Météo-France Seasonal Forecast Bulletin

FEBRUARY - MARCH - APRIL 2019

1. General synthesis
    1. FMA 2019
2. Oceanic analysis of December 2018
    1. SST anomalies
    2. vertical section
    3. Hovmüller diagram of the 20°C isotherm
    4. History of Nino3.4
3. Oceanic forecast
    1. SST anomaly
    2. NINO3.4 Plumes
4. Drivers
    1. SSW
5. Atmospheric circulation forecasts
    1. velocity potentiel and stream function at 200hPa
    2. SSW
    3. 500 hPa Geopotential anomalies
    4. Z500 scores
    5. Z500 anomalies in C3S models
6. Weather regimes
    1. winter Sea Level Pressure classification
    2. scores
7. Modes of variability
    1. forecast
    2. East Atlantic mode of variability impacts
8. Forecast of climatic parameters
    1. Temperature
    2. T2M probabilities in C3S models
    3. Precipitation
    4. precipitation probabilities in C3S models
    5. Tropical Storm Frequency
9. Monthly forecast of 20190121
    1. Z500
    2. temperature
    3. precipitation
10. Synthesis map on Europe
    1. Temperature
    2. Precipitation

General synthesis : FMA 2019

- globably there is a quite **good predictability**, with relativly good agreement between models for the main features

- **weak El Nino** will continue during the next 3 months

- some teleconnections from the tropics to mid-latitudes over the Pacific, up to North America (PNA+). Over the Atlantic ocean, modifications of the Walker circulation (see downward motion anomaly over South America) seem to influence tropical circulation, but in most models the signal propagation toward mid-latitudes is difficult to identify.

- circulation over **North Atlantic and Europe** : quite good agreement between models for a positive **East Atlantic (EA) circulation** (3-month mean)

- as a consequence, we priviledge a dominant **warm signal over Mediteranean basin, and for precipitation a NorthWest-SouthEast constrast over Europe** with wetter than normal conditions more probable in the North and Western Europe. This is consistent with a positive EA circulation, forecasted by a majority of models

Oceanic analysis of December 2018 : SST anomalies

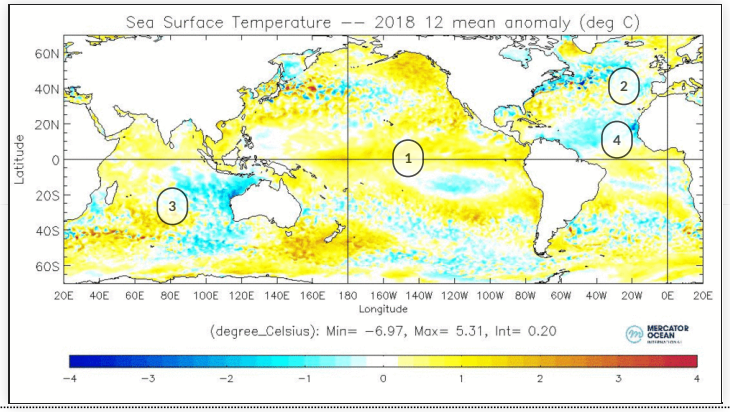
Current situation : weak El Niño

INDEX FOR DECEMBER :

Nino3.4 = +0.7°C (Mercator Ocean PSYV4R2 analysis)

DMI near 0 (BOM : http://www.bom.gov.au/climate/enso/indices.shtml)

Decreasing phase of the PDO, which returns to 0 in sliding annual average (JMA : http://ds.data.jma.go.jp/tcc/tcc/products/elnino/decadal/pdo.html)

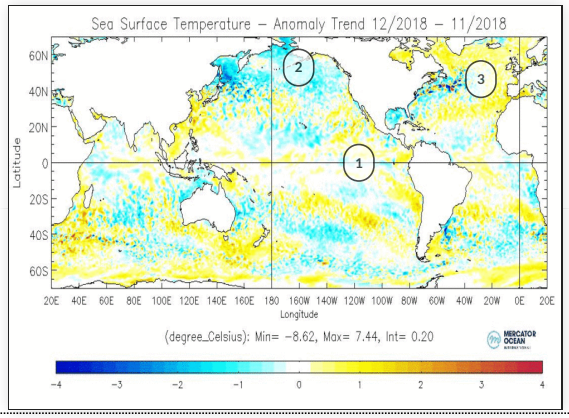


2- continuation of the horseshoe structure with a reduced hot zone

4- persistence of the cold anomaly in the intertropical zone

1- warm anomaly related to the current El Niño. the anomaly is uniform along the equator. There is no east-west contrast as expected during an El Nino phenomenon

3- strong west-east contrast which persists for several months



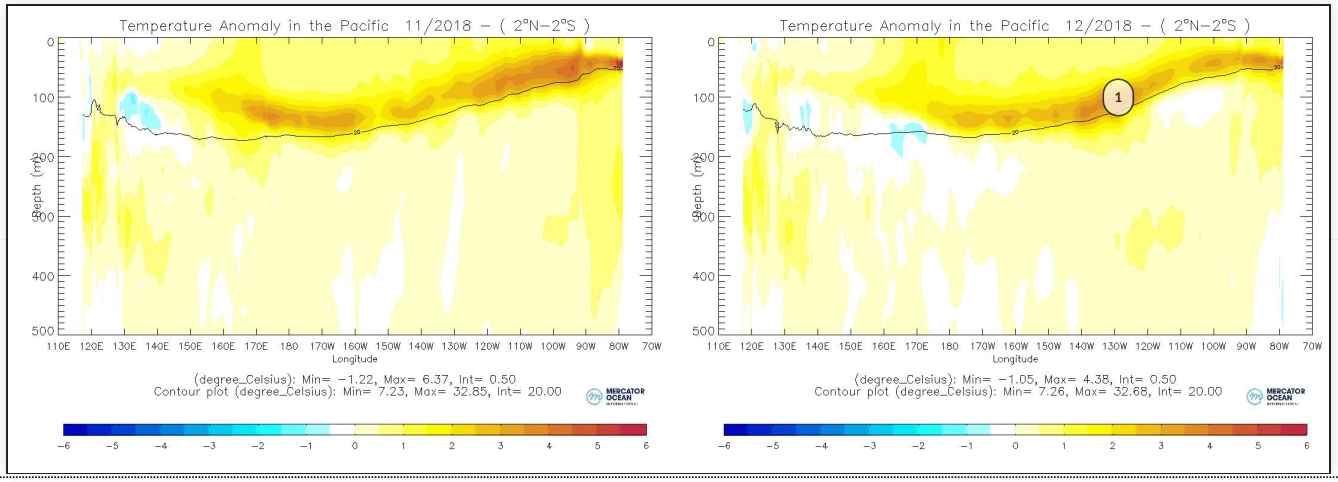
2- strong attenuation of the hot anomaly

1- little evolution of the anomaly: slight warming near the American coasts

3- attenuation of anomalies throughout the North Atlantic: the warm zones have cooled, the cold zones have warmed

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

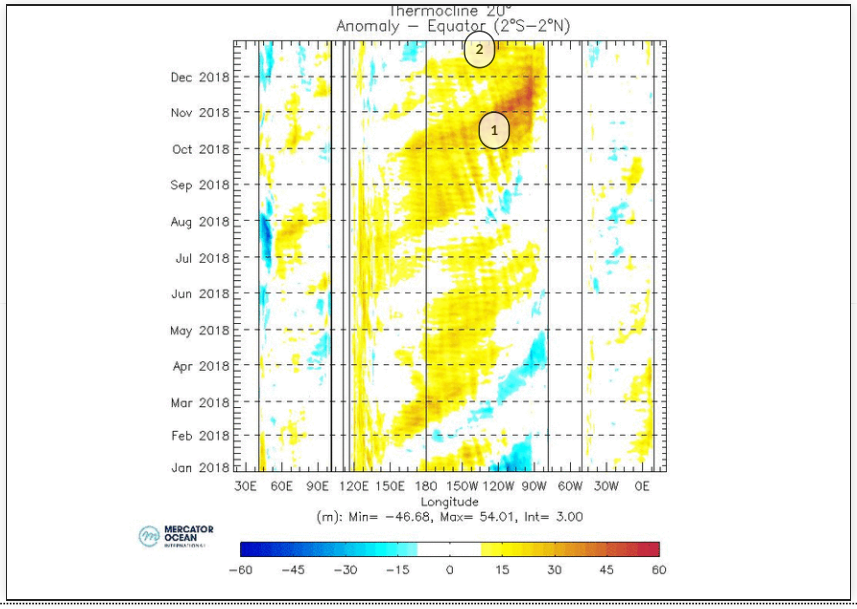
Oceanic analysis of December 2018 : vertical section



1- Kelvin wave less strong than in November

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

Oceanic analysis of December 2018 : Hovmüller diagram of the 20°C isotherm

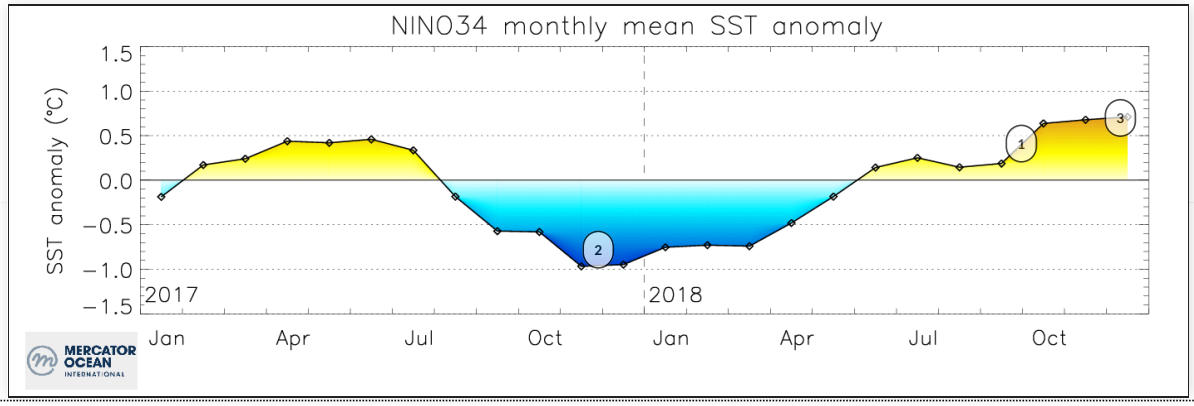


1- Kelvin wave of October which caused the strong growth of the anomaly in the NINO3.4 box

2- kelvin wave of December, less marked than the previous one.

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

Oceanic analysis of December 2018 : History of Nino3.4



1- strong increase in October

3- Current level around + 0.7 ° C / + 0.8 ° C

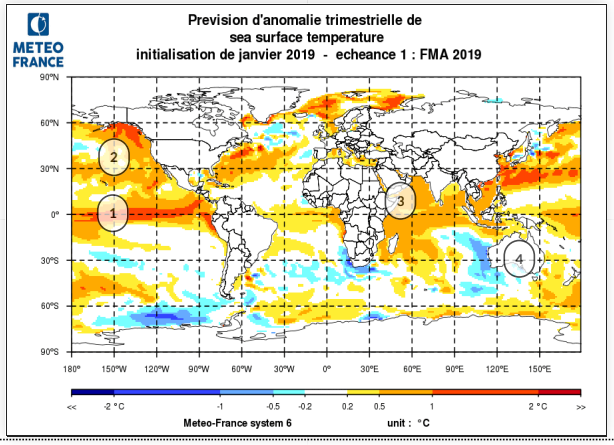
2- La Nina phenomenon of winter 2017-2018

Evolution of SST in the NINO3.4 box

Oceanic forecast : SST anomaly

Good models agreement

The current weak El Niño episode will continue during the next 3 months, capping at its peak intensity.

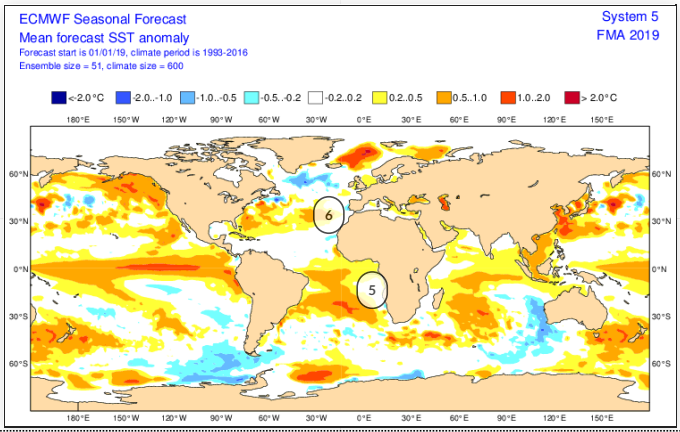


4- maintaining west-east contrast. The cold zone is shrinking.

2- North Pacific globally warm.

1- In the El Nino impact zone, MF6 is slightly warmer than CEP5.

3- warm throughout the Indian Ocean except in the Southeastern part. In these conditions the DMI will remain neutral



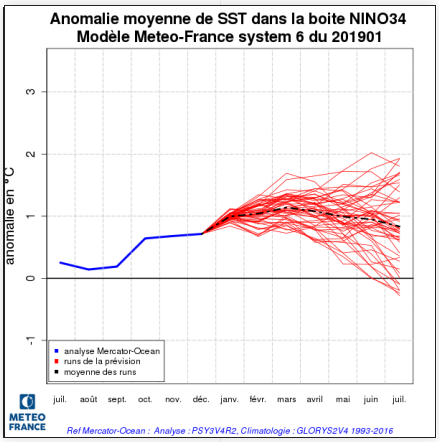
5- continuing warmer than normal conditions on the equator

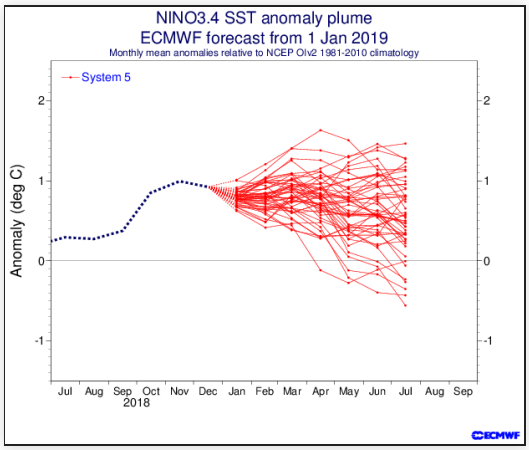
6- continuing of the "Cold Blob" anomaly but almost disappearance of the tripolar structure with a generalized warming of the North Atlantic

Oceanic forecast : NINO3.4 Plumes

Forecasted Phase : week El Niño

For the next 3 months, the anomaly peaks near its maximum intensity. MF-S6 is slightly warmer than SEAS5. In both models, the anomaly will remain below 1 ° C, confirming the low intensity of the phenomenon.

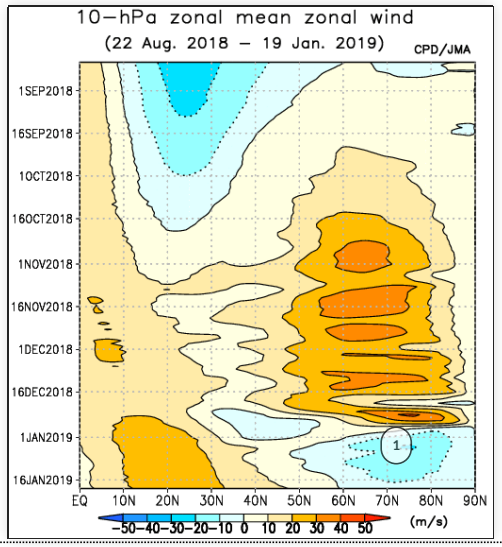




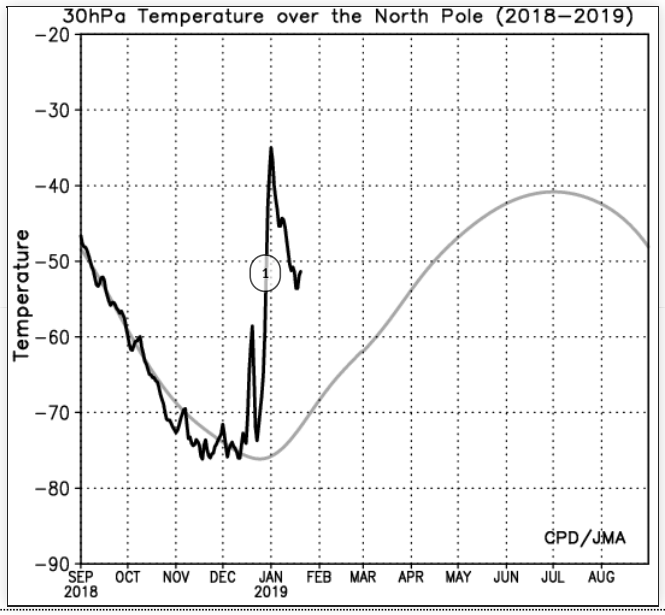
Drivers : SSW

The change in the stratosphere wind direction show a weakening of the polar vortex, It is associated with a sudden stratospheric warming up (SSW)

The SSW favors the NAO- weather regime.



1- change in wind direction

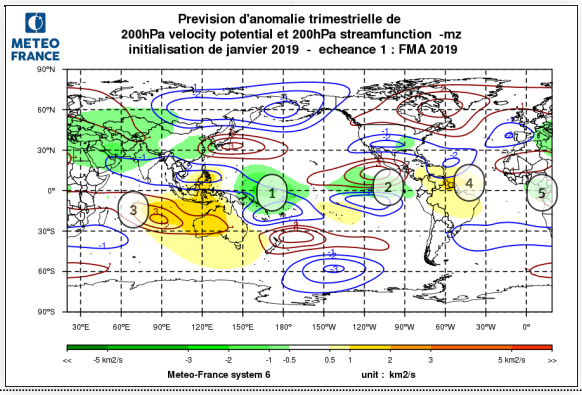


1- sudden stratospheric warming

10 hPa zonal wind Hovmuller diagram and 30 hPa temperature histogram. (c) Tokyo Climat Center JMA

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

The general structure of the fields is quite similar in MF-S6 and SEAS5 models , but they are in disagreement for most kernel intensities of VP and location of SF. Their atmospheric response is not classical in a situation El Nino, even weak. The JMA model has a more classic scheme.



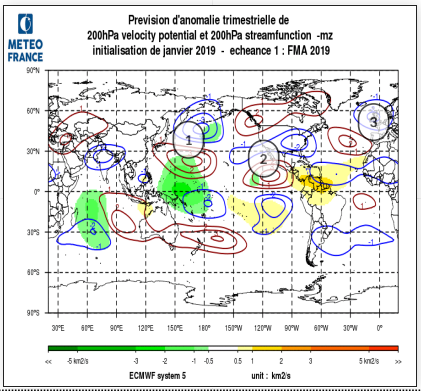
1- VP : main upward motion kernels

2- VP : upward motion kernels, stronger in MF6 than CEP5

4- VP : downward motion kernel

3- VP : disagreement over Indian Ocean : strong downward motion kernel in MF-S6 in the east strong upward motion with SEAS5 in the west

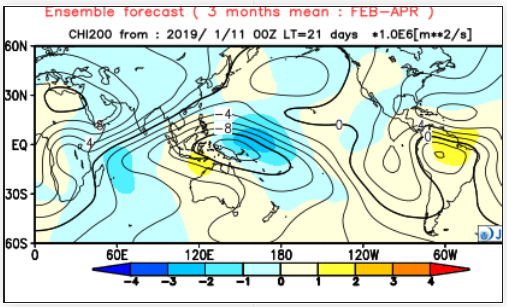
5- VP : disagreement between models over Africa

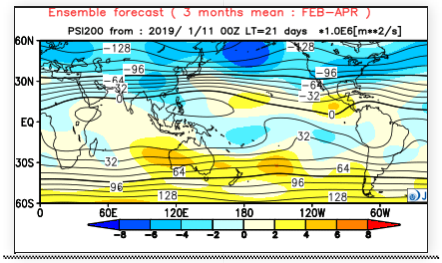


1- SF : teleconnection over the Western basin

2- SF : teleconnection over the Eastern basin

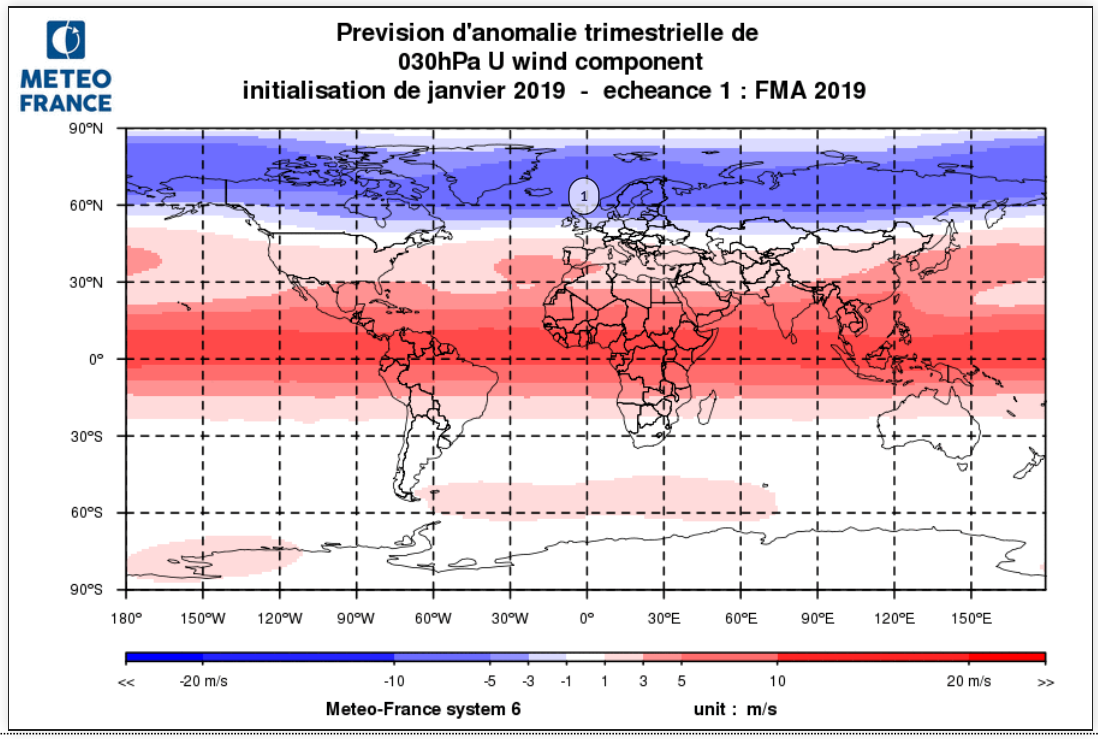
3- SF : disagreement over Europe





Atmospheric circulation forecasts : SSW

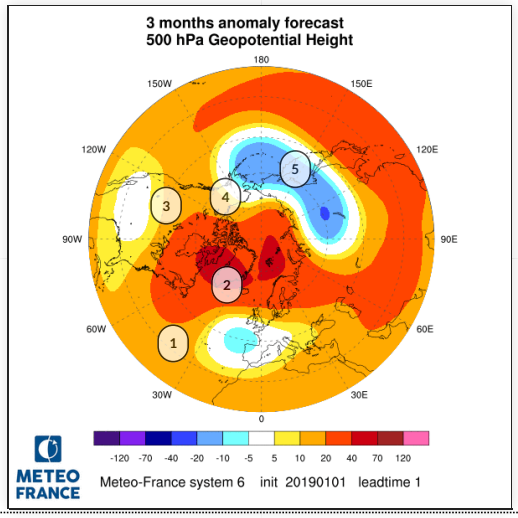
The 3-month average shows a negative wind anomaly at high latitudes, a sign of a marked weakening of the polar vortex due to SSW. The phenomenon is associated with a reinforcement of a NAO- weather regime structure.



1- marked weakening of the polar vortex

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Despite a clear disagreement in the upper troposphere,
MF-S6 and SEAS5 models have a general pattern quite similar at 500 hPa.
Focus on Europe and the North Atlantic : low values on Western Europe and high values from Scandinavia to Greenland and Canada



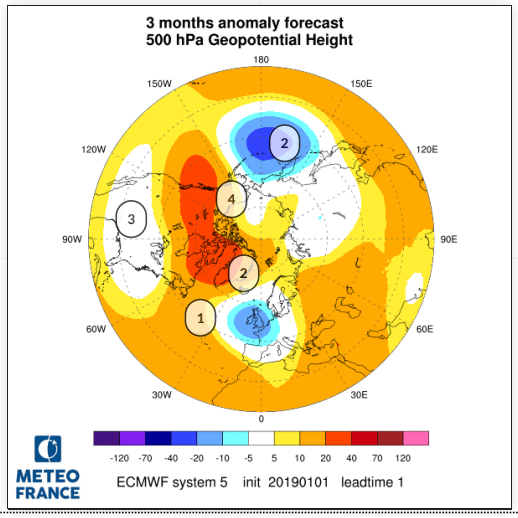
3- relative low values

4- relative high values

5- Geopotenial low

2- high values, stronger than SEAS5

1- Geopotential low, shifted slightly southwestward compared to SEAS5



2- Geopotential low

4- higher values than MF-S6

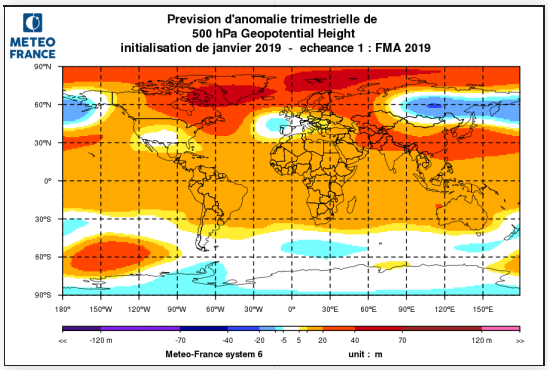
3- relative low values

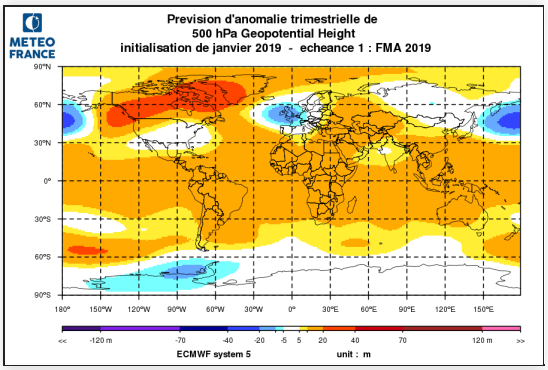
2- high values weaker than MF-S6

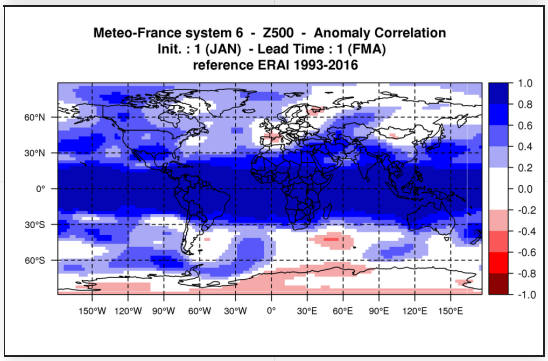
1- Geopotential low, shifted slightly northeaster compared to MF-S6

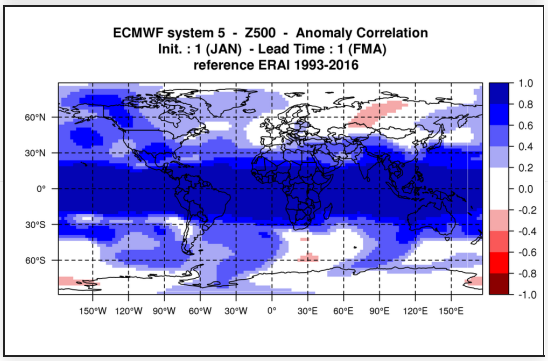
Atmospheric circulation forecasts : Z500 scores

Good scores over Eastern Mediterranean sea. Poor predictability over Western Europe.



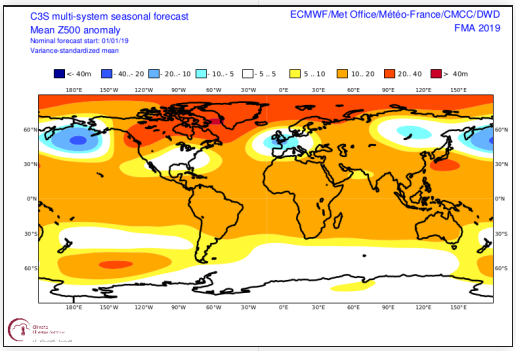


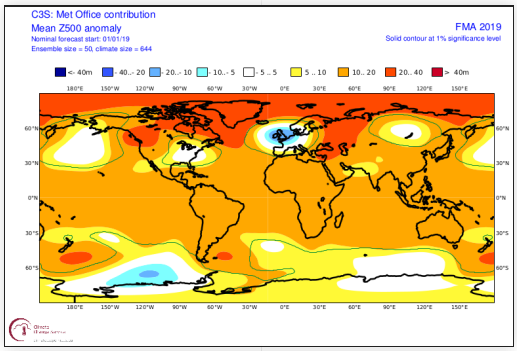


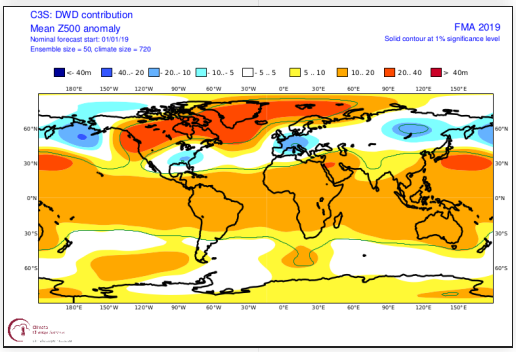


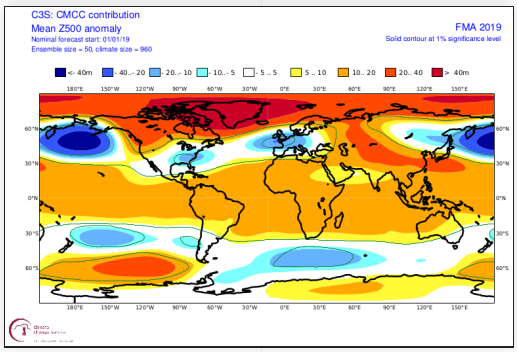
Atmospheric circulation forecasts : Z500 anomalies in C3S models

Good general agreement between all C3S models in the northen hemisphere



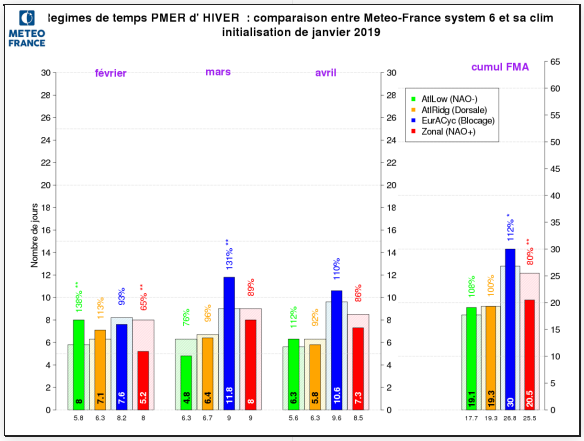


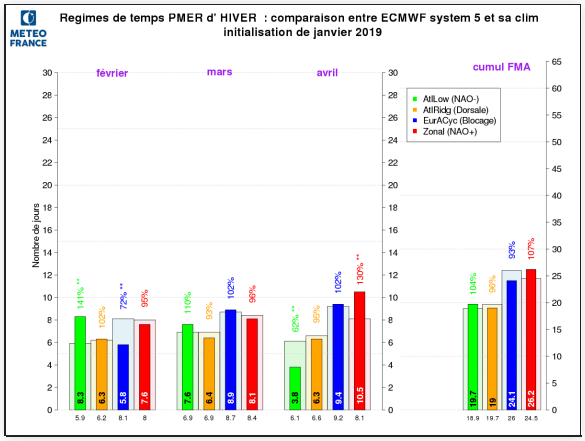




Weather regimes : winter Sea Level Pressure classification

Clear excess of Blocking weather regime with MF-S6. Conversely, NAO + is in deficit
No significant trend in SEAS5
Given the low predictability of the weather regimes, we will not consider any options.

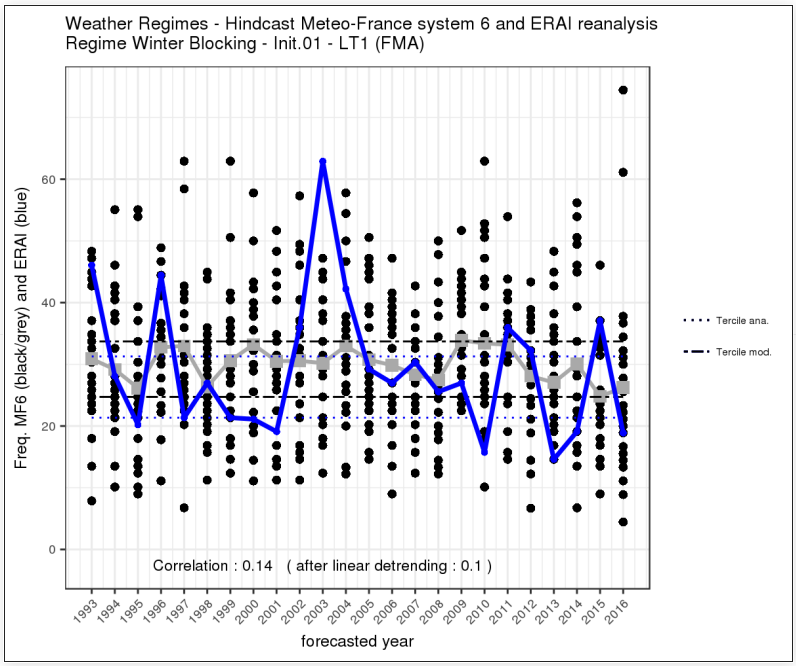




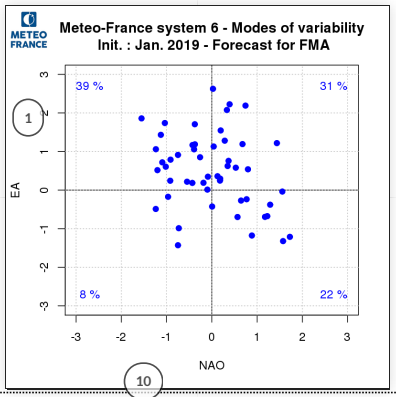
see the winter weather regime patterns

Weather regimes : scores

Very low value of correlation

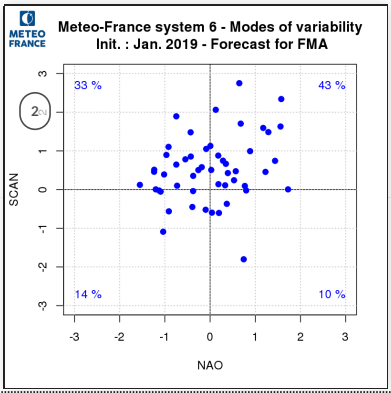


Modes of variability : forecast

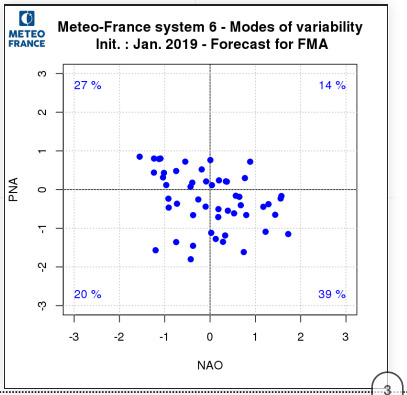


1- EA : 70%

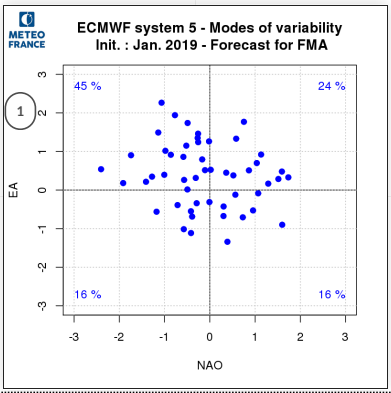
10- both models opt for a dominant EA mode



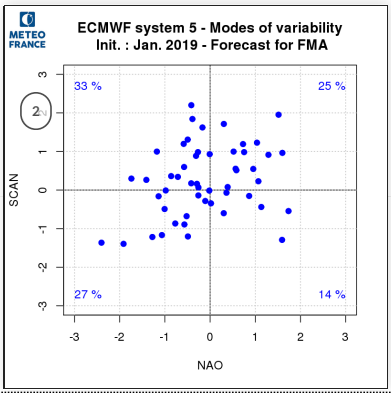
2- 76% : SCAN is clearly favored with MF-S6



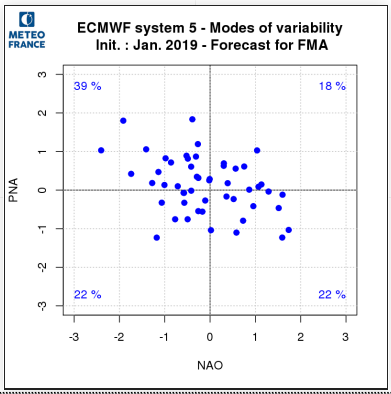
3- no clear trend regarding PNA



1- EA : 69%



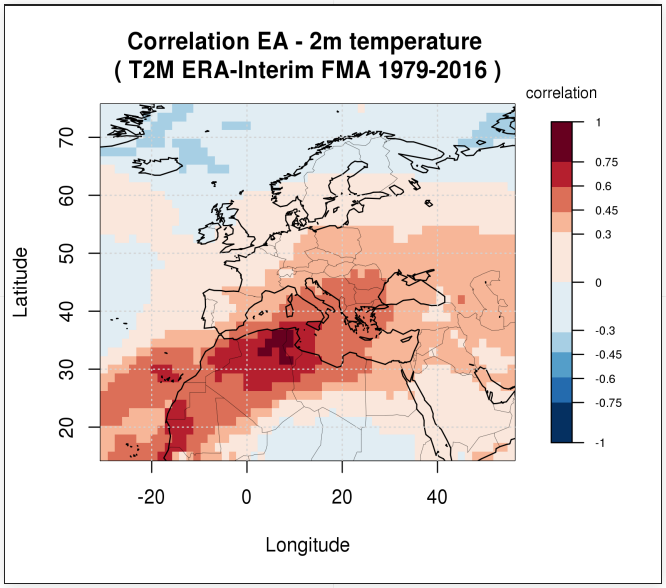
2- SCAN : 58%

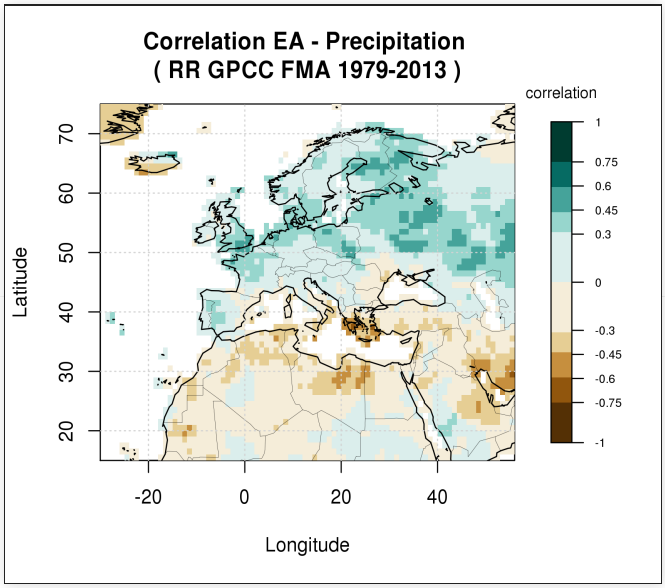


see the modes of variability patterns

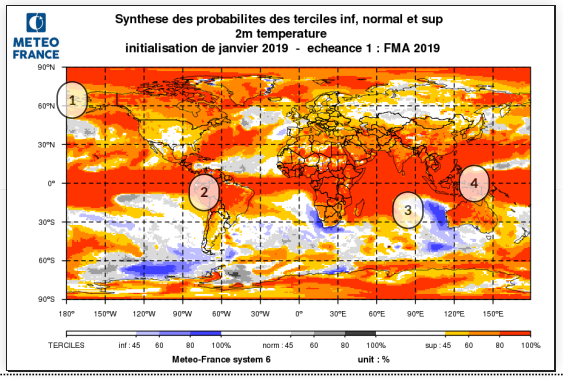
Modes of variability : East Atlantic mode of variability impacts

The modes forecast is more robust than the weather regimes forecast.
Both models are favor the EA mode. we will choose this option.





Forecast of climatic parameters : Temperature

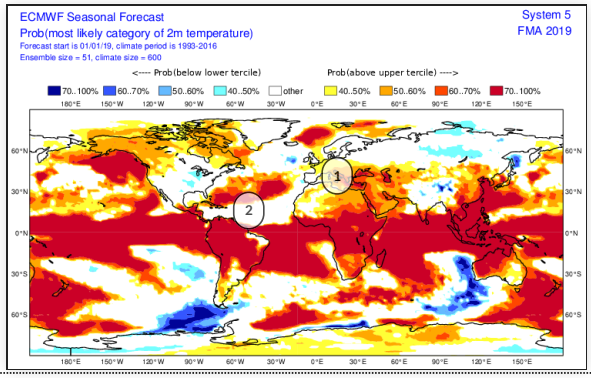


3- warmer than normal for "La Réunion"

4- warmer than normal

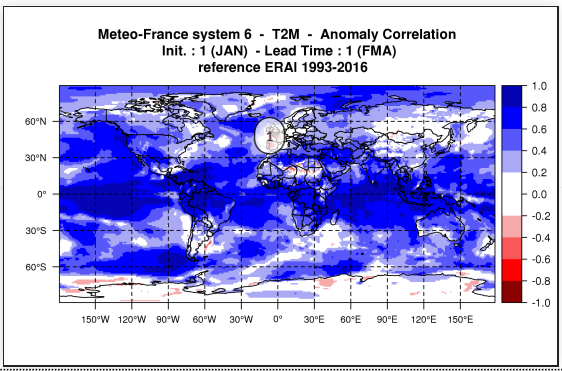
2- warmer than normal

1- warner than normal over Alaska and western Canada consistent with PNA+

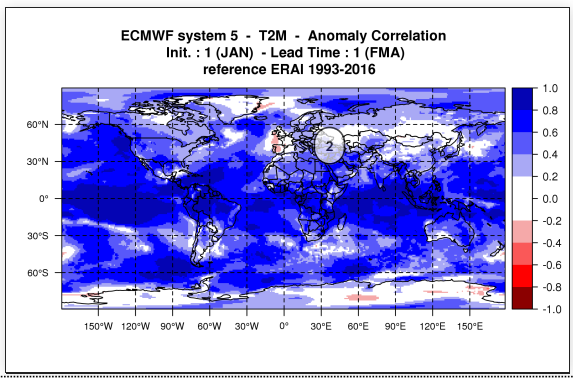


2- normal on the Lesser Antilles, with the evolution towards neutral conditions in SST.

1- warmer than normal likely on the eastern Mediterranean



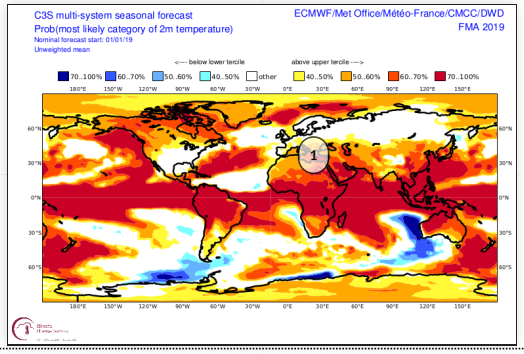
1- No predictability over Western Europe



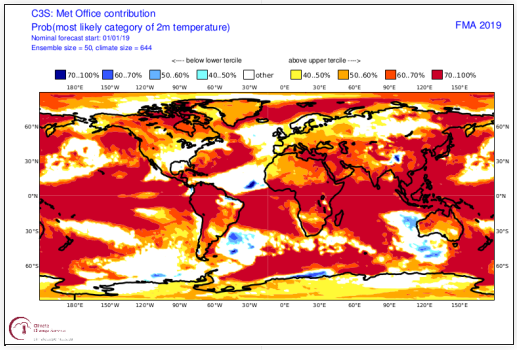
2- Significant correlation over continental Europe and Eastern Mediterranean Sea

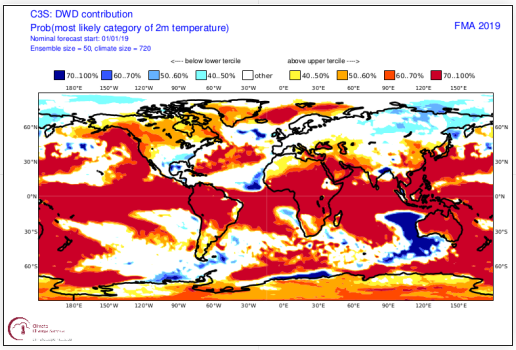
Forecast of climatic parameters : T2M probabilities in C3S models

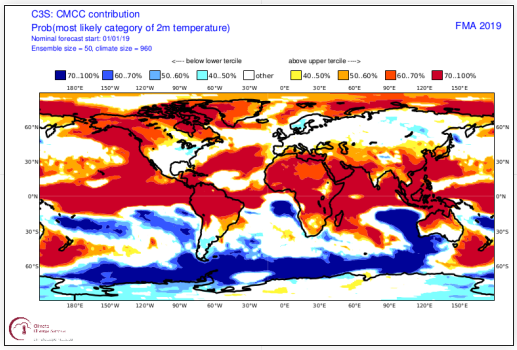
the UKMO model is hotter than other models in the northern hemisphere.
The CMCC model is cooler than other models in the southern hemisphere.
The C3S multi-model pattern is consistent with EA+ mode of variability.



1- Warm anomaly consistent with EA mode

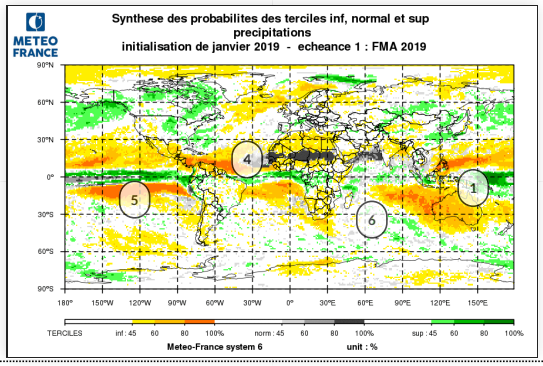






C3S multi-models probability map (on the top right) and UKMO, DWD, CMCC models.

Forecast of climatic parameters : Precipitation

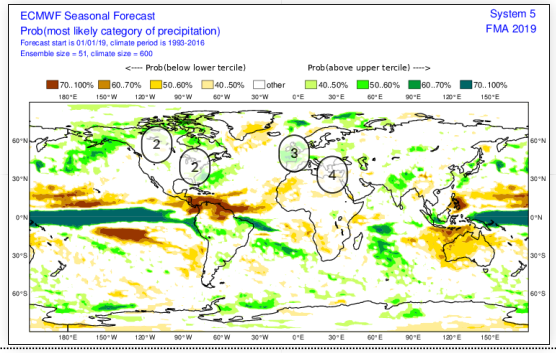


1- Structure of anomalies consistent with El Nino

4- still dry in the West Indies

5- north-south contrast in Polynesia

6- no signal

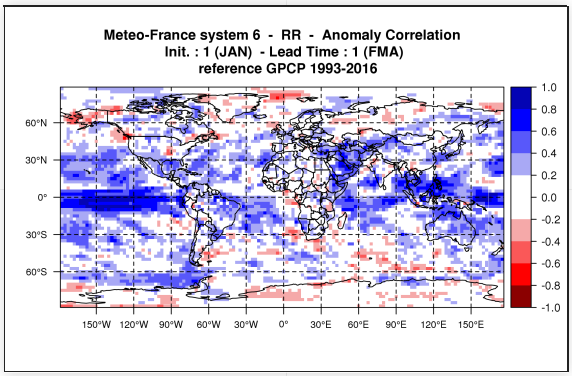


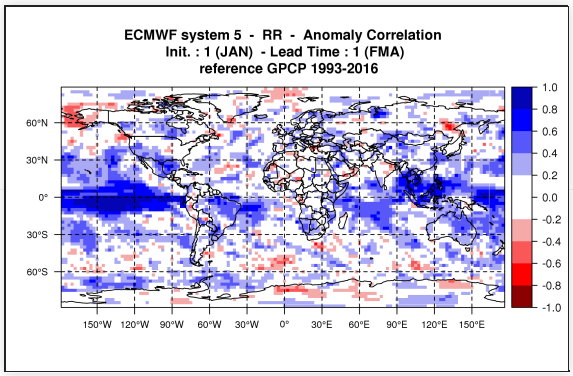
2- PNA consequences

2- PNA consequences

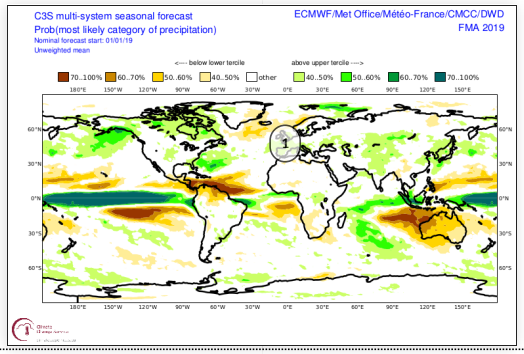
3- wet signal

4- dry signal

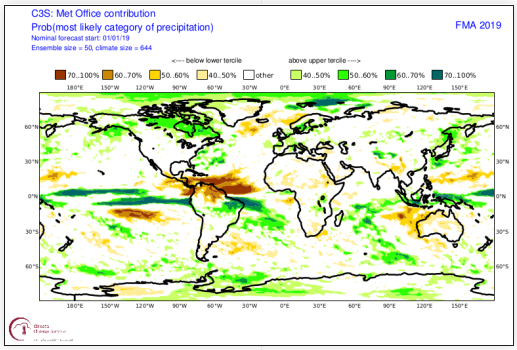


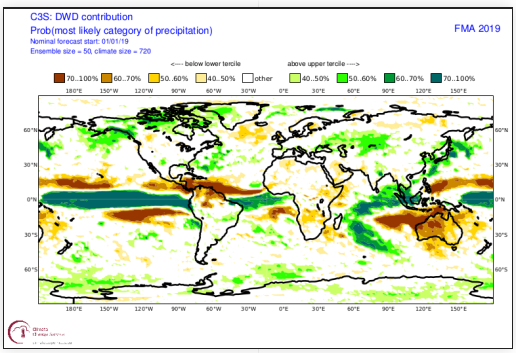


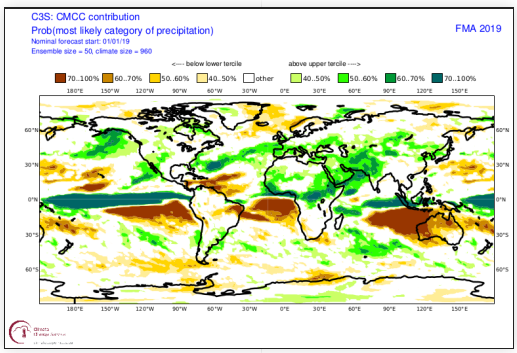
Forecast of climatic parameters : precipitation probabilities in C3S models



1- wet signal

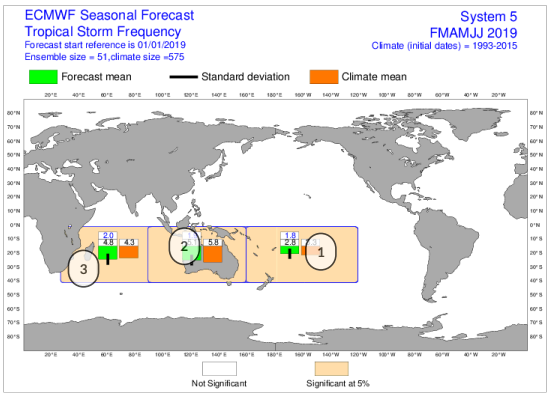






C3S multi-models probability map (on the top right) and UKMO, DWD, CMCC models.

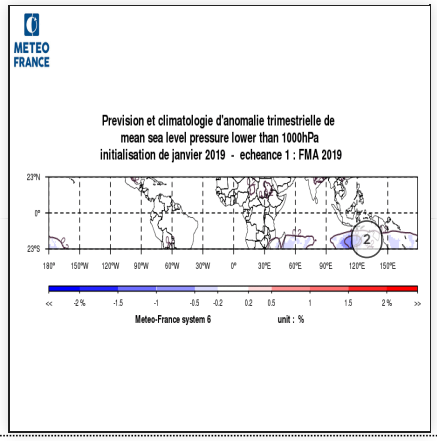
Forecast of climatic parameters : Tropical Storm Frequency



2- expected activity significantly below normal, consistent with the current El Niño and the SST below normal in the Indian Ocean West of Australia.

1- expected activity below normal, contrary to what is observed on average in El Nino condition.

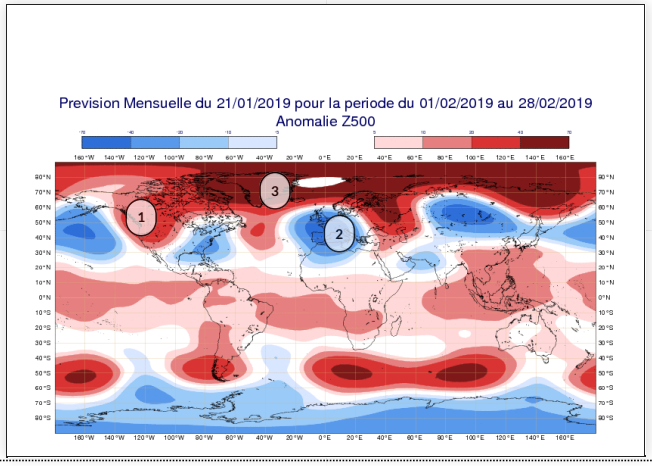
3- above-normal activity related to the SST anomaly in this area



2- Frequency below normal, consistent with current El Niño.

Monthly forecast of 20190121 : Z500

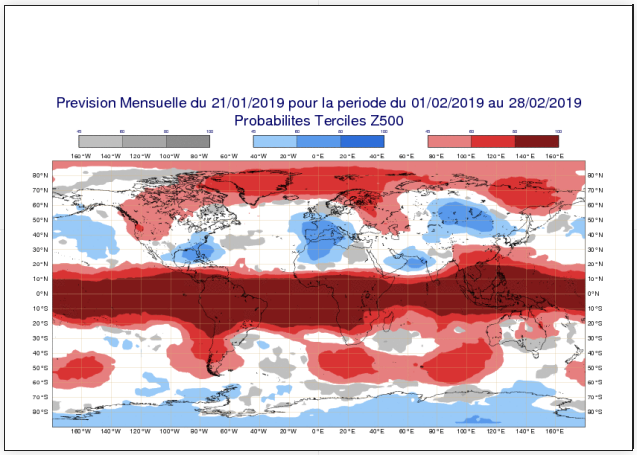
Probable strong influence of the SSW for the month of February with a NAO- structure type and a deep minimum on Western Europe.



1- Typical PNA+ pattern

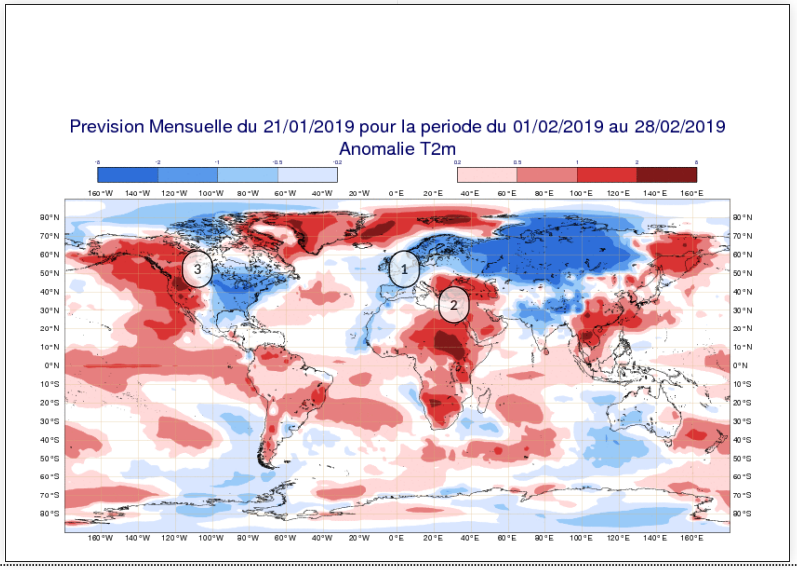
2- Z500 low over Western Europe. Consistent with NAO- situation

3- High values. Consistent with NAO- situation



Monthly forecast of 20190121 : temperature

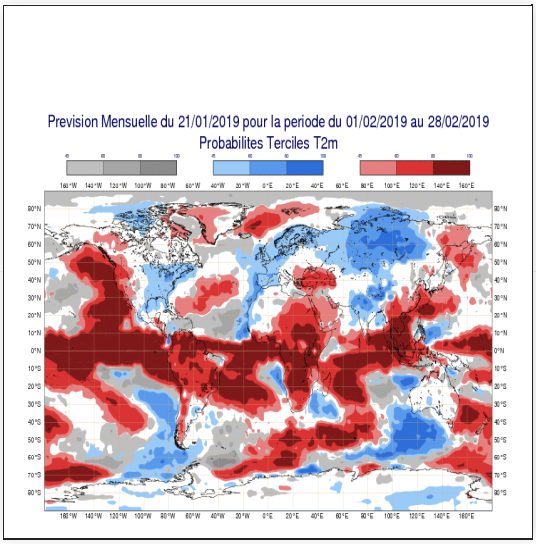
The temperature pattern is consistent with PNA+ over America and NAO- over Europe.



1- Cold anomaly over the main part of Europe

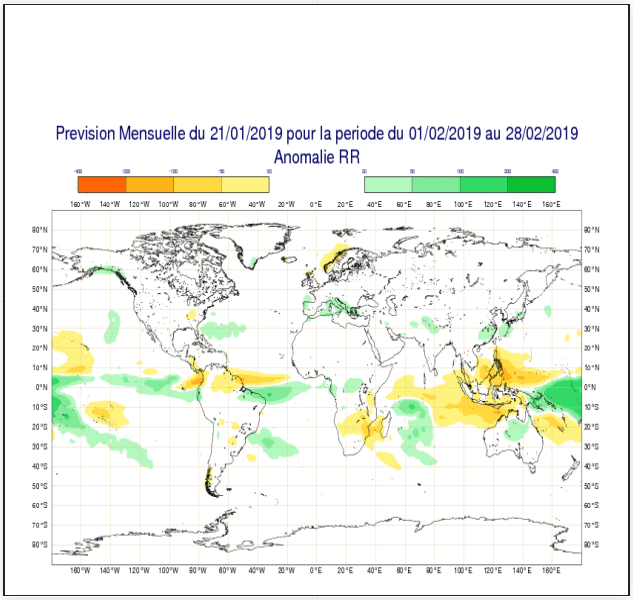
2- Warm anomaly on Southeastern Mediterranean Basin

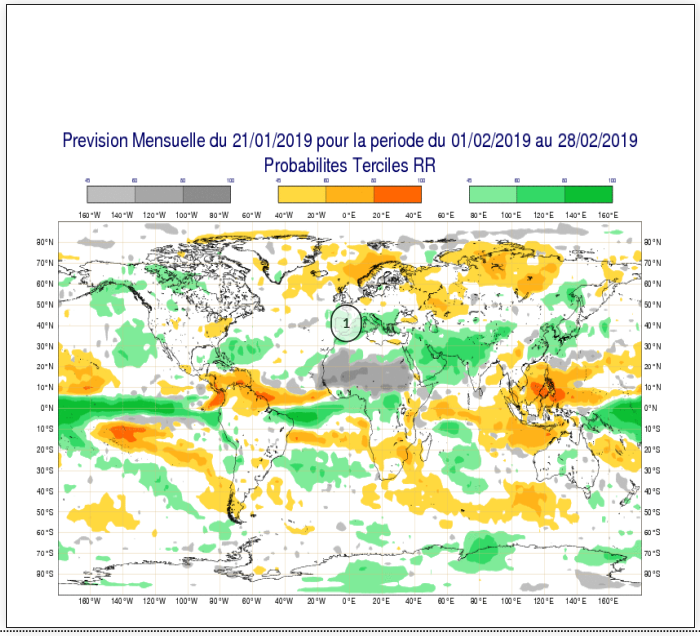
3- Strong contrast between warm anomaly over northwestern North America and cold anomaly over southwest



Monthly forecast of 20190121 : precipitation

The monthly forecast for February is significantly different from the seasonal forecast.

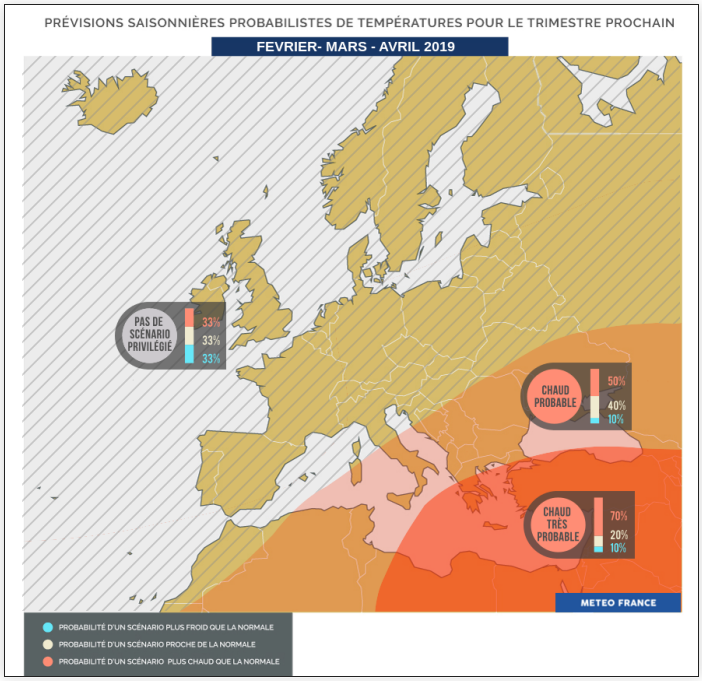




1- Wet signal on southwestern Europe and Western Mediterranean Basin

Synthesis map on Europe : Temperature

Consistent with a positive phase of EA mode of variability, warmer than normal is likely on the Southeastern Europe and on the Mediterranean regions. The probability is even higher on the east of the Mediterranean Basin.
No scenario from Western Europe to Scandinavia. February could be very different from the rest of the quarter and no average trend emerged over the 3 months.



Synthesis map on Europe : Precipitation

Drier than normal probable on North Africa and Eastern Mediterranean. Wetter than normal in northern Europe. And wetter than normal in western Europe where the probable rainy February weather should impact the quarterly average.