

Météo-France Seasonal Forecast Bulletin

NOVEMBER - DECEMBRE - JANUARY 2020/2021

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General synthesis : NDJ 2020/2021

A) Oceanic forecast :

- **ENSO : A La Niña is underway** with both oceanic and atmospheric signature . Most models suggest the La Niña will strengthen, peaking in December.
- **IOD** : negative situation becoming neutral during next quarter.

B) Drivers:

- The central Pacific La Nina conditions associated with negative PDO promotes the Atlantic Ridge regime and the positive phase of the NAO.

C) Atmospheric circulation:

- classical response to "La Niña" in the tropics (upward motion anomaly over the Eastern Indian Ocean and Maritime Continent, downward motion anomaly over Central Pacific).
- over the North Atlantic and Europe : all the models predict high field values over the Atlantic with more or less extension towards Europe. They are less in agreement with the positioning of low relative values further north, generally towards Scandinavia.

D) Most likely conditions :

- Wet conditions from India in Southeast Asia to the Maritime Continent and Australia, as well as over northern South America.
- **over Europe** : weak warm signal on the east. Drier than normal in the southwestern part of Europe. Wet probabilities over Scandinavia

Next bulletin : scheduled on November 20th

Oceanic analysis of September 2020 : SST anomalies

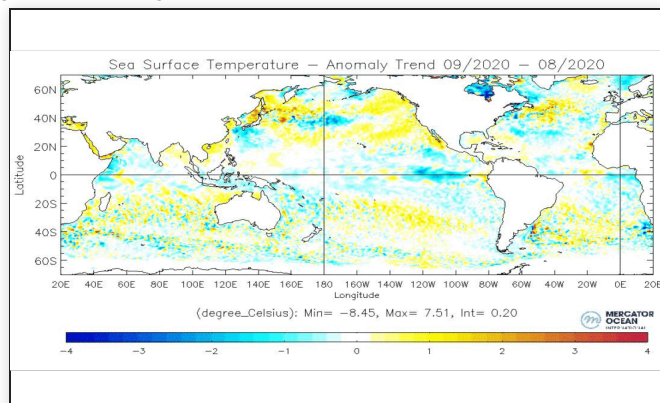
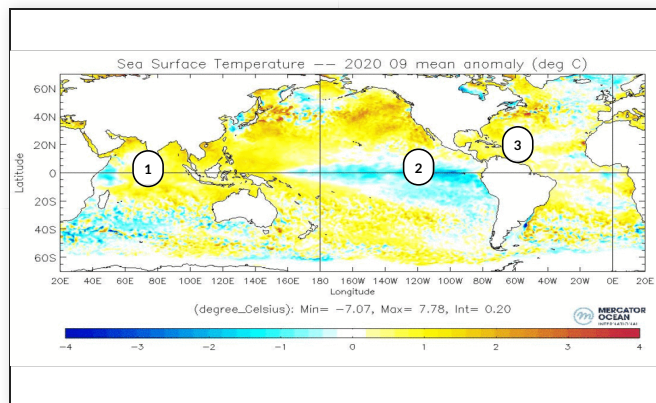
Current ENSO situation : La Nina conditions

In the Pacific : the cooling along the equator in the center of the basin leads to cold conditions below the La Nina threshold in the Nino3.4 box.

Little change in the Southern hemisphere. The northern hemisphere remains warmer than normal.

The Atlantic remains globally warmer than normal in the tropics and up to mid-latitudes despite a lighth cooling.

The Indian Ocean is still warmer than normal north of 20°S. The IOD gradient still negative.

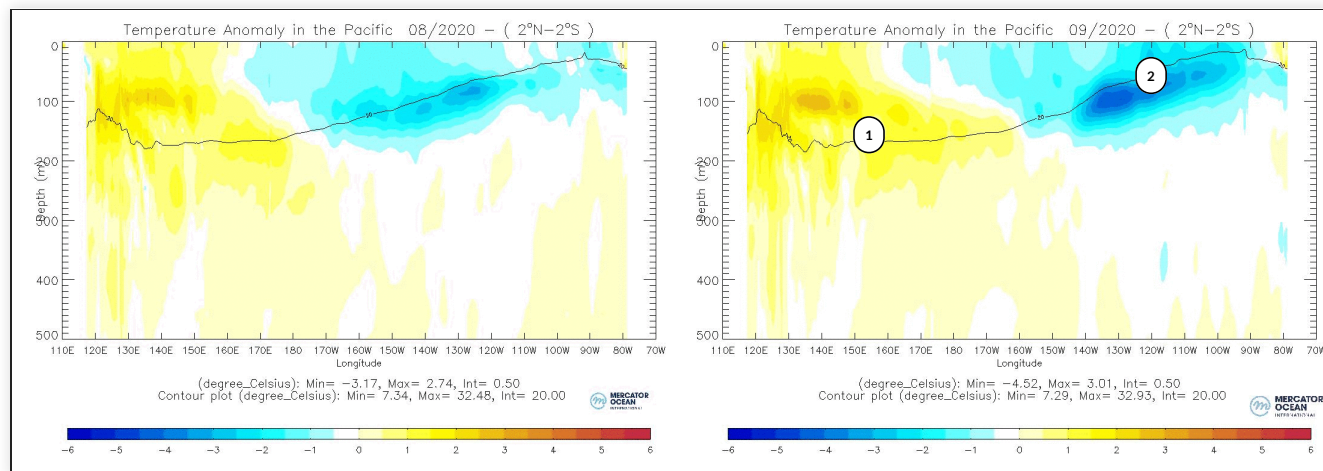


SST Anomalies and trend with the previous month (c) Mercator-Ocean

- 1 - warm Indian Ocean
- 2 - LA Nina cold anomaly
- 3 - warmer than normal

Oceanic analysis of September 2020 : Pacific vertical section

In subsurface, strong cooling in eastern and central part, and significant warming in the western part. The result is a strong east-west contrast.

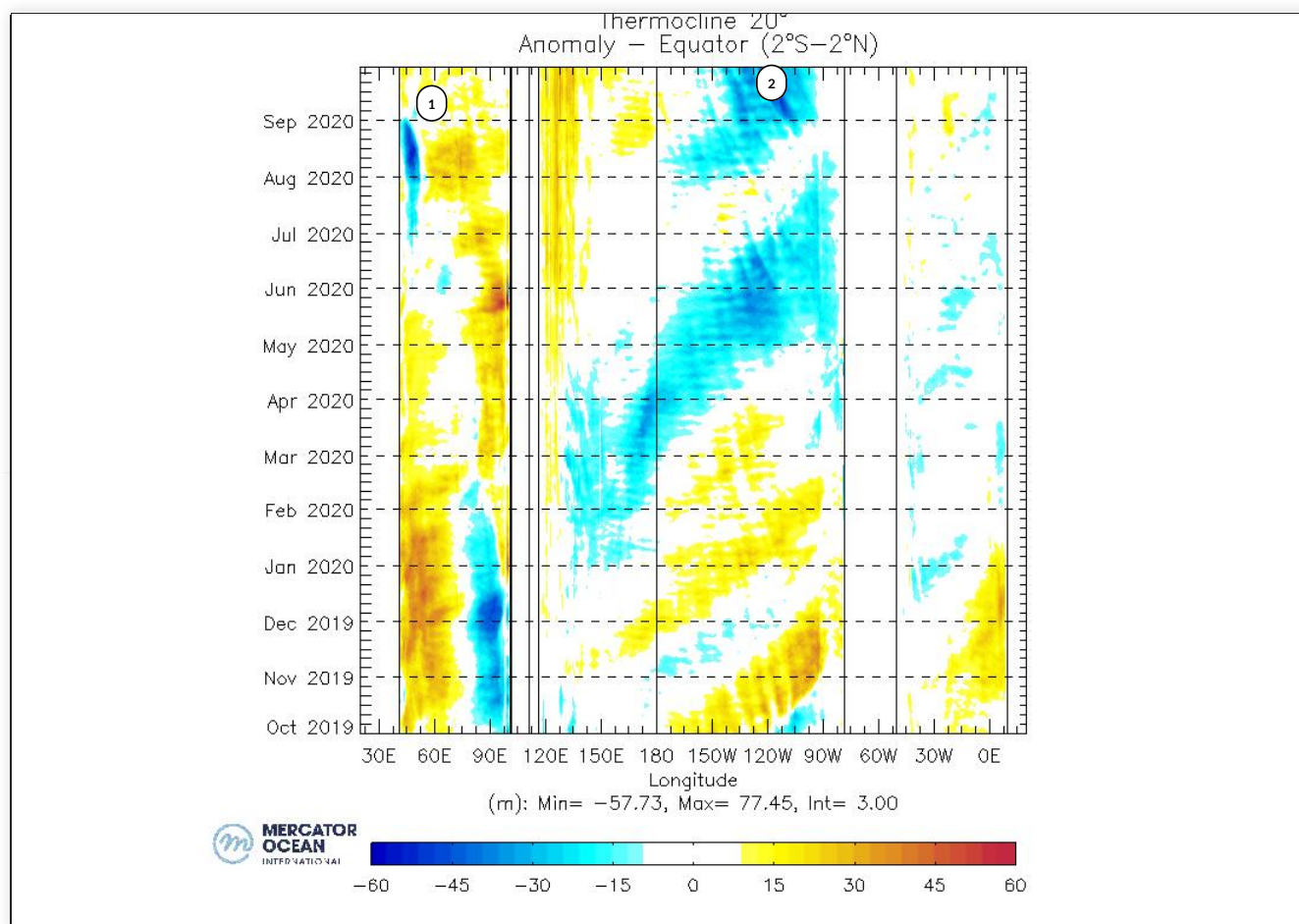


Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

- 1 - warming in the West
- 2 - Cooling in the East

Oceanic analysis of September 2020 : Hovmüller diagram of the 20°C isotherm

In the Pacific, cold subsurface anomaly in the center of the basin during the month of September.



Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 °C isotherm) (c) Mercator-Ocean

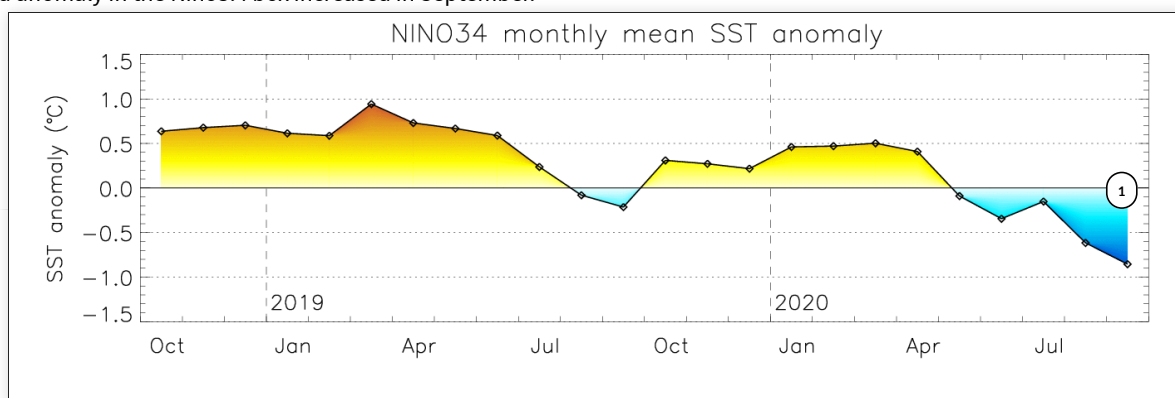
- 1 - the east-west gradient dissipated in september
- 2 - Cold anomalies continued to spread eastward (kelvin wave)

Oceanic analysis of September 2020 : Pacific Ocean - Nino3.4 index history

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -0.8 °C

(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

The cold anomaly in the Nino3.4 box increased in September.



Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

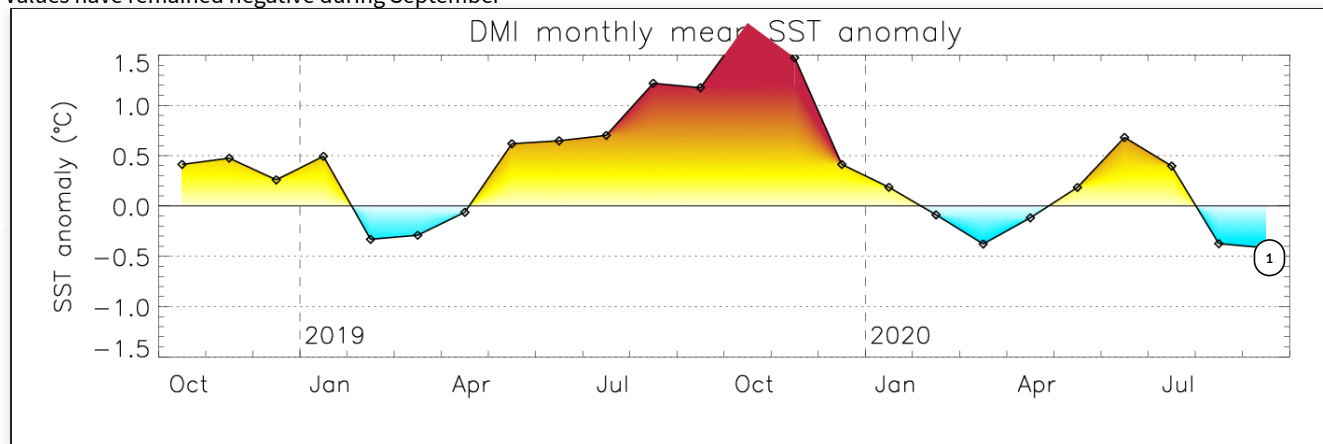
1 - Negative anomaly below the Nina threshold

Oceanic analysis of September 2020 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.4°C

(see BOM site for weekly values : <http://www.bom.gov.au/climate/enso/monitoring/iod1.png>)

Values have remained negative during September



Evolution of SST in the DMI box (c) Mercator-Ocean

1 - Return to negative phase

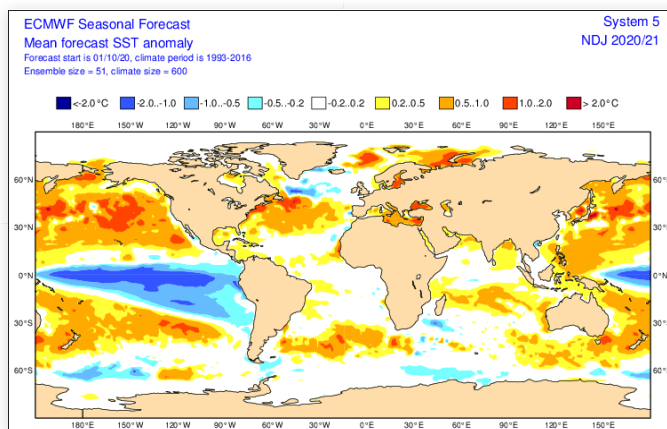
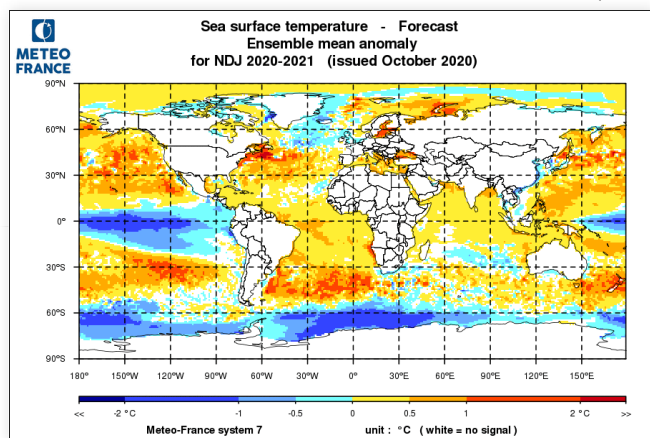
Oceanic forecast : SST anomaly

Good agreement between MF-S7 and ECMWF-SEAS5. Same anomaly patterns, little differences in intensity.

In the Pacific Ocean : La Nina is underway as well as the strong anomalies in the north hemisphere.

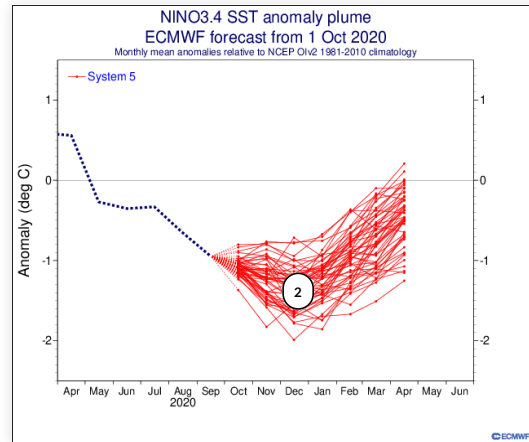
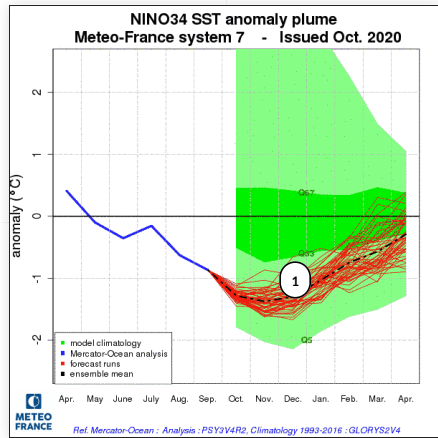
In the Indian Ocean : No west/east contrast. IOD returns to neutral values. Little difference between models in the southern basin

In the Atlantic Ocean : MF-S7 is a little warmer along the equator and in the southern hemisphere. Marked dipole (cold south of Greenland and warm area off Newfoundland)



Oceanic forecast : NINO3.4 Plume diagrams

Good consistency of the two models on a strengthening of La Nina event, peaking in december

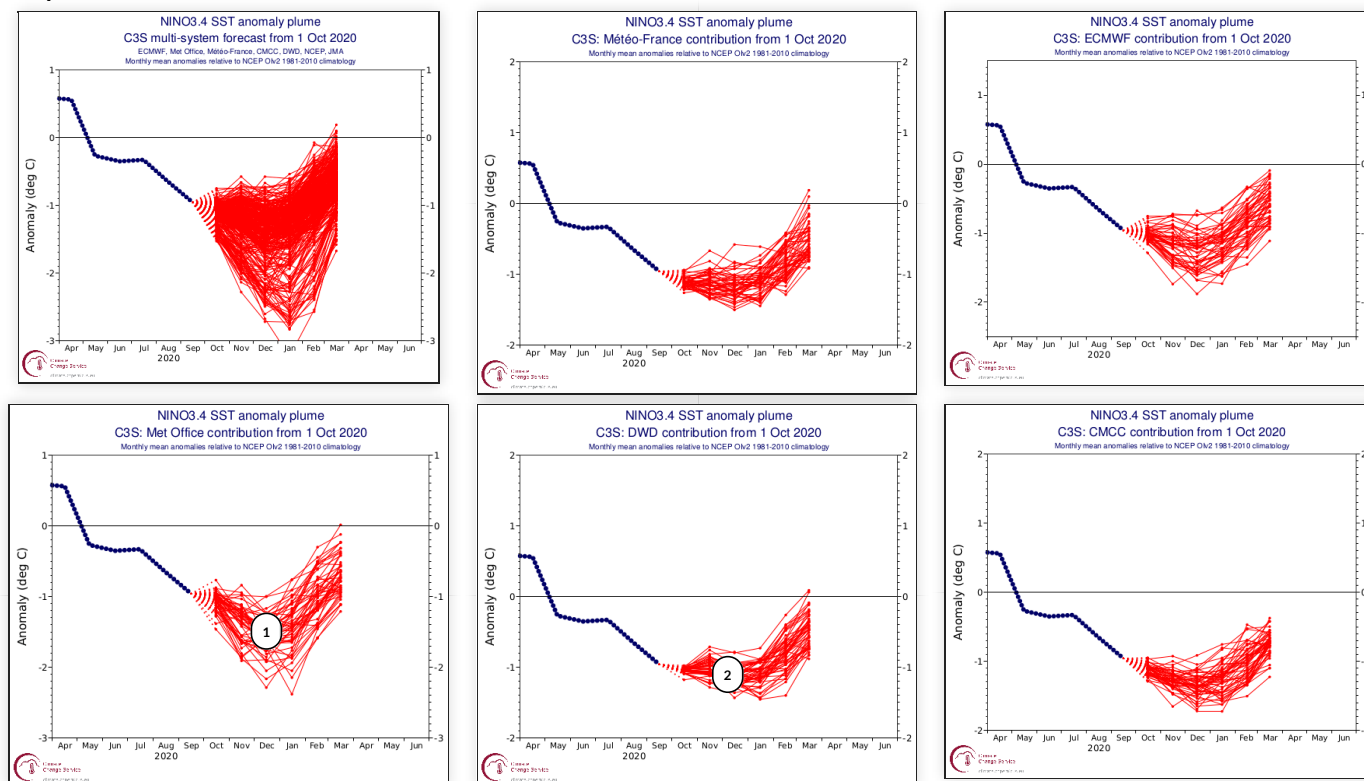


- 1 - Little dispersion of runs (values around -1.4°C)
- 2 - same signal with a little more spread

Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

Good agreement, the simulations foreseen a negative anomaly lower to -1°C .

Expected Phase for the next three months : La Niña

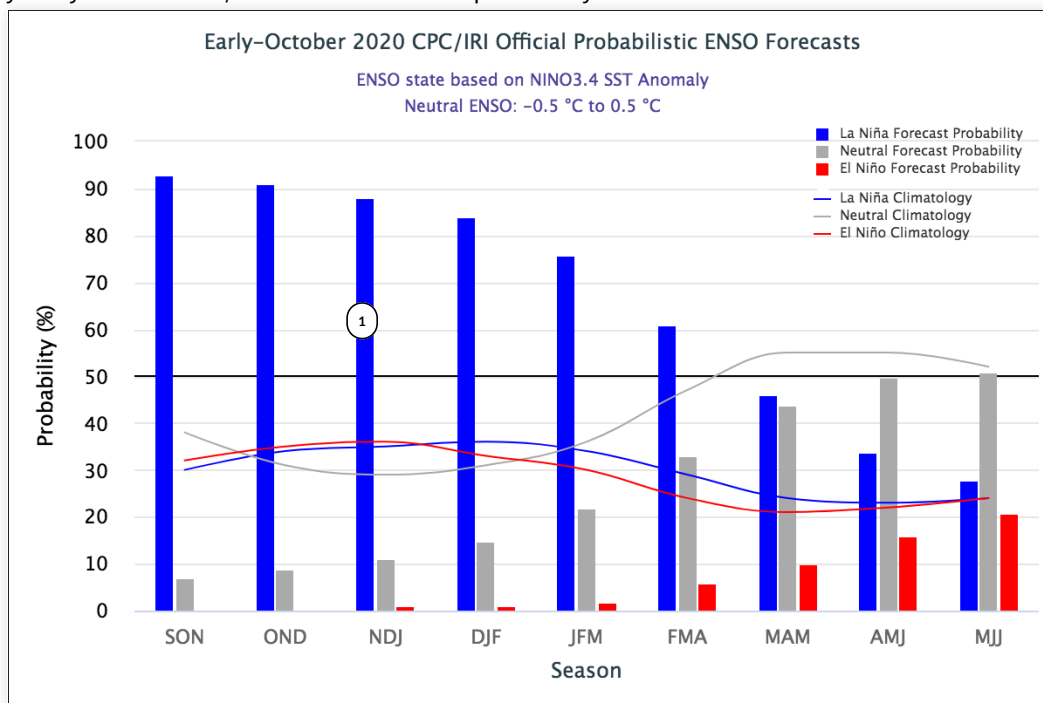


C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

- 1 - Met Office model has the larger spread
- 2 - the DWD model is very little dispersed

Oceanic forecast : Synthesis from IRI

La Niña is very likely for NDJ 2020/2021 with a near 90% probability.

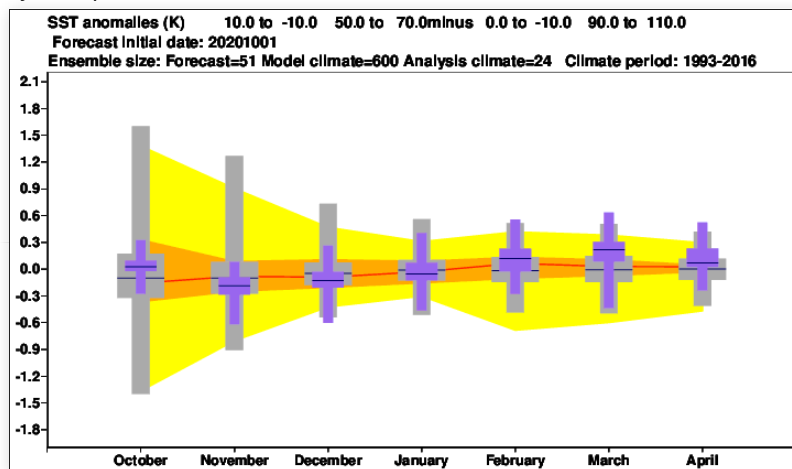
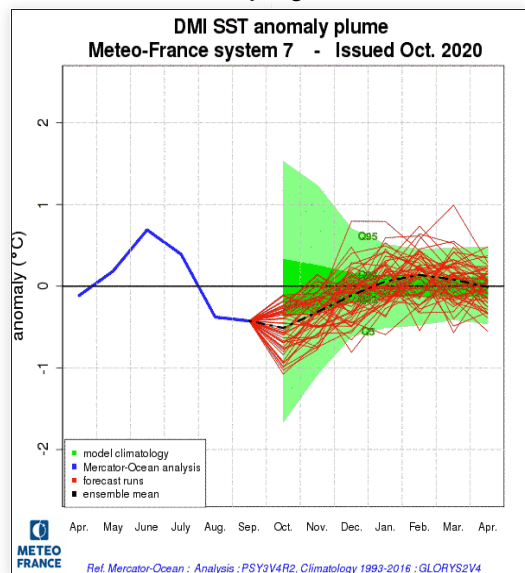


Probability of Niño, Niña, and neutral phases for the next 8 quarters. source <http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>

1 - La Nina forecast is very likely

Oceanic forecast : Indian ocean - DMI evolution

The DMI index, currently negative, will return to neutrality next quarter

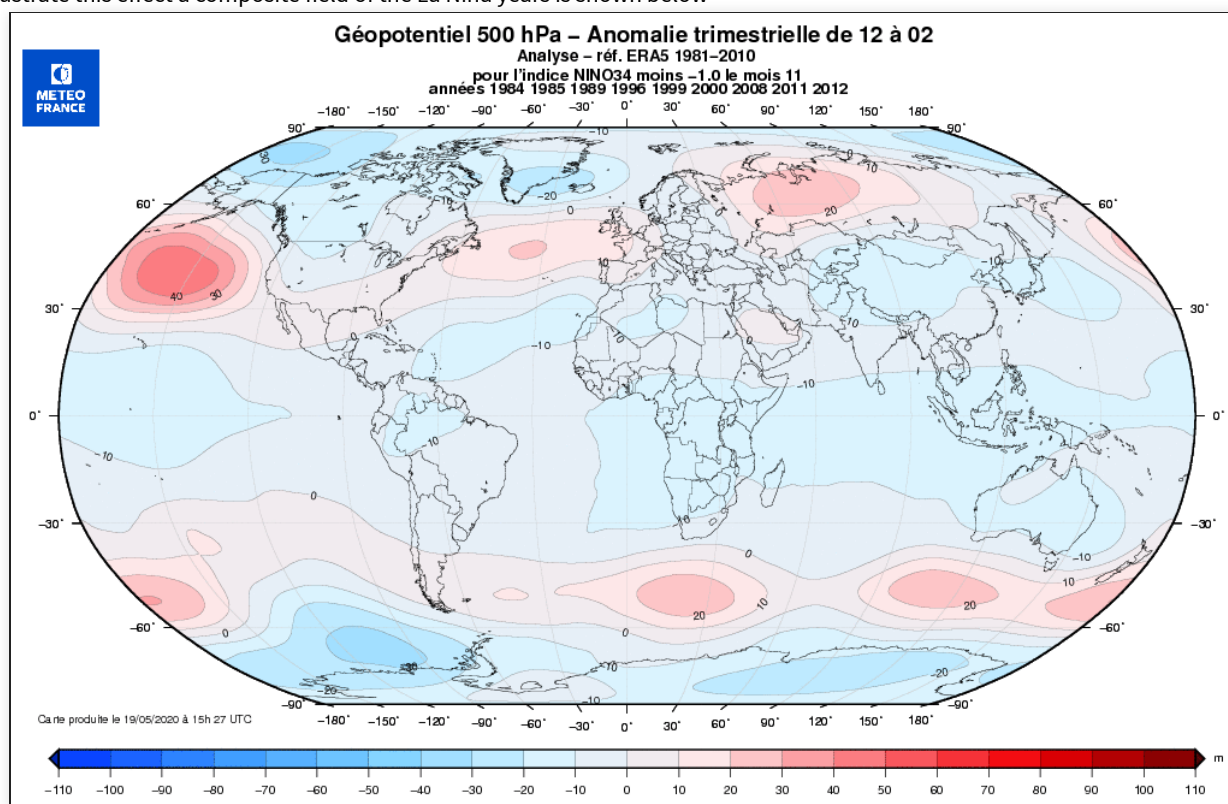


DMI index : analysis, forecasts and model climatology with MFT on the right and SEAS5 on the left

Drivers : Pacific SST : Statistical effect of La Nina

In winter La Nina is often associated with the Atlantic Ridge regime.

To illustrate this effect a composite field of the La Nina years is shown below



Composite field of Geopotential at 500hPa for La Nina years between 1980 and 2019

Drivers : Pacific SST : La Nina and PDO

On the Pacific a La Nina is underway with a negative phase of PDO.

This article [link](#) discusses the combined impact of La Nina and PDO on the atmospheric circulation over the North Atlantic.

In case of central Pacific La Nina, what seems to be the case for next quarter, combined with negative PDO phase, a positive NAO signal is highlighted.

For the next quarter (NDJ) the combination of central Pacific La Nina with negative phase of PDO favors the positive phase of NAO.

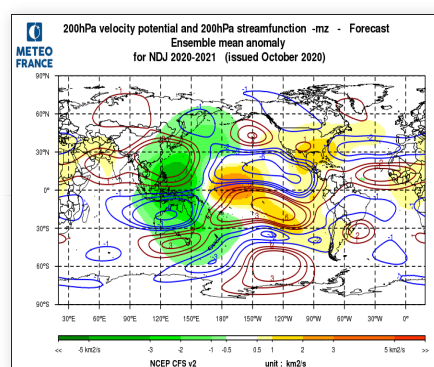
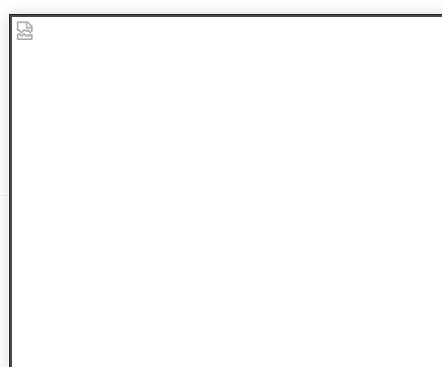
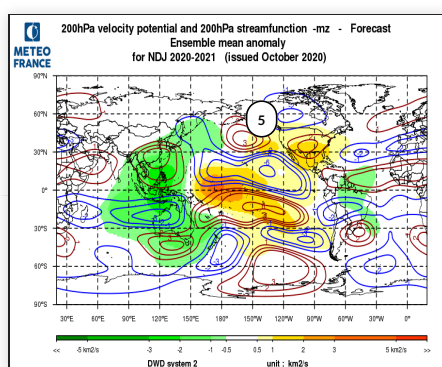
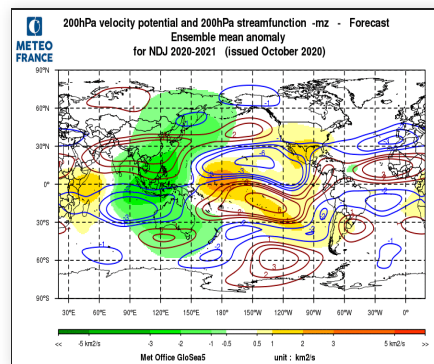
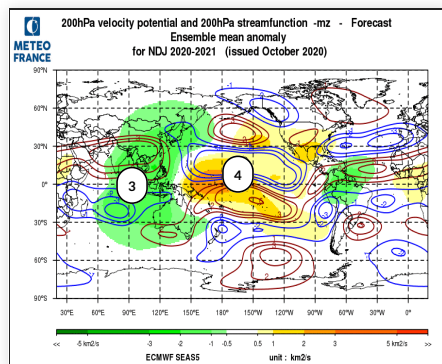
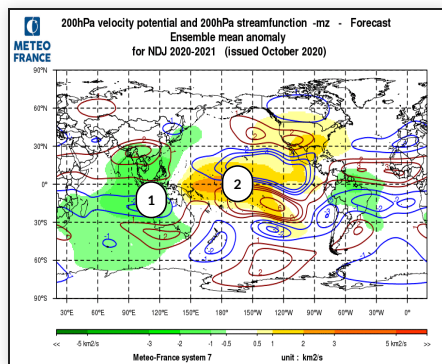
Drivers : Summary

- In winter La Nina conditions favor the Atlantic Ridge regime
- This year with a conjunction of central Pacific La Nina and the negative phase of PDO, the positive phase of NAO is favored

Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : the models are in good agreement. both with regard to the principle dipole in the Pacific-Indian zone, and for a secondary dipole in the America-Atlantic-Africa zone.

Streamfunction : the models agree remarkably well on the structure of the field, with similarities in teleconnections especially around the Pacific.

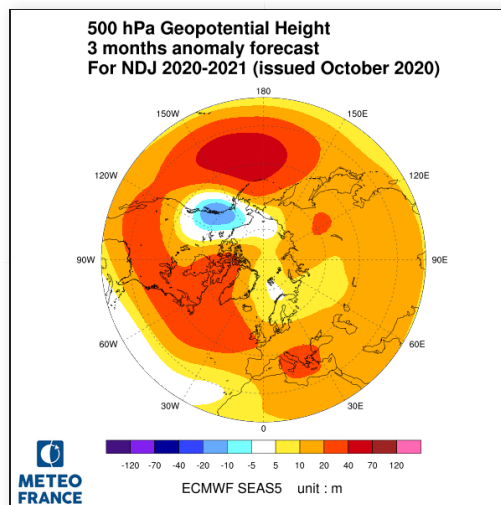
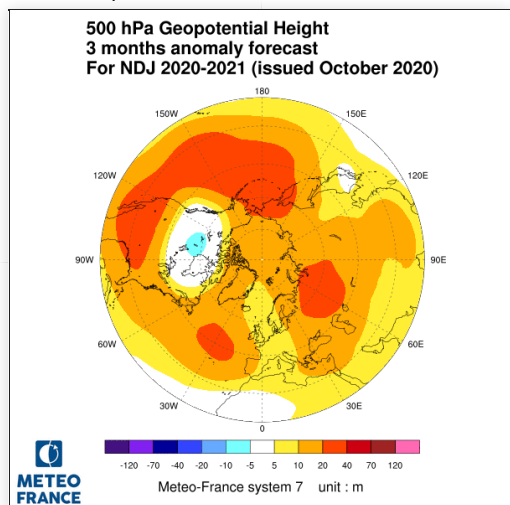


MF7, SEASS, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

- 1 - VP : large area of upward motion anomaly
- 2 - VP : large downward motion anomaly
- 3 - SF : anticyclonic circulation anomalies at 200hPa on each side of the equator
- 4 - SF : cyclonic circulation anomalies at 200hPa on each side of the equator
- 5 - teleconnection to mid-latitudes

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

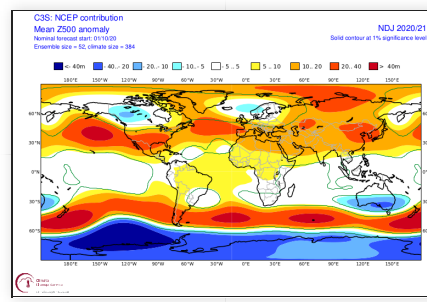
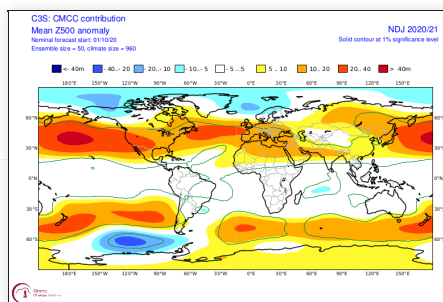
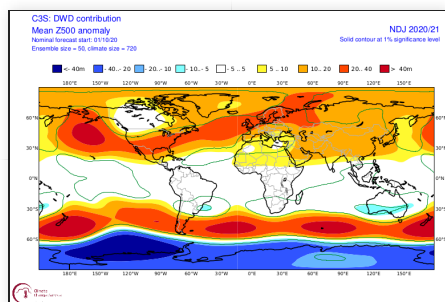
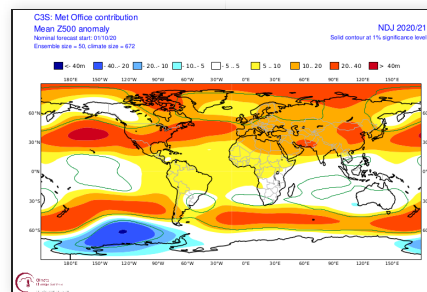
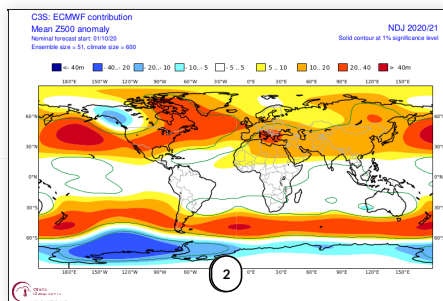
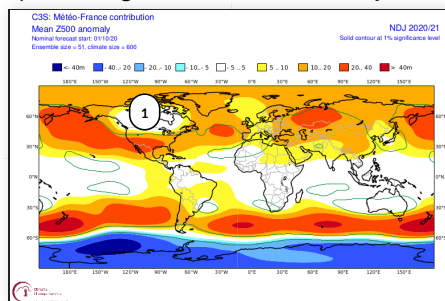
Similarities over the Pacific and North America with, however, a shift in anomalies. On the Atlantic models suggest stronger positive anomalies at temperate latitudes. On Eurasia the forecasts are different.



polar projection of MF7 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

From the Pacific to North America and the Atlantic, a tripole structure (positive/negative/positive) is present in all models. The precise positioning of the minimum can vary little from one model to another.



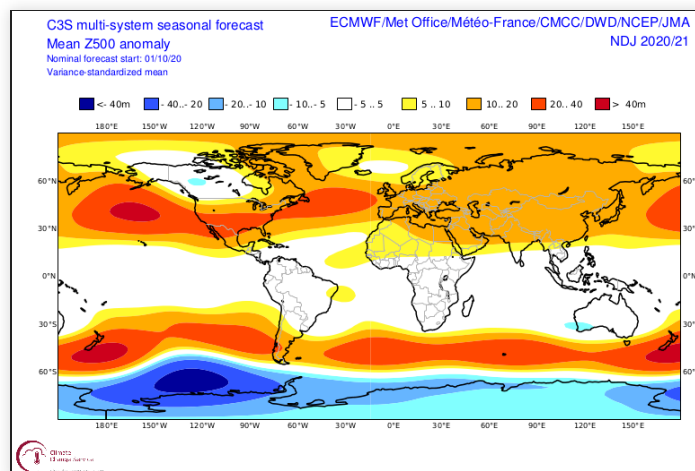
MF-S7, SEASS, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

- 1 - large low values area
- 2 - High values area
- 2 - High values area

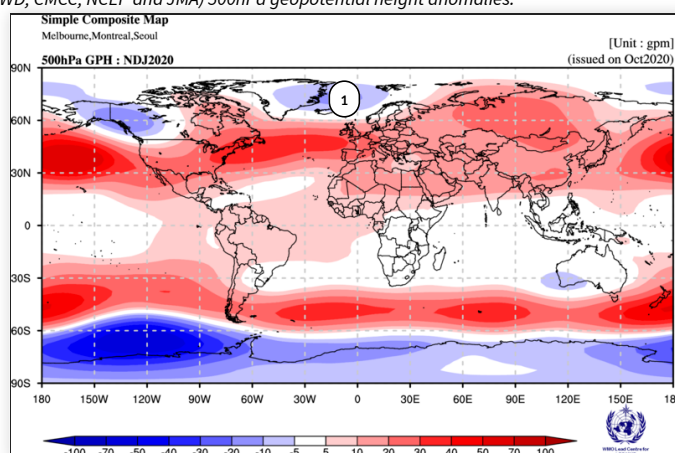
Atmospheric circulation forecasts : Z500 anomalies multi-systems

The two multi-models are close on the North Atlantic and Europe. The high mean values predicted over the Atlantic between 40 ° N and 50 ° N extend towards Europe and the relative low values further north extend towards Scandinavia.

In the southern hemisphere positive SAM is favoured.



C3S multi-models (MF-S7, SEAS5, UKMO, DWD, CMCC, NCEP and JMA) 500hPa geopotential height anomalies.

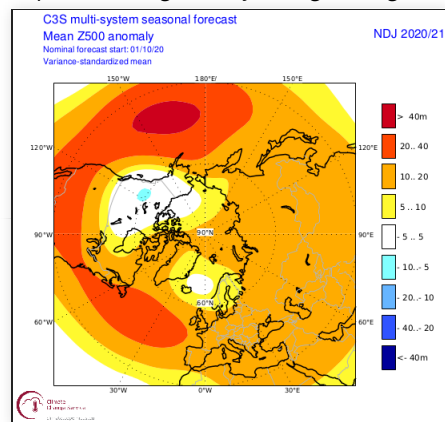
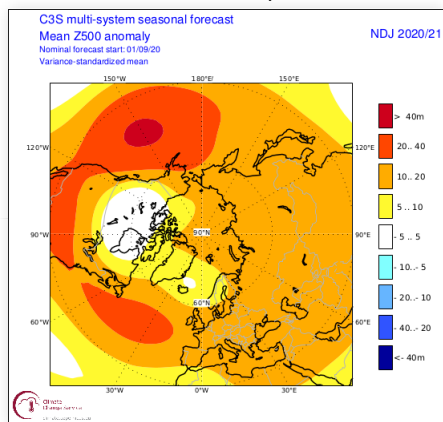
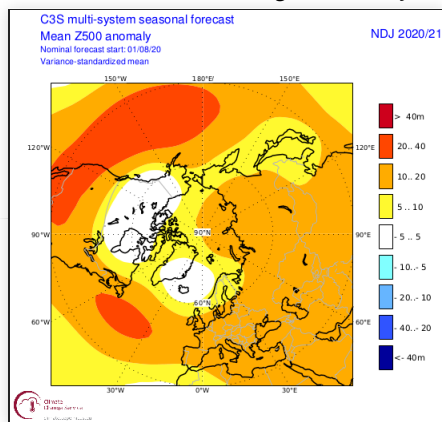


Others models of WMO multi-models 500hPa geopotential height anomalies.

1 - Forecast close to the C3S multimodel

Atmospheric circulation forecasts : Forecast stability

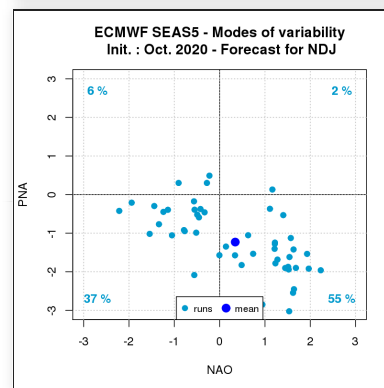
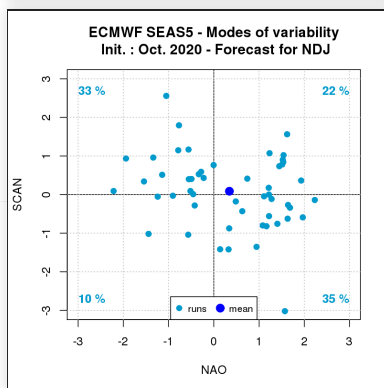
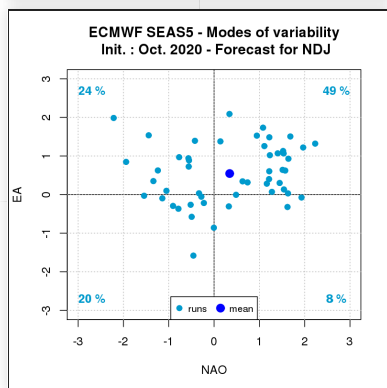
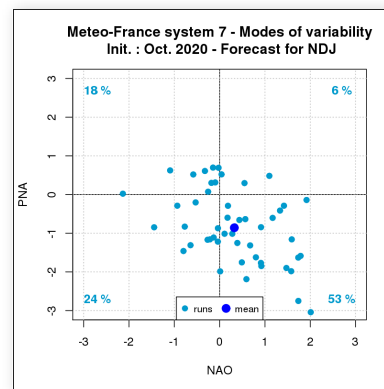
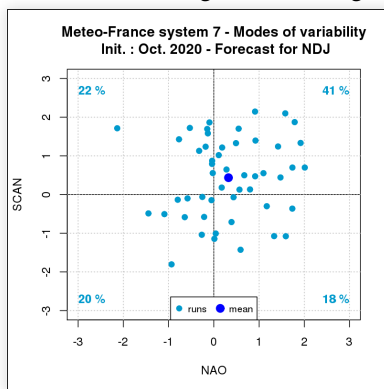
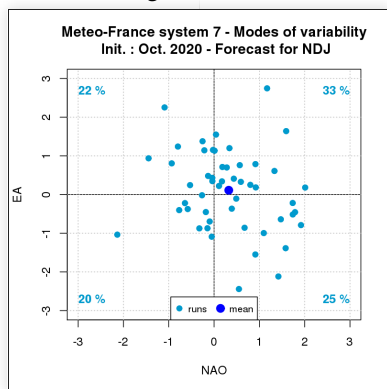
The C3S multi-model has good stability of its Z500 forecast for the NDJ quarter. It maintains its pattern and gradually strengthening it.



Successive forecasts from August to October of the C3S multi-model for the NDJ quarter

Modes of variability : forecast

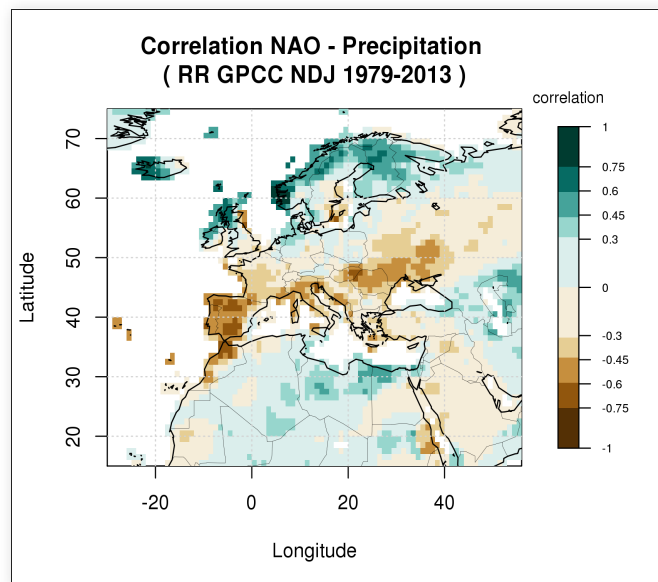
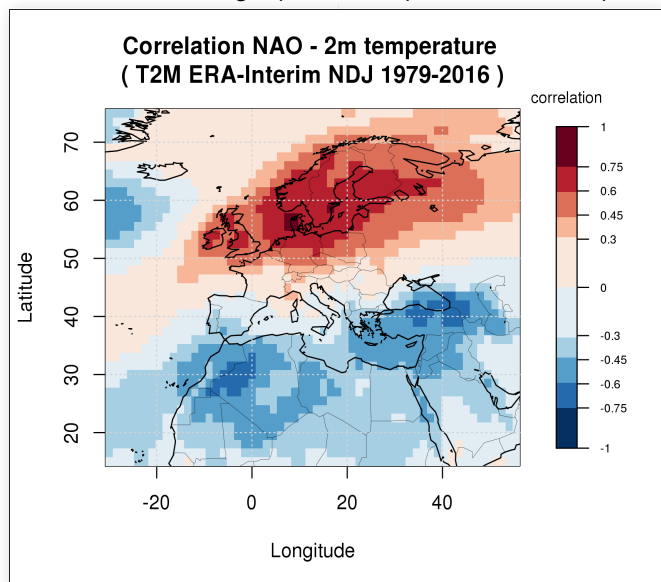
As usual, EA + modes are favored (weakly). The geopotential fields at 500 hPa doesn't clearly show this trend, which is probably linked to climate change. NAO + modes is also weakly favored which is in agreement with geopotential anomalies



[see the modes of variability patterns](#)

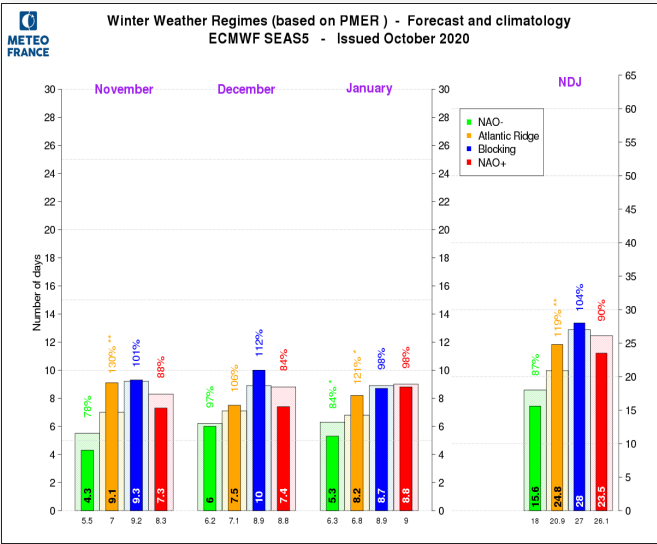
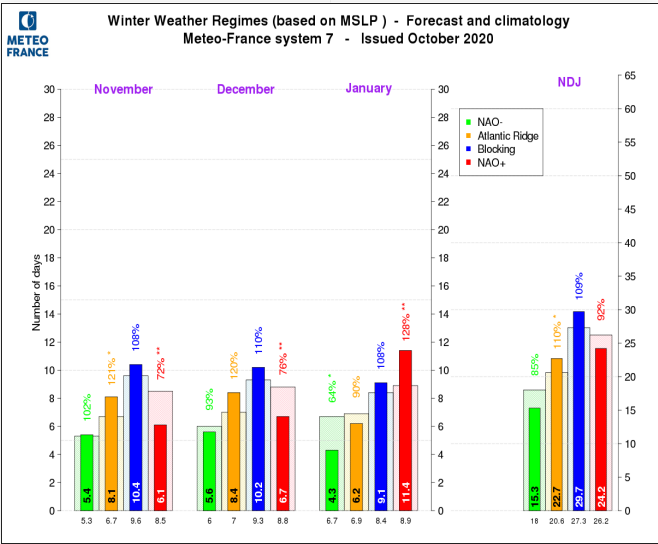
Modes of variability : NAO impacts

NAO mode has a strong impact on Europe for this 3-month period



Weather regimes : winter MSLP

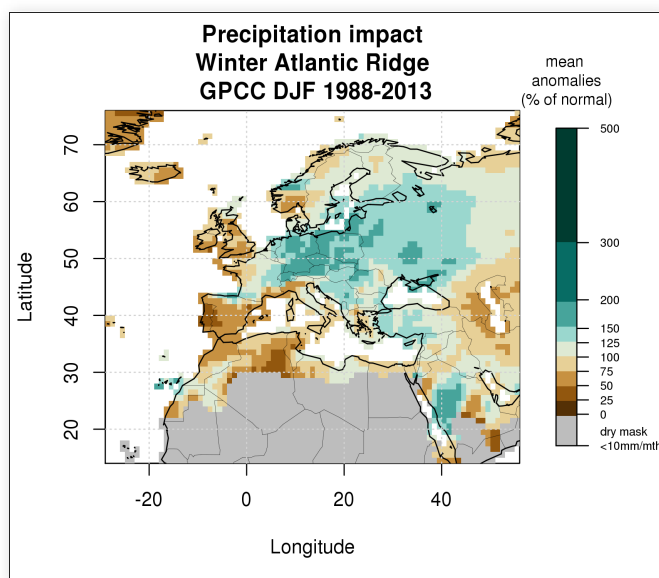
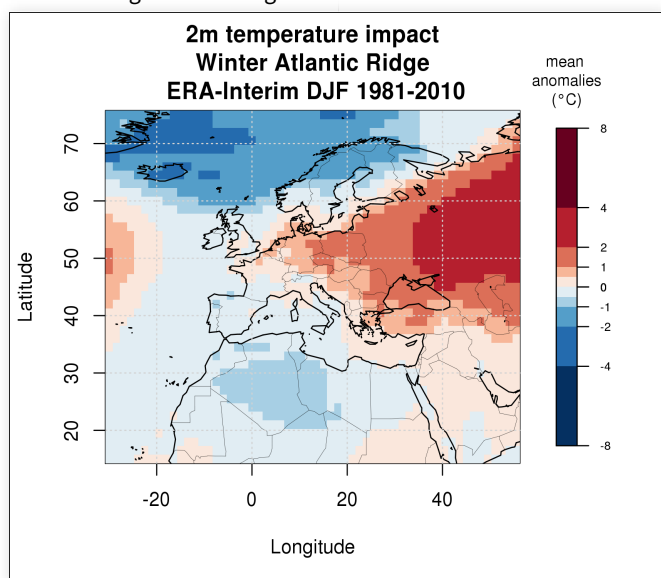
The Atlantic Ridge regime is more frequent than climatology. It is the only regime statistically different.



Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S7 (left) and SEAS5 (right).

Weather regimes : Impacts

Atlantic Ridge weather regime is favored

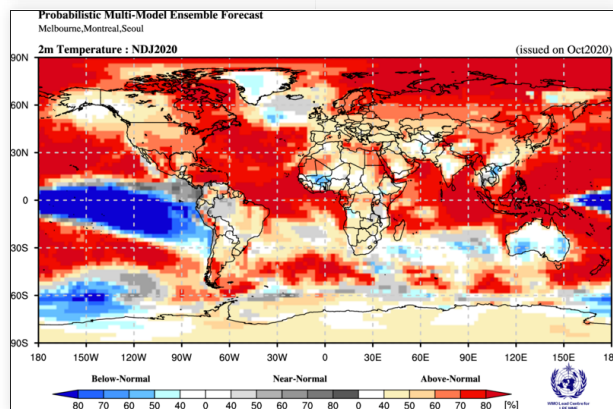
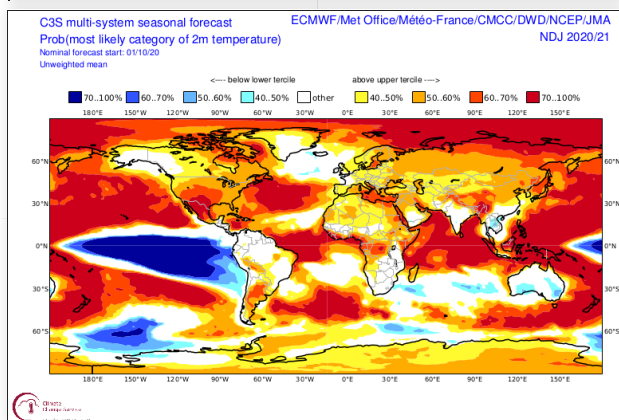
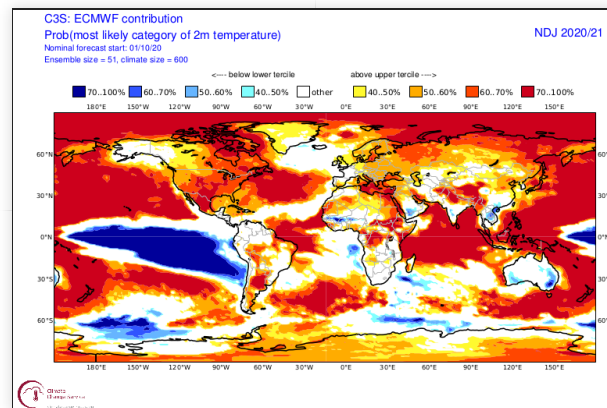
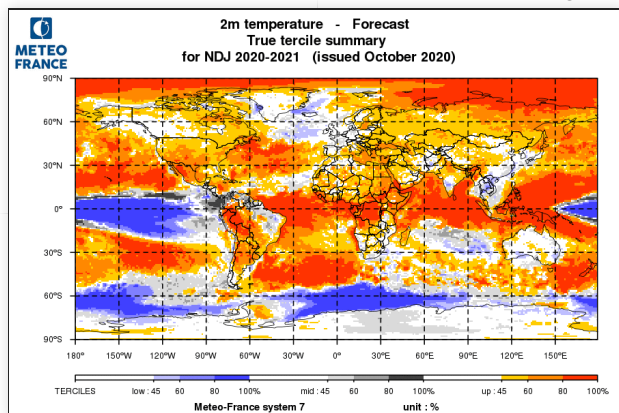


Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

The tropics are heavily impacted by the La Nina phenomenon.

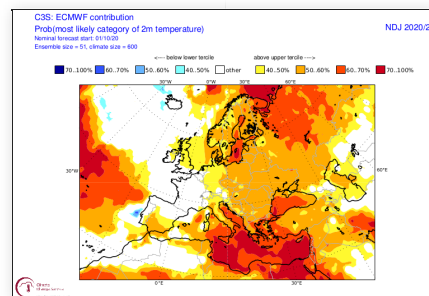
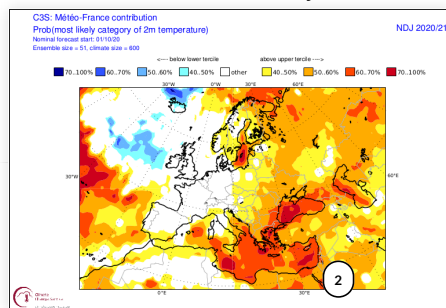
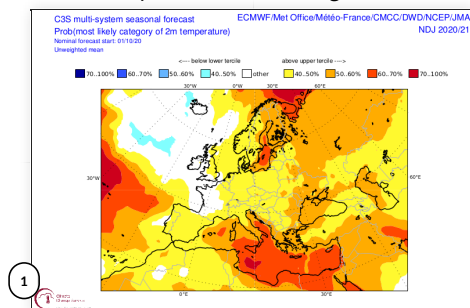
On the northern hemisphere the models are similar on large scales



2m temperature probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

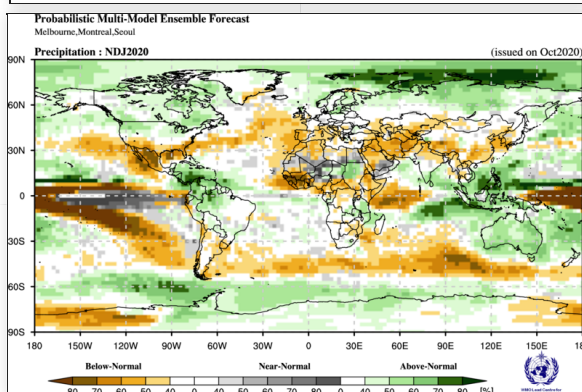
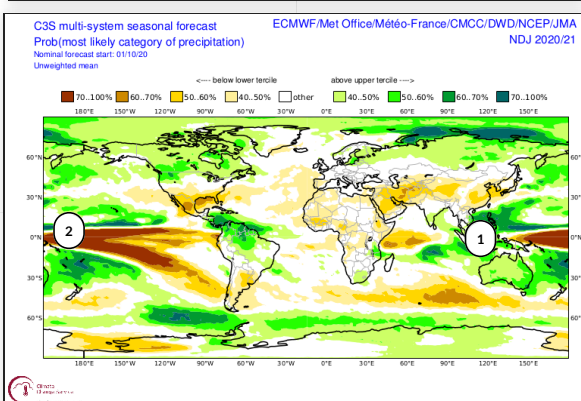
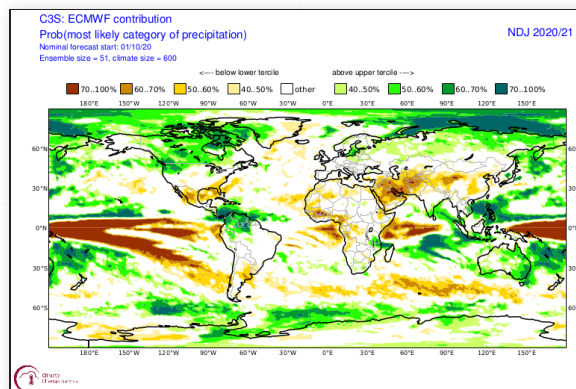
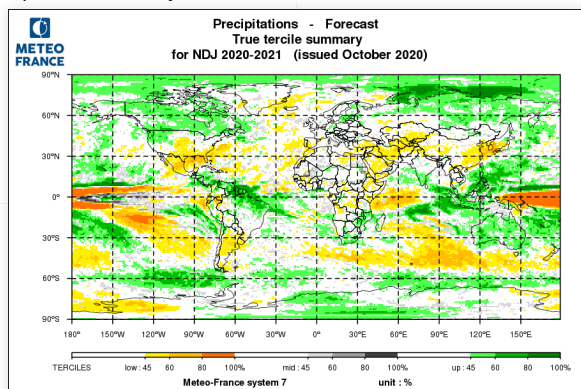
Forecast of climatic parameters : T2M probabilities over Europe in C3S models

Over Europe, a weak warm signal dominates in the multi-model, more clearly on the east.



Forecast of climatic parameters : Precipitation

In the La Nina situation, the forecast in the tropics remains very similar to that of the previous months. Heavier than normal precipitation is likely from India in Southeast Asia to the Maritime Continent and Australia, as well as over northern South America.

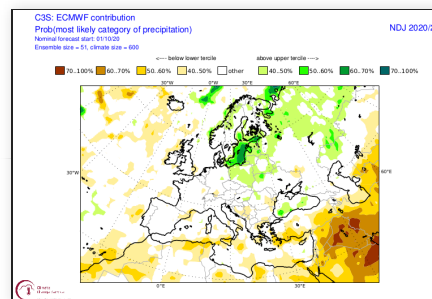
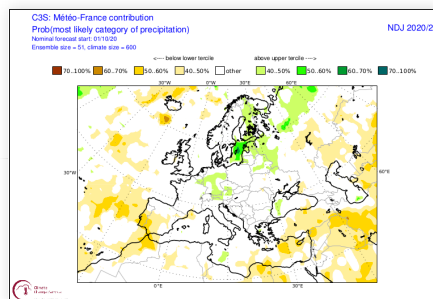
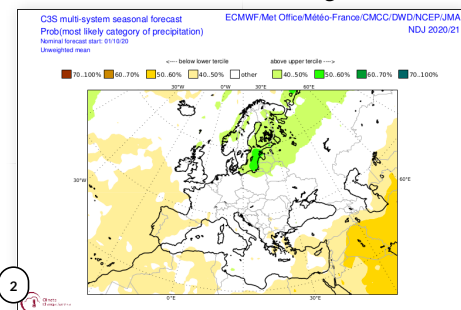


precipitation probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

- 1 - Strong wet signal (La Nina)
- 2 - Dry signal linked to the Nina

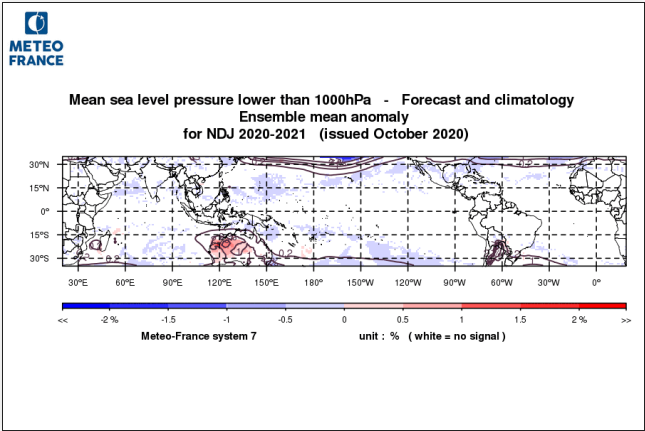
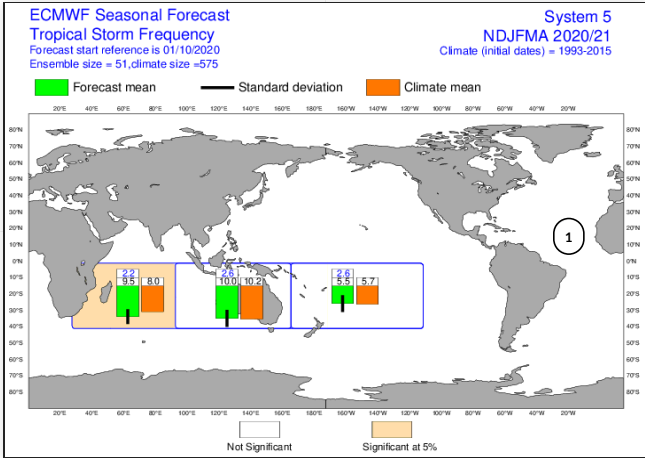
Forecast of climatic parameters : Precipitation probabilities over Europe in C3S models

The models forecast increased precipitation over Scandinavia and deficit on the Atlantic side as well as on the Middle East. This is consistent with the Atlantic regime favored by models.



Forecast of climatic parameters : Tropical Storm Frequency

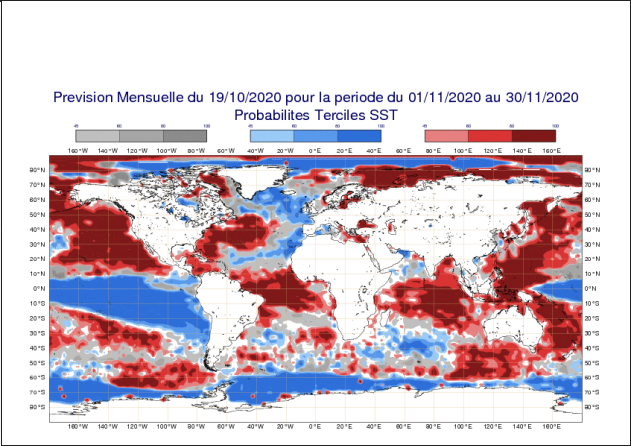
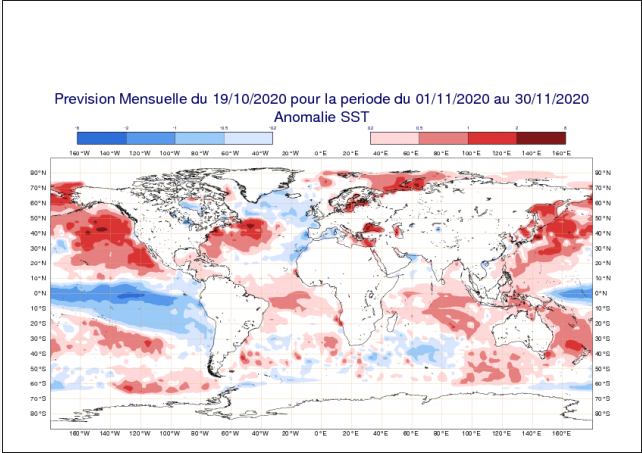
The La Nina situation is generally unfavorable to cyclonic activity in the central Pacific, but on the contrary, should strengthen it in the western part of the basin.



1 - close to normal

Monthly forecast of 20201019 : SST

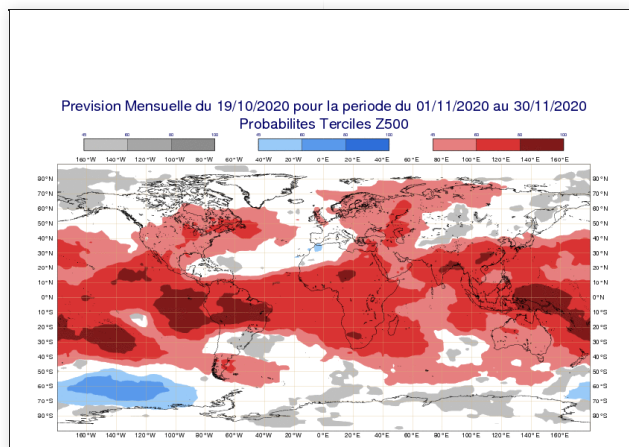
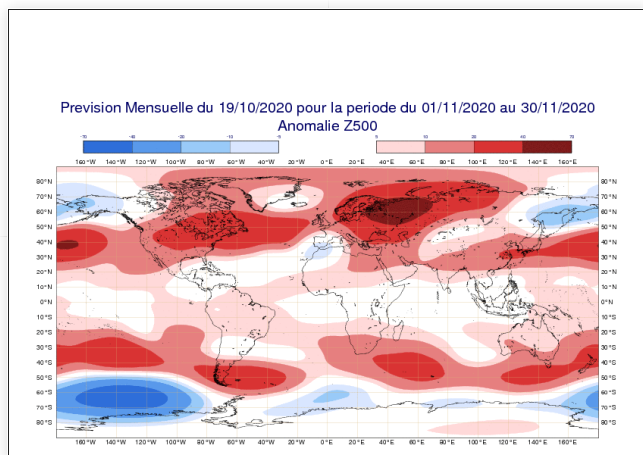
On the tropics and on the northern hemisphere, the monthly forecast is very consistent with the seasonal forecast.



Monthly forecast of 20201019 : Z500

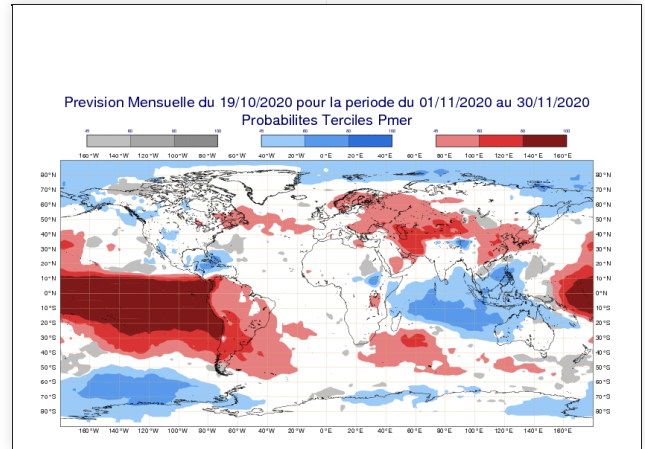
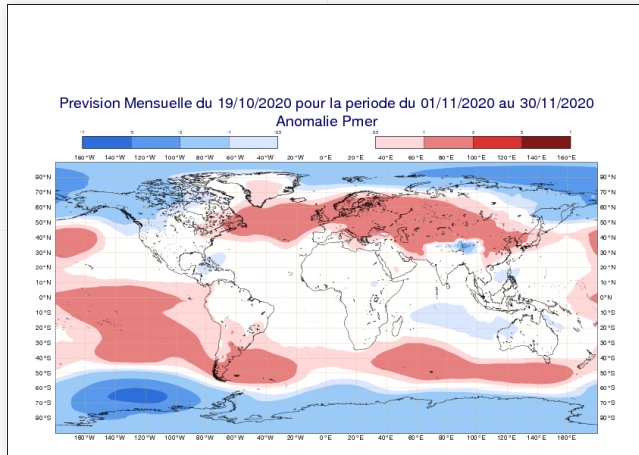
The monthly forecast of the ECMWF has a field structure closer to the seasonal forecast on the northern Pacific and America (negative PNA index) as well on the southern hemisphere (positive SAM index) and on the Atlantic (high relative values at temperate latitudes).

On the other hand there are differences with seasonal forecast for Eurasia on the predicted positive anomaly of Scandinavia in northern Russia.



Monthly forecast of 20201019 : MSLP

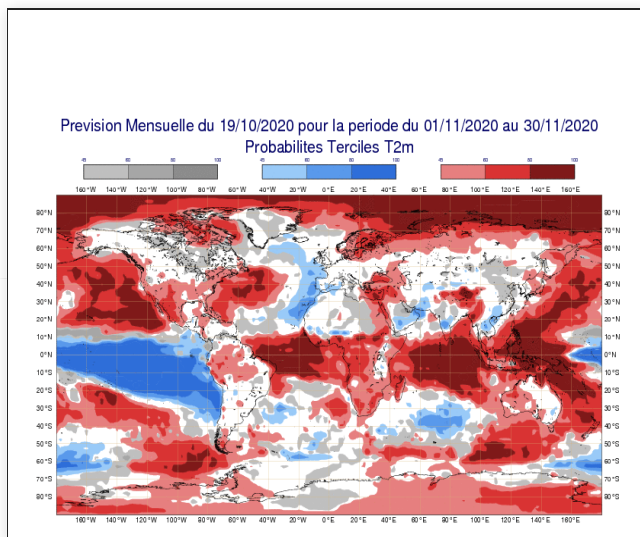
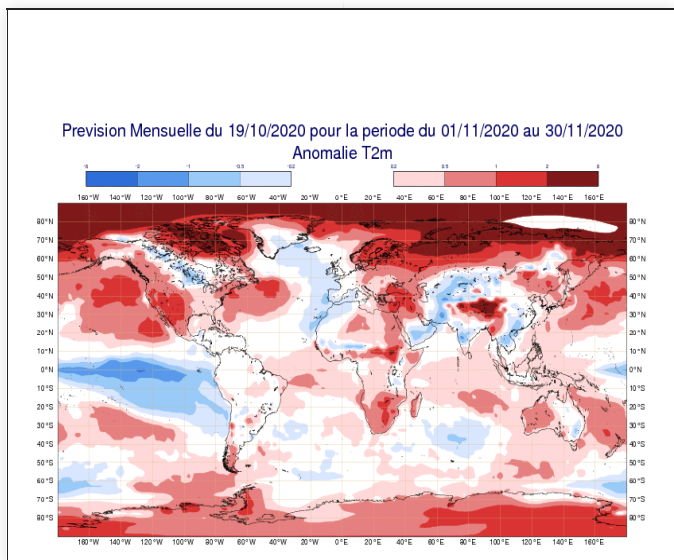
The strong values on the Atlantic extend over a large part of Europe. The weak field further north remains consistent with the seasonal forecast.



Monthly forecast of 20201019 : temperature

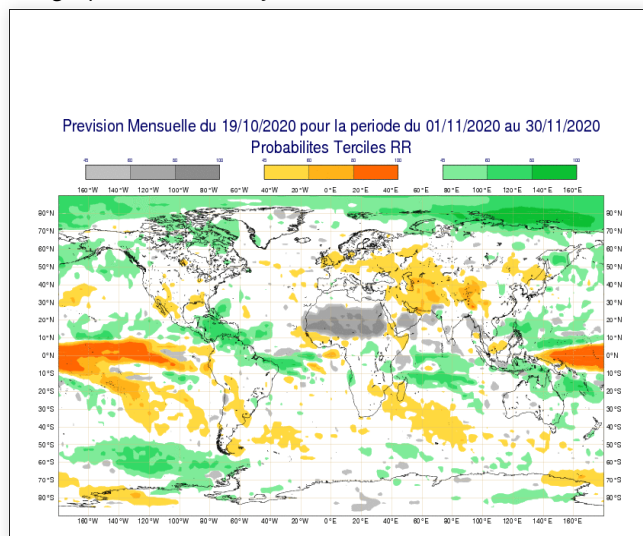
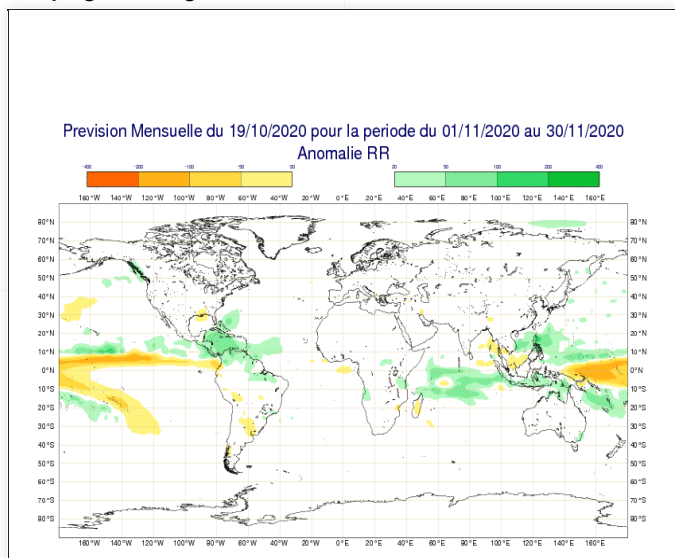
Weak signal in western Europe, dominant warm signal in the east which is close to seasonal forecasts

Note the very strong anomalies expected at high latitudes of the northern hemisphere in connection with the extremely weak ice cover at the end of summer and its more difficult reconstitution.



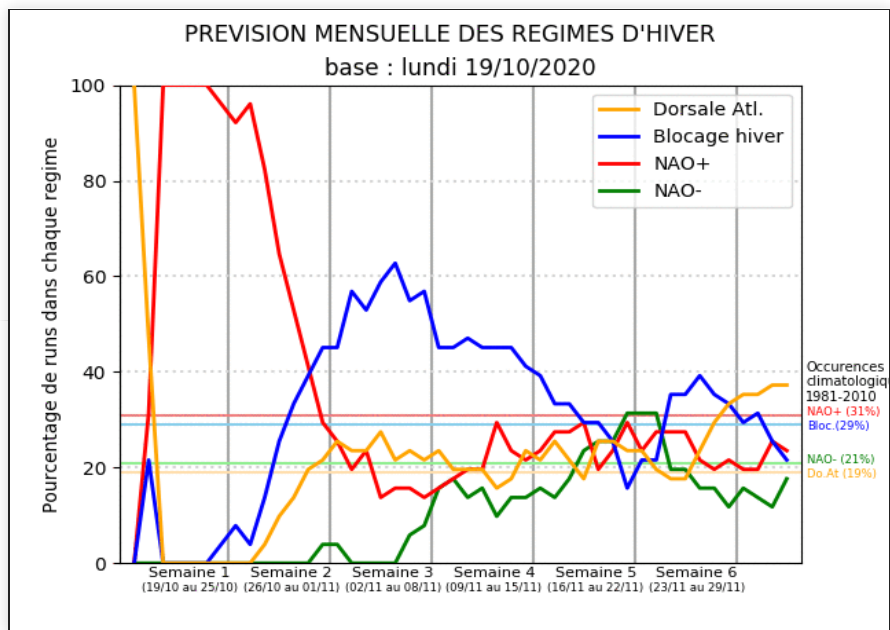
Monthly forecast of 20201019 : precipitation

A dry signal emerges around the 50th north in connection with the positive geopotential anomaly.



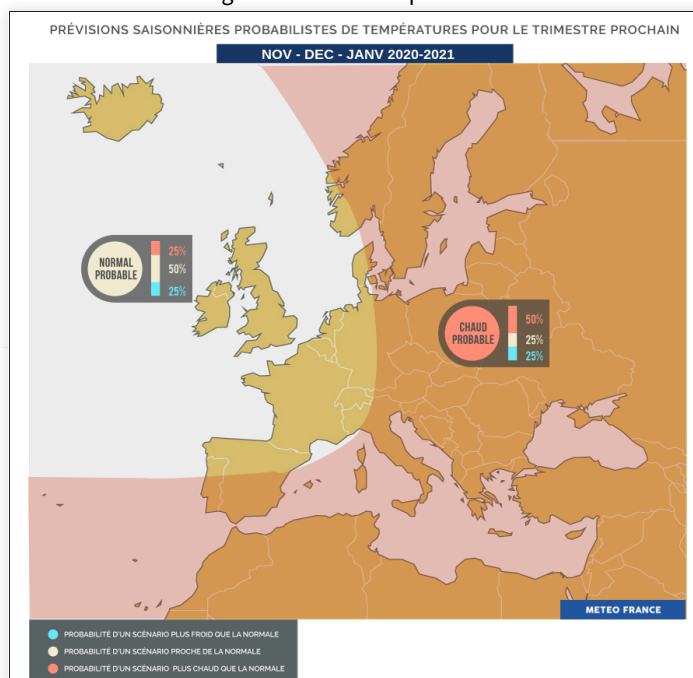
Monthly forecast of 20201019 : winter SLP weather regimes

Blocking regime is dominant in the first part of November. Then none of regimes emerge.



Synthesis map for Europe : Temperature

The temperature signal is weak. On the north-west of Europe, the influence of a dominant northwest flow is expected to keep temperatures within normal. Elsewhere in Europe, a weak warm signal dominates, probably more related to climate change than to the general circulation which provides few determining elements for temperatures.

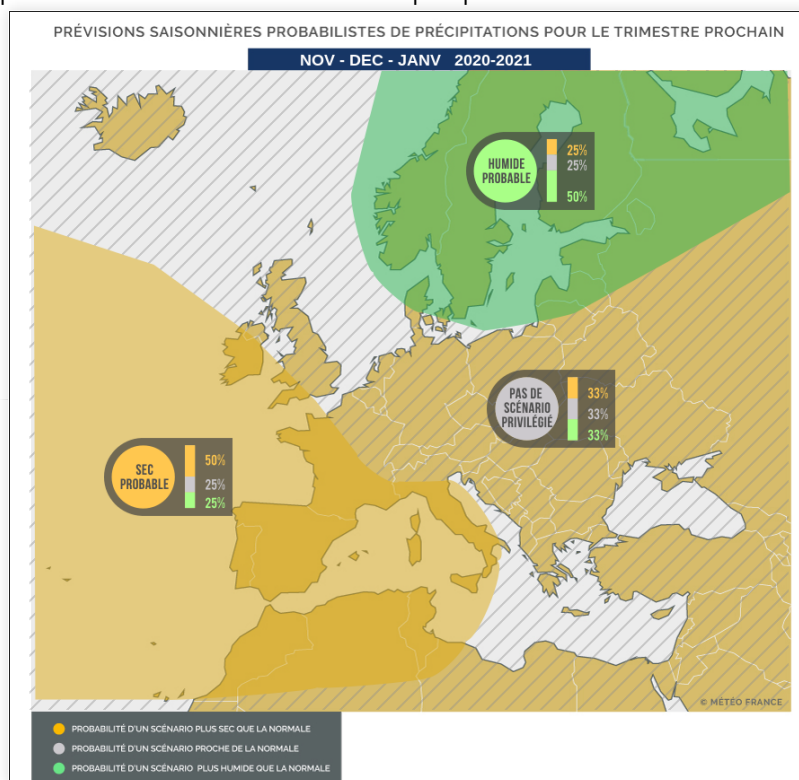


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/AVH

Synthesis map for Europe : Precipitation

More frequent high pressure conditions likely over the west of the continent should reduce rainfall.

The weak pressure field expected over Scandinavia should increase precipitation.



Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/AVH