VERIFICATION BULLETIN

AUGUST - SEPTEMBER - OCTOBER 2020

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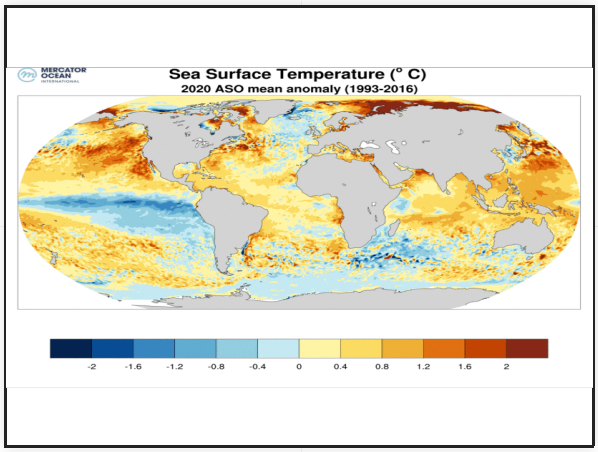
Introduction : Objective

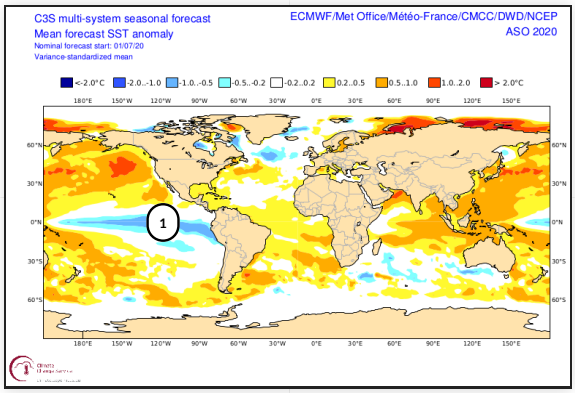
- **The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean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

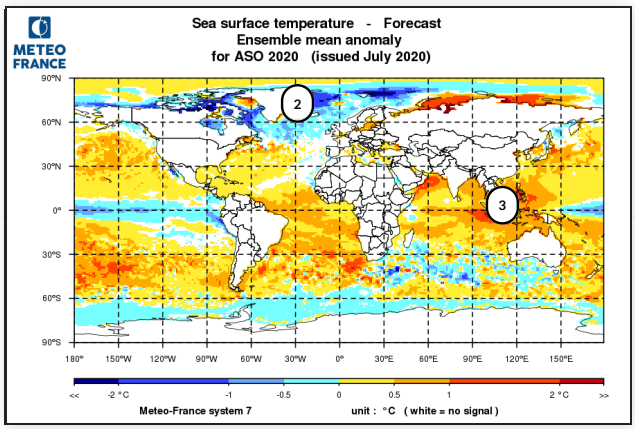
Oceans : surface temperature anomalies

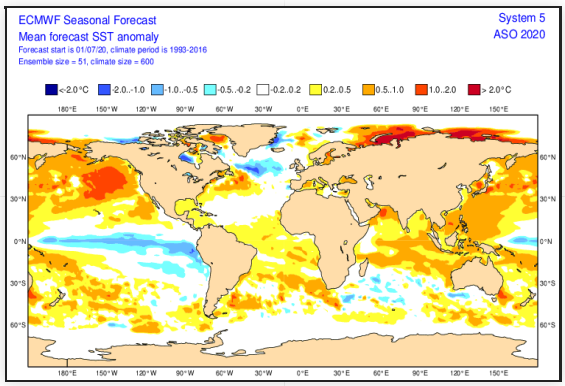
The general structure of SST anomalies was well anticipated, however in the Pacific Ocean, the main anomaly linked to the La Nina phenomenon has been underestimated by the models in intensity and also in extension in the southern part. Conversely, the warm anomalies on the Maritime Continent were overestimated especially by MF-S7.

The SST anomalies observed in the Arctic were particularly strong this summer in connection with a record melting of the sea ice. The model from the European Center anticipated this phenomenon rather well, unlike the MF-S7 which displays anomalies that are much too cold.









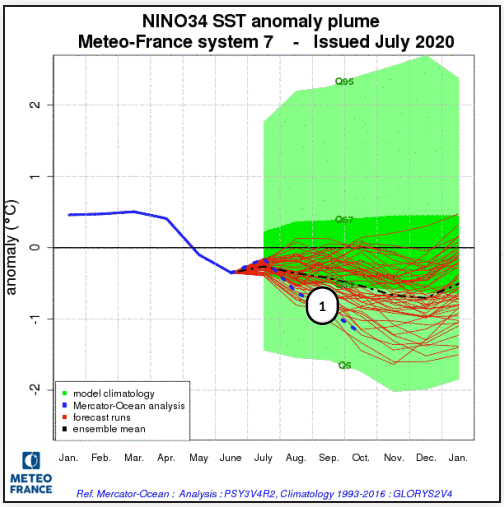
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and SEAS5 (bottom right)

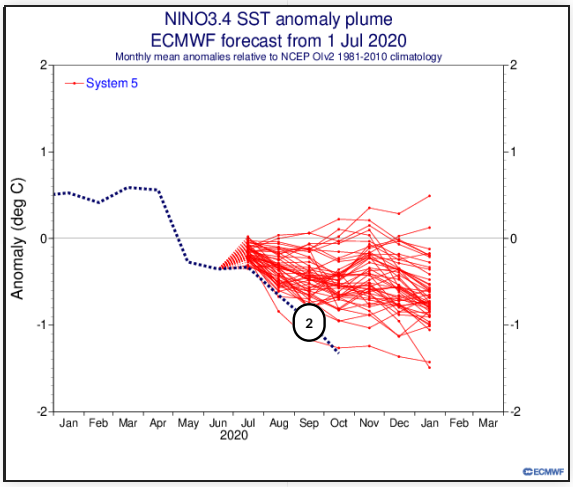
1 - Intensity and extension of the cold anomaly is under estimated
2 - MF-S7 has too cold forecast
3 - MF-S7 forecast is a little warmer than the observed SST

Oceans : ENSO

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

The rapid amplification of the La Nina phenomenon over the summer was not anticipated by the models. The negative anomaly in the Nino3.4 box has been significantly underestimated.





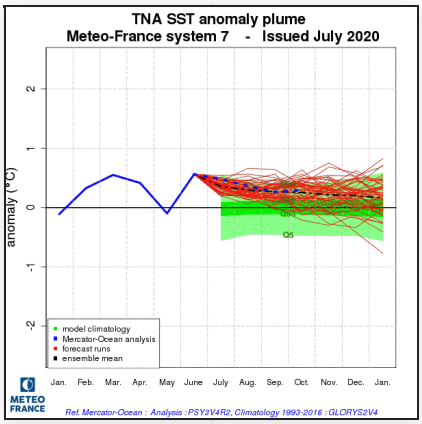
1 - The observed trend is decreasing faster than the ensemble mean forecast
2 - The observed trend is decreasing much faster than forecasts

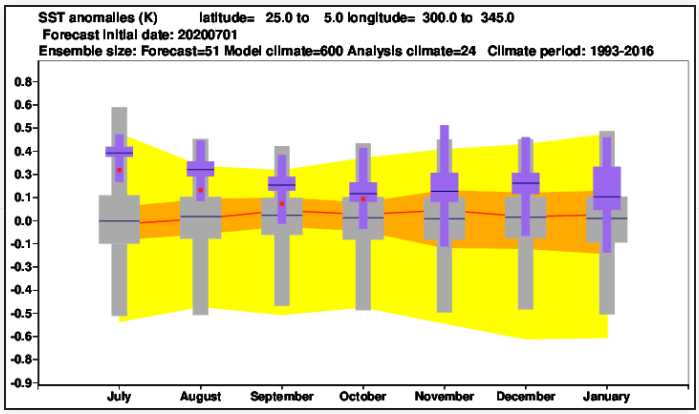
Oceans : tropical Atlantic and Indian Ocean index

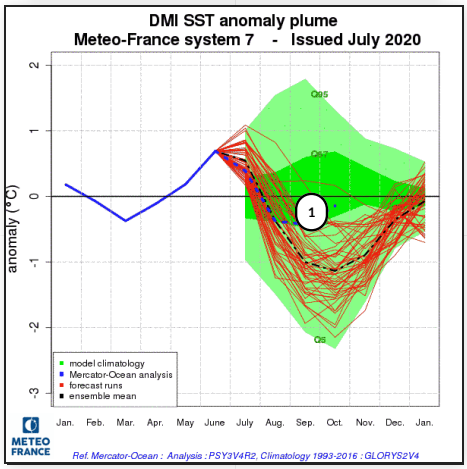
Both models had very similar forecasts :

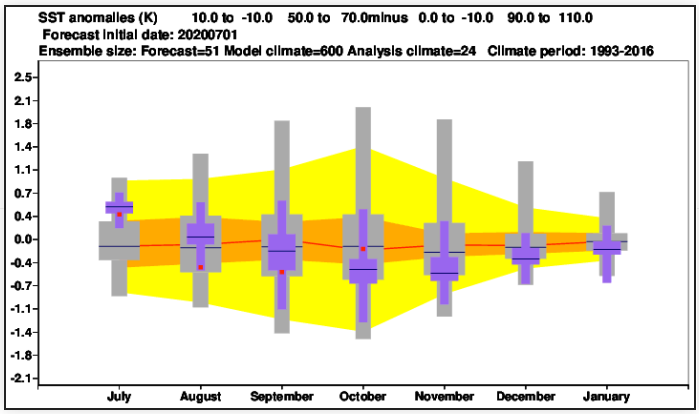
- TNA : The hot anomaly is well predicted by MF-S7 and a little overestimated by ECMWF-SEAS5.

- DMI : In connection with the underestimation of the La Nina phenomenon and its consequences on the SST of the Maritime Continent, the forecast for the DMI index diverges from the analysis from September.





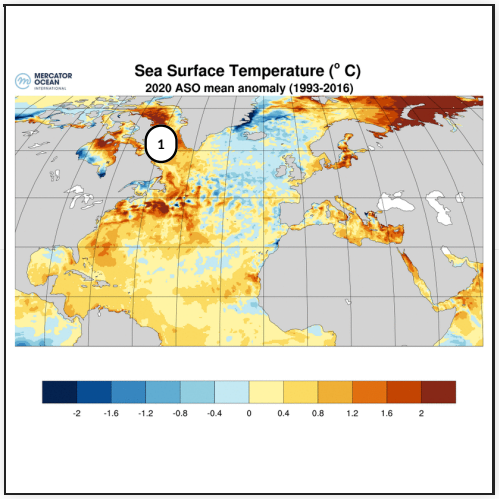


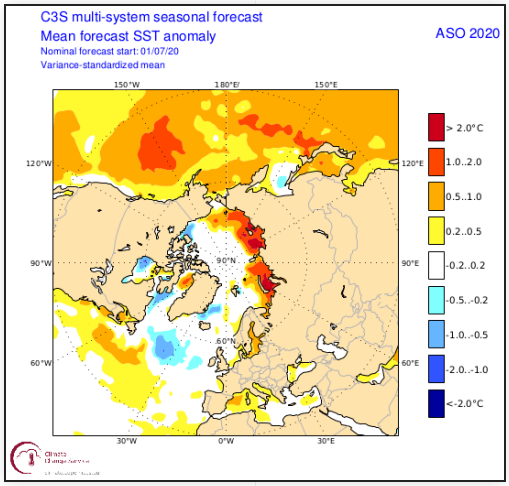


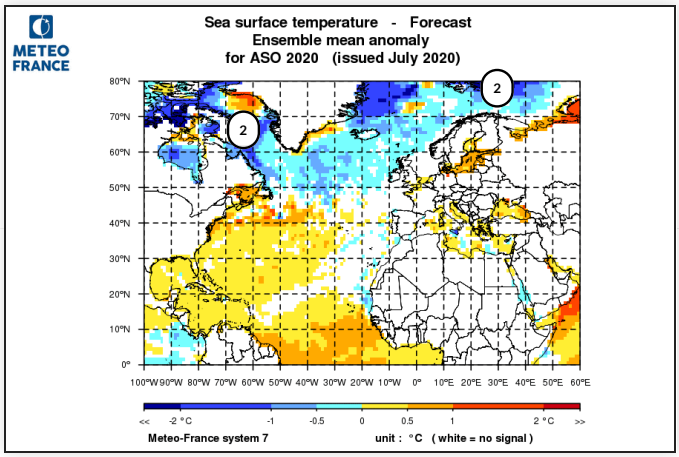
1 - DMI index starts to grow much earlier than forecast

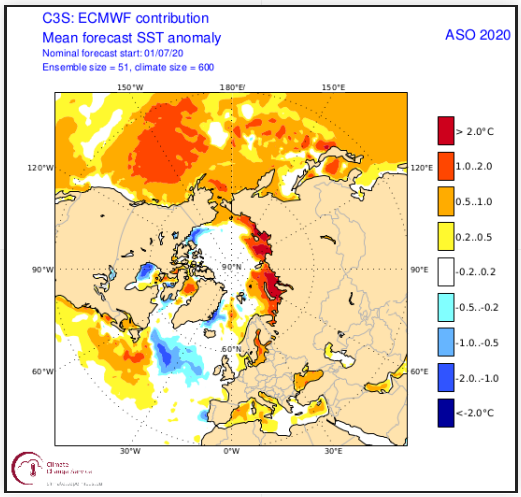
Oceans : North Atlantic SST

The warm anomalies between Greenland and Canada was not forecasted by the models. The forecast for MF-S7, in this area, is far too cold in connection with a poor forecast of the extension of the sea ice.









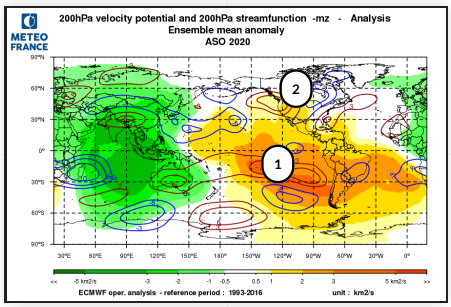
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and ECMWF SEAS5 (bottom right)

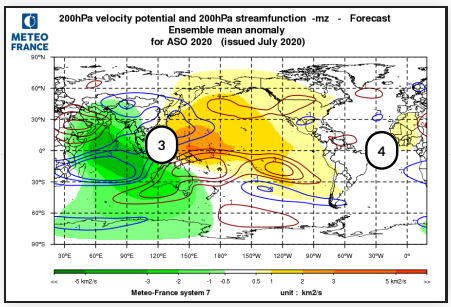
1 - This warm anomaly was not expected
2 - Too cold forecast
2 - Too cold forecast

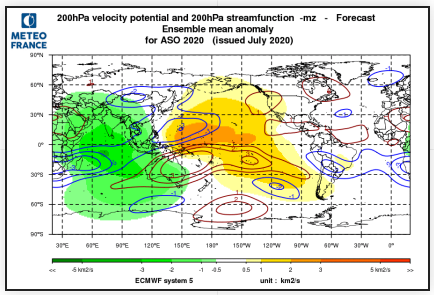
Atmospheric circulation : Global teleconnection

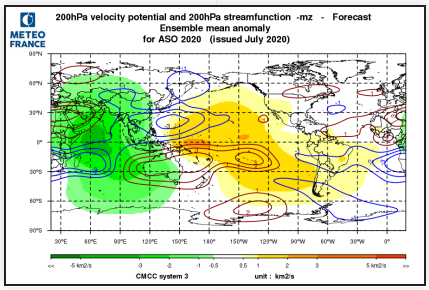
VP : The models predicted a very active dipole around the Maritime Continent (see the DMI index). In connection with the colder than expected SST anomalies over the eastern and southern Pacific, the area of strong subsidence anomaly has developed over the southeast of the basin. Poor forecast over the Atlantic.

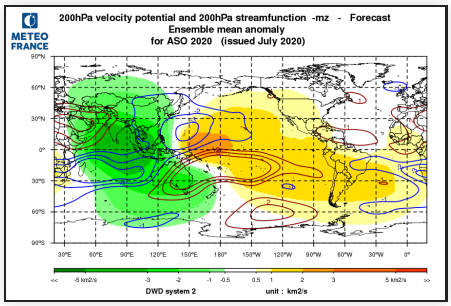
SF : Similarly, the reaction observed around the Maritime Continent was much weaker than expected. A beautiful PNA- teleconnection structure has formed in North America, in connection with La Nina more intense than expected.

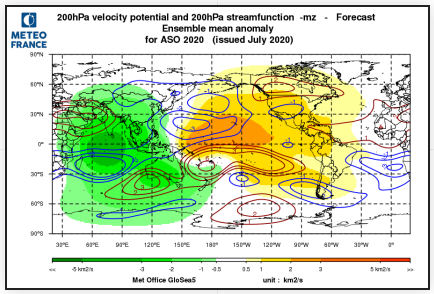










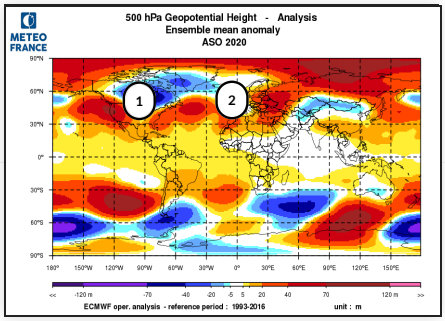


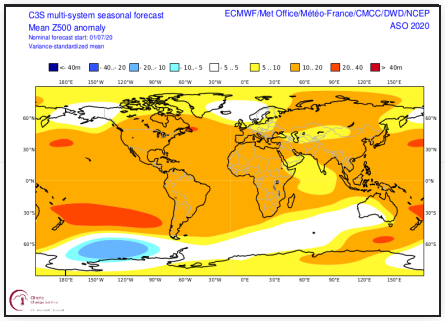
ECMWF analysis, MF-S7, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

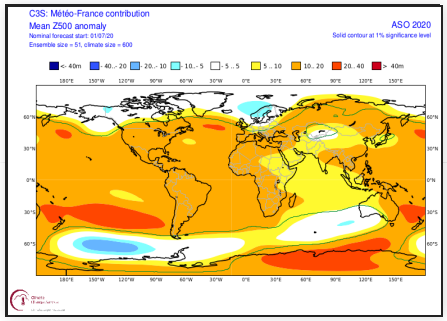
1 - active downward motion anomaly linked with cold SST
2 - PNA- teleconnection
3 - VP: the dipole was not as active as expected
4 - poor forecast over the Atlantic

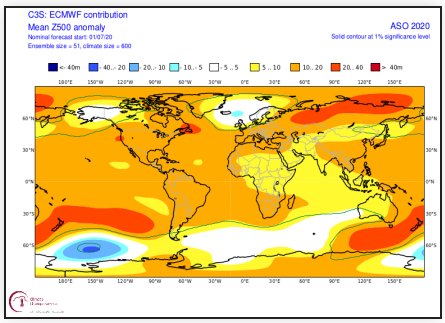
Atmospheric circulation : 500hPa Geopotential height

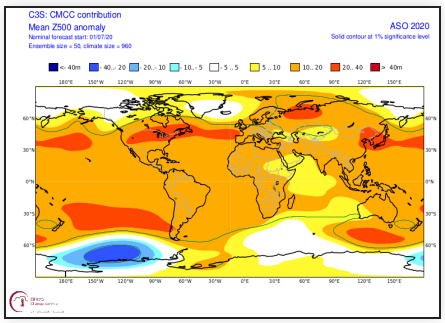
The PNA- structure, with a slight shift to the east, is very marked over North America. On Eurasia, the large-scale structure of the field predicted by the models is correct. The anomaly in Western Europe (mainly due to October situation) seems too small to have been anticipated at seasonal forecast scale.

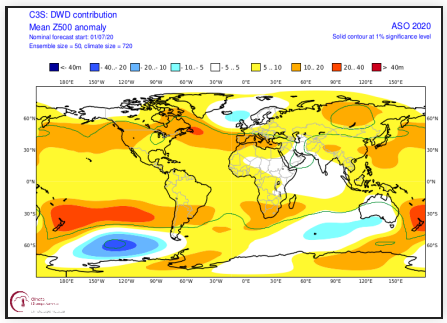










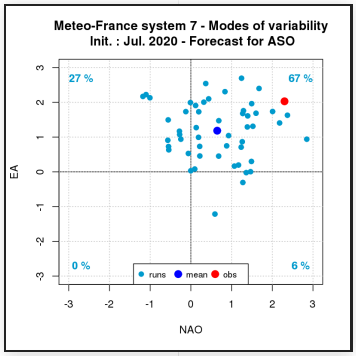


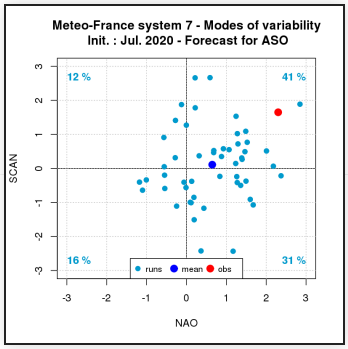
ECMWF analysis, C3S multi-system, MF-S7, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

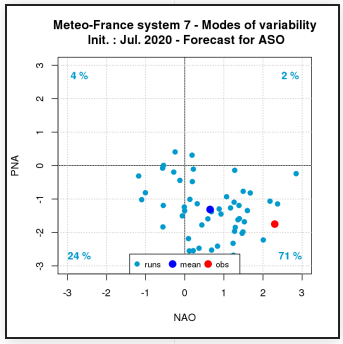
1 - Strong PNA- (schifted to the east)
2 - localised low values not forecasted by the models

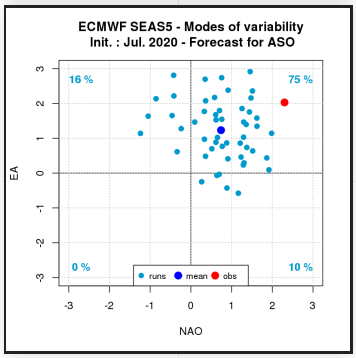
Atmospheric circulation : Modes of variability

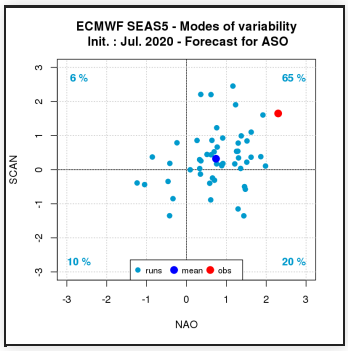
PNA- and EA+ were planned with a fairly strong intensity, which was however underestimated. The intensity of NAO+ was greatly underestimated. The SCAN, planned around neutrality, was in fact strongly positive.

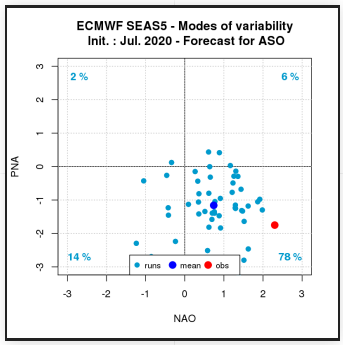






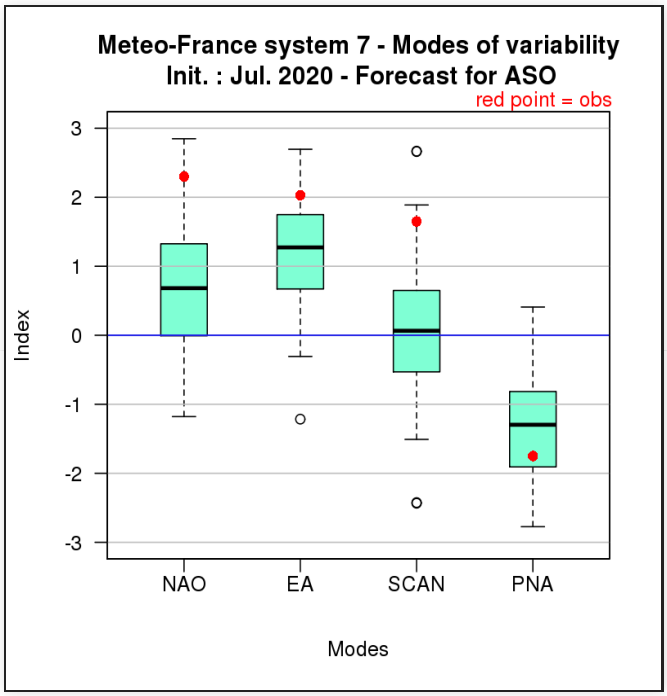


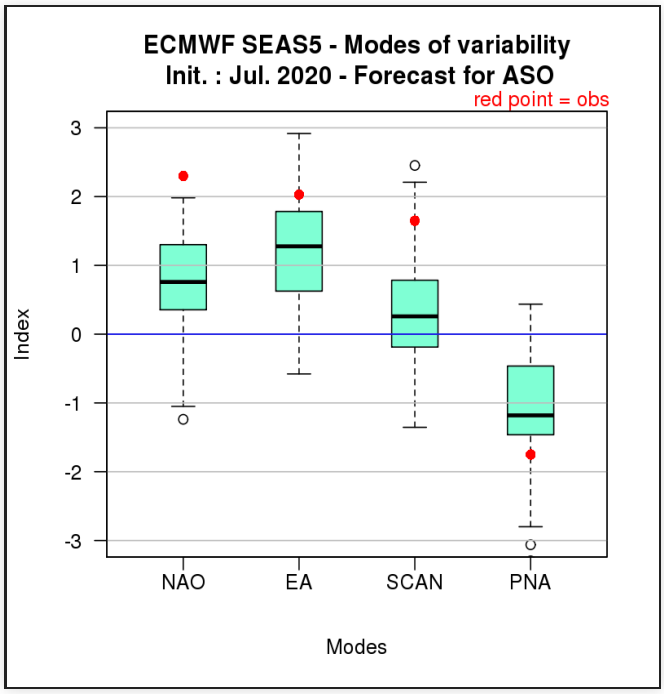




Atmospheric circulation : Modes verification

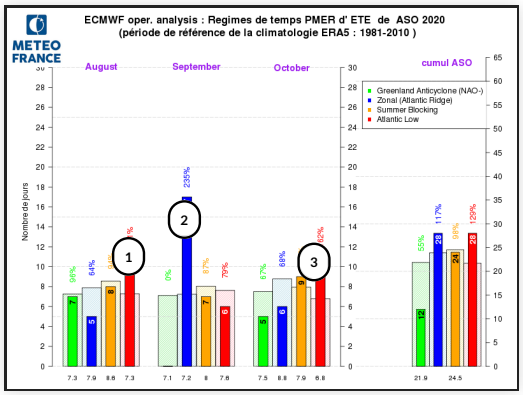
Same observation as for the previous slide

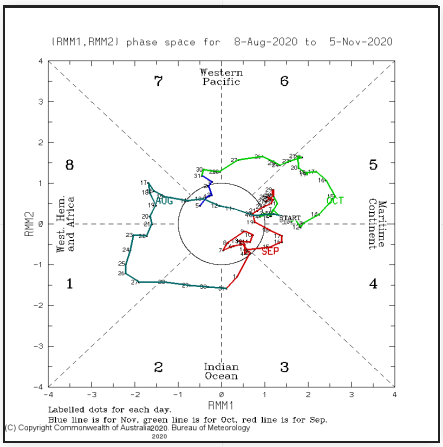


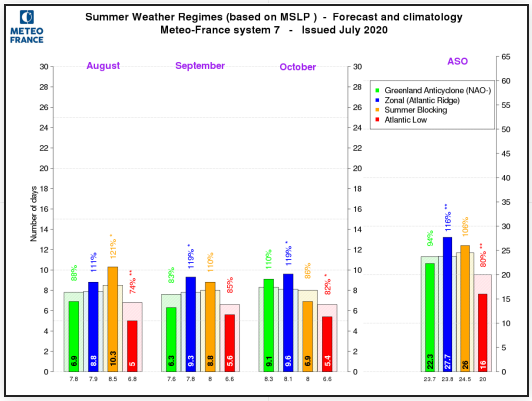


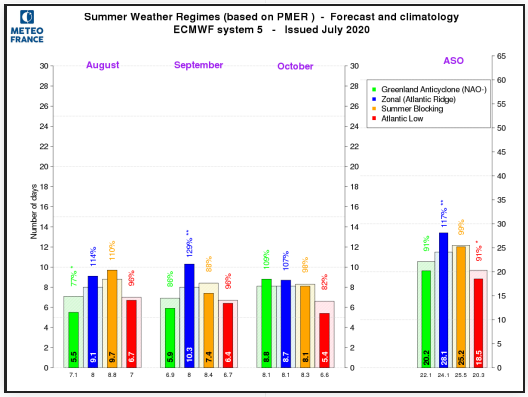
Atmospheric circulation : Summer SLP weather regimes

The fairly homogeneous forecasts, favoring the Zonal regime to the detriment of the Atlantic Low, could not take into account the monthly variability. In the quarterly analysis, Zonal and Atlantic Low were also favored and the Greenland Anticyclone is in deficit.









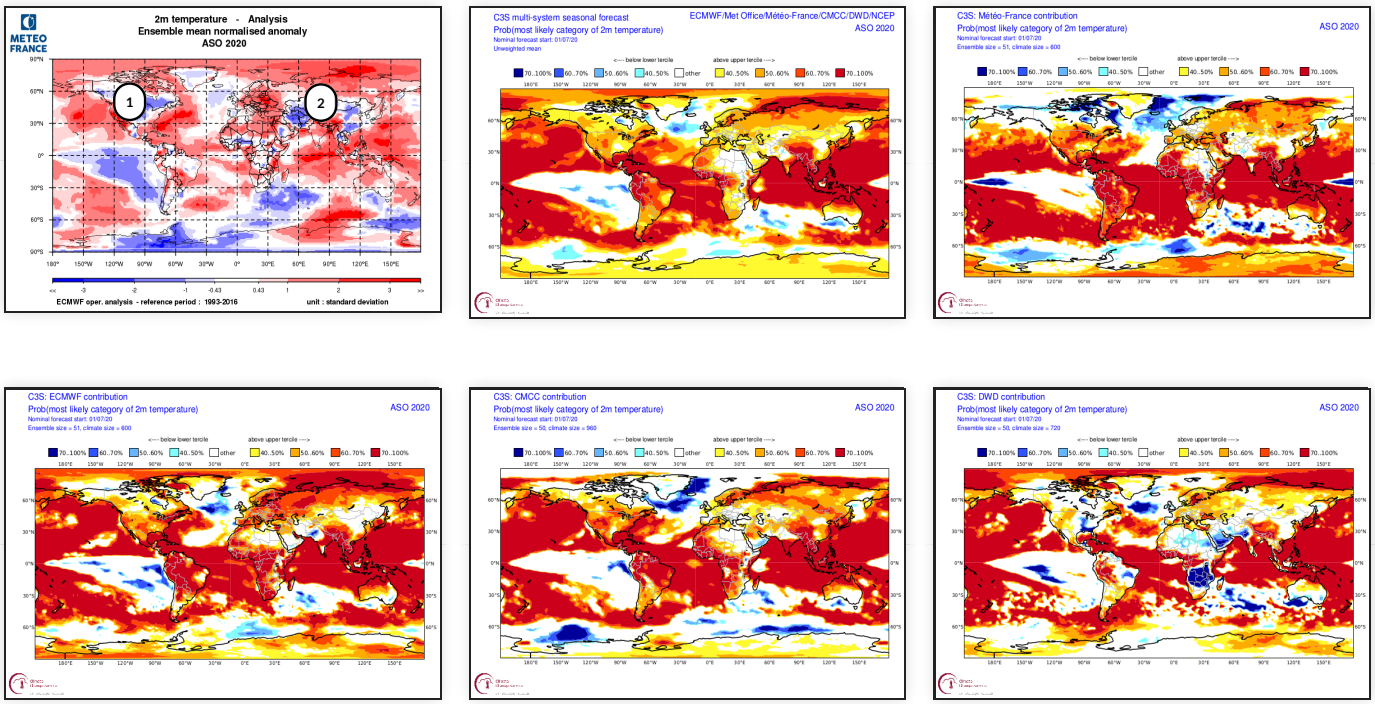
weather regime : ECMWF analysis top left, MF7 and ECMWF forecasts at the bottom. MJO phase top right

1 - predominance of the Atlantic Low weather regime
2 - very strong predominance of the zonal regime in September
3 - predominance of the Atlantic Low weather regime

Climatic parameters : temperature on the globe

The strong anomalies in North America, linked to the PNA- teleconnection, were not foreseen by the models.

The cold anomalies over Central Asia have been largely underestimated.

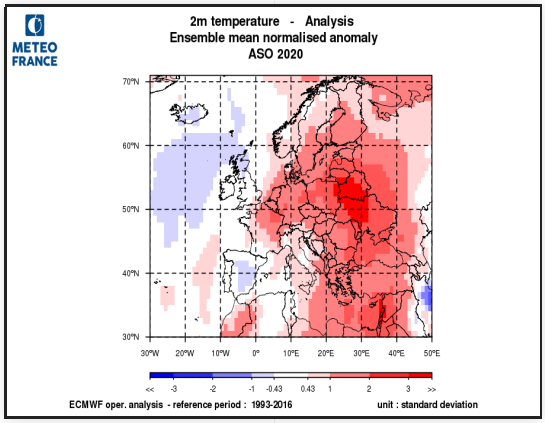


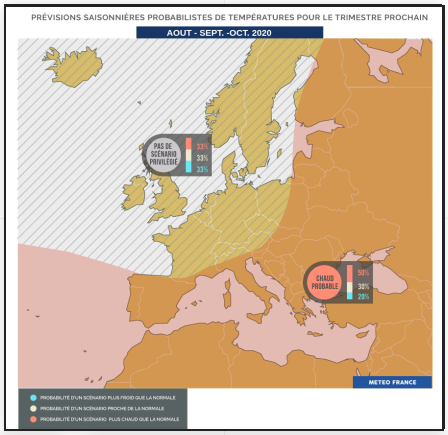
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S7 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

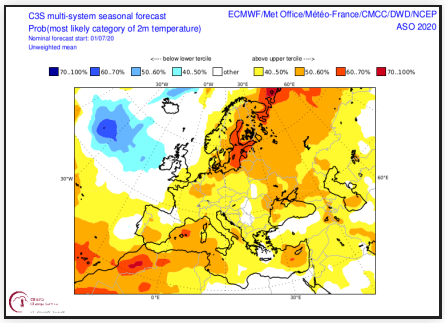
1 - none of the models predicted these anomalies.
2 - underestimated cold anomalies

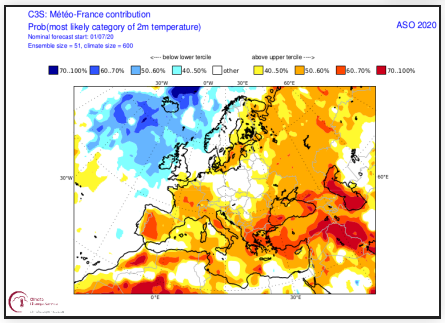
Climatic parameters : temperature over Europe

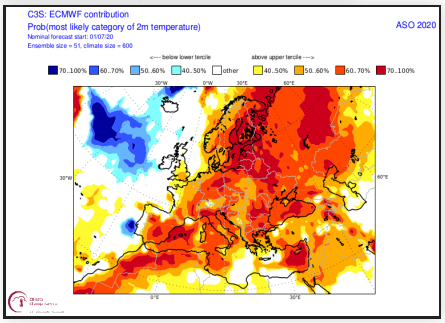
The thalweg located on the Atlantic coast (Atlantic Low regime) during October, produced cold anomalies which contrast with the strong anomalies generated over Eastern Europe. This relatively small-scale configuration was not anticipated by the models, resulting in a smoother synthesis map than what happened.







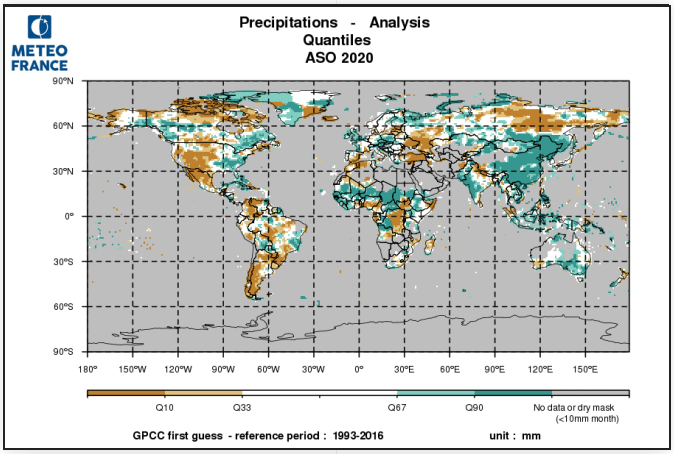


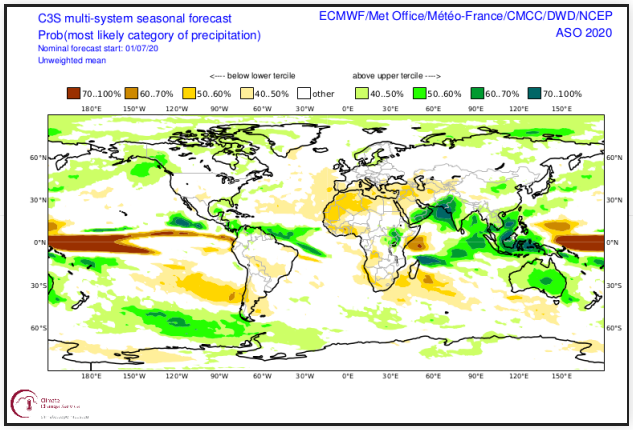


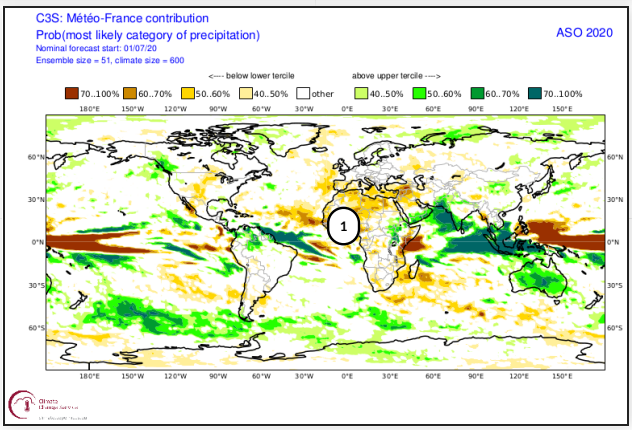
ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S7 and SEAS5 on the bottom line.

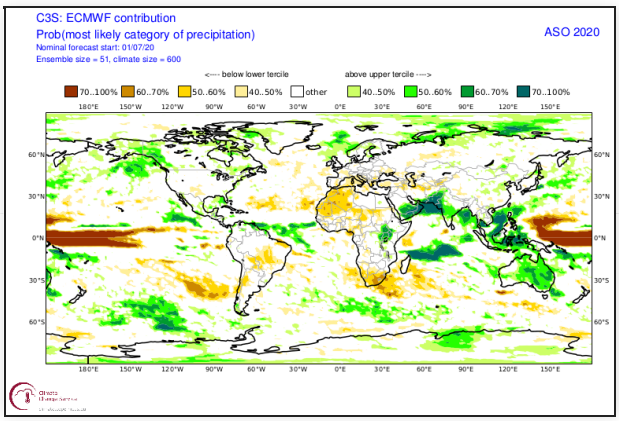
Climatic parameters : Precipitations over the globe

The excess precipitation over India, the Maritime Continent and Australia was well anticipated. The forecast trends for America and China were fairly consistent with the analysis, although largely understated. On the other hand, the excess monsoon over Africa were not predicted.







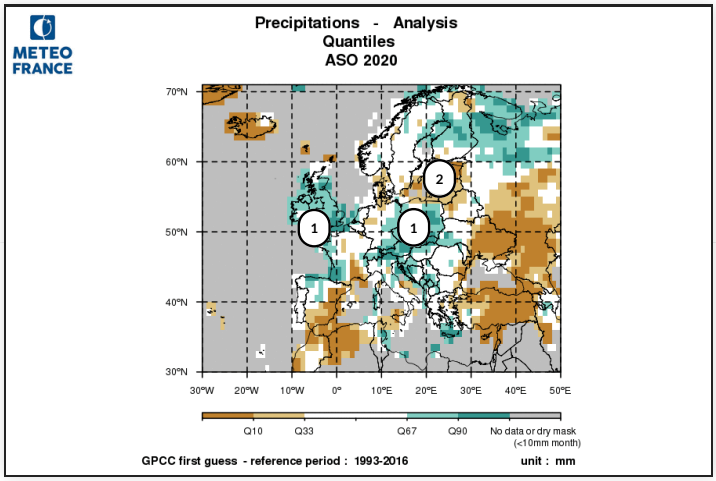


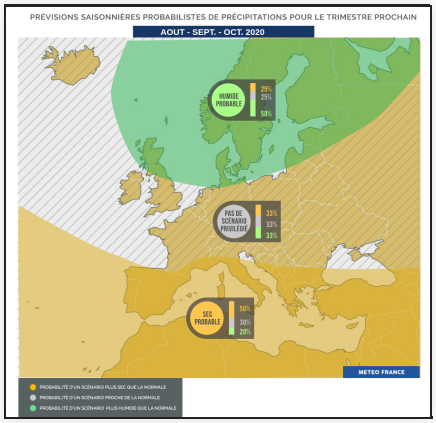
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S7 and SEAS5 on the bottom line.

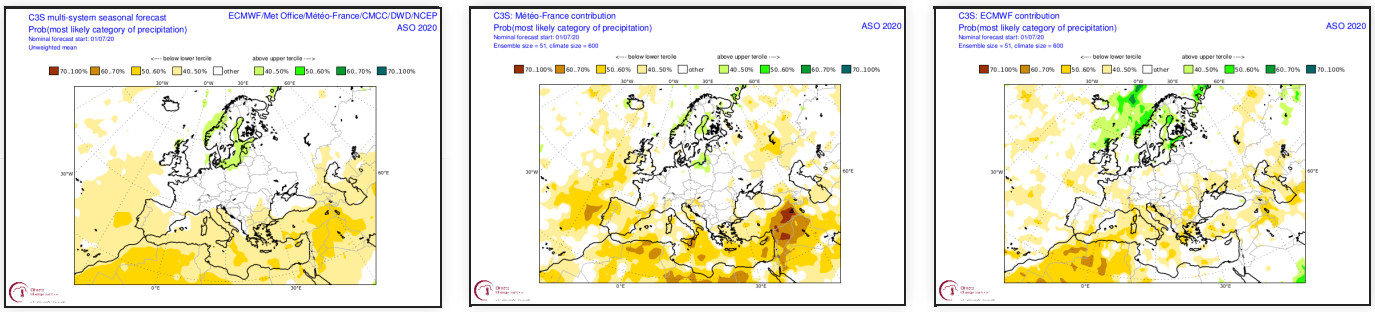
1 - too dry forecast

Climatic parameters : Precipitations over Europe

As for temperatures, the thalweg of relatively small scale over Western Europe in October, generated precipitation on the Atlantic coast, the Alps and Poland which were not predicted by the models. The synthesis map is also very smooth compared to what happened.







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 produce by the thalweg in October
1 - Excess precipitation produce by the thalweg in October
2 - Unexpected dry anomaly (small scale)

General summary : for the period JAS 2020

1) **Oceans :**

In the Arctic area, the hot anomalies were underestimated in particular by MF-S7, which did not take into account the exceptional melting of the sea ice this summer.

The rapid intensification of the La Nina phenomenon in the Pacific was not correctly predicted by the models. The resulting atmospheric coupling was logically not anticipated either.

2) **Large scale atmospheric circulation :**

VP and FC at 200hPa : The dipole over the Maritime Continent has been overestimated. With the La Nina phenomenon more intense than expected, the activity was localized more to the east and central Pacific. The resulting PNA- teleconnection was not anticipated by the models.

Z500 : The PNA- type structure was not anticipated by the models. The relatively small scale thalweg that affected Western Europe in october could not be detected at the seasonal forecast scale.

3) **Climatic parameters over Europe :**

The thalweg which affected Western Europe in October, has greatly impacted the balance sheet for the quarter, both for temperatures and for precipitation. The forecasts on a seasonal scale could not anticipate this period and are therefore too smooth.