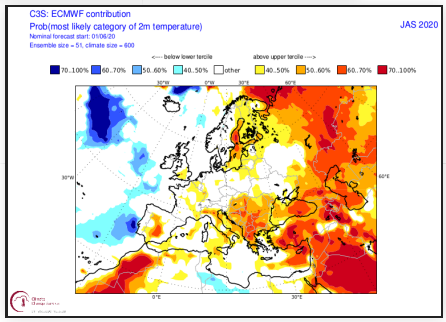
.The dipole (cold in the north and hot in the south) was relatively well forecasted by models. MF7 is better on extending heat to Western Europe.







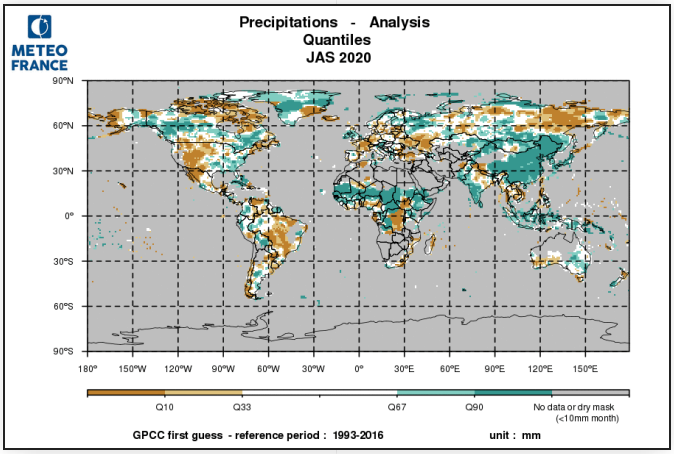


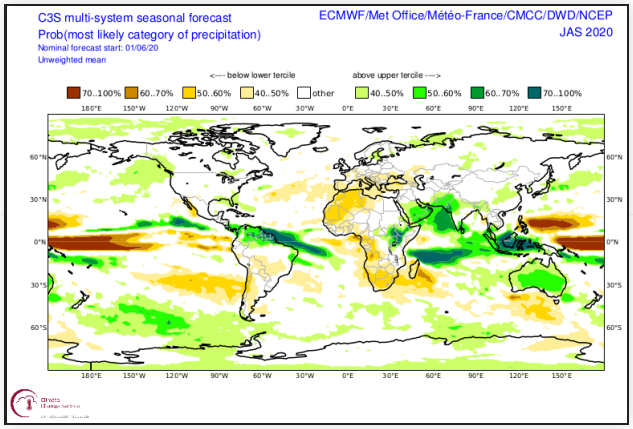


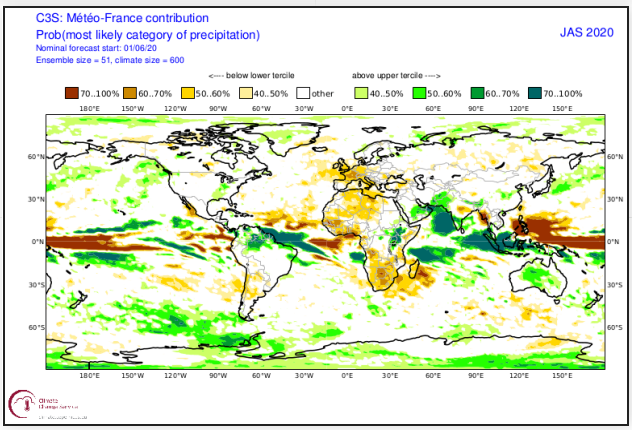
ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S7 and SEAS5 on the bottom line.

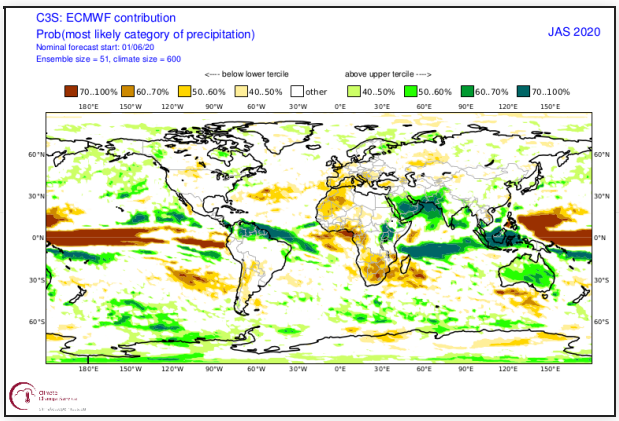
Climatic parameters : Precipitations over the globe

Forecasts were extremely poor across the globe, with the exception of the Maritime Continent where the expected excess precipitation did occur.





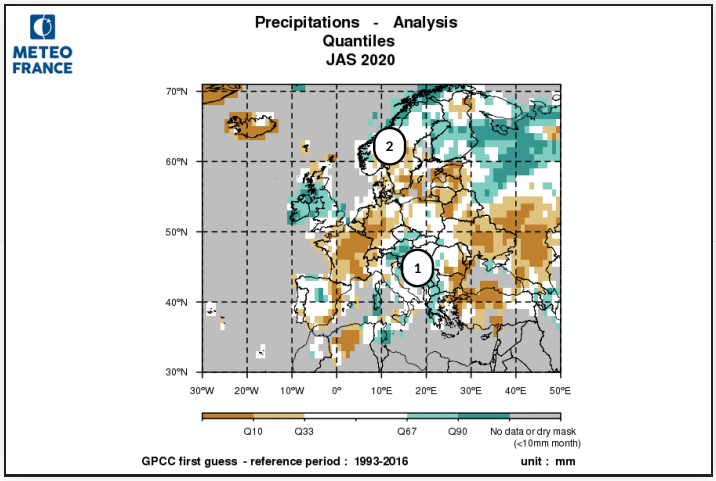


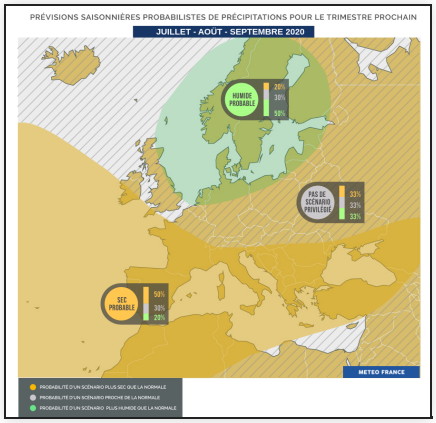


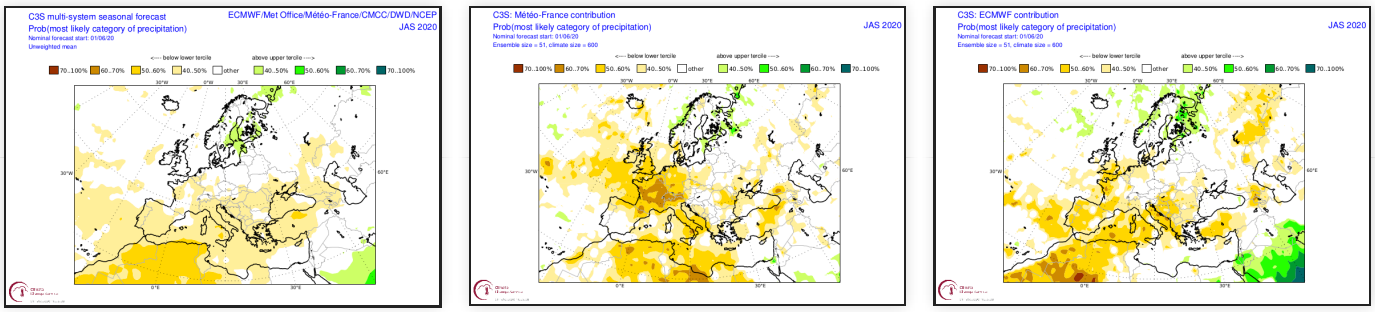
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S7 and SEAS5 on the bottom line.

Climatic parameters : Precipitations over Europe

The synthetic forecact map captures the low frequency signal (wet in the north and dry in the south) but not the synoptic anomalies (wet towards the Balkans, dry around the Baltic).







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).

1 - Excess precipitation over the area with the strongest dry signal in the models
2 - Unexpected dry anomaly

General summary : for the period JAS 2020

1) **Oceans :**

SST patterns were generaly very well captured by the models except at high northern latitudes where unexpected very hot anomalies occurred

2) **Large scale atmospheric circulation :**

VP and FC at 200hPa : kernels on the Indian Ocean and West Pacific were generally well foreseen. Poor forecast on West Africa.

Z500 : The multi-models favors the reinforced westerly circulation as observed.
The prediction of the modes of variability is qualitativaly quite good but not quantitatively.

3) **Climatic parameters over Europe :**

Low frequency signal is captured (warm and dry in the south/ cold and wet in the north) but not the synoptic structures.