

Météo-France Seasonal Forecast Bulletin

MARCH - APRIL - MAY 2020

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General synthesis : MAM 2020

A) Oceanic forecast :

very good agreement between models.

- **neutral ENSO situation** for the coming 3 months. Cold anomaly over the southeastern Pacific. Warmer than normal elsewhere.

- Return to neutral IOD but still **warm SST anomaly along the African coasts of the Indian Ocean.**

- **South tropical Atlantic** significantly warmer than climatology.

B) Atmospheric circulation :

remarkable agreement between models.

- Upward potential velocity over western Indian Ocean/Eastern Africa and North Pacific. Downward potential velocity over South Pacific and maritime continent more or less marked.

- On northern hemisphere **EA+ and NAO+ continue to be favoured by most models**, in a very good continuity with the last month's forecast, likely related to the highly positive IOD in recent months.

=> Most likely conditions :

- Generally warmer than normal with the exception of North America and the Indian subcontinent. Wetter than normal over eastern Africa, northeast Brazil, and also at high latitudes in the northern hemisphere. Dry over southern Africa, Australia (signal attenuated) and the tropical North Atlantic.
- **For Europe :**
warmer than normal. Wetter than normal on the north, drier than normal on the southeast and the Mediterranean basin.

Oceanic analysis of January 2020 : SST anomalies

Current situation : Neutral ENSO conditions. Returning to neutral IOD.

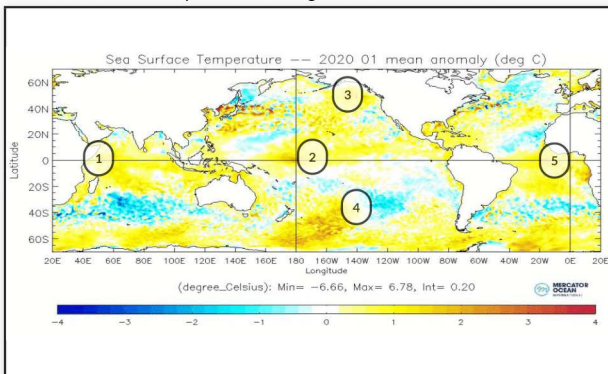
Index issued from Mercator Ocean PSYV4R2 analysis :

NINO3.4 : +0.3 °C (see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

DMI : close to 0°C Returning to normal seasonal values

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

TSA : +1.2°C it corresponds to a strong deviation from normal.



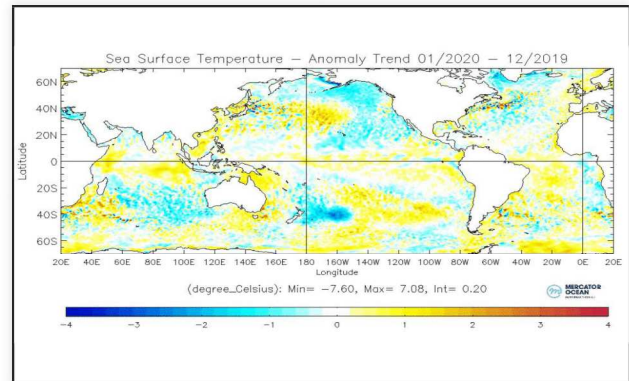
2- still warmer than normal in the western equatorial Pacific

1- still warmer than normal

3- hot anomaly lessens compared to previous month

4- attenuation of the anomaly dipole

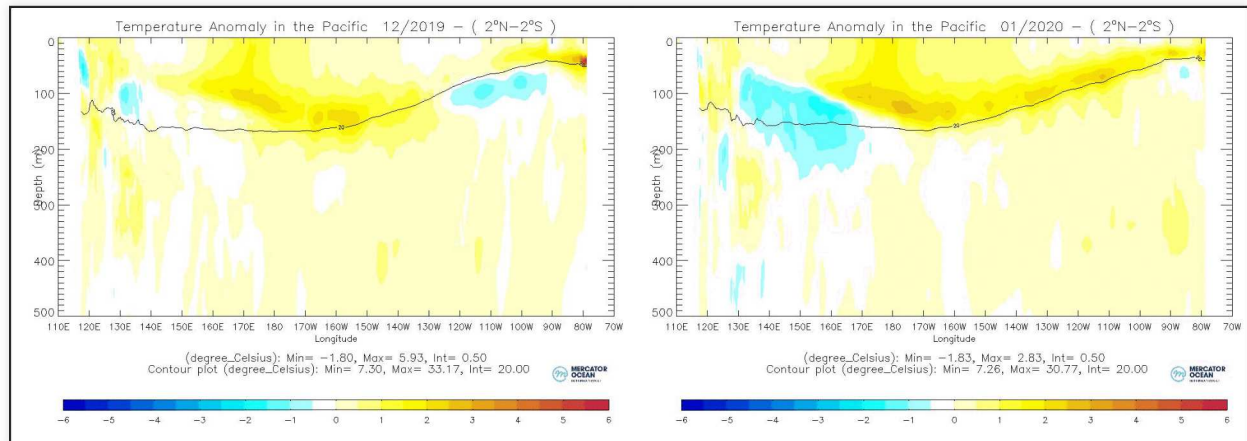
5- Strong positive SST anomalies relative to the climatology



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

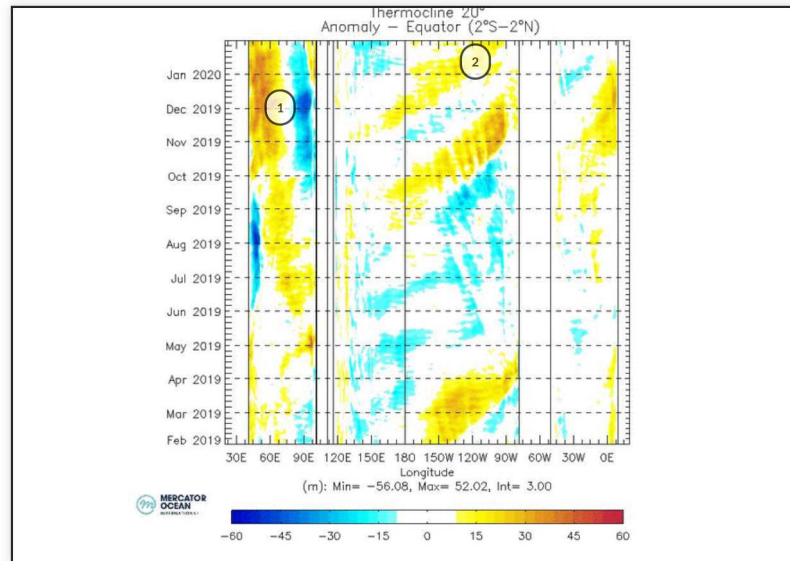
Oceanic analysis of January 2020 : vertical section

hot subsurface anomalies propagating towards the east of the basin last month



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

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



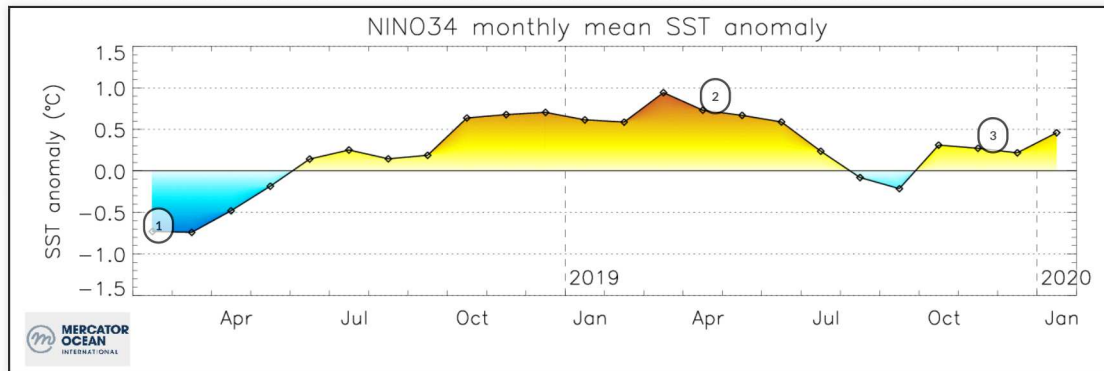
1- Strong IOD

2- Weak waves in the Pacific Ocean

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

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

Slight increase in this index last month. ENSO remains in neutral conditions near the borderline of weak El Niño.



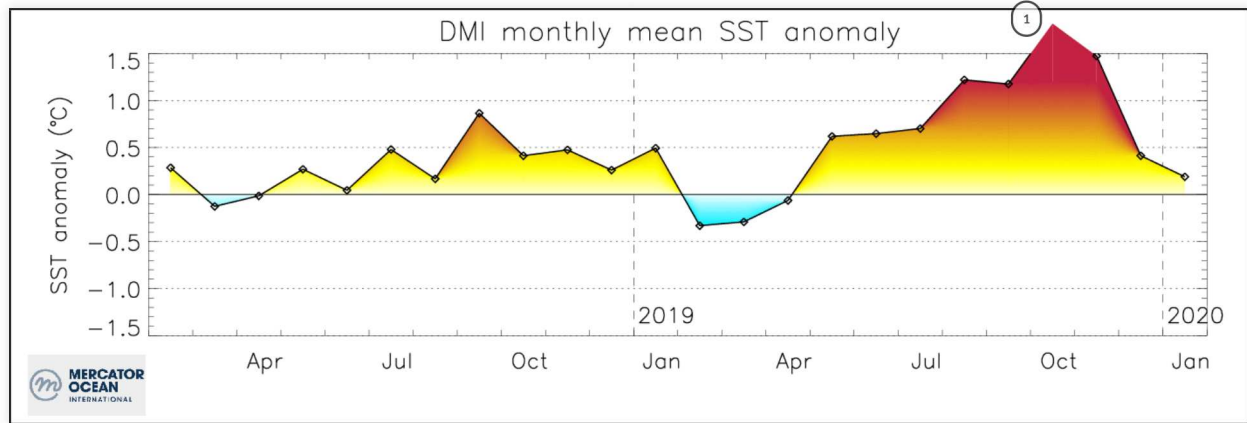
2- Weak El Niño during winter 2018-2019 and spring 2019

1- La Nina event of winter 2017-2018

3- Neutral conditions

Evolution of SST in the NINO3.4 box

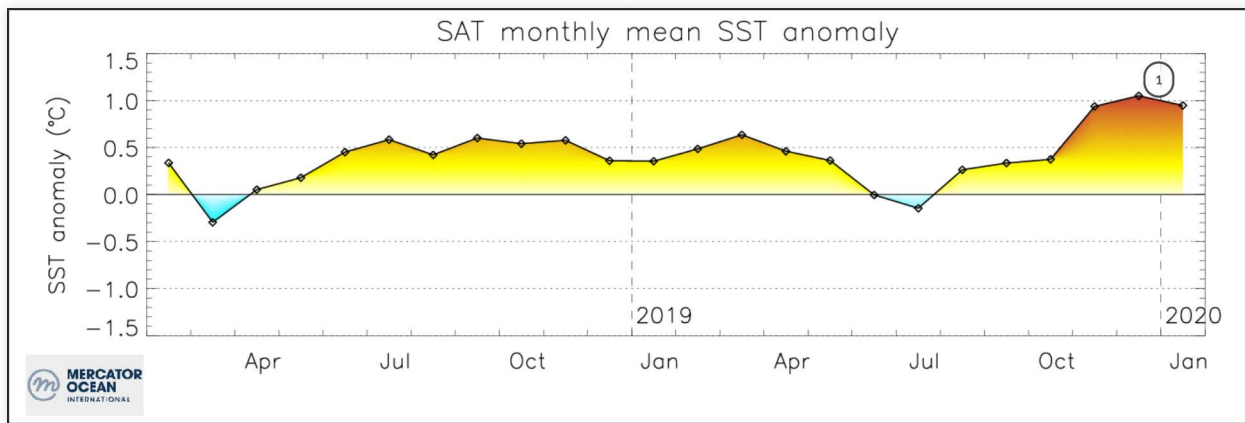
Oceanic analysis of January 2020 : Indien Ocean - DMI index history



1- IOD on record in october

Evolution of SST in the DMI box

Oceanic analysis of January 2020 : Atlantic Ocean : SAT index history



1- Strong deviation from normal for this index

Evolution of SST in the SAT box

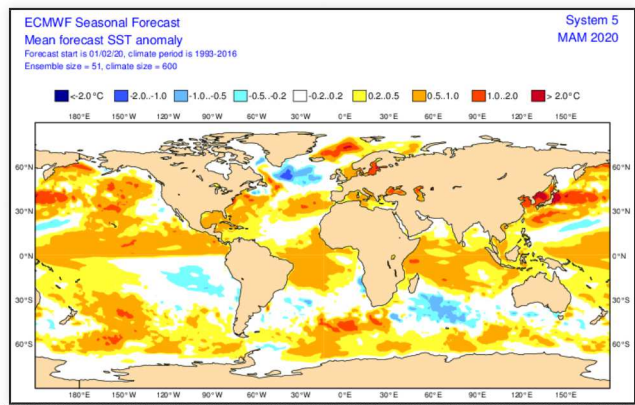
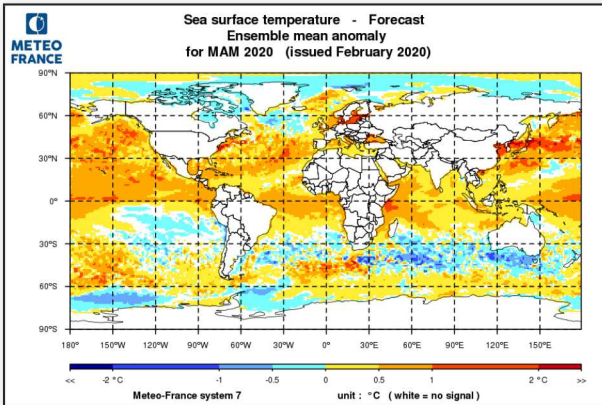
Oceanic forecast : SST anomaly

Good agreement between MF-S7 and ECMWF-SEAS5

In the Pacific Ocean : South of the equator, the cold anomaly over the eastern half should persist. Everywhere else the ocean is expected to be warmer than normal. The average anomaly over the Nino zone, straddling the equator, should remain slightly positive.

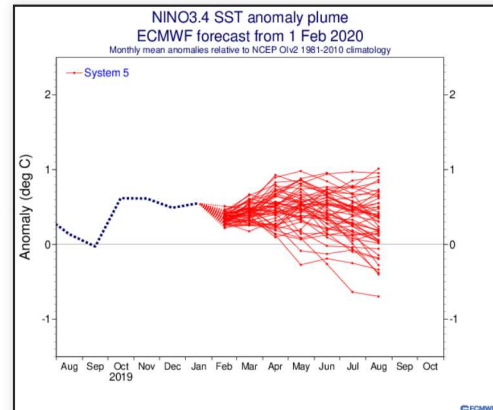
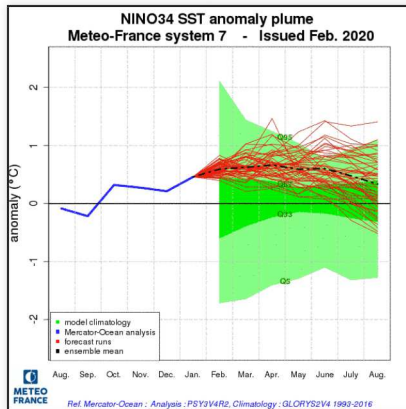
In the Indian Ocean : Generalized warm anomaly forecasted north of 30°S. Colder than normal south of 30°S.

For the Atlantic, Persistence of a large positive anomaly from the North American coasts and the Caribbean sea to the Iberian Peninsula. Persistence of the cold anomalies in southwest Iceland and neutral conditions off the African coast. Persistence of the positive anomaly south of the equator.



Oceanic forecast : NINO3.4 Plume diagrams

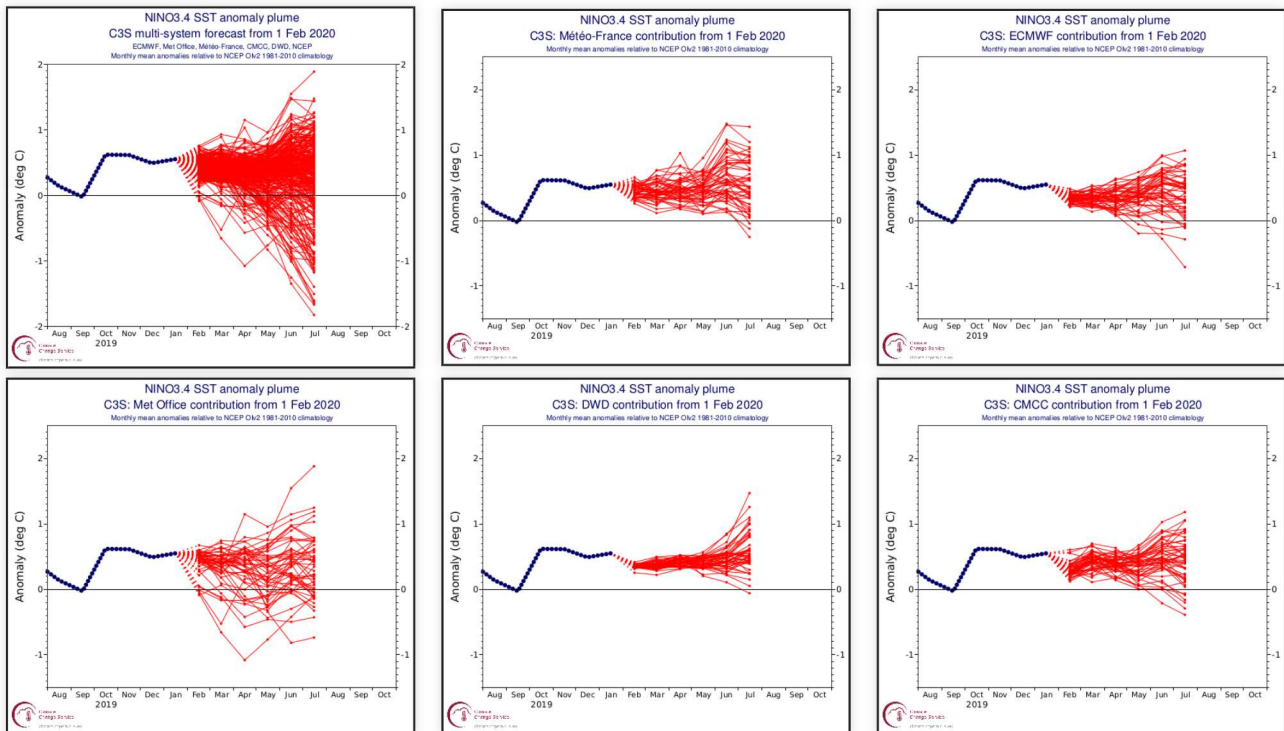
Signal stability pour the next few months with moderate dispersion.



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

Good agreement between models. Most members forecast a weak positive anomalie (about 0.3°C in average). Neutral El Nino conditions are therefore most likely for the coming months.

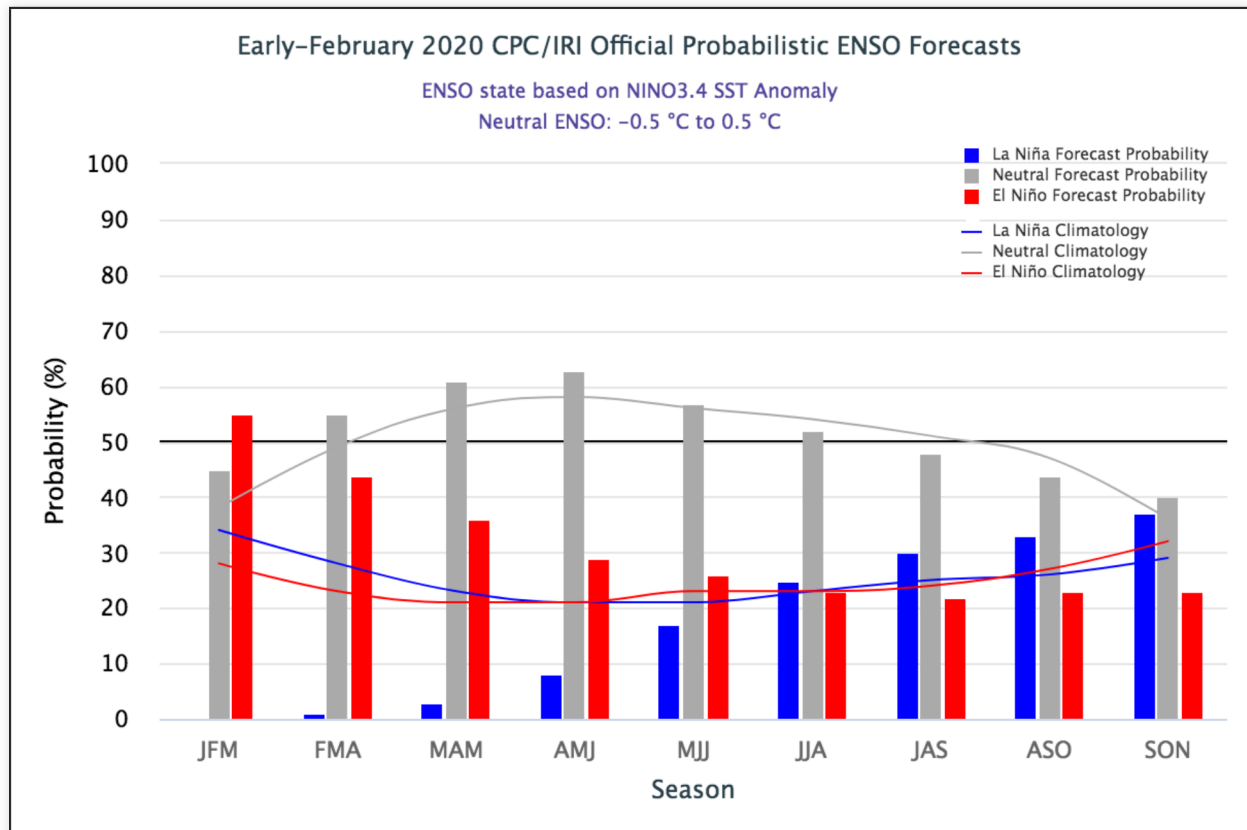
Forecasted Phase : neutral conditions, close to a weak Niño



C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010. https://climate.copernicus.eu/charts/c3s_seasonal/

Oceanic forecast : Synthesis from IRI

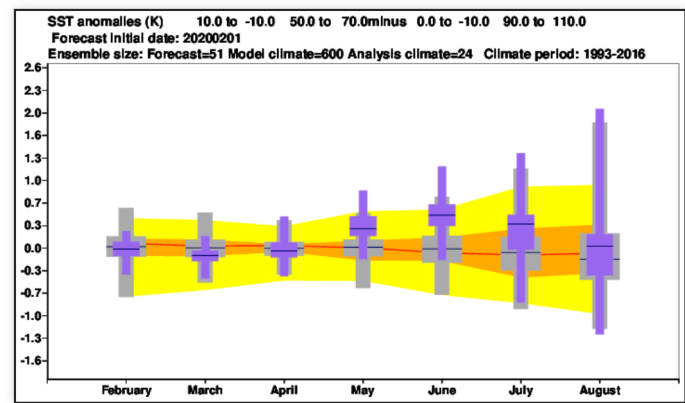
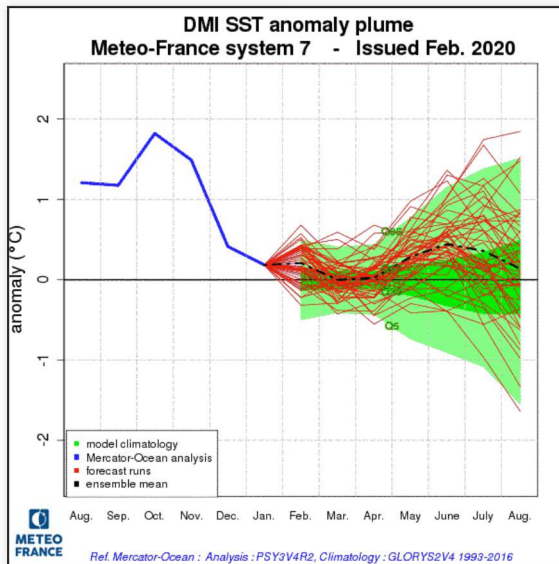
Neutral conditions are most likely (about 60 %) for the MAM period



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

Oceanic forecast : Indian ocean - DMI evolution

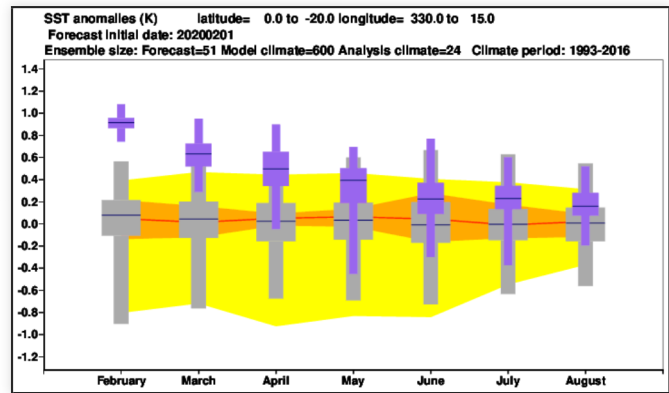
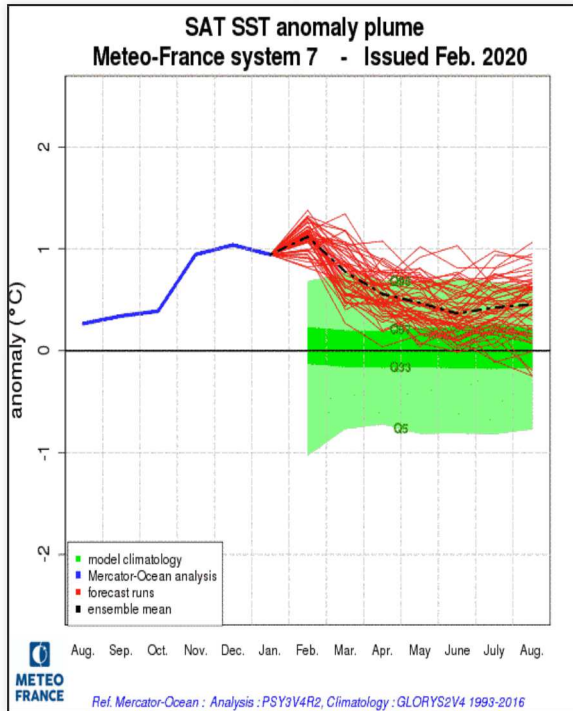
The expected DMI stay close to the normal.



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

Oceanic forecast : Atlantic ocean - SAT evolution

Gradual decrease in the SAT index which should, however, retain fairly strong values in the coming months compared to climatology (most members in the upper tercile).



Anomaly on the SAT box : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

Drivers : Indian and Pacific SST

According to this article : <https://journals.ametsoc.org/doi/10.1175/JCLI-D-14-00839.1>

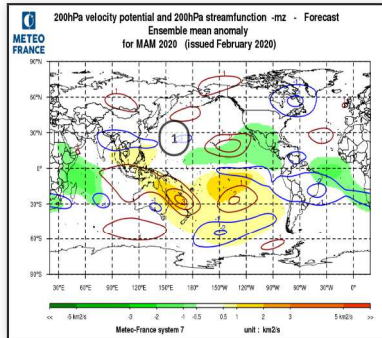
In the case of positive IOD dipole without ENSO event, NAM (North Annular Mode) is strong and positive during January-April (cf. fig 4.c)

This is consistent with the results of a statistical model with SST input and MSLP output, showing that NAO+ regime is favoured for the next quarter.

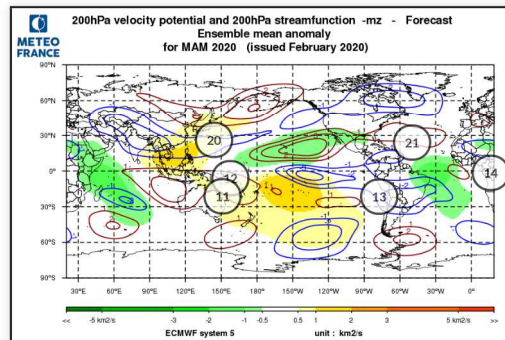
Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : The models converge for an area of upward motion over the western Indian Ocean/eastern Africa, North Pacific and South tropical Atlantic. The downward motion area on the South Pacific and Maritime continent is more or less marked according the models. They differ on the caribbean and South America : DWD and CMCC forecasts downward motion while MF7 and SEAS5 haven't signal.

Streamfunction : ECMWF,DWD and CMCC have a fairly coherent scheme, MF7 is less clear especially on the Pacific.



1- Less marked patterns in MF7, especially in SF and on the Pacific



11- VP : Persistence of upward motion area linked to positive SST anomaly

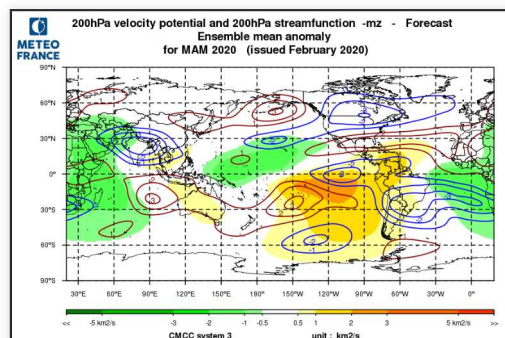
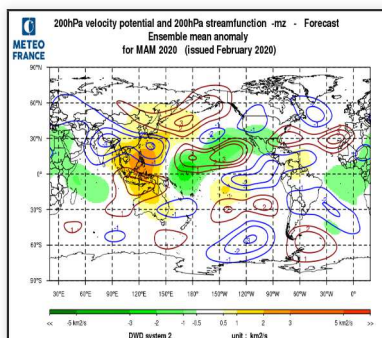
14- Subsidence zone on Central and South America, more or less marked depending on the models

13- VP : upward/downward motion area linked with hot/cold SST anomaly

12- This subsidence zone is linked to relatively cooler than normal waters

20- SF : Possible teleconnexion explaining the low geopotentials anomaly towards India and the high anomaly on the pacific north (see following map)

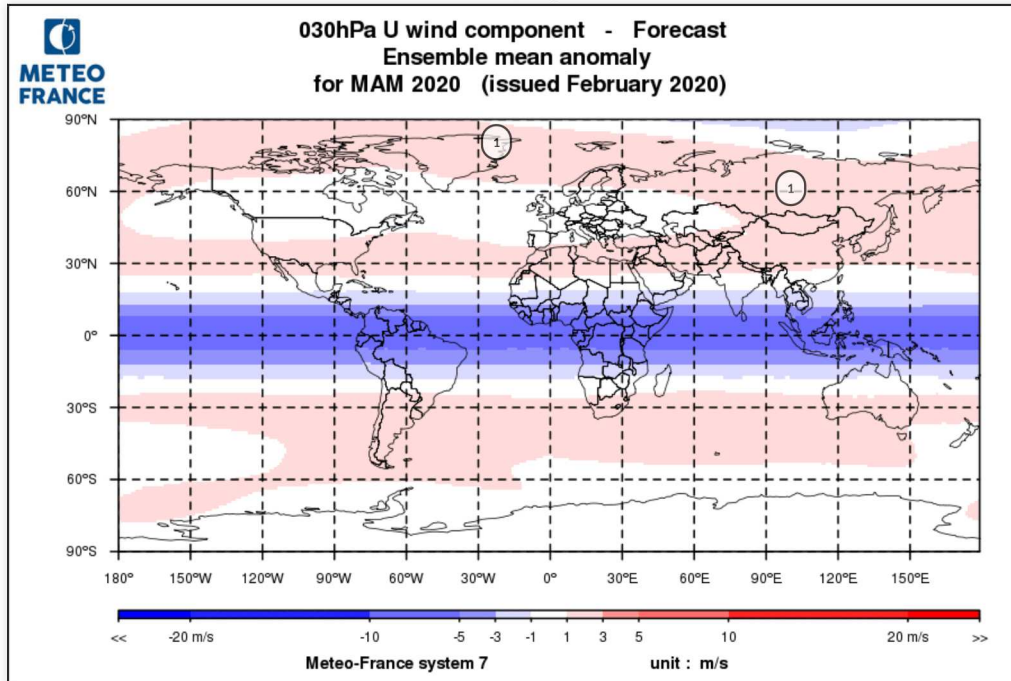
21- Possible teleconnexion



MF7, SEAS5, DWD and CMCC 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 forecasts : polar vortex

30 hPa zonal wind anomaly shows enhanced polar vortex for the coming 3 months. This should favour AO+ and NAO+ modes.

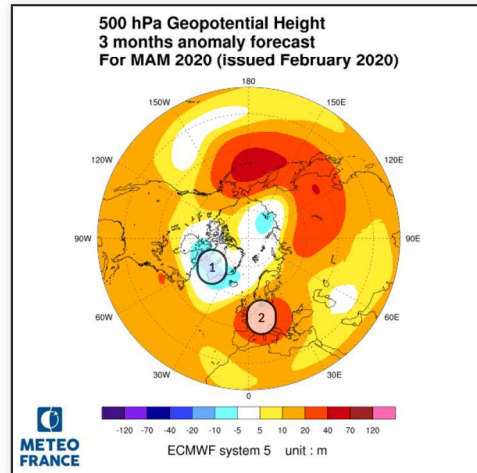
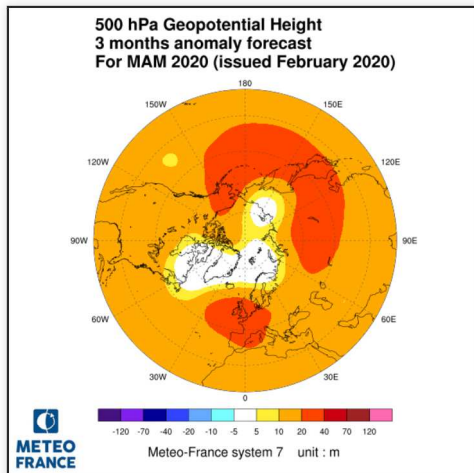


1- enhanced polar vortex

1- enhanced polar vortex

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

MF7 and ECMWF have a coherent scheme with low values at the pole and a high value belt at mid latitudes. ECMWF is more dynamic on the North Atlantic. ECMWF digs a minimum from the Middle East to China, which MF7 does not do.



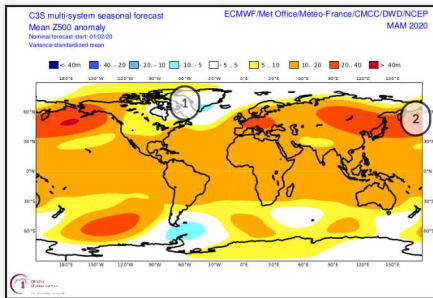
1- minimum more hollow

2- Larger maximum

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

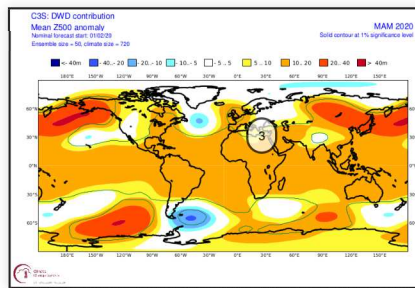
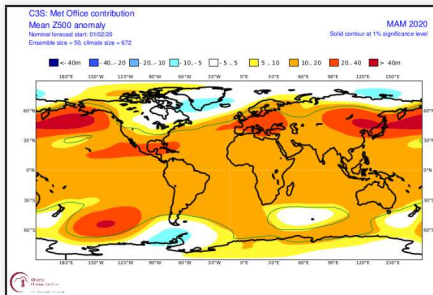
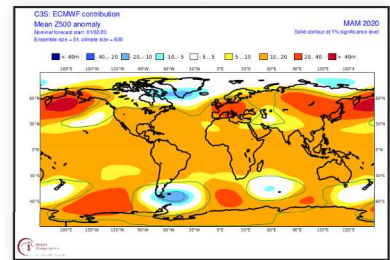
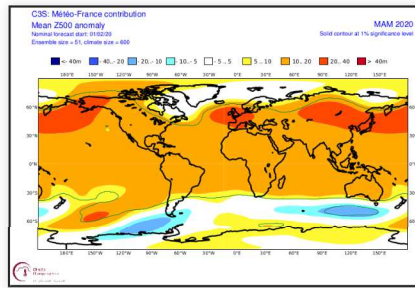
Atmospheric circulation forecasts : Z500 anomalies in C3S models

In the northern hemisphere, very good agreement between models regarding general situation for spring. The low geopotential from Middle East to China is the trace of the stream-function cyclonic anomaly (not seen by all models) unlike the high geopotential from East Asia to the North Pacific. On the Atlantic, NAO+ and EA+ circulation types seem to be highly likely, like the previous forecast. A positive geopotential anomaly concerns a large part of Europe.

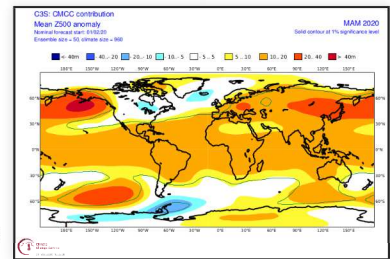


2- High geopotential structure present in all models

1- Relative negative geopotential anomaly forecasted by models



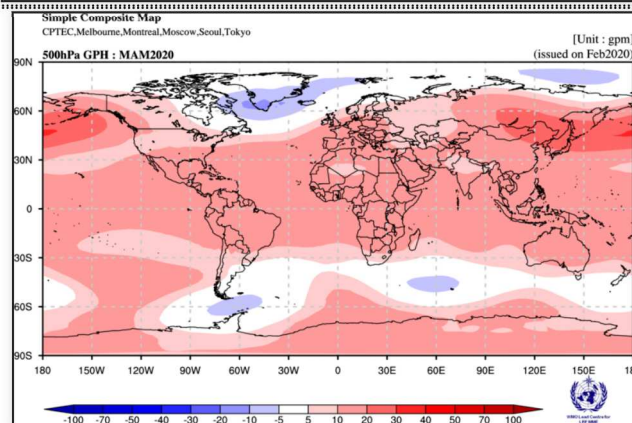
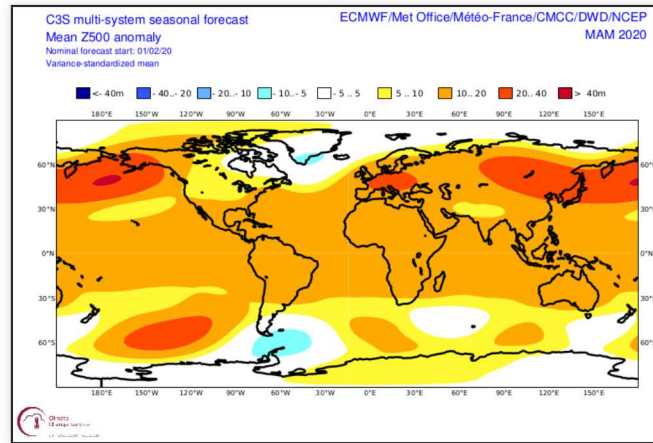
3- Less marked anomaly than others models



C3S multi-system, MF7, SEAS5, UKMO, DWD and CMCC 500hPa geopotential height anomalies.

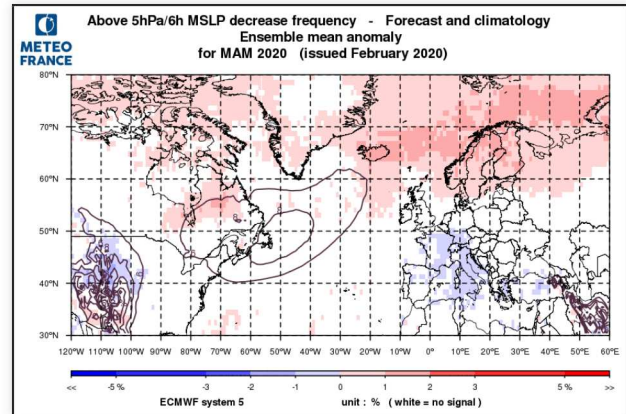
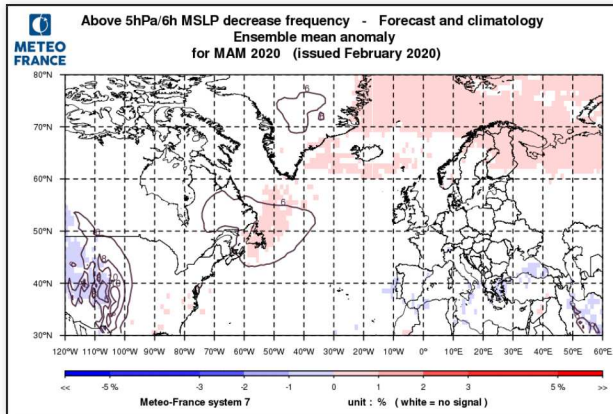
Atmospheric circulation forecasts : Z500 anomalies multi-systems

Remarkable consistency between the C3S multi-model and all but C3S multi-model (bottom map).



Atmospheric circulation forecasts : Strong MSLP decrease

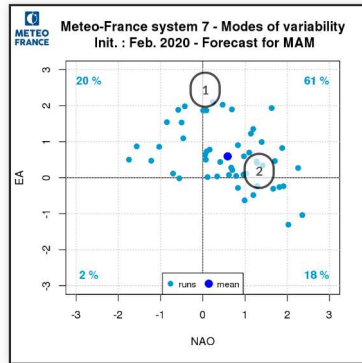
With ECMWF, the frequency of depressions is greatly increased in their North Atlantic rail. As noted earlier, MF7 has less contrasted fields and generates a weak signal.



Frequency of more than 5hPa/6h MSLP decrease in MF7 (left) and ECMWF (right)

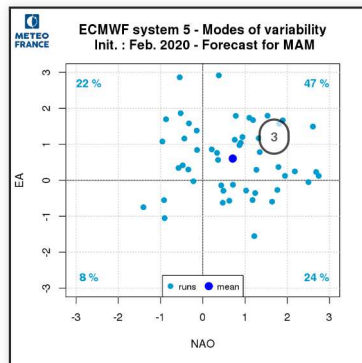
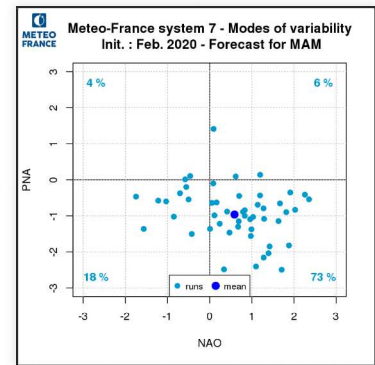
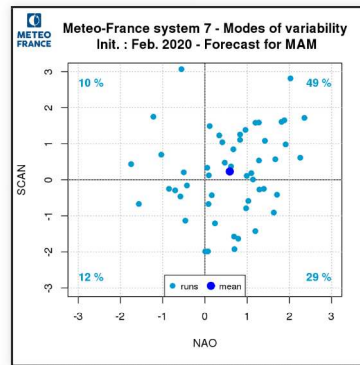
Modes of variability : forecast

Both models suggest a high probability of positive NAO mode, positive EA mode and negative PNA mode.

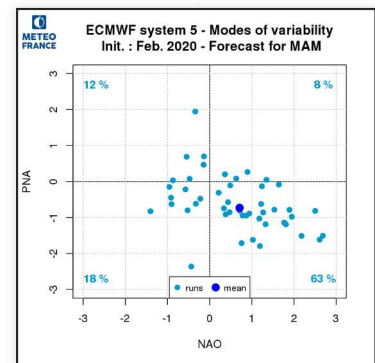
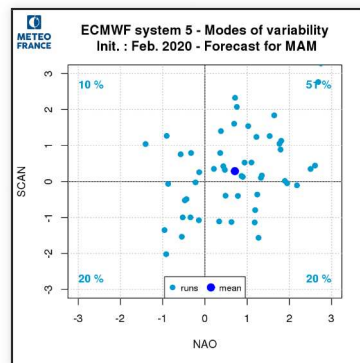


1- positive EA for 81% of runs.

2- positive NAO for 79% of runs.



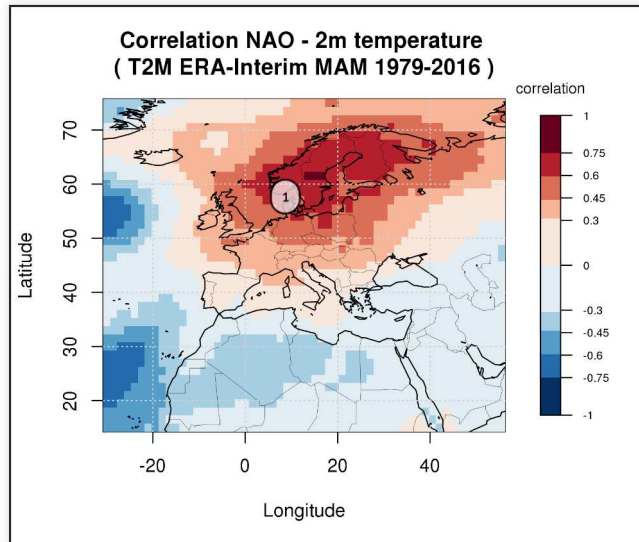
3- EA+ / NAO+ favoured



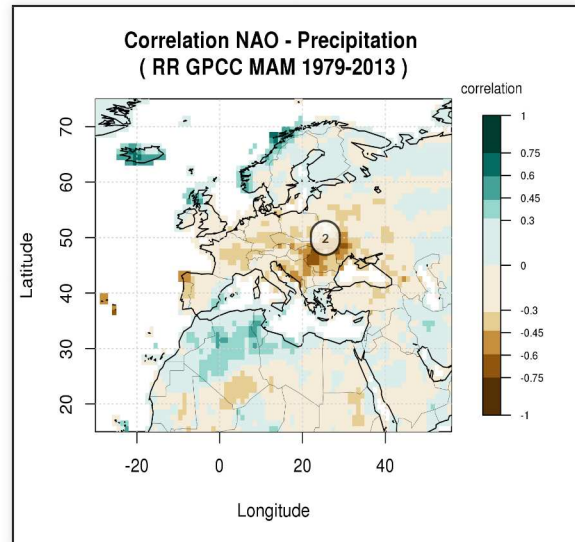
see the modes of variability patterns

Modes of variability : NAO impacts

NAO+ mode should be favoured



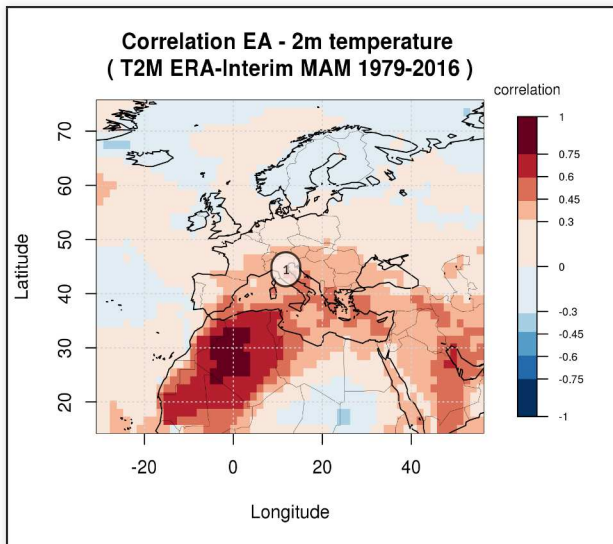
1- Warmer than normal over north-western Europe, and particularly over Scandinavia



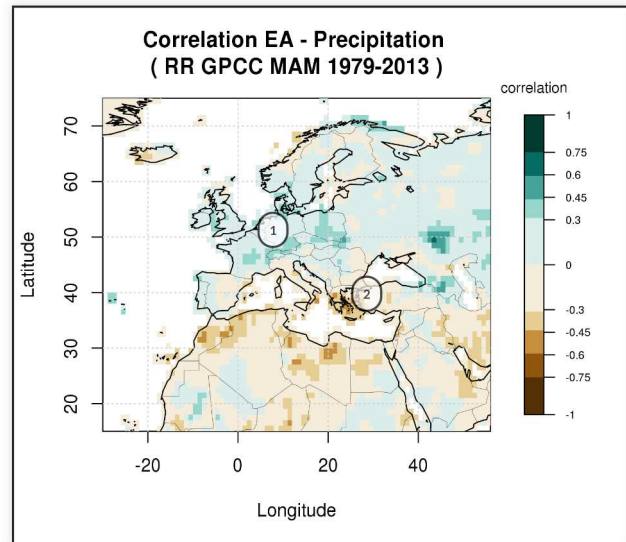
2- drier than normal for southern Europe; wetter for northern Europe.

Modes of variability : East Atlantic impacts

EA+ mode should be favoured



1- Warm signal for southern Europe

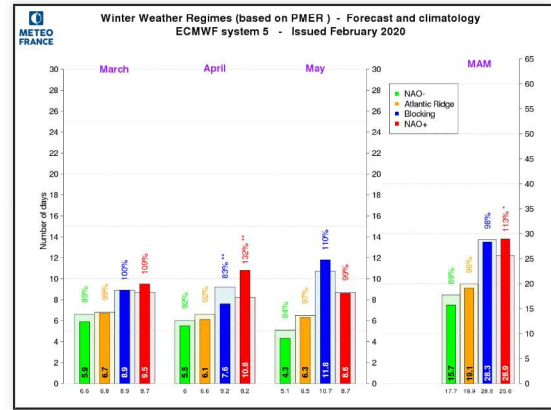
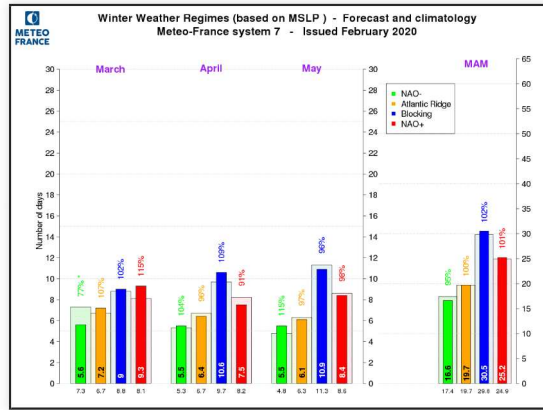


2- Dry conditions for south-eastern Europe

1- wet conditions over northern Europe

Weather regimes : winter Sea Level Pressure classification

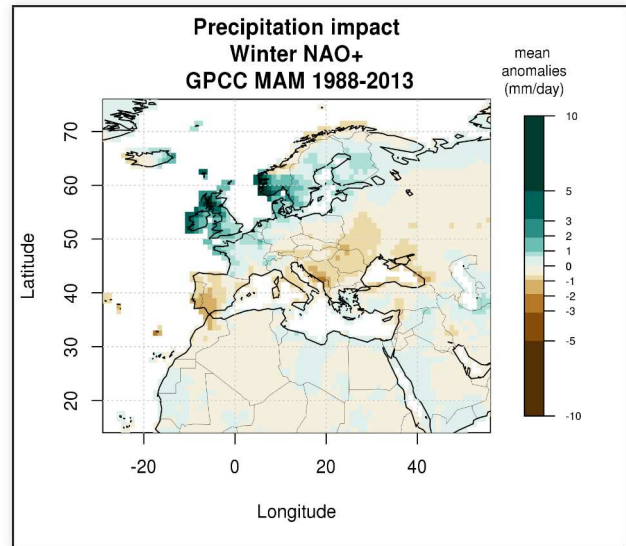
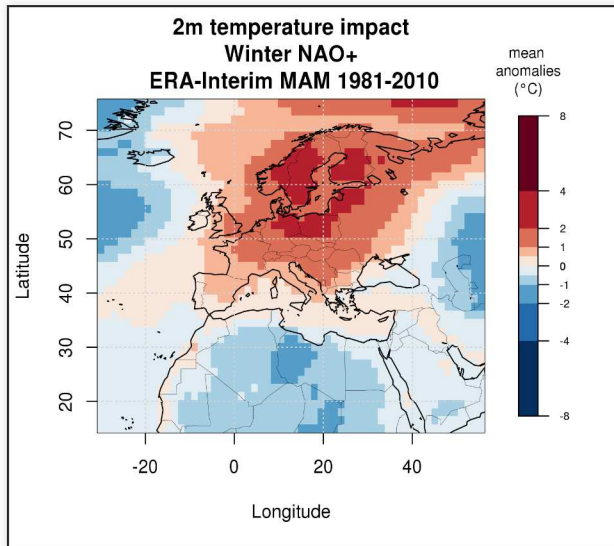
ECMWF favors NAO+ to the detriment of NAO-. No significant anomalies with MF7.



Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF7 (left) and SEAS5 (right).

[See the winter weather regime patterns](#)

Weather regimes : Impacts

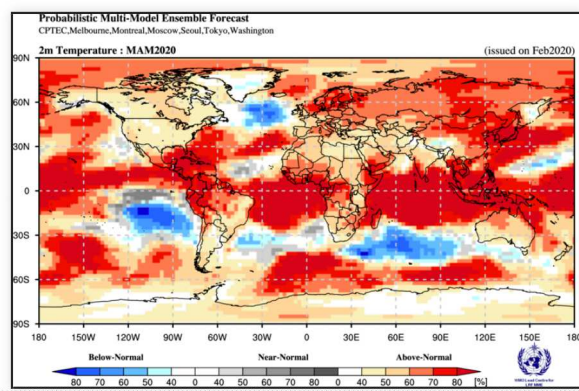
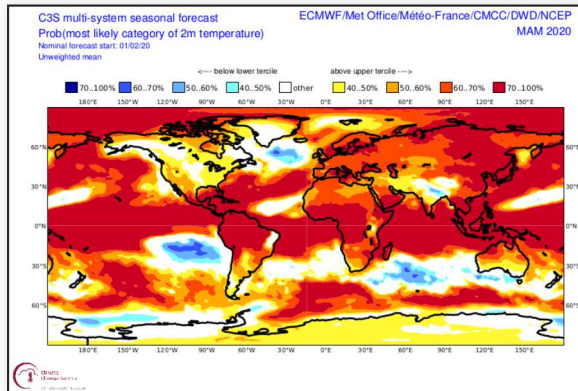
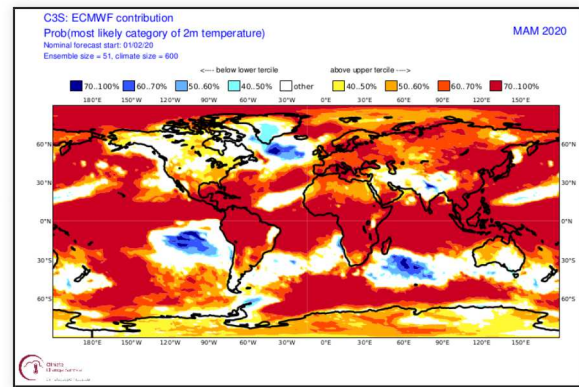
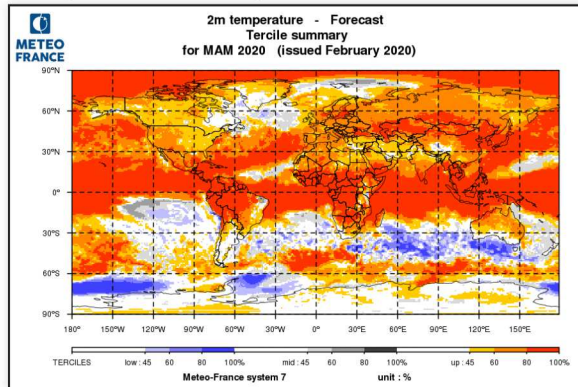


Impact of Winter NAO+ weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

Remarkable good agreement between models all over the world.

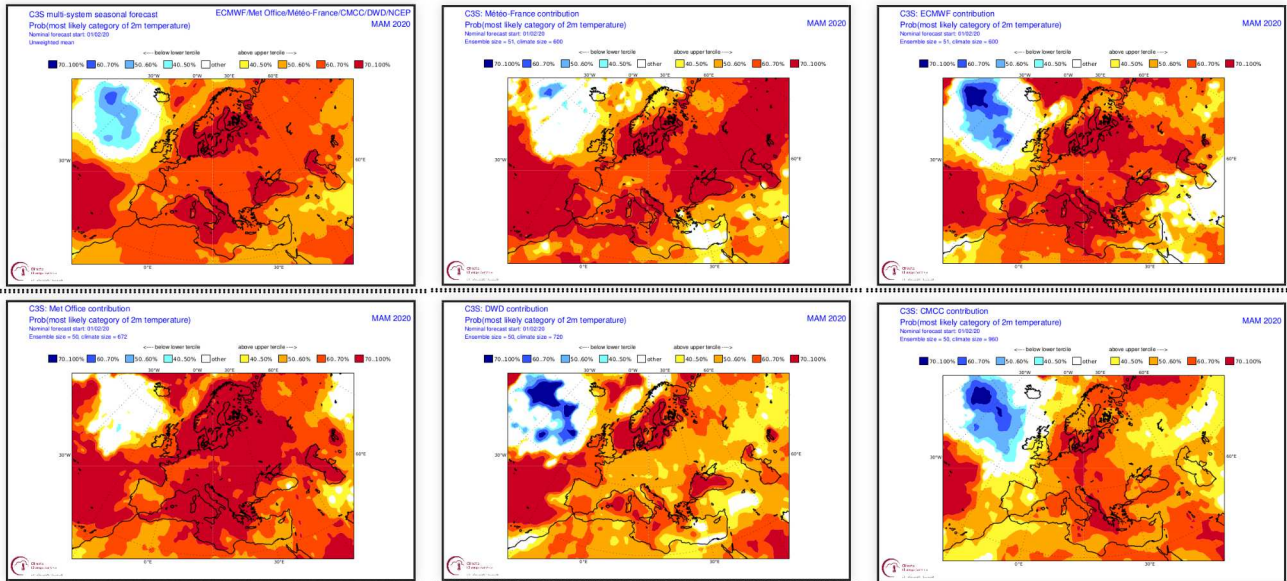
Warm signal on most of the globe except North America/Greenland and regions around India.



2m temperature probability map from MF7 (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

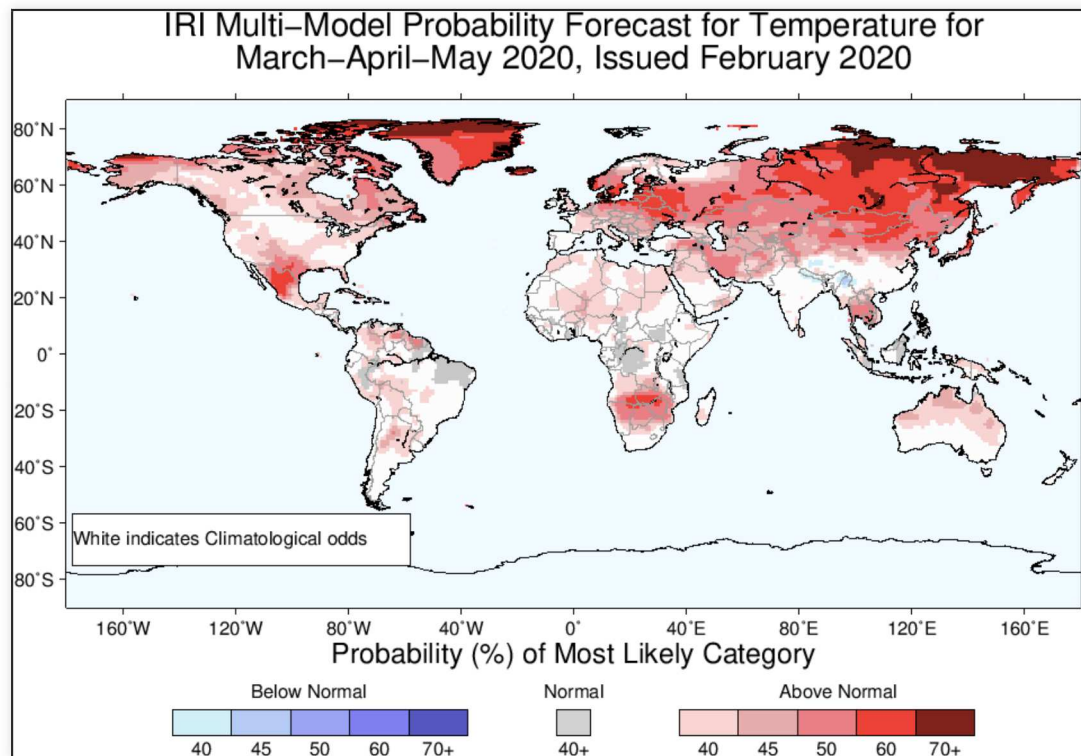
In agreement with their general circulation pattern, all the models favor a warm option over Europe and the Mediterranean basin.



C3S multi-models probability map (top left) and MFT, ECMWF5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Température synthèse de l'IRI

The multi-model synthesis of the IRI is consistent with other ensemble systems, although the warm signal is weaker, especially in tropical latitudes.



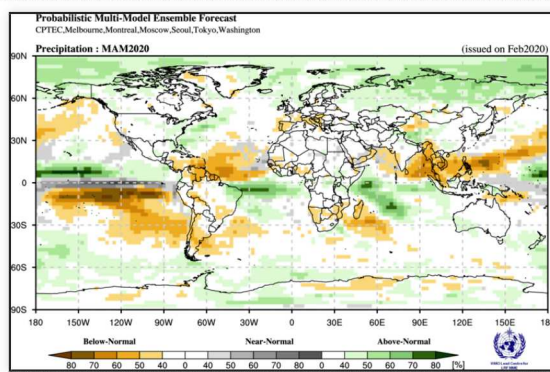
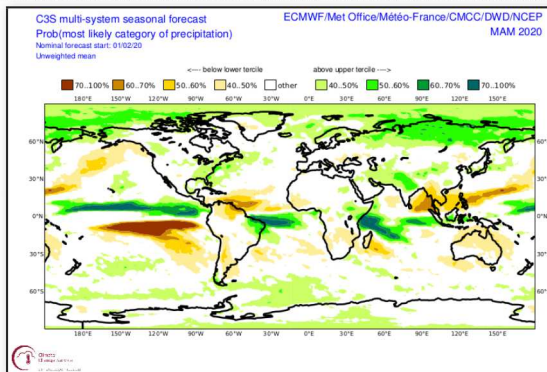
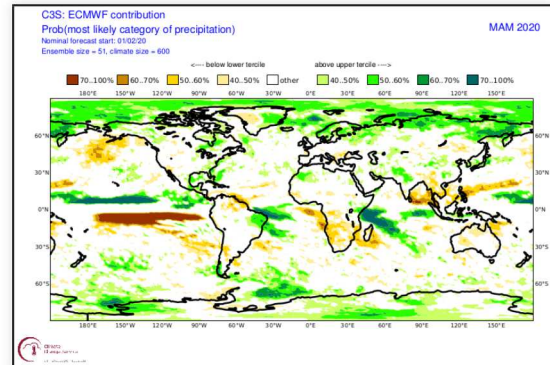
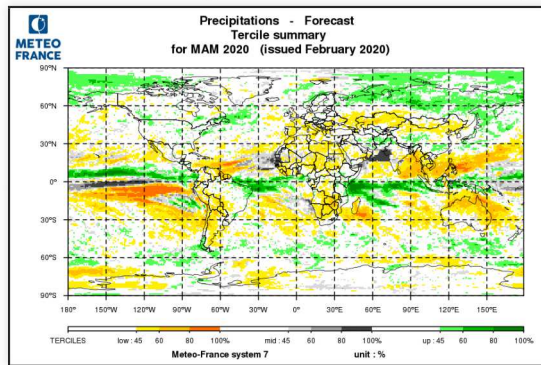
<https://iri.columbia.edu/our-expertise/climate/forecasts/>

Forecast of climatic parameters : Precipitation

Remarkable consistency of the models even at mid latitudes.

In the tropical belt, the signal is closely linked to SST anomalies. Nearby terrestrial regions are impacted.

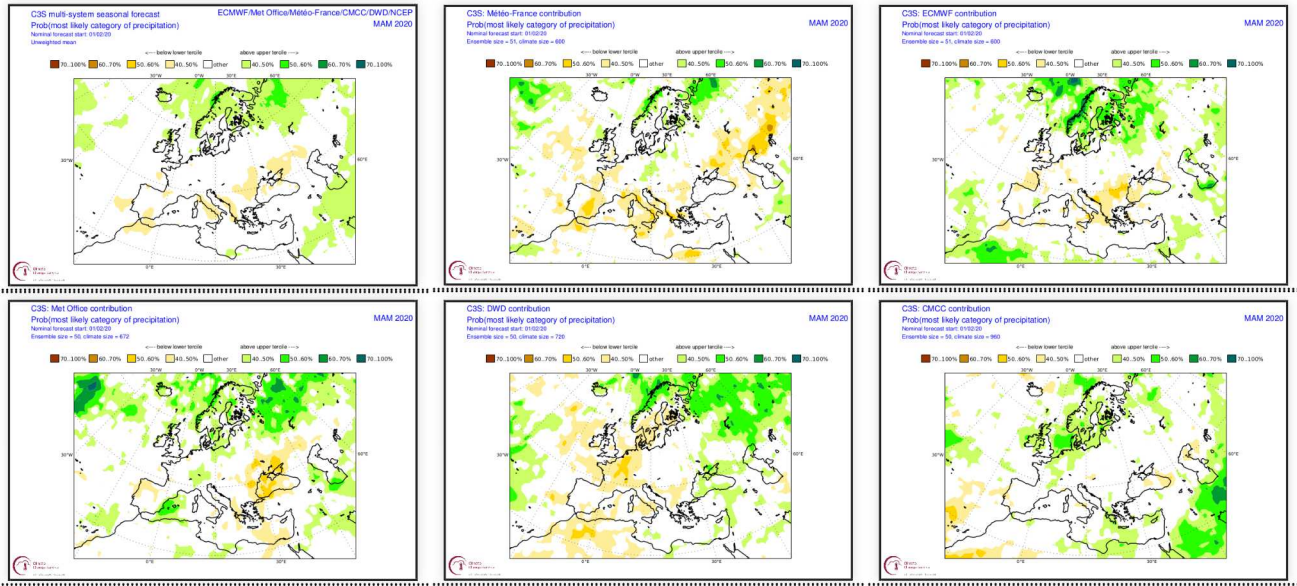
Wet conditions for the high latitudes of the northern hemisphere.



precipitation probability map from MF7 (top left), ECMWF-SEAS5 (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

In agreement with positive NAO and/or EA modes, enhanced wet signal for northern Europe and dry signal for southern Europe and the Mediterranean basin.

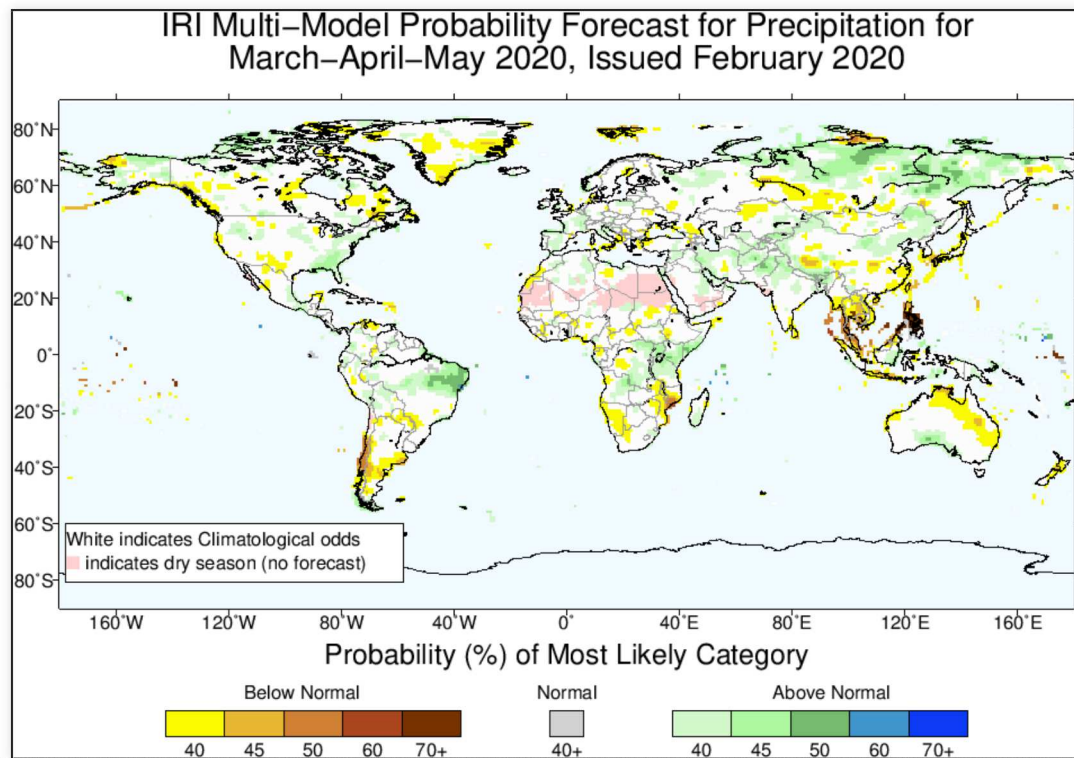


C3S multi-models probability map (top left) and MFT, SEASS, UKMO, DWD, CMCC models.

Forecast of climatic parameters : IRI precipitation synthesis

The precipitation signal is similar in the tropics as well as at high latitudes.

On the other hand it is different on the west of Europe where wet signal is more likely.

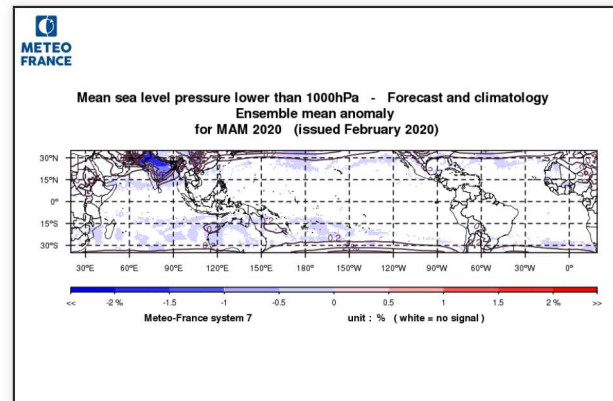
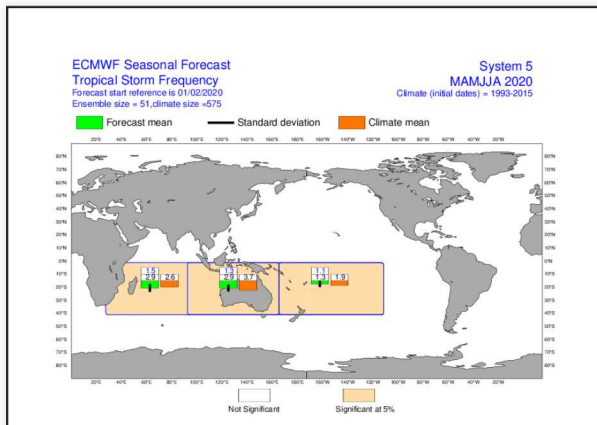


<https://iri.columbia.edu/our-expertise/climate/forecasts/>

Forecast of climatic parameters : Tropical Storm Frequency

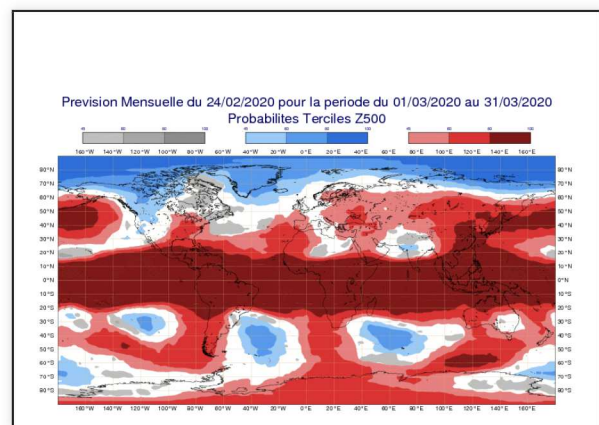
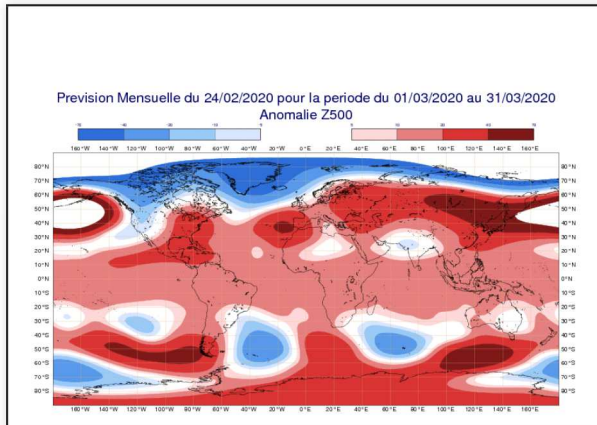
According to IOD and VP200 anomalies, above normal activity is forecast for Western Indian Ocean and below normal activity is forecast around Australia and over Southern Pacific.

MF7 (index based on the frequency of low < 100hPa) shows also a reduction of tropical storm activity around Australia and over Southern Pacific.



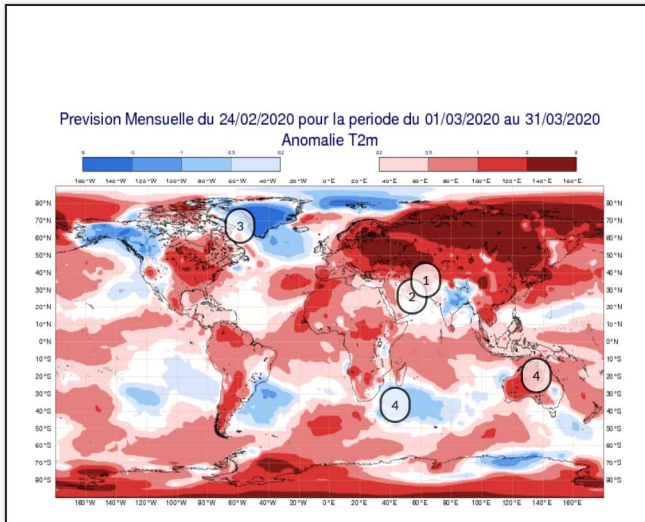
Monthly forecast of 20200224 : Z500

The monthly forecast is similar to the seasonal forecast, especially for the North Atlantic and Europe with a strong contrast in geopotential anomalies.



Monthly forecast of 20200224 : temperature

Structures similar to seasonal forecast with lower tercile probabilities reinforced.



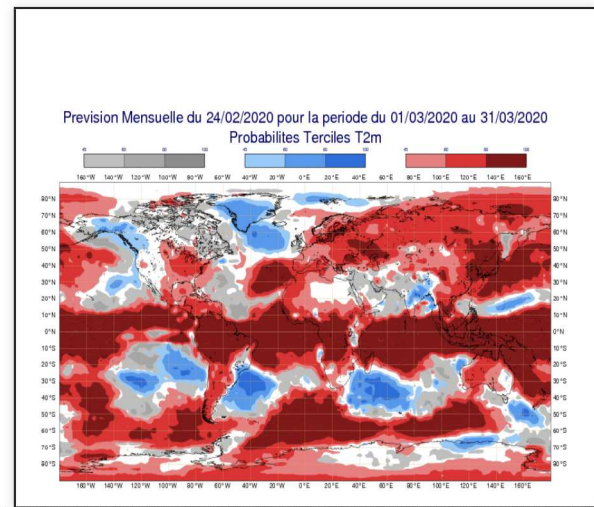
1- Very strong anomaly expected over Siberia and northern Europe.

4- Probable continuation of the hot anomaly over southern Africa and Australia

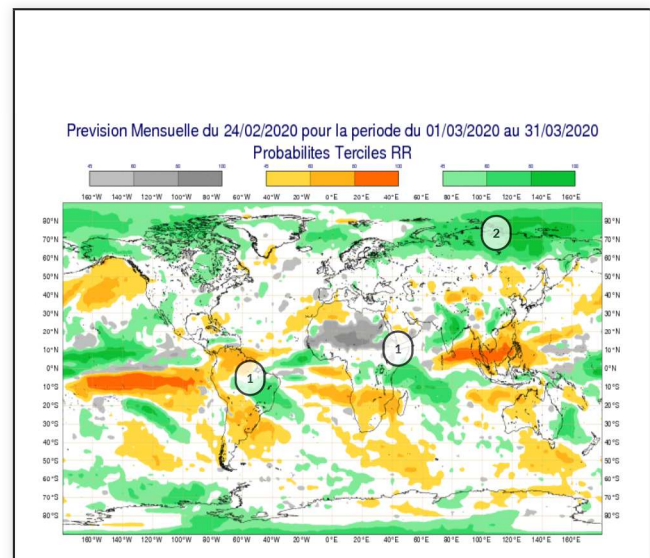
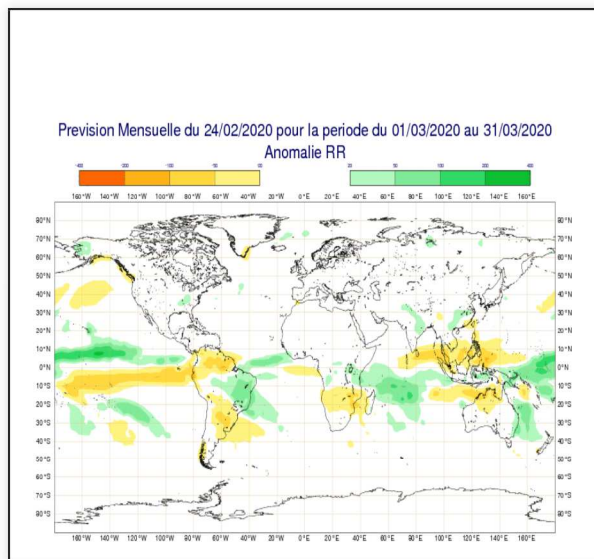
4- Probable continuation of the hot anomaly over southern Africa and Australia

2- Cold anomaly consistent with the general situation described in the seasonal forecast.

3- Expected cold anomaly .



Monthly forecast of 20200224 : precipitation

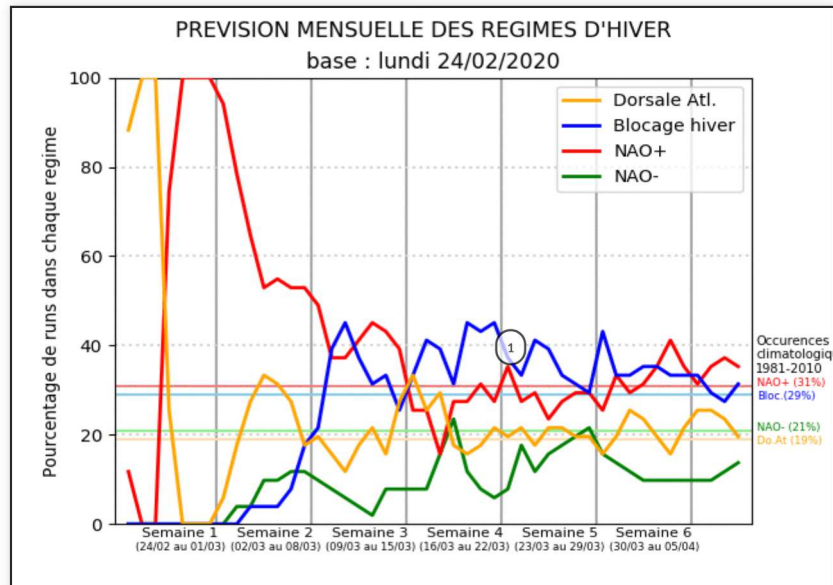


2- Wet anomaly linked to the strengthening of the west flow.

1- The anomalies are consistent with the general situation described in the seasonal forecast.

1- The anomalies are consistent with the general situation described in the seasonal forecast.

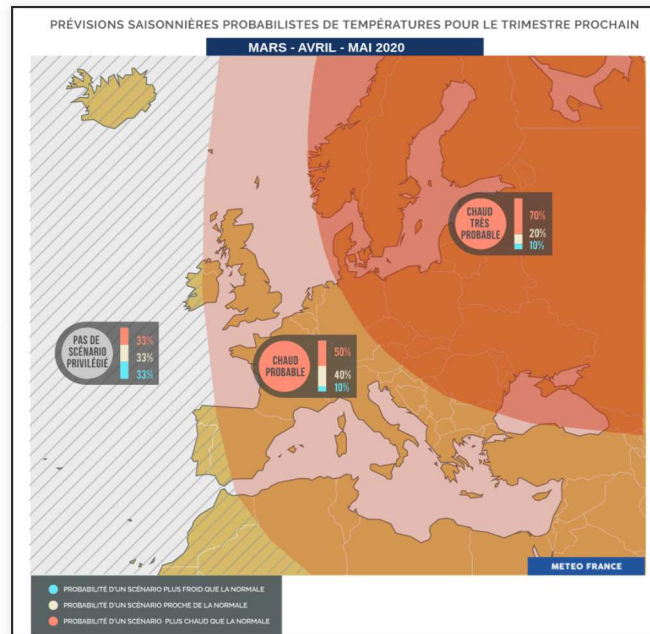
Monthly forecast of 20200224 : winter SLP weather regimes



1- The blocking regime dominates over the month. NAO+ and Atlantic Ridge are a little more frequent than normal at the expense of the NAO- regime

Synthesis map for Europe : Temperature

The general circulation dominated by the NOA + or EA + modes give a high probability of temperature above normal particularly in the north-east of Europe.



Synthesis map for Europe : Precipitation

As expected with NAO+ and EA+ modes of variability, wetter than normal conditions are expected over the north of the continent and drier than normal conditions should prevail over South-Eastern Europe and the Mediterranean Basin.

