

Météo-France Seasonal Forecast Bulletin

JANUARY - FEBRUARY - MARCH 2021

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General synthesis : JFM 2021

The models are very constrained by the ongoing La Nina event. The forecasts are extremely close, both geographically and in their temporal evolution.

A) Oceanic forecast :

- **ENSO : ongoing moderate La Niña.** The phenomenon is currently at his peak and start to decrease next quarter.
- **IOD :** neutral situation during next quarter.

B) Drivers.:

- La Nina.

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 from Unite States to Europe. They are less in agreement with the positioning of low values further north around Iceland.

D) Most likely conditions :

- Wet conditions from Maritime Continent to Australia, as well as over northern South America. Dry conditions elsewhere in the tropics.
- **over Europe :** Weak warm signal on the east. Drier than normal around iberia peninsule and Middle East. Wet expected over Scandinavia

Next bulletin : scheduled on January 20th
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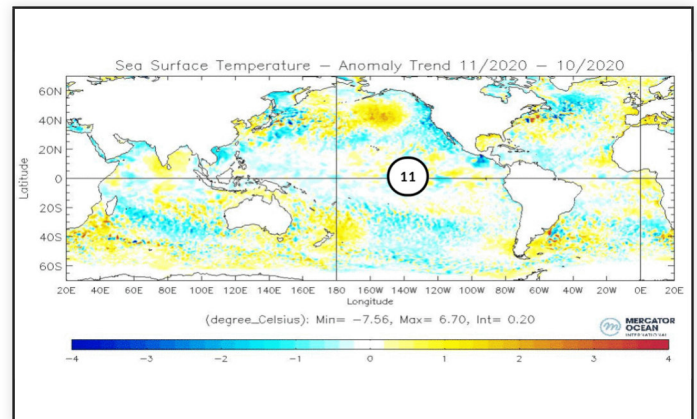
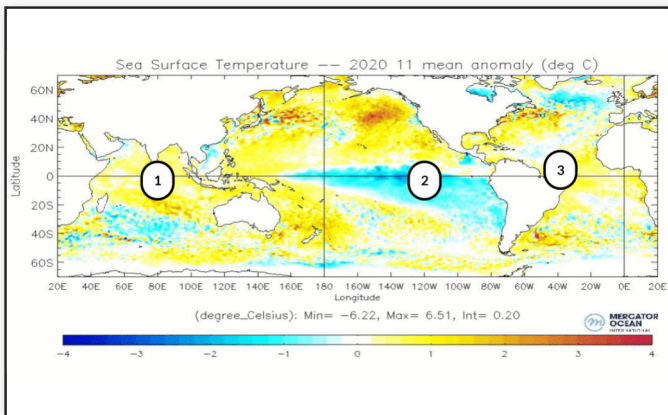
Oceanic analysis of November 2020 : SST anomalies

Current ENSO situation : La Nina conditions

In the Pacific : Cooling along the equator continued in November in the central part of the basin. The La Nina event is now well established.

The Indian Ocean is still warmer than normal except in the southwest part.

In the Atlantic : positive anomalies in the tropics. In the North Atlantic, the western part is warmer than normal while the northwestern part shows quite marked cold anomalies

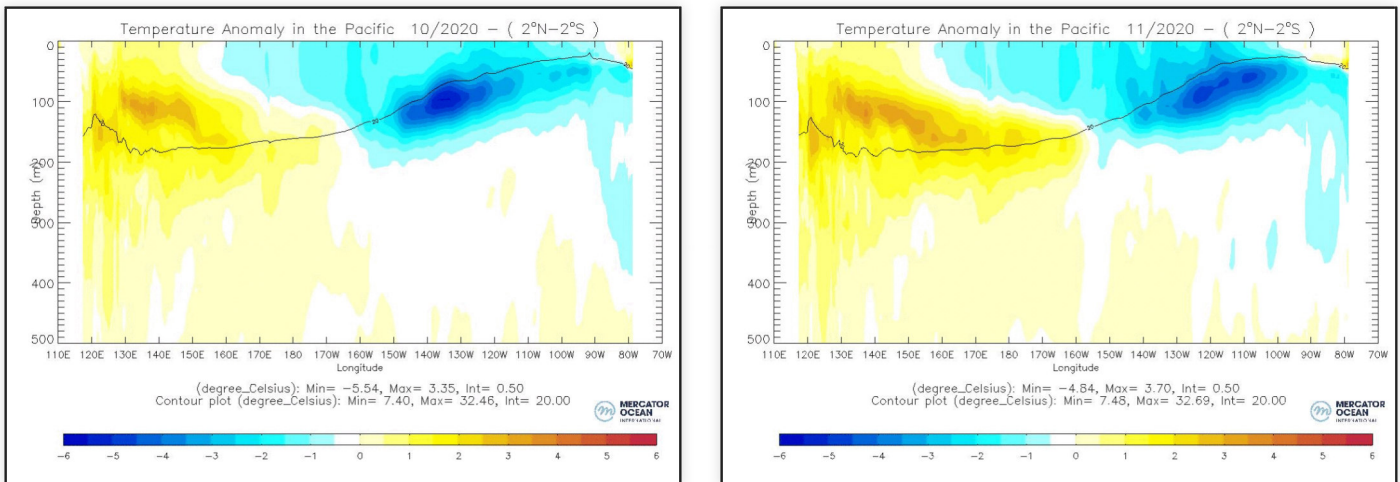


SST Anomalies and trend with the previous month (c) Mercator-Ocean

- 1 - warm Indian Ocean
- 2 - LA Nina cold anomaly
- 3 - warmer than normal
- 11 - weak cooling in Nino3.4 box

Oceanic analysis of November 2020 : Pacific vertical section

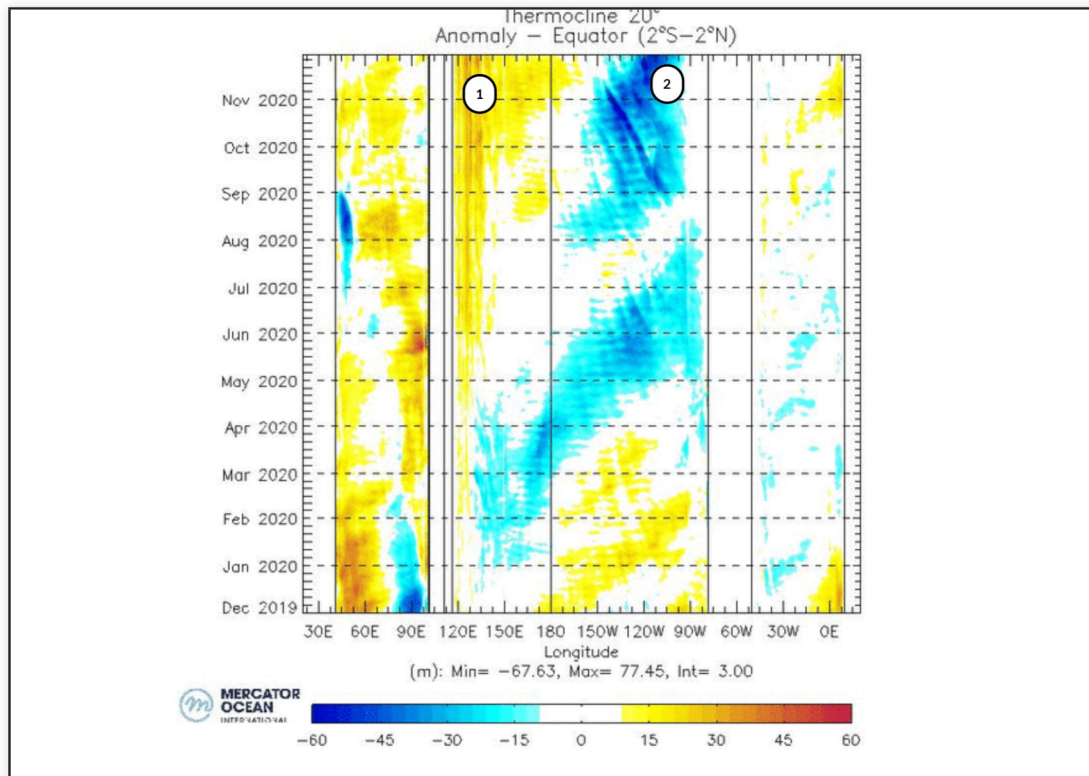
In subsurface, strong cooling continuation in the eastern and central part. Significant warming in the western part. The strong east-west contrast has further strengthened



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

Oceanic analysis of November 2020 : Hovmöller diagram of the 20°C isotherm

The strong subsurface contrast continues in November.



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

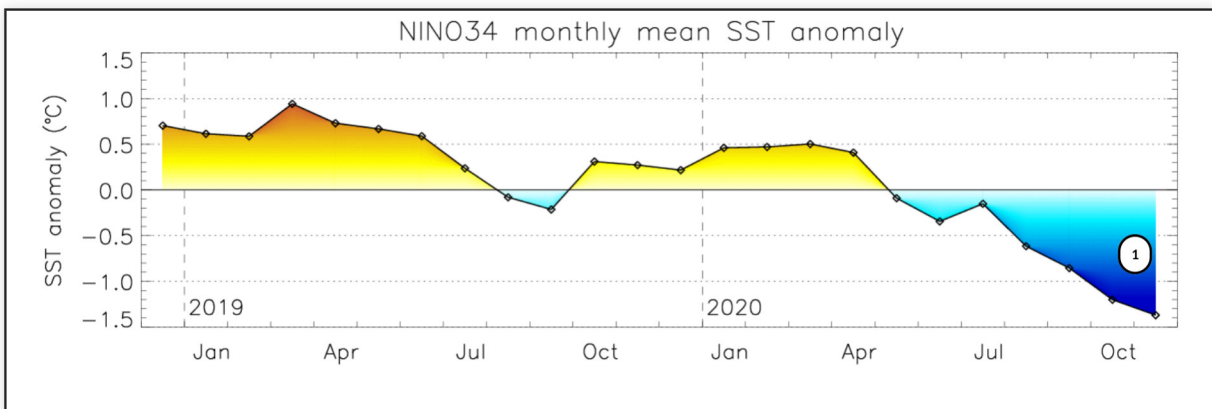
- 1 - Warm anomalie in the west part
- 2 - Cold anomalies in the east part of the Pacific

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

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -1.2 °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 clearly increased during the last month.



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

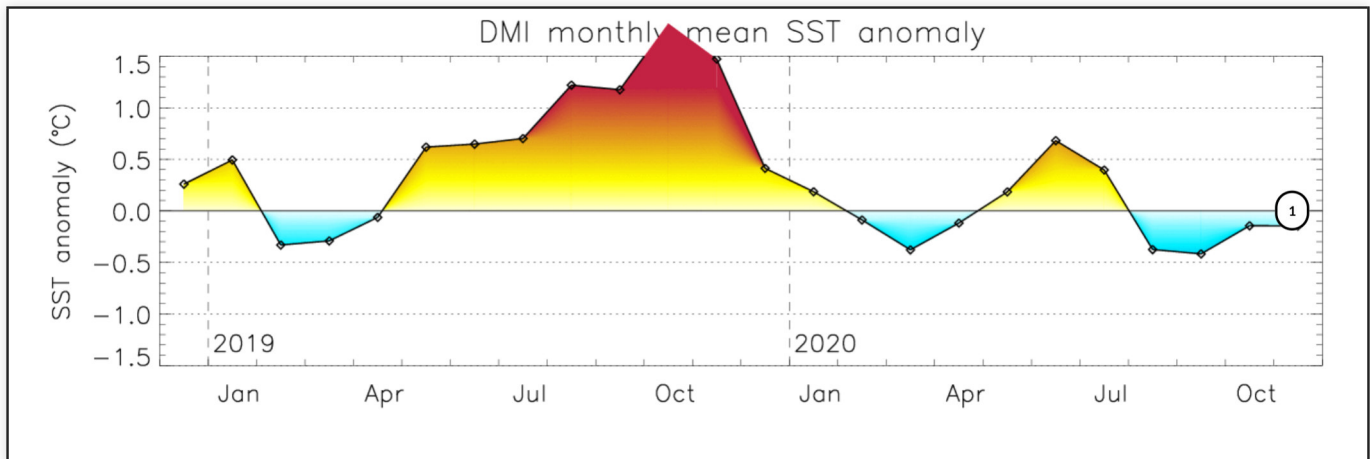
1 - The cold anomaly gets strong

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

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.2°C

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

Near neutral conditions



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

1 - Near neutral conditions

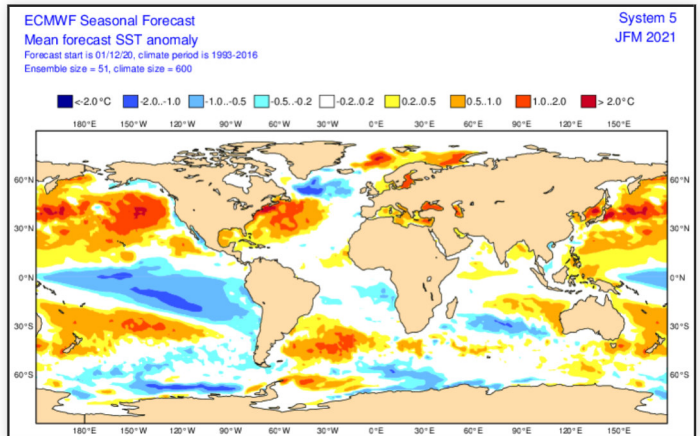
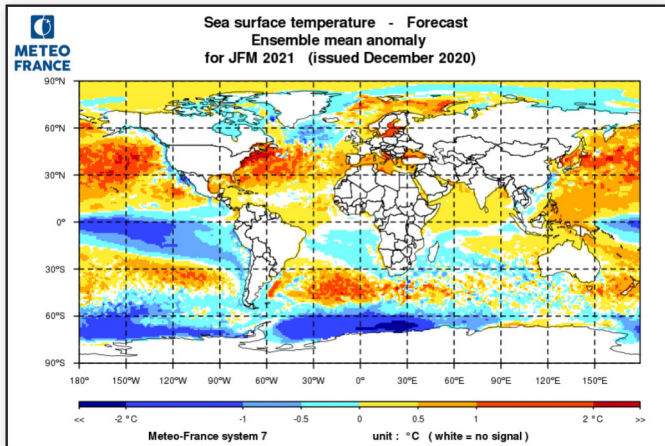
Oceanic forecast : SST anomaly

Very good agreement between MF-S7 and ECMWF-SEAS5. Same anomaly patterns and similar intensity.

In the Pacific Ocean : The ongoing La Nina phenomenon will continue beyond the next quarter. The strong anomalies in the north hemisphere and around 30°S will get even stronger.

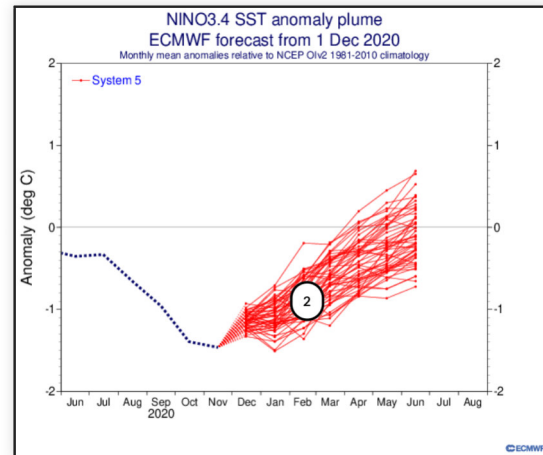
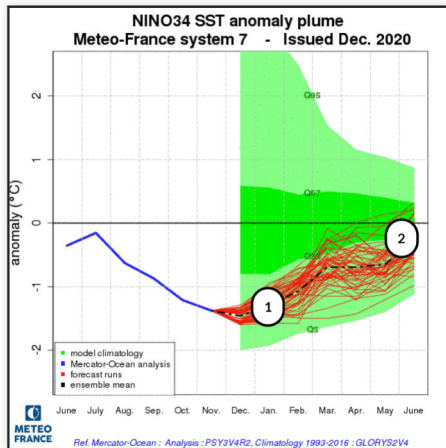
In the Indian Ocean : No west/east contrast, near neutral IOD. neutral values.

In the Atlantic Ocean : Dipole marked near Newfoundland



Oceanic forecast : NINO3.4 Plume diagrams

Good consistency of the two models with continued Nina conditions despite a slow and gradual warming

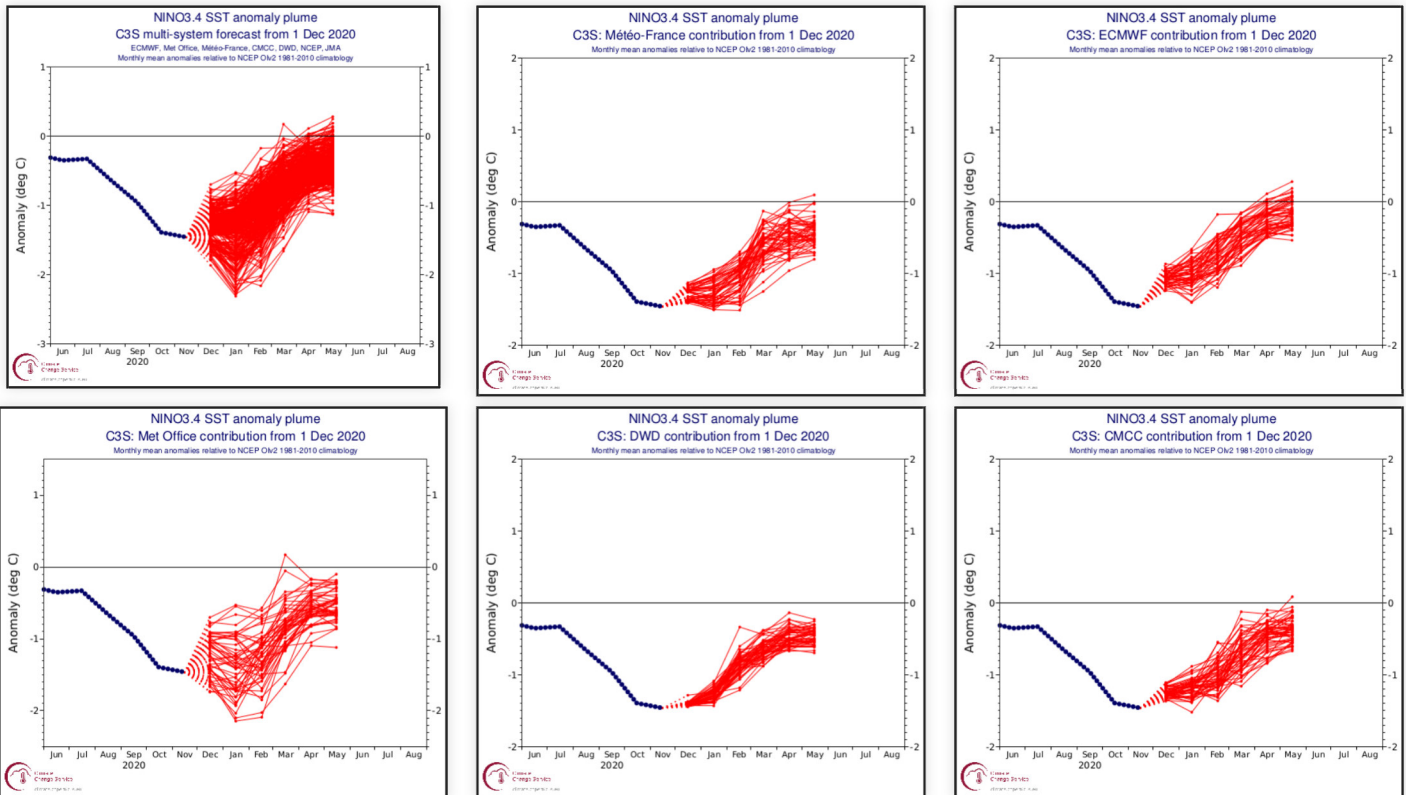


- 1 - Little dispersion of runs (values around -1.4°C)
- 2 - Return to neutrality expected in the spring.
- 2 - same signal with a little more spread

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

The lowest values are currently reached. Expected gradual warming

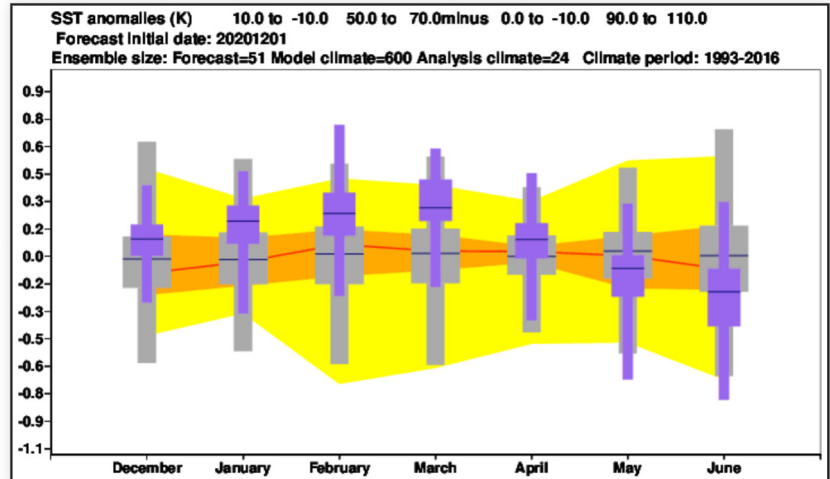
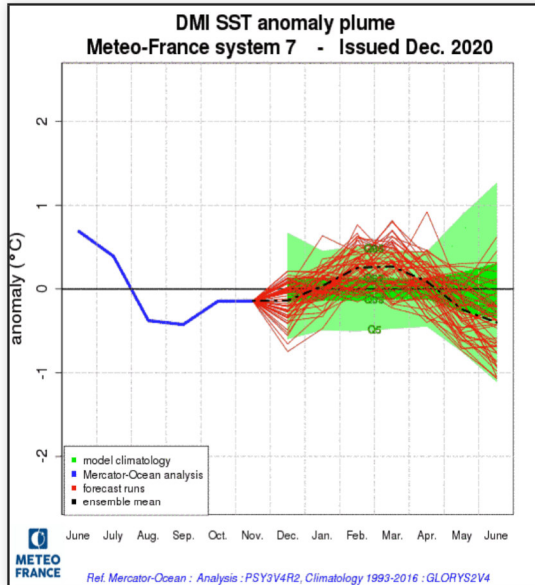
Expected Phase for the next three months : moderate La Niña



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

Oceanic forecast : Indian ocean - DMI evolution

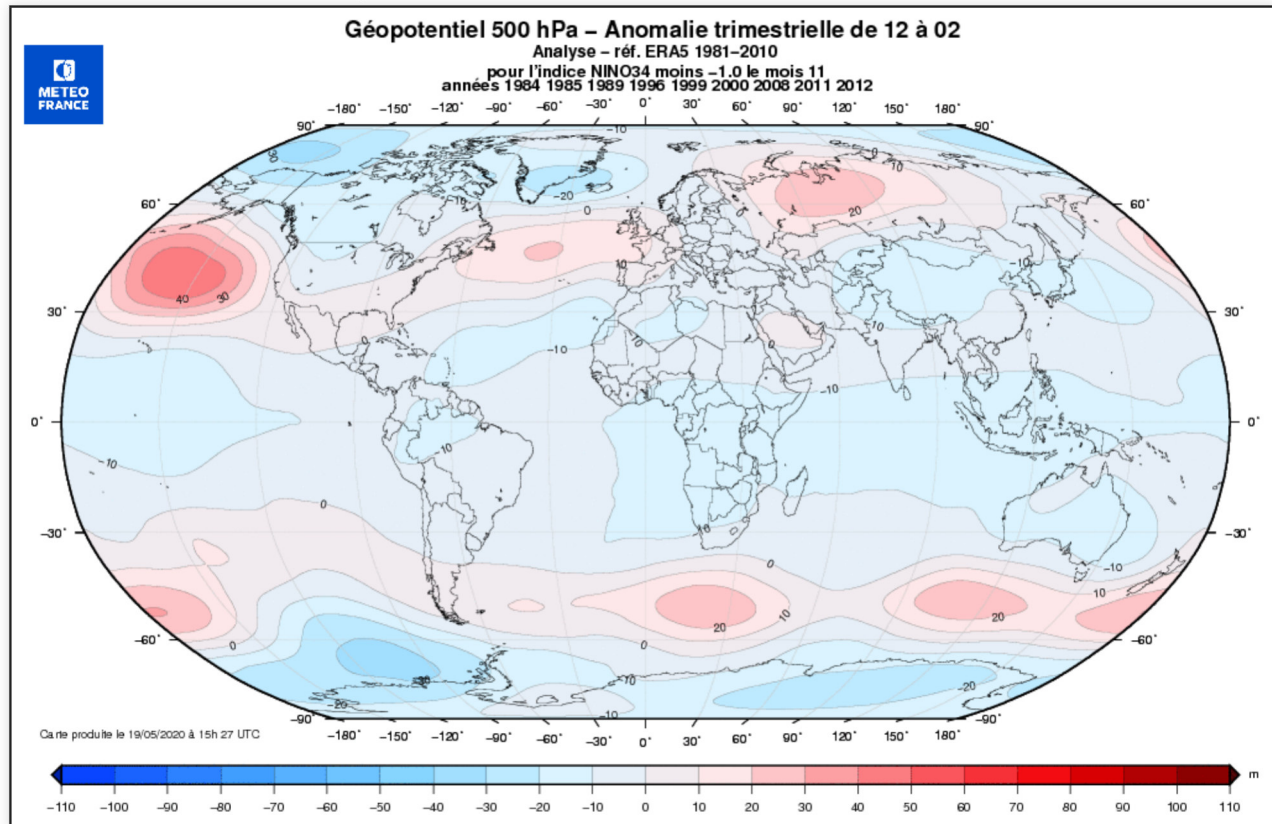
DMI index close neutrality or slightly warmer during the next quarter



DMI index : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

Drivers : Pacific SST : Statistical effect of La Nina

The composite field of Z500 for La Nina years is shown below.



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

Drivers : Summary

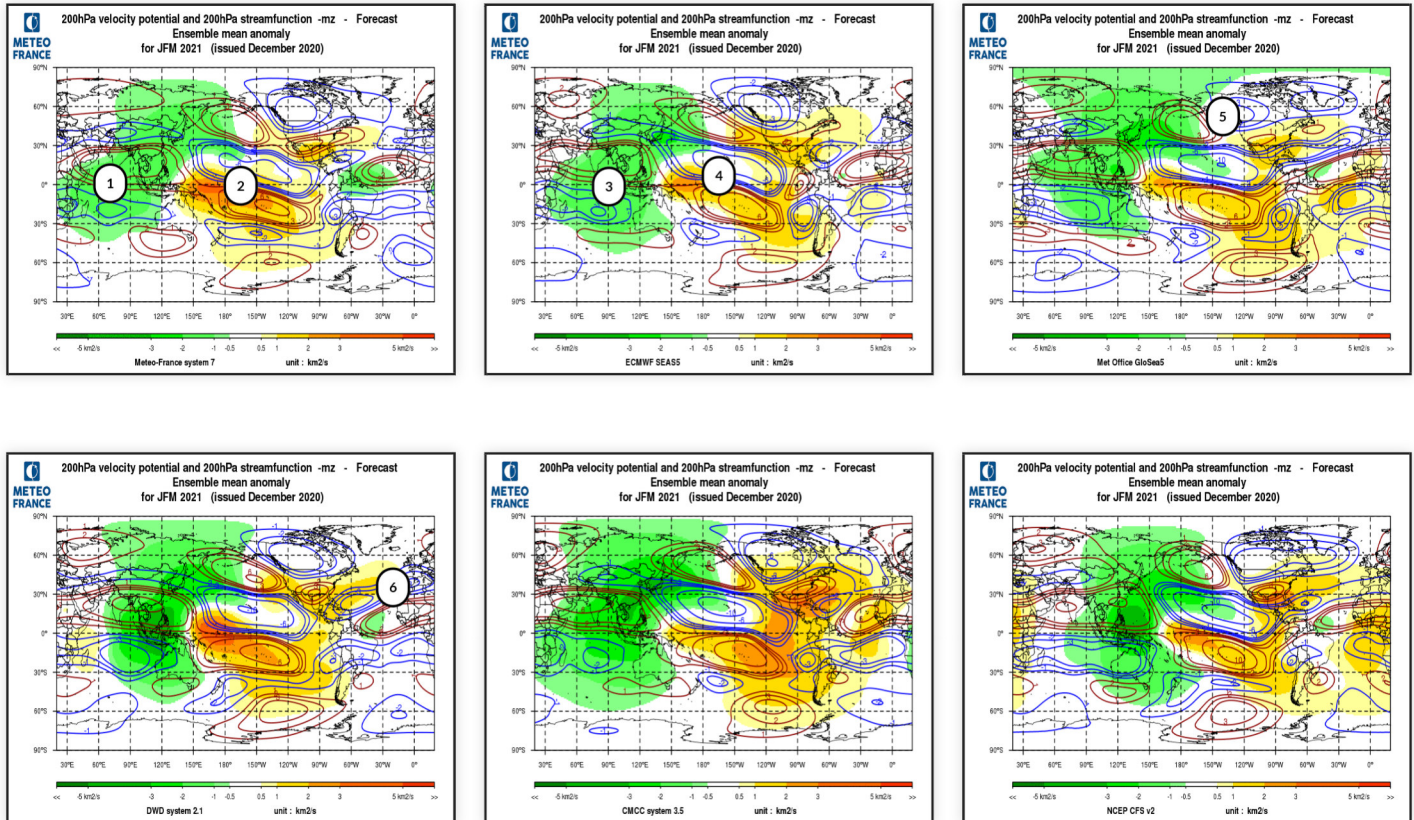
In winter La Nina conditions favor the Atlantic Ridge regime

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

Good agreement between the models in both PV and FC.

Velocity Potential : the models foreseen a principle dipole in the Pacific-Indian zone, and a secondary dipole in the America-Atlantic-Africa zone.

Streamfunction : The models agree remarkably well both in the tropics and for teleconnections to mid-latitudes, both in the Pacific and in the Atlantic.

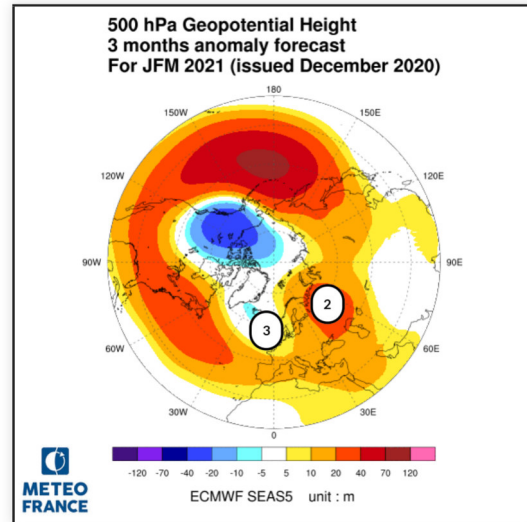
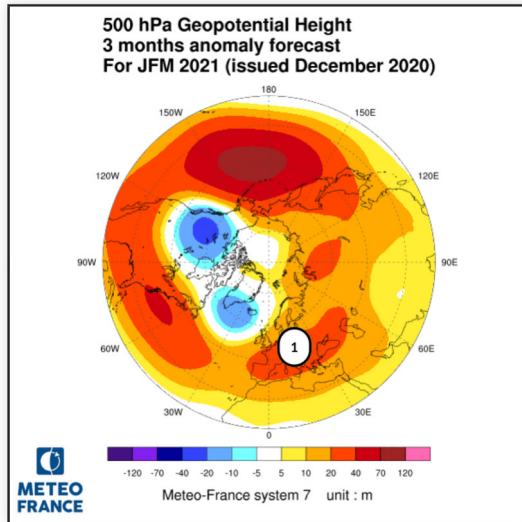


MF7, SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

- 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 - teleconnections to North America.
- 6 - teleconnection to the Atlantic

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Very good consistency overs the Pacific and North America. Both models opt for a high value belt from America to Europe and a lower field to Greenland (NAO+), however SEAS5 is much hollow with lower values from Iceland to the British Isles and the high values shifted to Eastern Europe.

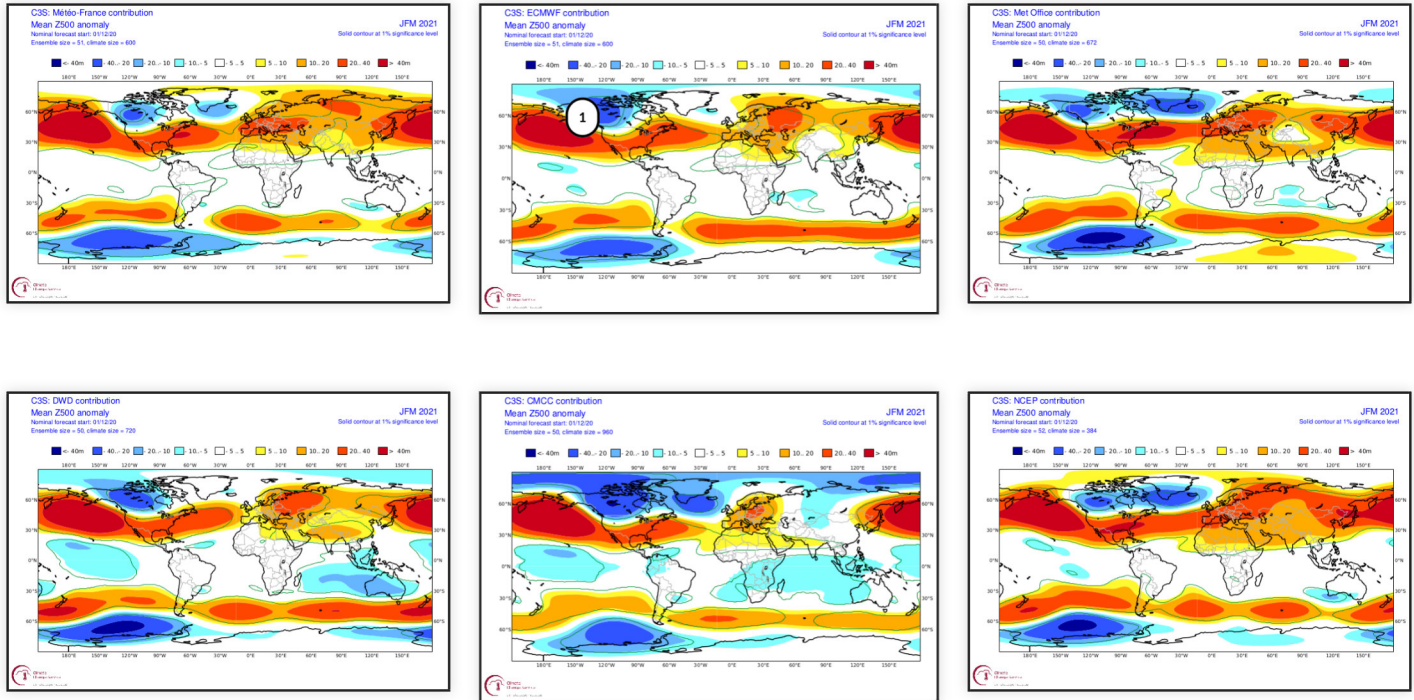


polar projection of MFT and SEAS5 500hPa geopotential height anomalies.

- 1 - Positive anomaly positioned on a large part of Europe
- 2 - Positive anomaly in Eastern Europe
- 3 - Relative weakness of anomaly

Atmospheric circulation forecasts : Z500 anomalies in C3S models

Good agreement between the models all over the globe. In the northern hemisphere, almost all models agree for high values of Z500 from the Northern Pacific to United States and Europe, and low values further north. The PNA- structure is very marked. The precise positioning and the value of the minimum near Iceland can vary from a model to another. It is generally quite north, close to the NAO mode of variability pattern, or a NAO+ weather regime structure slightly shifted to the north.

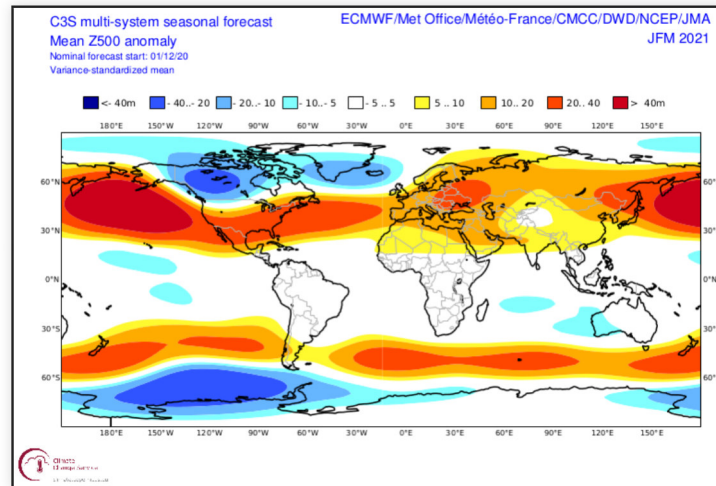


MF-S7, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

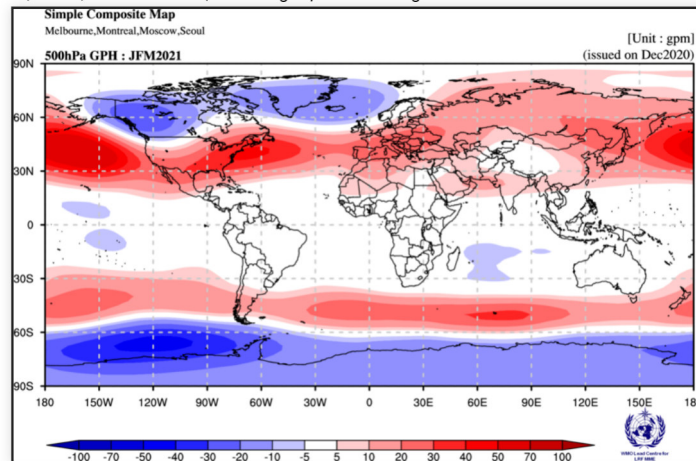
1 - classical scheme of PNA-

Atmospheric circulation forecasts : Z500 anomalies multi-systems

The two multi-models are very close. The low mean values predicted over the Atlantic near Iceland is more marked in the non-C3S multi-model.



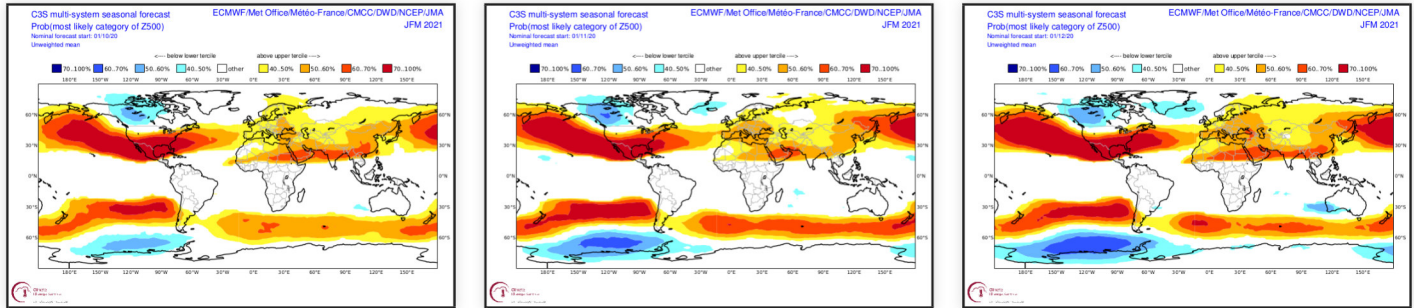
C3S multi-models (MF-S7, SEAS5, UKMO, DWD, CMCC, NCEP and JMA) 500hPa geopotential height anomalies.



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

Atmospheric circulation forecasts : Forecast stability

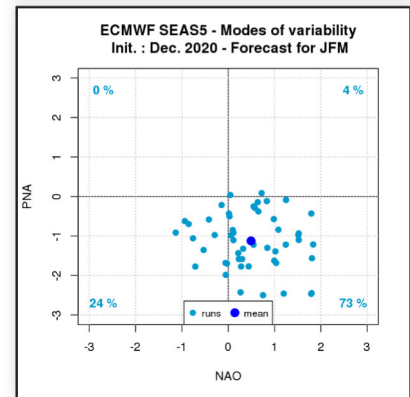
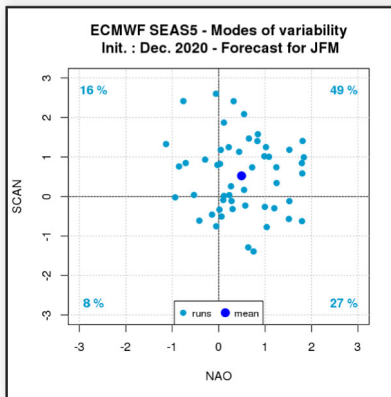
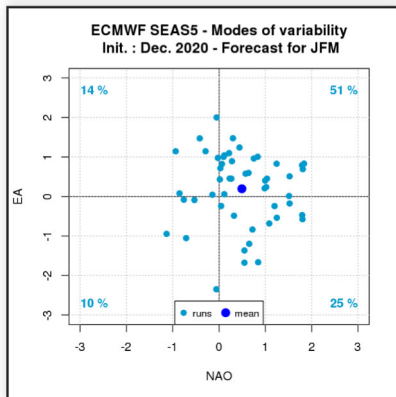
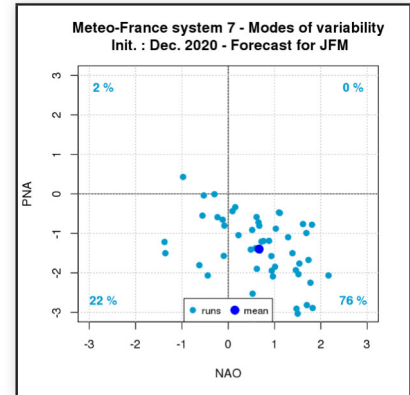
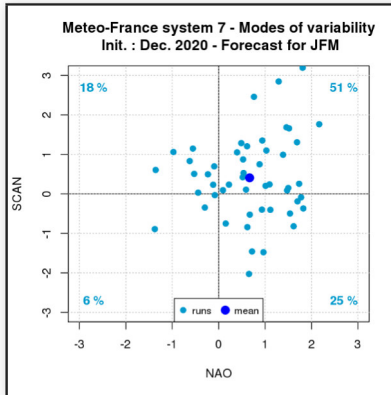
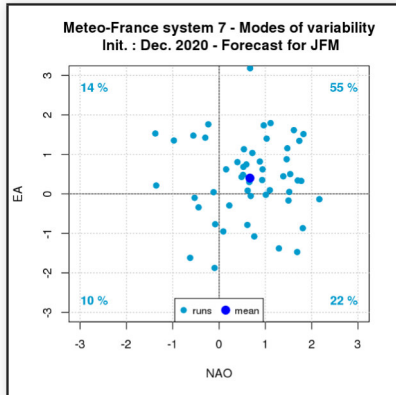
The C3S multi-model has good stability of its Z500 forecast for the JFM quarter. It maintains its pattern and gradually strengthening it.



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

Modes of variability : forecast

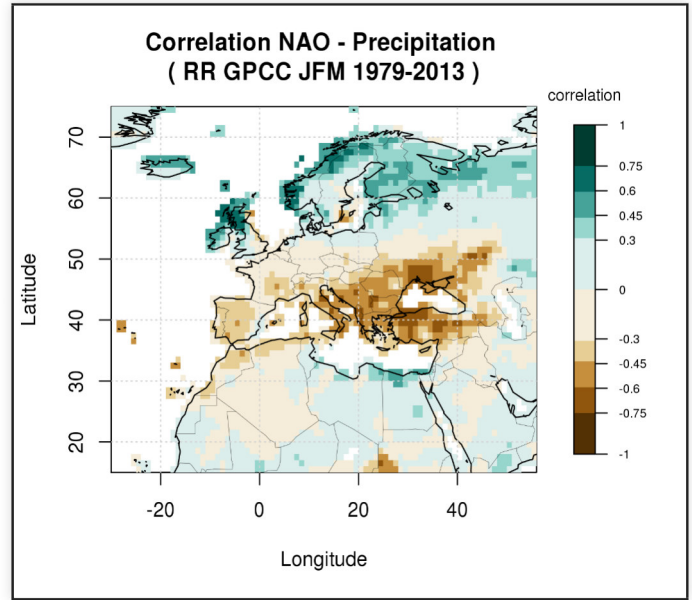
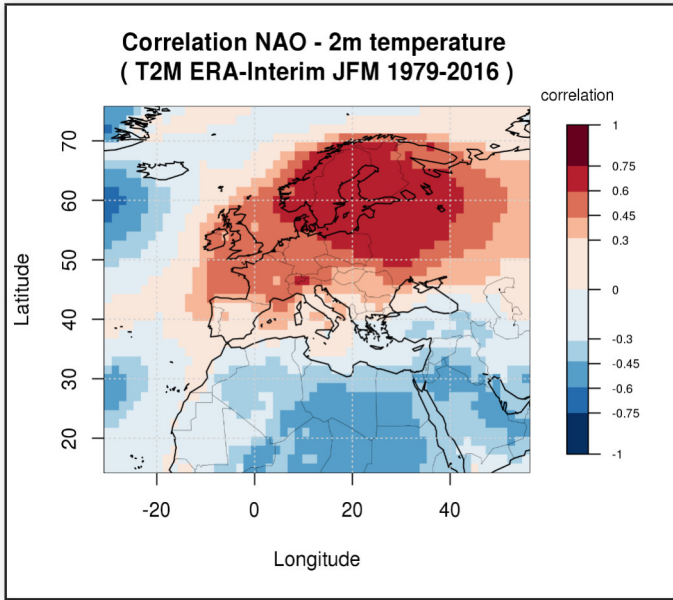
The two models are very close. Totally strong negative PNA. Majority NAO + EA + and SCAN +.



[see the modes of variability patterns](#)

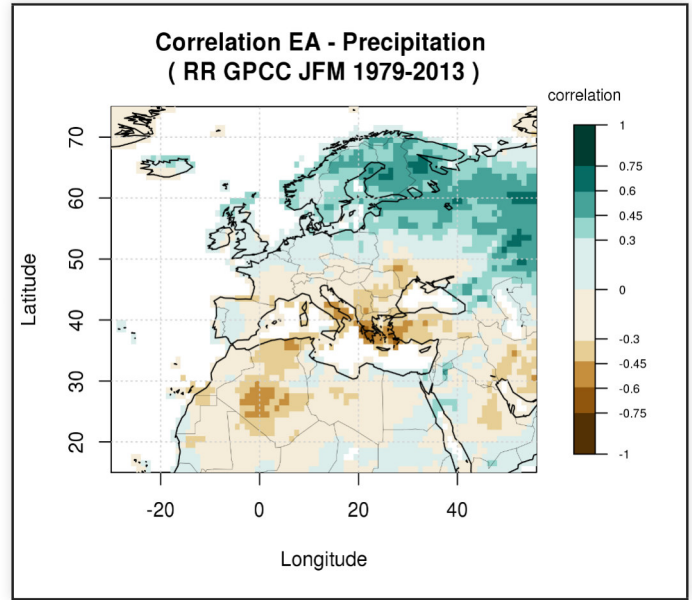
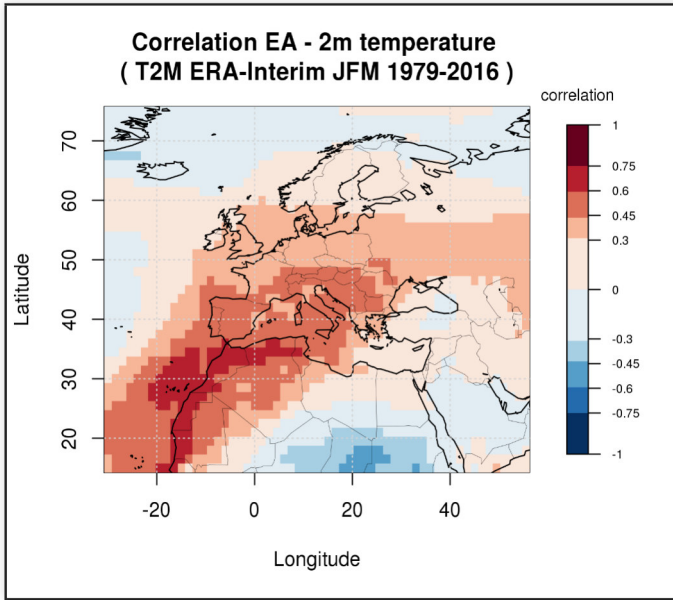
Modes of variability : NAO impacts

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



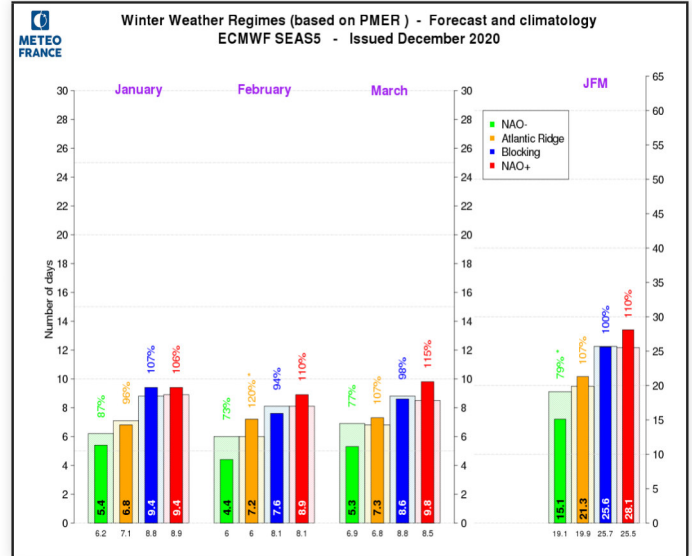
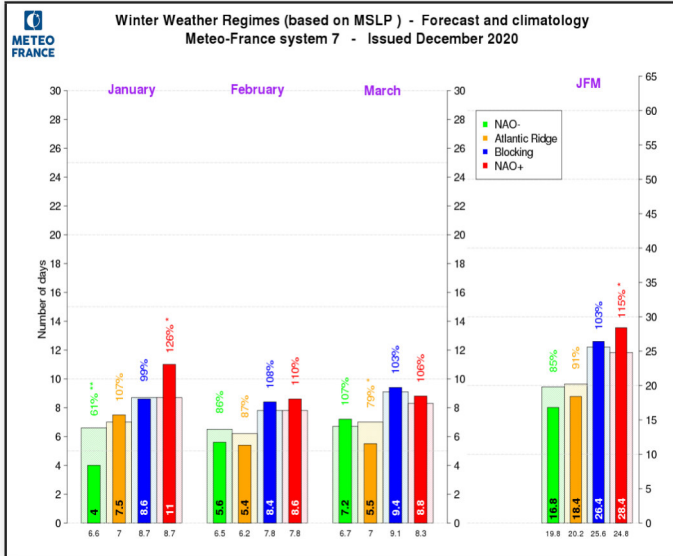
Modes of variability : EA impacts

EA mode has a strong influence in particular on the temperature for Western Europe.



Weather regimes : winter MSLP

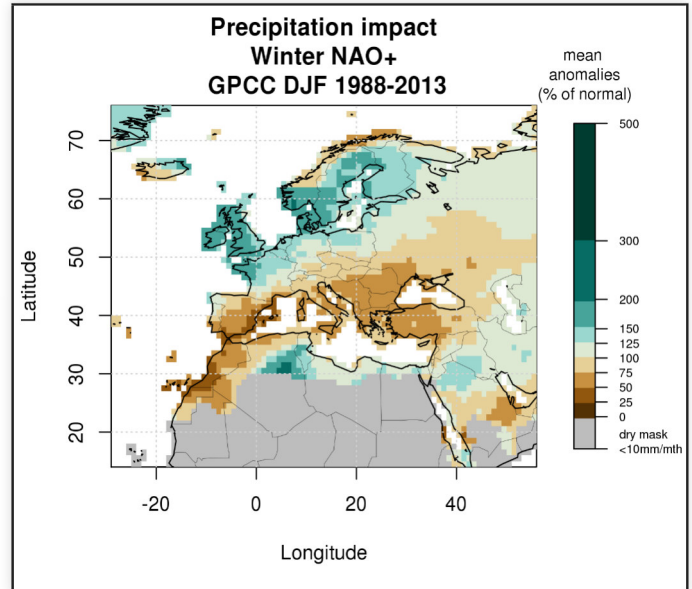
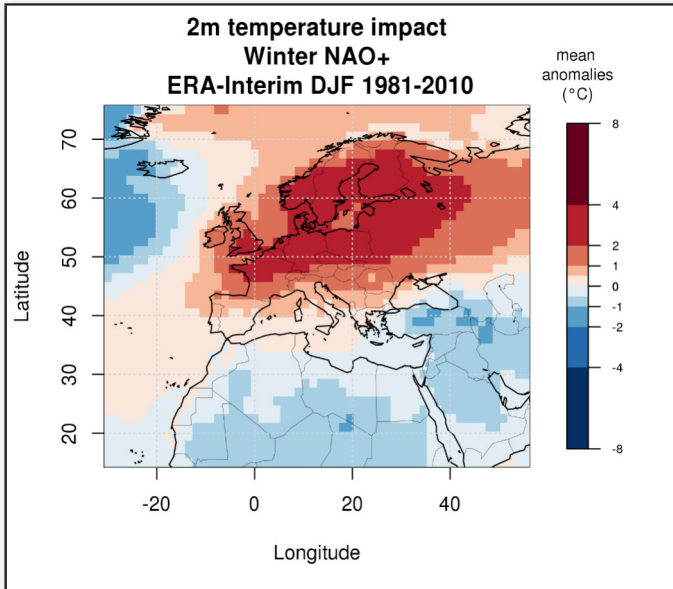
The NAO+ regime is favored to the detriment of NAO- regime.



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

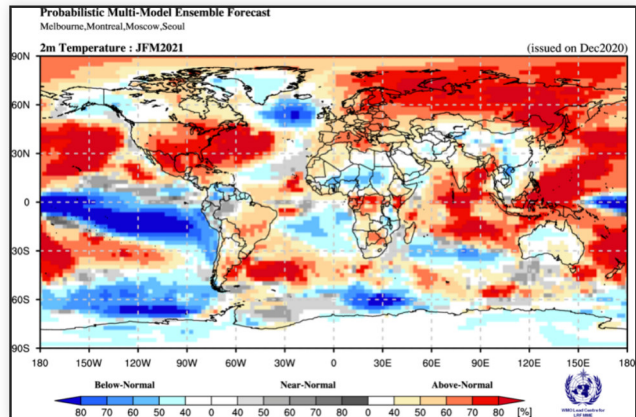
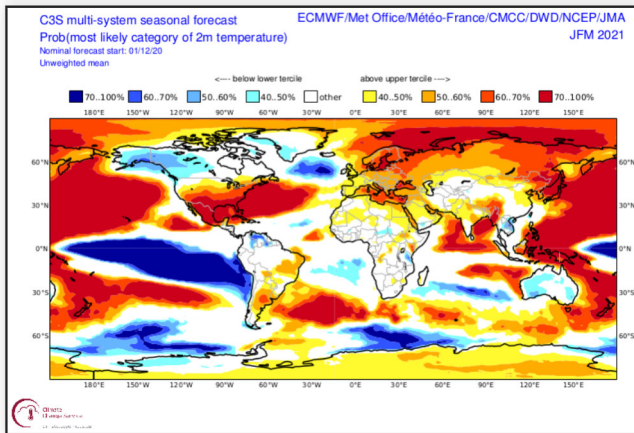
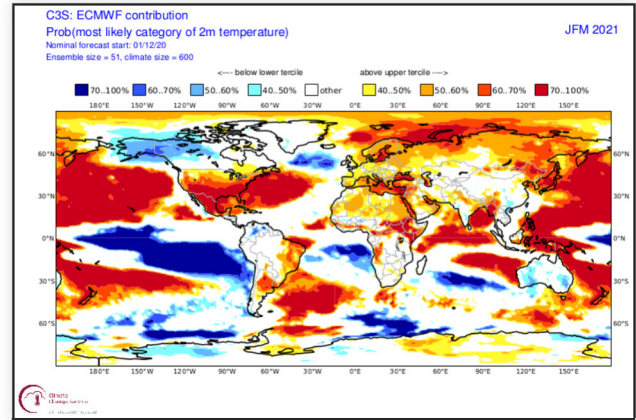
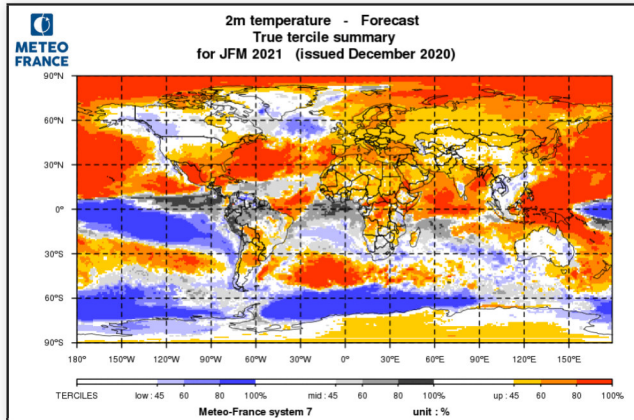
NAO+ weather regime should be favored



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

Forecast of climatic parameters : Temperature probabilities

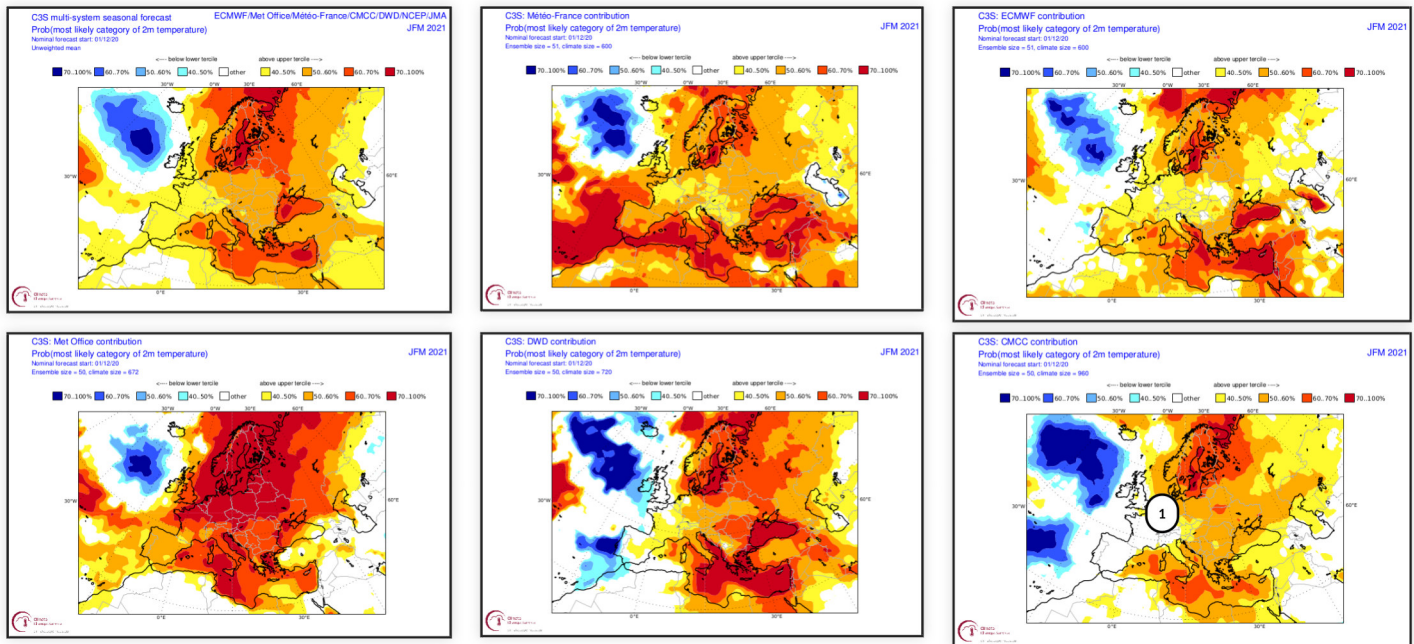
The models are very constrained by the La Nina situation. They give extremely consistent temperature forecasts.



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

A warm signal dominates on Mediterranean on Scandinavia and eastern Europe. Over Western Europe, no signal or weak tendency to warm temperatures.



C3S multi-models probability map (top left) and MF-S7, ECMWF-SEAS5, UKMO (bottom left), DWD, CMCC models.

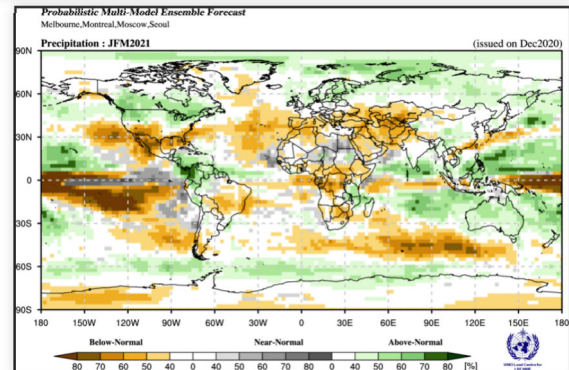
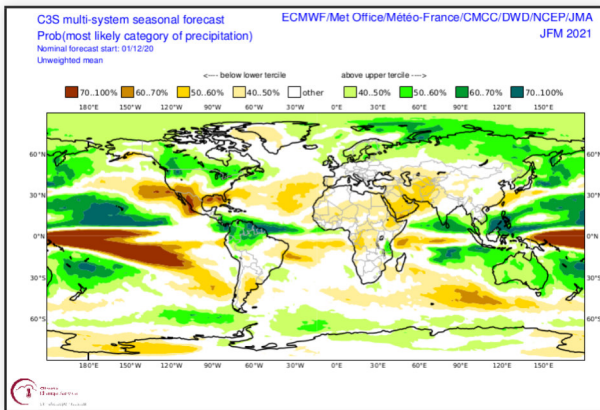
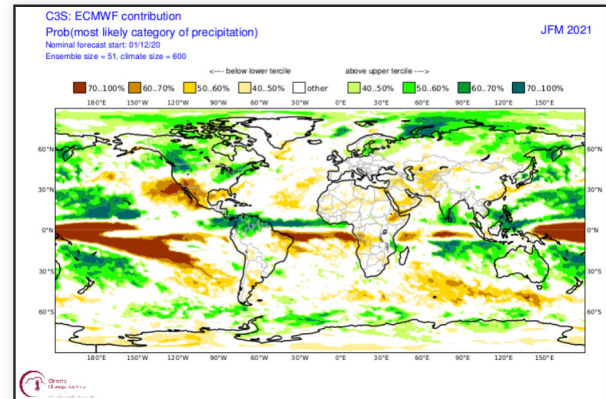
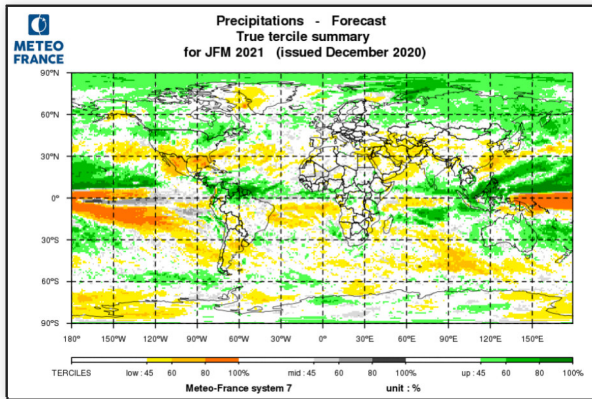
1 - CMCC has the colder forecast

Forecast of climatic parameters : Precipitation

In the tropics, the forecasts remain very similar to those of the previous months. Heavier than normal precipitation is likely from the Maritime Continent to Australia, as well as over northern South America.

Drier than normal from Mexico to Spain via the Atlantic, as well over Middle East

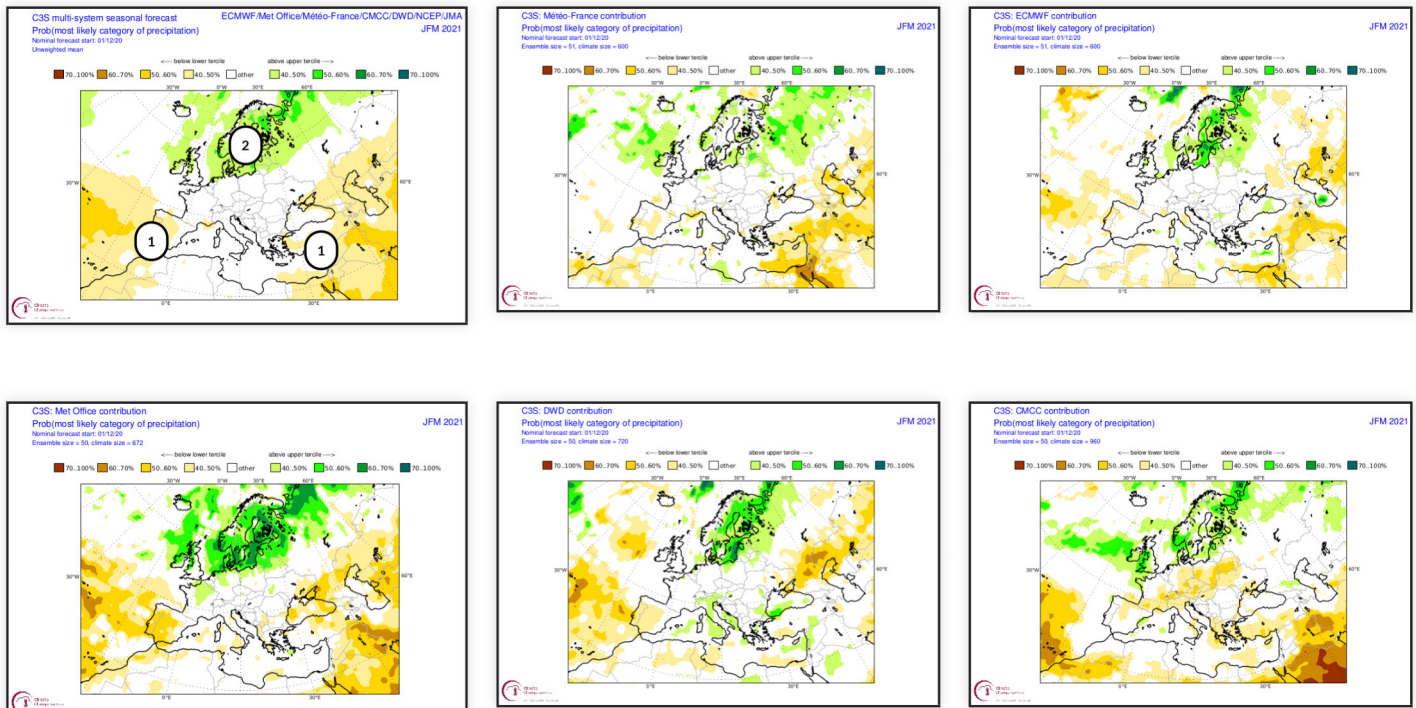
More rain than normal likely in higher latitudes.



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

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 NAO+ regime favored by models.

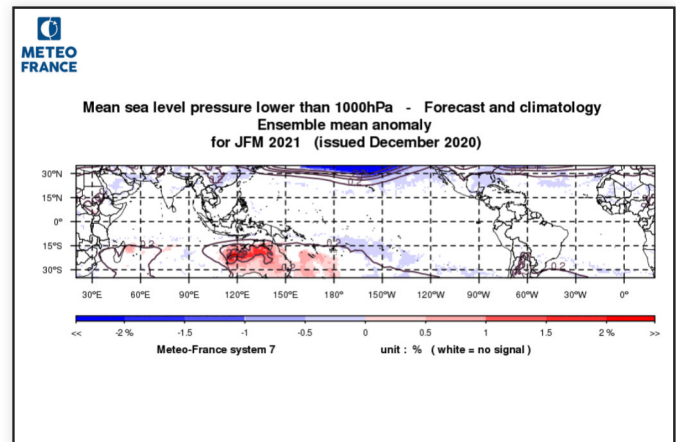
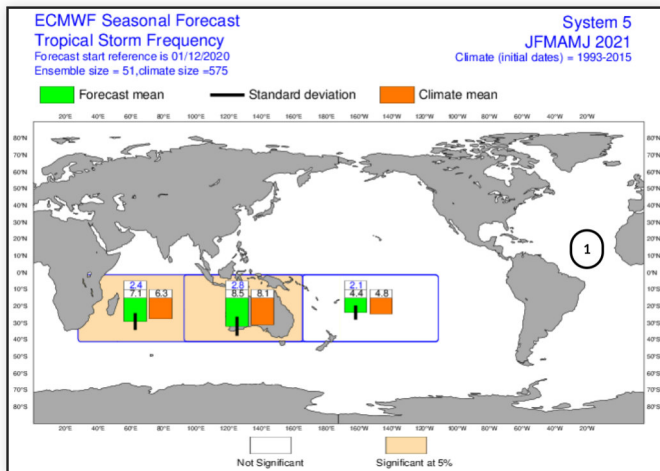


C3S multi-models probability map (top left) and MF-S7, SEAS5, UKMO, DWD, CMCC models.

- 1 - Dry signal linked to high geopotential forecasted
- 1 - Dry signal linked to high geopotential forecasted
- 2 - weak wet signal

Forecast of climatic parameters : Tropical Storm Frequency

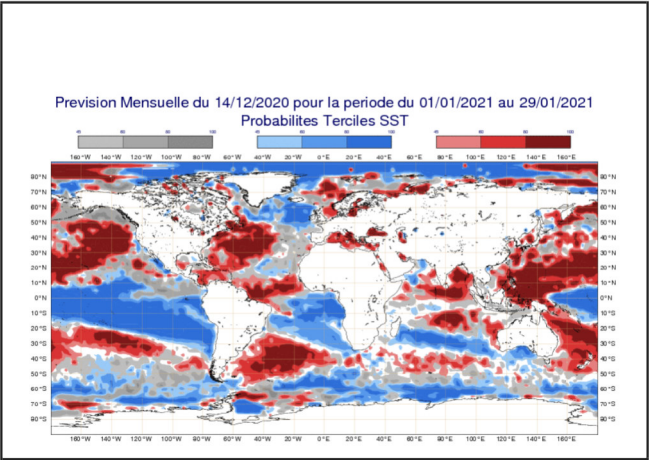
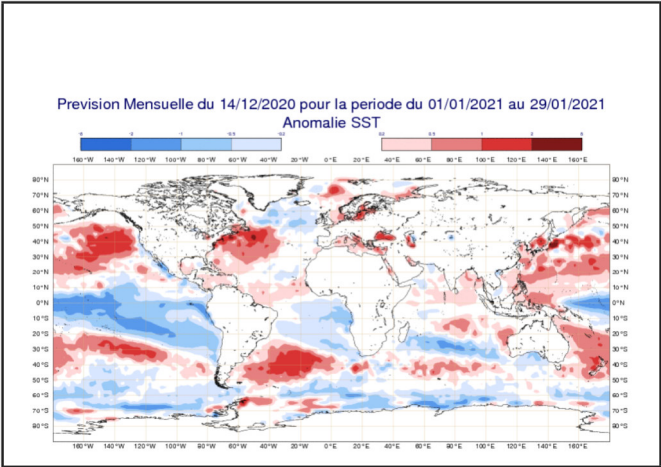
In the well-established La Nina situation, cyclone risk likely decreases in the central Pacific and likely increases around Australia and in the southwest Indian Ocean



1 - close to normal

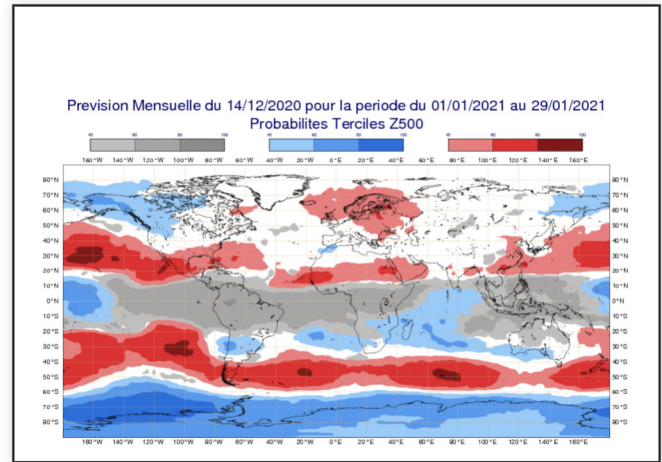
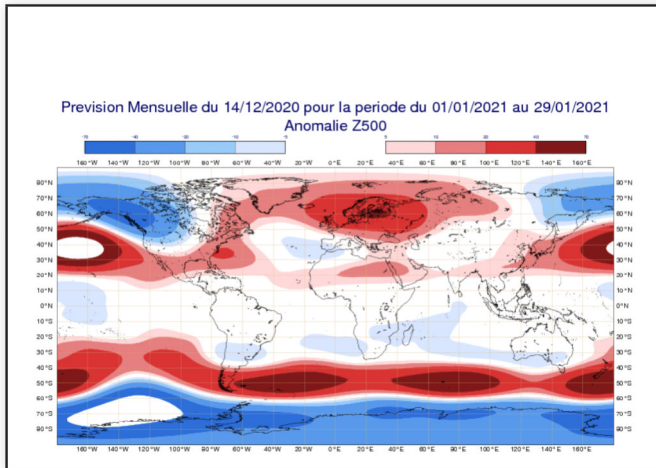
Monthly forecast of 20201214 : SST

The monthly forecast is very consistent with the seasonal forecast.



Monthly forecast of 20201214 : Z500

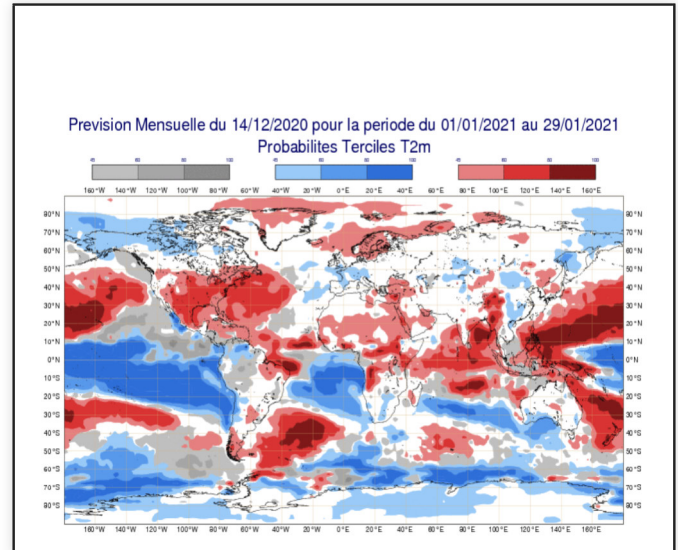
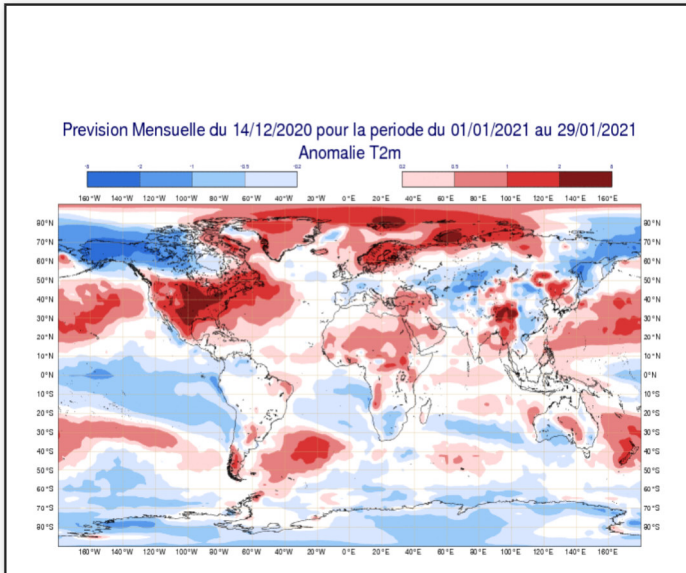
Negative PNA mode is present as in seasonal forecasts. Over Europe the monthly forecast is different from seasonal forecast with anomalies close to blocking regime



Monthly forecast of 20201214 : temperature

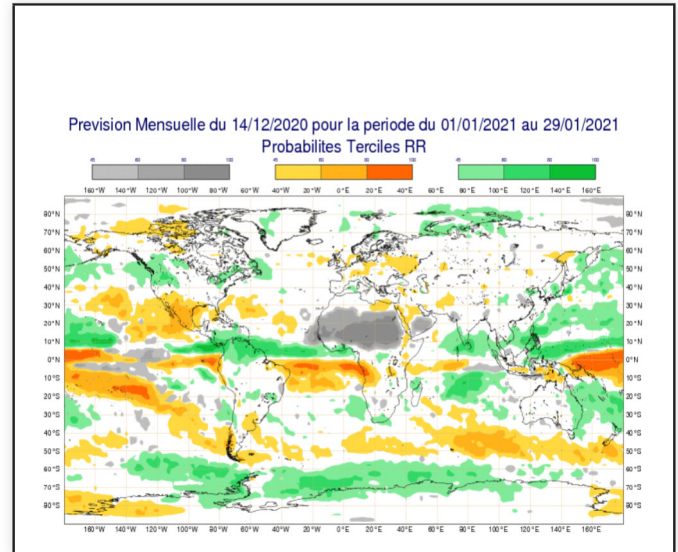
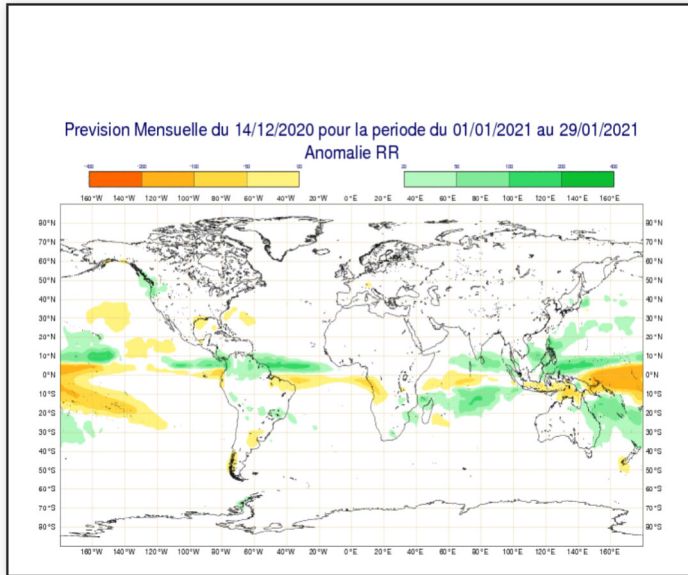
Dipole anomaly forecast for NorthAmerica compatible with seasonal forecast.

On Europe monthly forecasts are colder than seasonal forecasts.



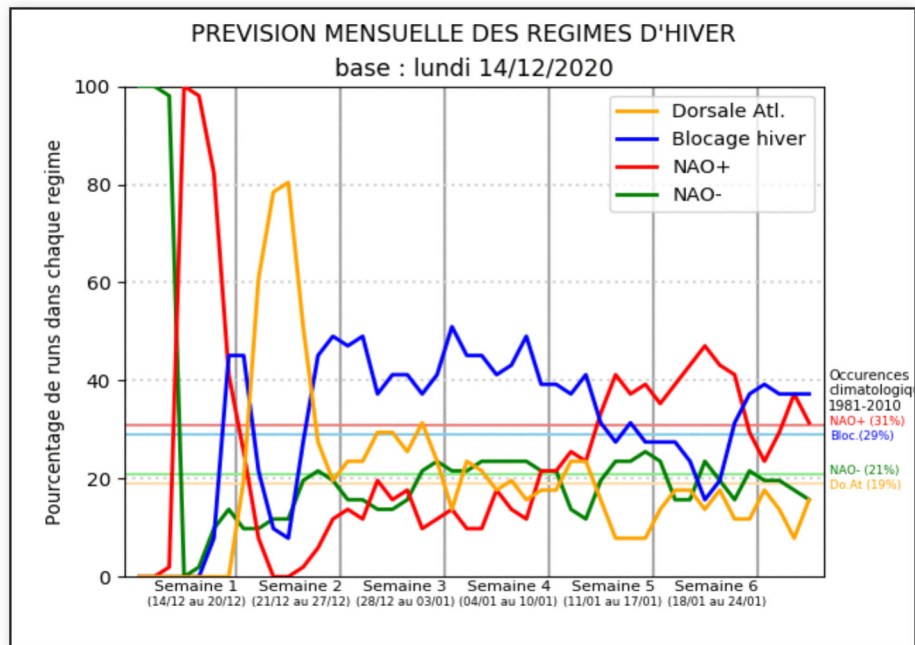
Monthly forecast of 20201214 : precipitation

A weak dry signal is present over Europe contrary to seasonal forecast.



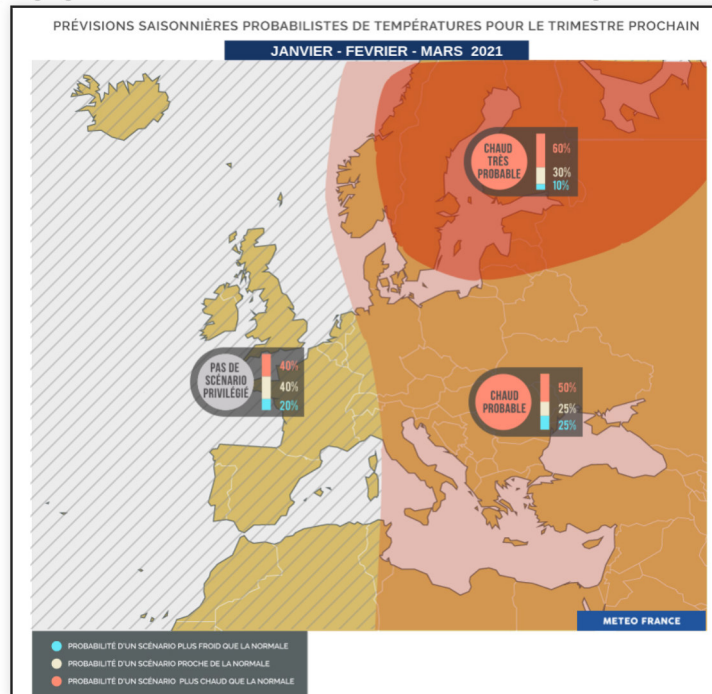
Monthly forecast of 20201214 : winter SLP weather regimes

The dominant NAO+ regimes in the seasonal forecast isn't present in the monthly forecast which favors Blocking.



Synthesis map for Europe : Temperature

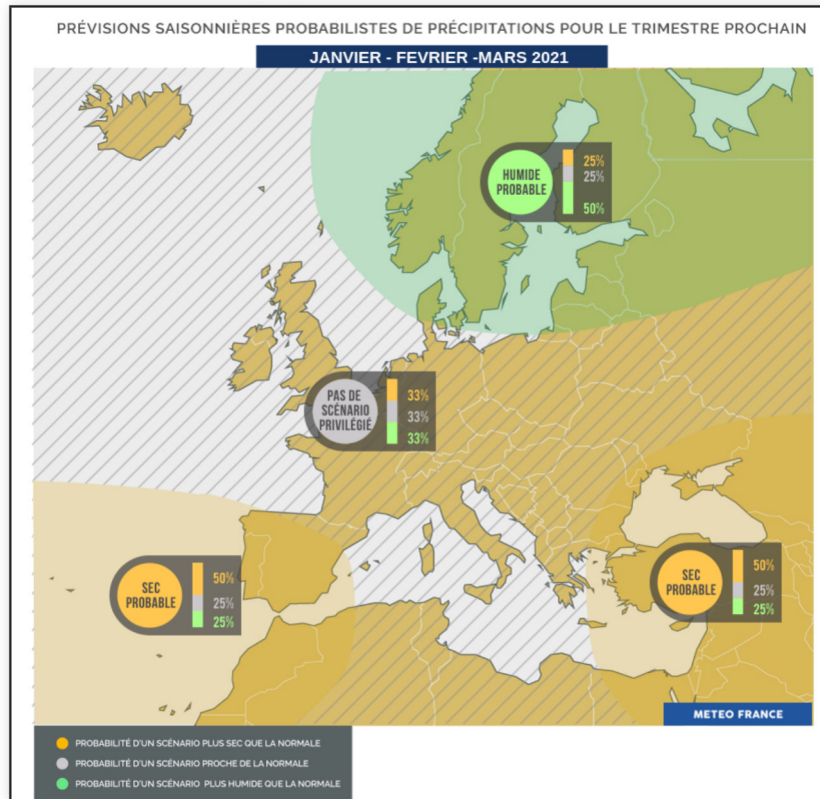
Temperatures are expected to be milder than normal from Scandinavia to Eastern Europe and Mediterranean. Further west, the oceanic influence is thwarted by high geopotential fields and no dominant scenario emerges for temperatures.



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

Synthesis map for Europe : Precipitation

Oceanic influence is expected to be stronger than normal over and around Scandinavia, bringing additional precipitation. Conversely, the south-east of Europe, the east of Mediterranean basin and the Iberia peninsula should remain mostly away from disturbances, hence precipitation probably below normal. No majority scenario between these three areas.



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