VERIFICATION BULLETIN

OCTOBER - NOVEMBER - DECEMBER 2021

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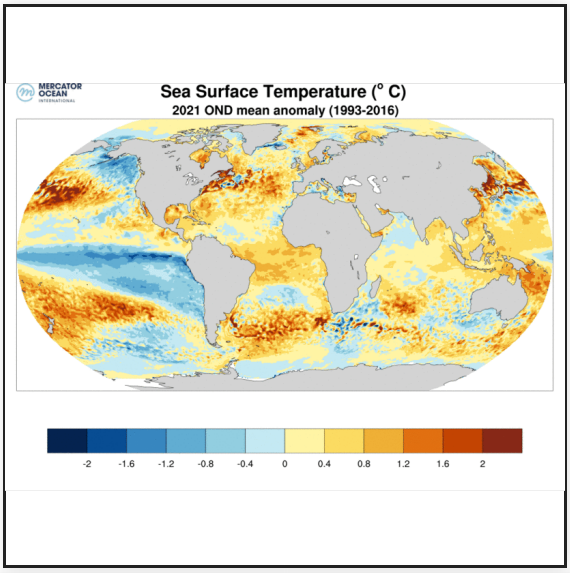
Introduction : Objective

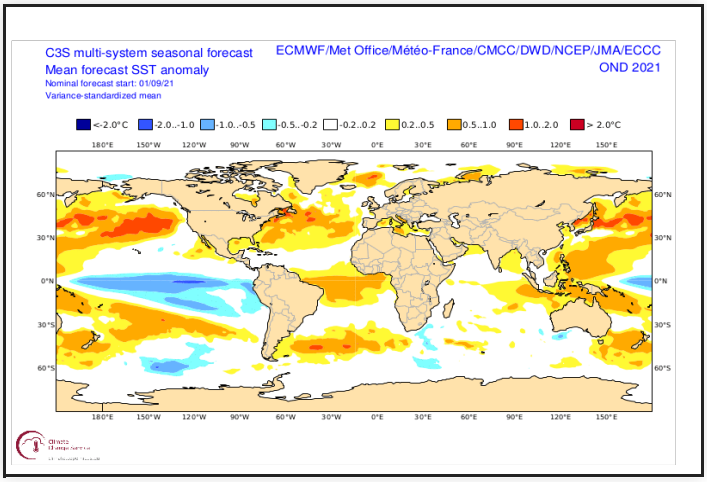
- **The objective of the Seasonal Verification Bulletin is to present an evaluation of the main elements highlighted in the Seasonal Forecast Bulletin : oceanic forcings, large scale circulation patterns, and a focus on temperature and precipitation forecast over Northern Atlantic, Europe and the Mediterranean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

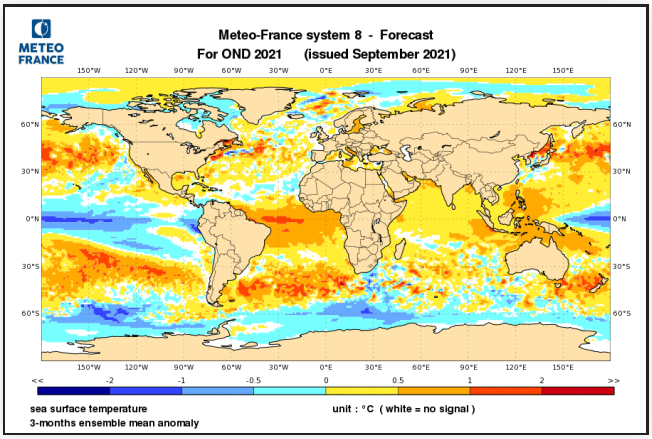
Oceans : surface temperature anomalies

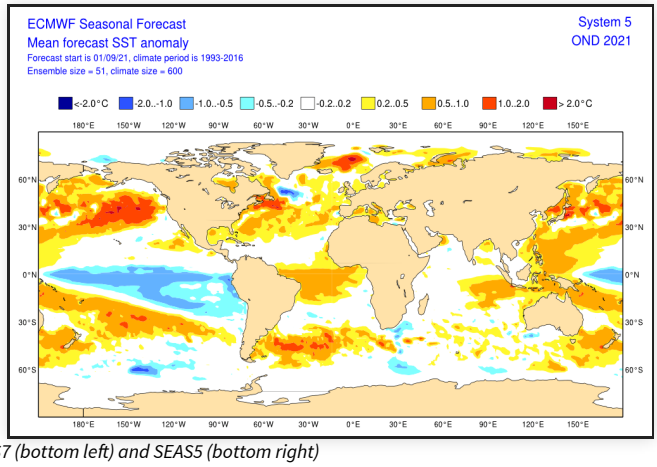
In the tropics, the main anomalies are well forecasted. However, the SST is not cold enough along the South American coasts and MF-S8 is too hot in Equatorial Atlantic.

At mid-latitudes, the main patterns are well forecasted, with the exception of the Gulf of Alaska, much colder on the analysis.







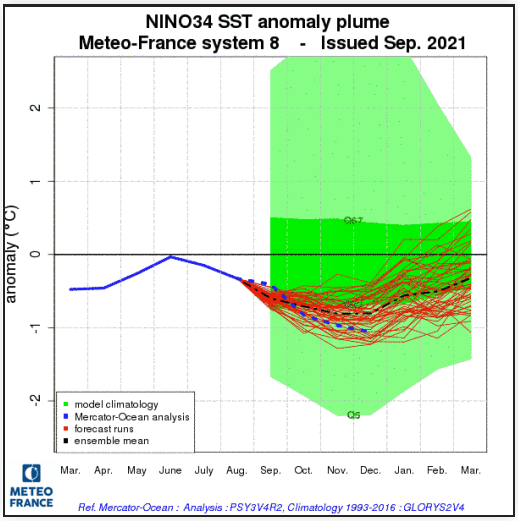


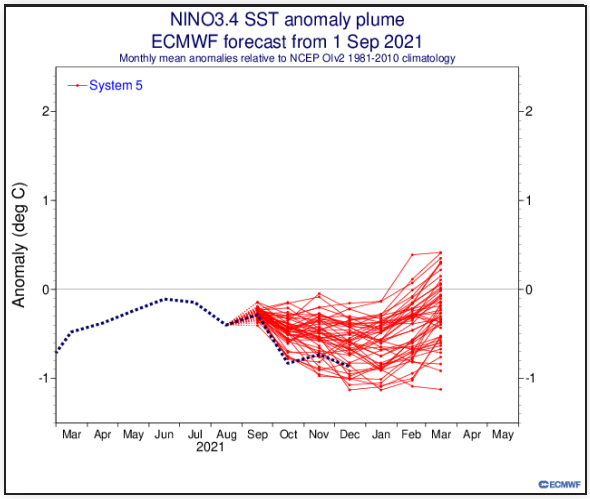
SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S7 (bottom left) and SEAS5 (bottom right)

Oceans : ENSO

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

MF-S8 is slightly warmer than analysis. For the ECMWF-SAE5 model, the difference is greater.

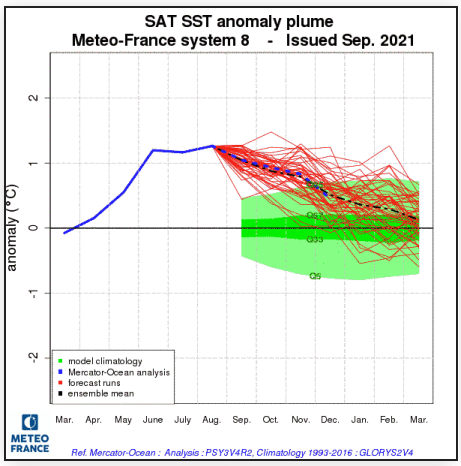


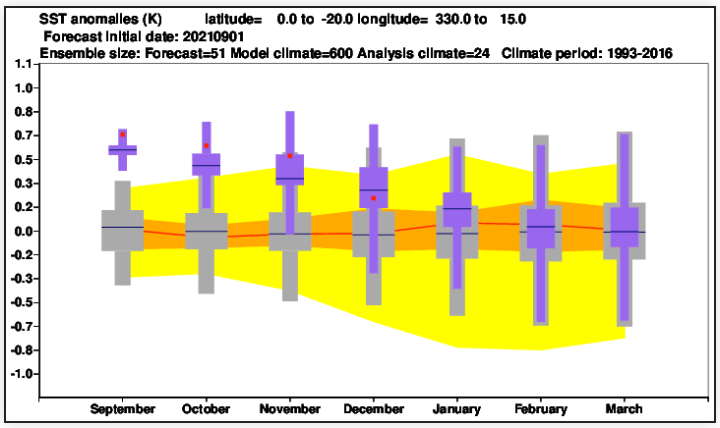


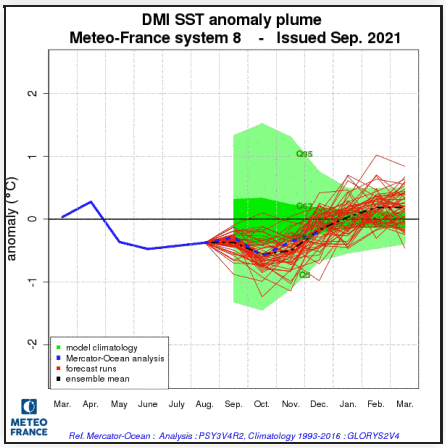
Oceans : tropical Atlantic and Indian Ocean index

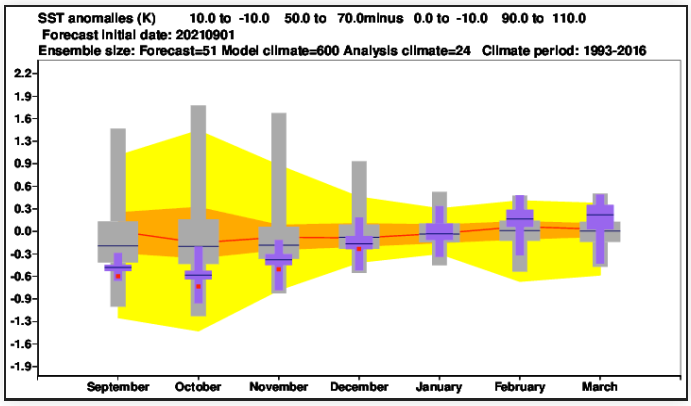
SAT : The negative trend was well anticipated.

DMI : The forecast of this index in the lower tercile of climatology was well predicted.



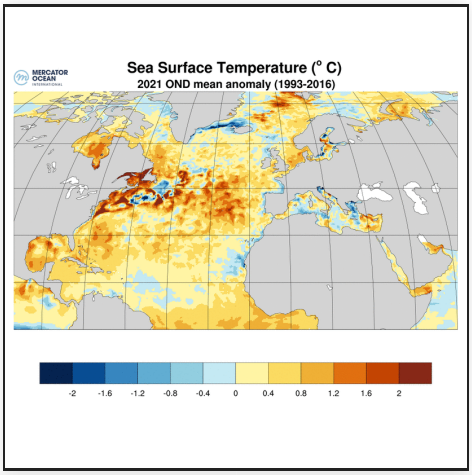


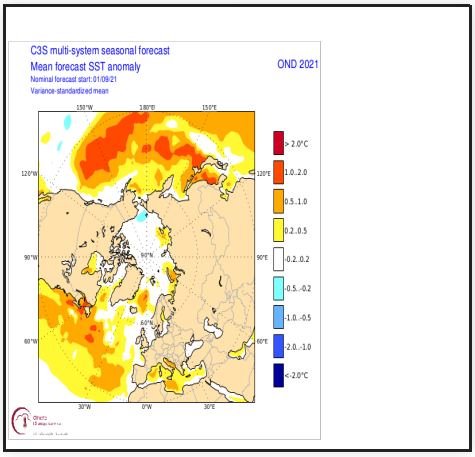


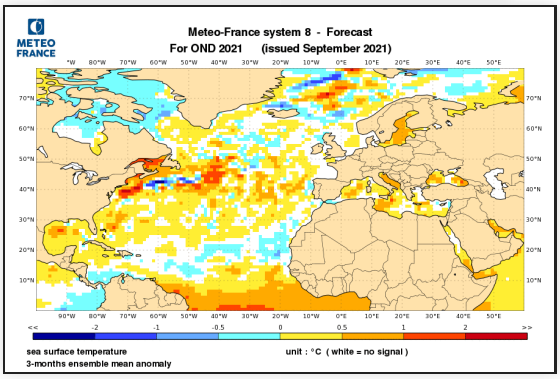


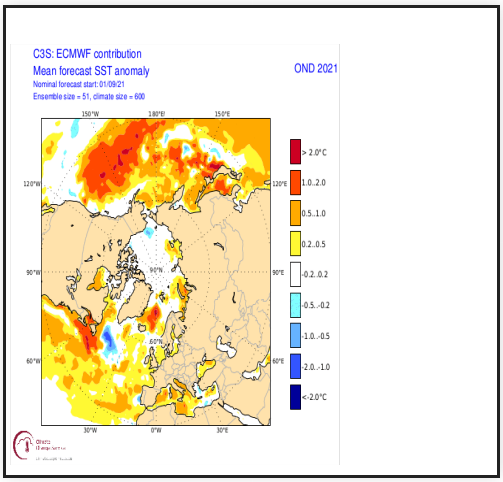
Oceans : North Atlantic SST

The strong positive anomaly in the western part of the Ocean (close to North America) is correct, as well as the warm anomaly extending from Florida to Spain.









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 : Good forecast for most models :

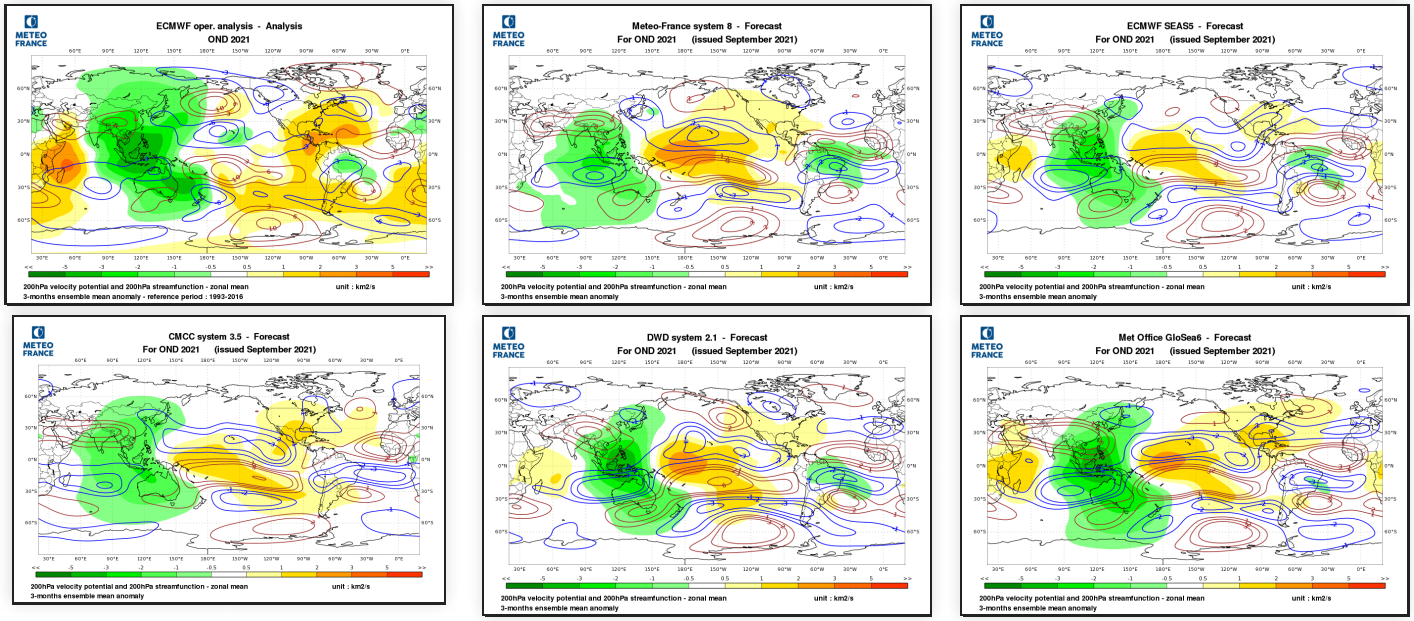
The upward anomaly from the Maritime Continent to East Asia and the downward anomaly over Pacific Ocean extended to Southern America and the Gulf of Mexico, associated to La Niña.

The upward anomaly over Amazonia, associated with the El Nino Atlantic.

MF-S8 is overall a bit worse.

The dowmload anomaly over East Africa.

SF : The three dipoles around the equator on the main oceans were well forecasted as well as the teleconnections to southern Pacific and the Alantic. In the North Pacific, teleconnections to North America are not well seen, in connection with the colder than expected Gulf of Alaska.

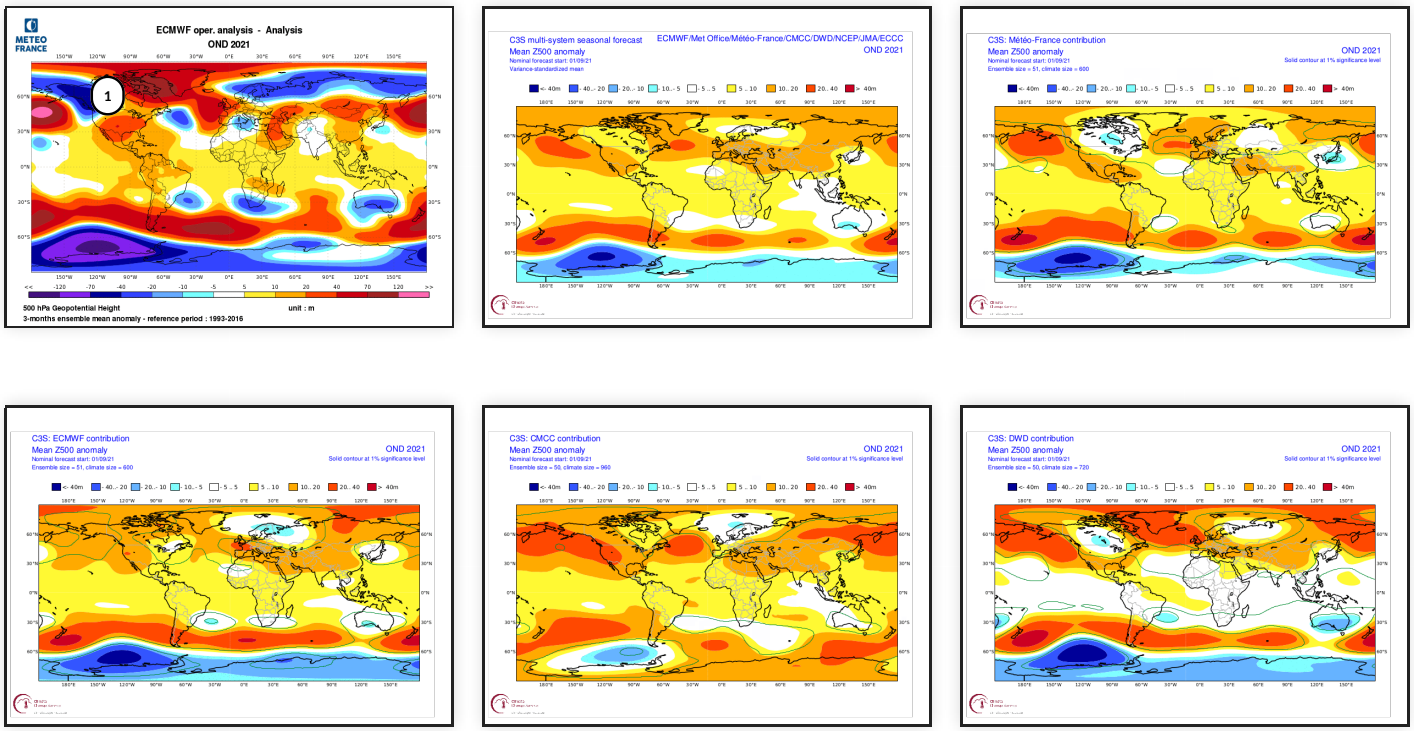


ECMWF analysis, MF-S7, ECMWF-SEAS5, CMCC, DWD and JMA 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation : 500hPa Geopotential height

On analysis, the PNA- pattern linked to La Nina is already clearly visible. It is only suggested by the multi-models.

Over Europe, the dipole positive anomaly between Greenland and Europe / negative anomaly over Scandinavia is globally predicted by the models. Note a small negative anomaly in the Mediterranean on analysis, not seen by the models.

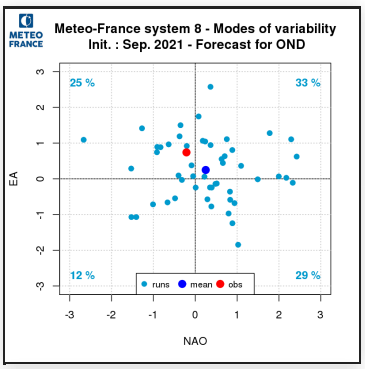


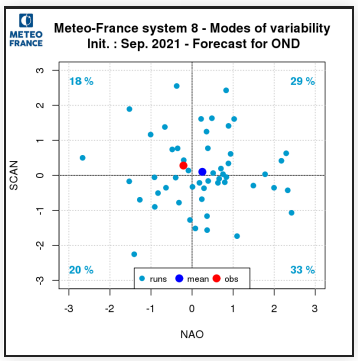
ECMWF analysis, C3S multi-system, MF-S7, ECMWF-SEAS5, CMCC and DWD 500hPa geopotential height anomalies.

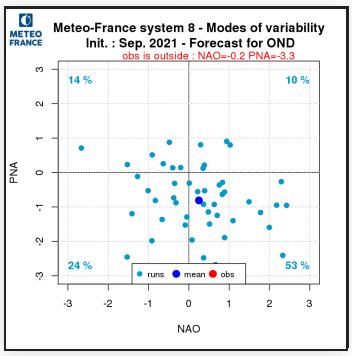
1 - Look like PNA -

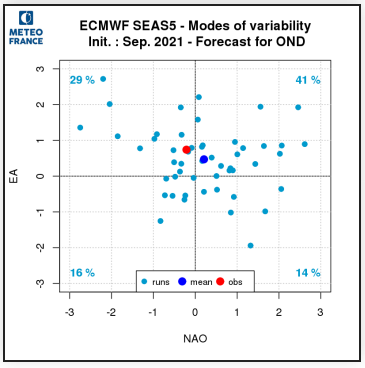
Atmospheric circulation : Modes of variability

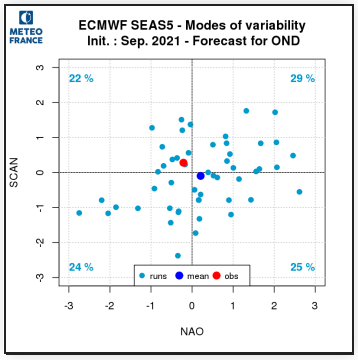
Both models predicted a PNA- but far from the observed value. The AE mode sign is correct. For the rest, the values are close to 0.

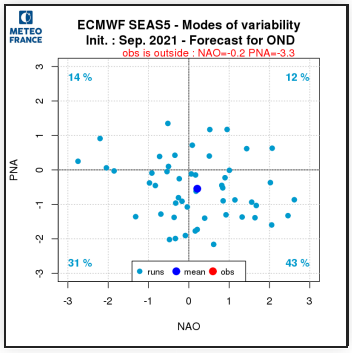






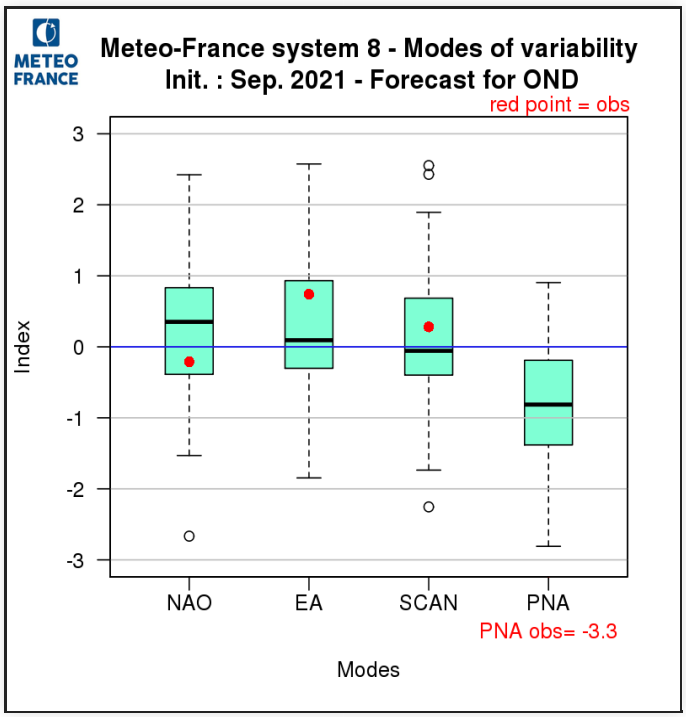


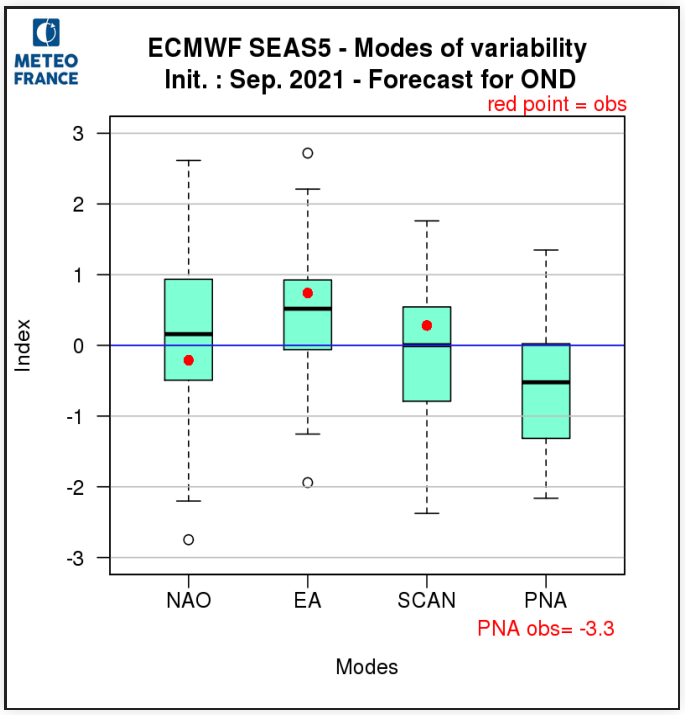




Atmospheric circulation : Modes verification

Same observation as for the previous slide

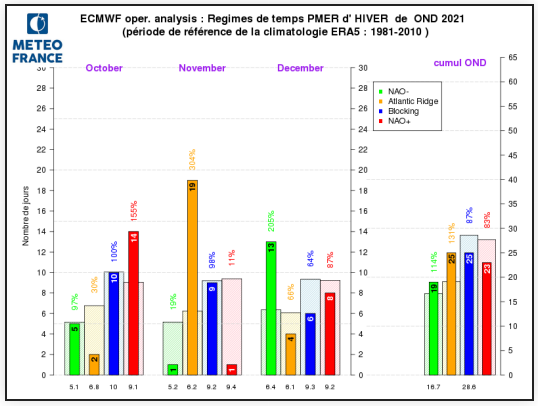


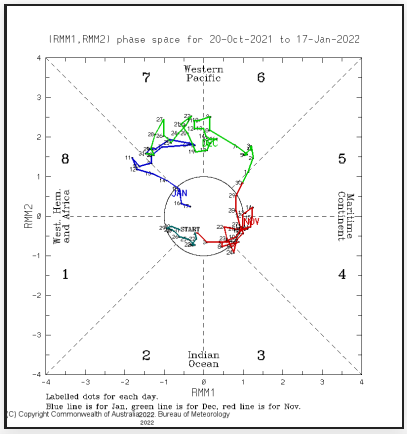


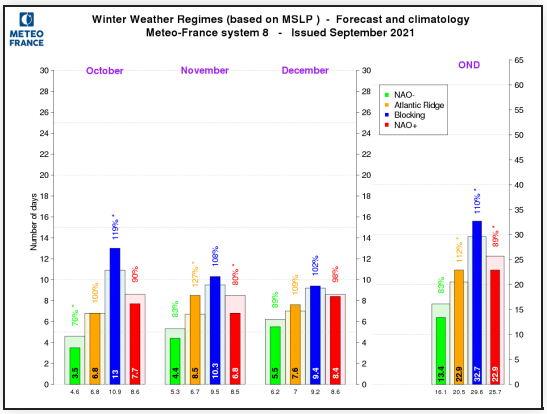
Atmospheric circulation : Winter SLP weather regimes

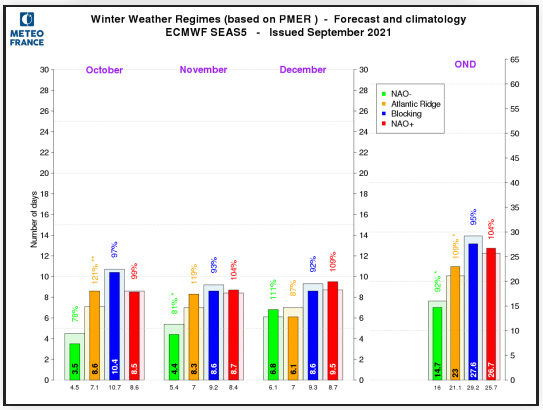
Over the quarter, the AR regime was dominant to the detriment of the Blocking and NAO+ regimes. Both models also slightly emphasize the AR regime.

It can be noted that, in november, the MJO was in phase 4. This may have favoured the Atlantic-Ridge regime during this month.
https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019GL084683







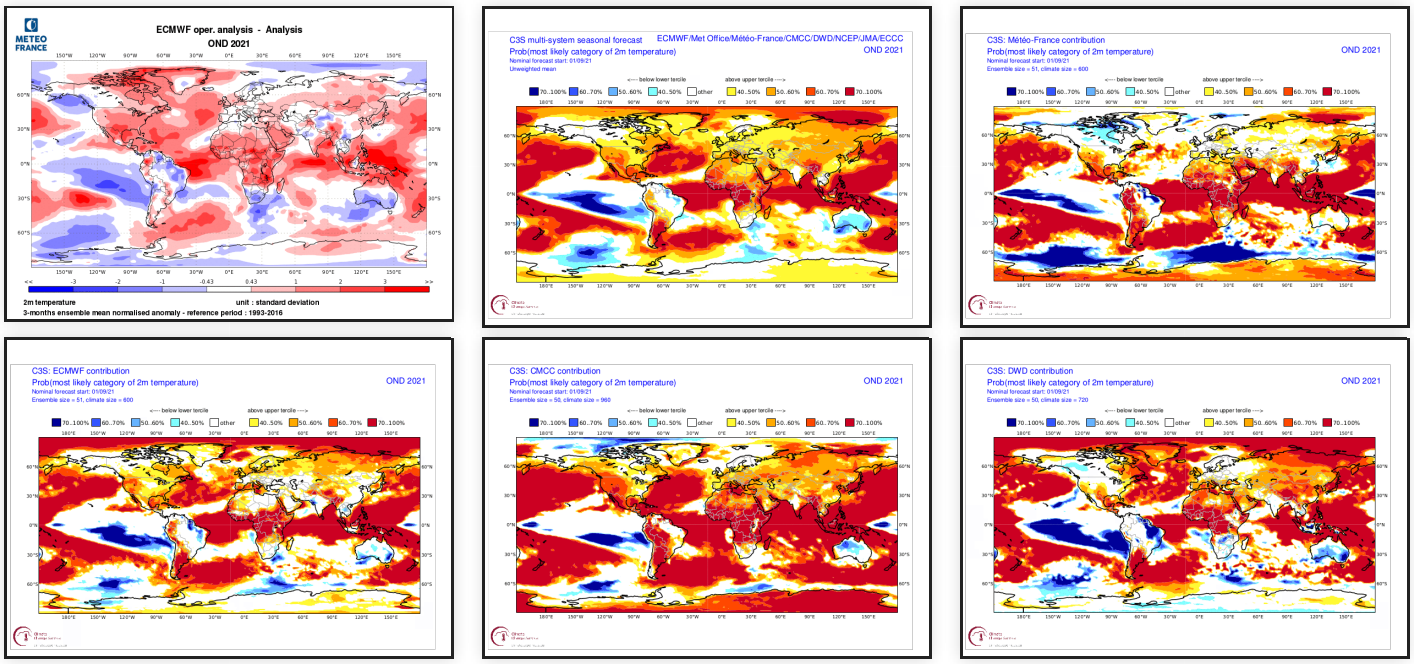


weather regime : ECMWF analysis top left, MF7 and ECMWF forecasts at the bottom. MJO phase top right

Climatic parameters : temperature on the globe

The main anomalies in the tropics tropics were well forecasted.

In connection with the divergences observed over the Gulf of Alaska, the cold/warm dipole over northern North America is not seen correctly by the models (except the DWD).

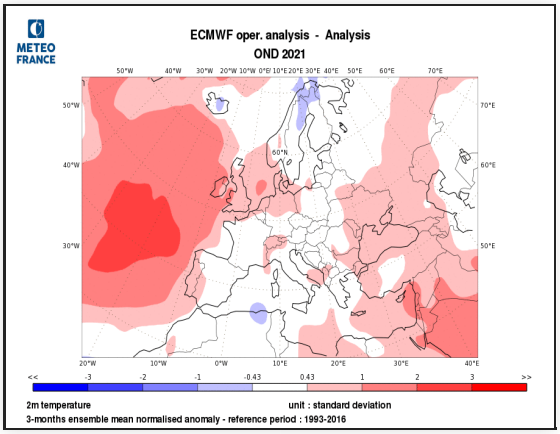


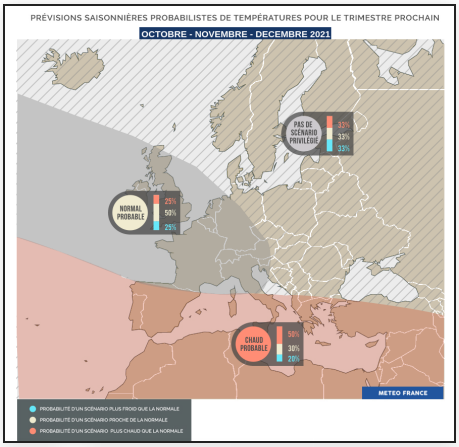
ECMWF analysis top left, forecast for multi-model top center and forecast for MF-S7 top right, ECMWF-SEAS5, CMCC, DWD on the bottom line.

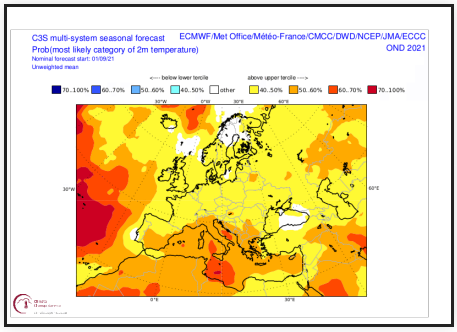
Climatic parameters : temperature over Europe

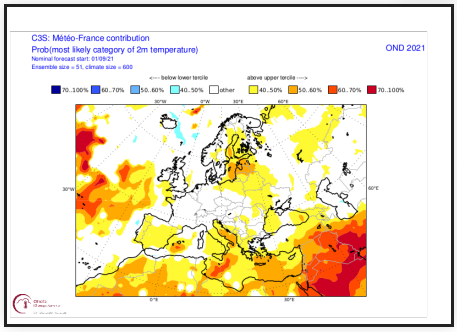
In Continental Europe, the anomalies observed are close to normal. There are hot anomalies over the near Atlantic and the British Isles on the one hand and over the Middle East on the other.

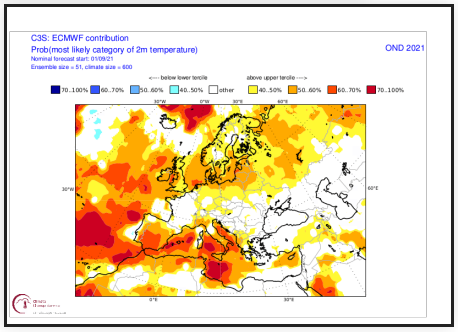
On the summary map, the normal signal over France and hot over the Middle East is correct.









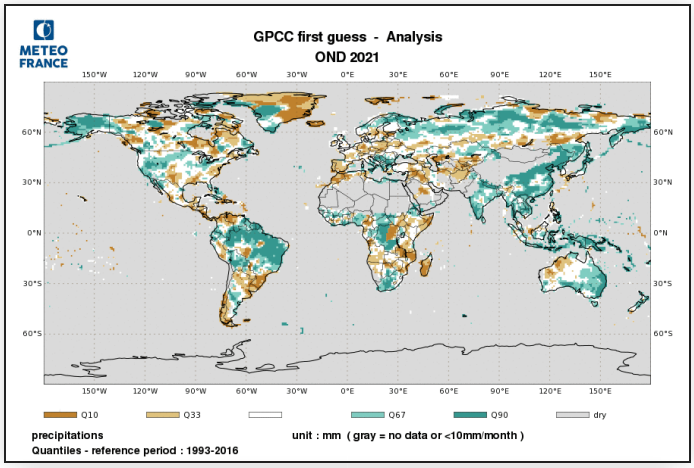


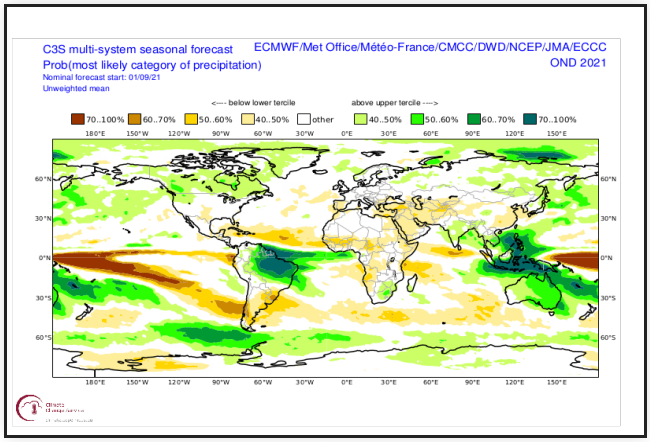
ECMWF analysis top left, synthetic forecast map top right. Forecast for multi-system , MF-S7 and SEAS5 on the bottom line.

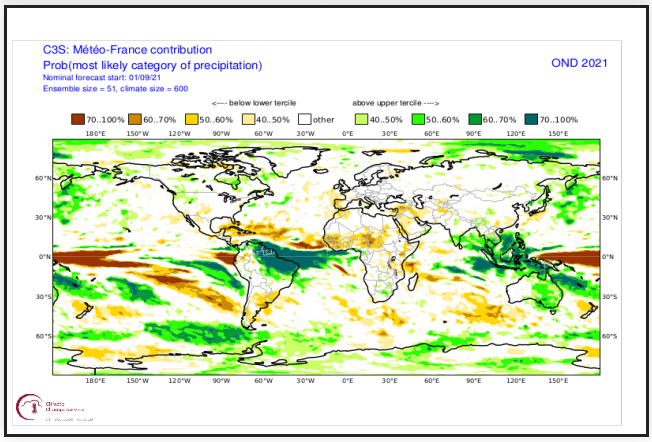
Climatic parameters : Precipitations over the globe

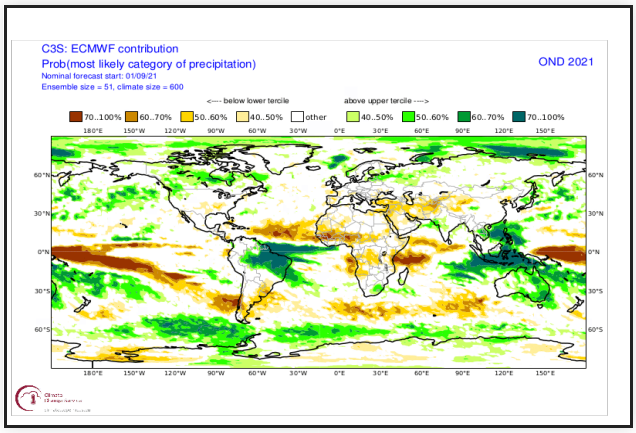
On the tropics, good forecast around Amazonia, Australia and the Maritime Continent. The wet signal aover South East Asia is not well seen by models.

At mid-latitudes, the wet signal over Alaska and Russia were too weak in the forecasts.







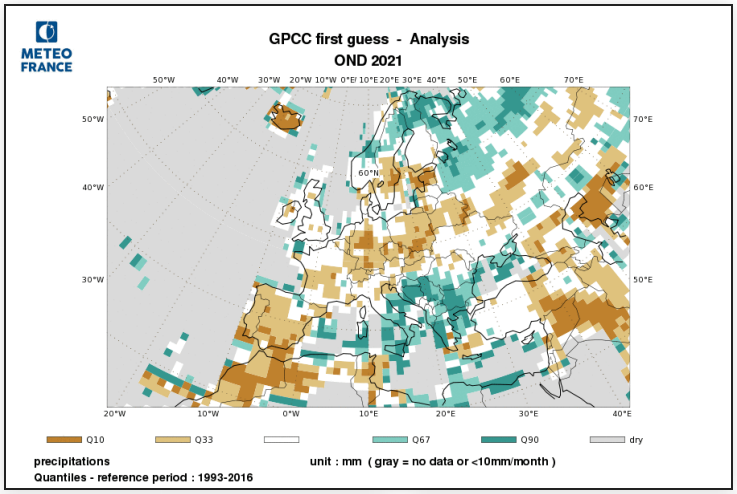


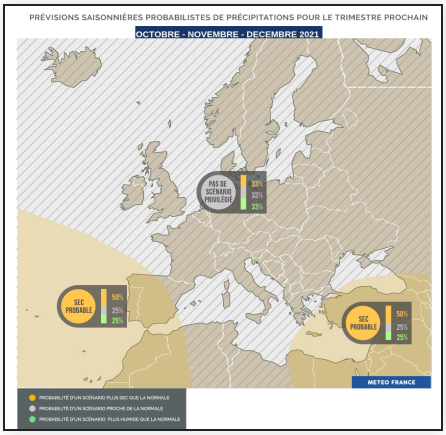
Standardized Precipitation Index analysed by IRI top left, forecast for multi-model top right and MF-S7 and SEAS5 on the bottom line.

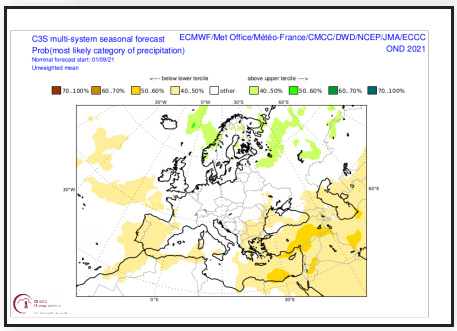
Climatic parameters : Precipitations over Europe

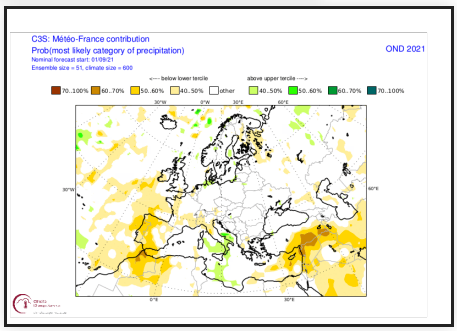
Dry conditions are observed in Europe, from Spain to the Baltic States, including France. On both sides, the signal is wet in Scandinavia and from the Balkans to Italy. The Middle East is drier than normal.

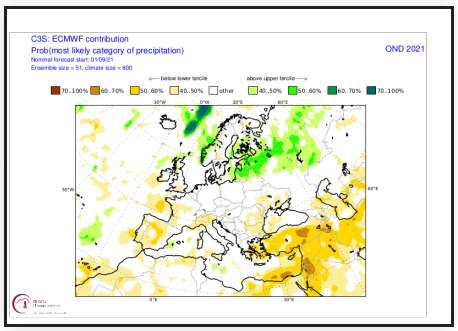
The summary map clearly identified the two drier than normal zones (south-west and south-east of the domain).











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).