Météo-France Seasonal Forecast Bulletin

FEBRUARY - MARCH - APRIL 2020

General synthesis : JFM 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 steel **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 and Eastern Africa and downward potential velocity over South Pacific.

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

=> Most likely conditions :

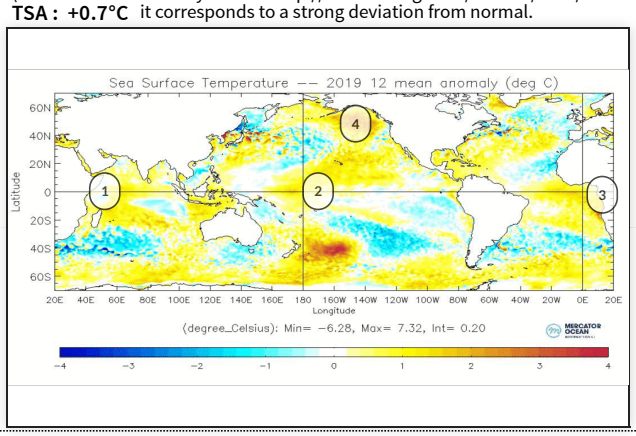
- Generally warmer than normal with the exception of North America and the Indian subcontinent.
  Wetter than normal over eastern Africa, northeast Brazil, and also at high latitudes in the northern hemisphere.
  Dry over southern Africa, Australia (signal attenuated) and the tropical North Atlantic.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

Oceanic analysis of December 2019 : SST anomalies

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

Index issued from Mercator Ocean PSYV4R2 analysis :

NINO3.4 : +0.2 °C (see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)
DMI : +0.5 °C Decreasing rapidly and returning to normal seasonal values
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/iod1.png)
TSA : +0.7°C it corresponds to a strong deviation from normal.

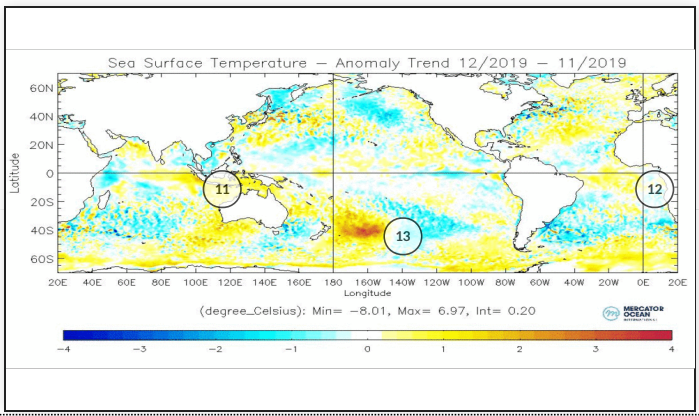


2- still warmer than normal in the western equatorial Pacific

3- Strong positive SST anomalies relative to the climatology

1- normal situation for the season

4- strong persistent hot anomaly



11- rebalancing the Indian Ocean dipole (IOD)

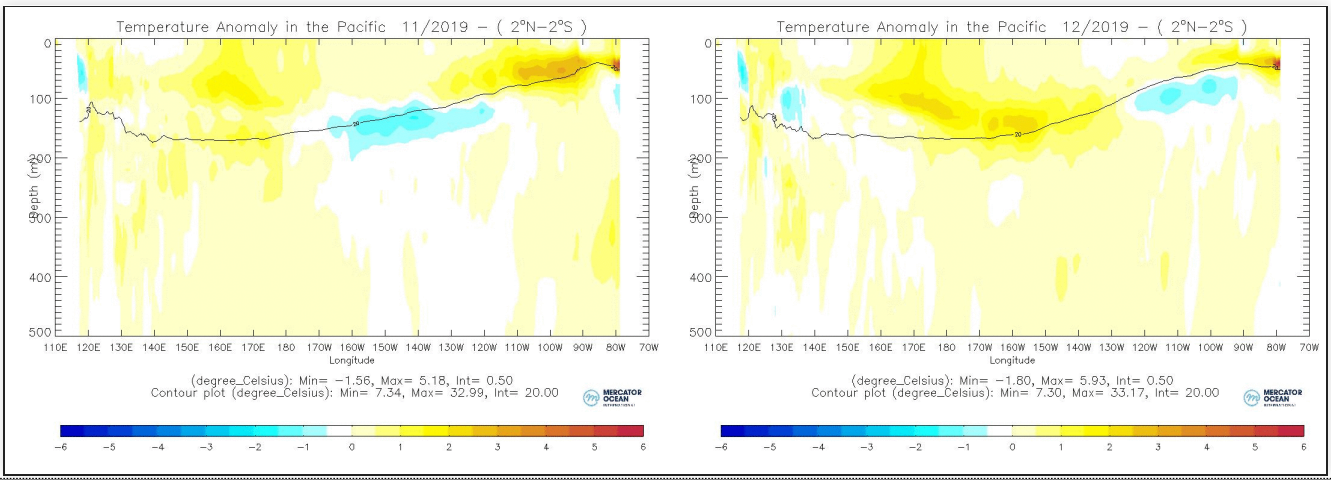
12- slight additional warming, reinforces the already strong values of the anomaly

13- reinforcement of the dipole leading to a strong east-west contrast

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

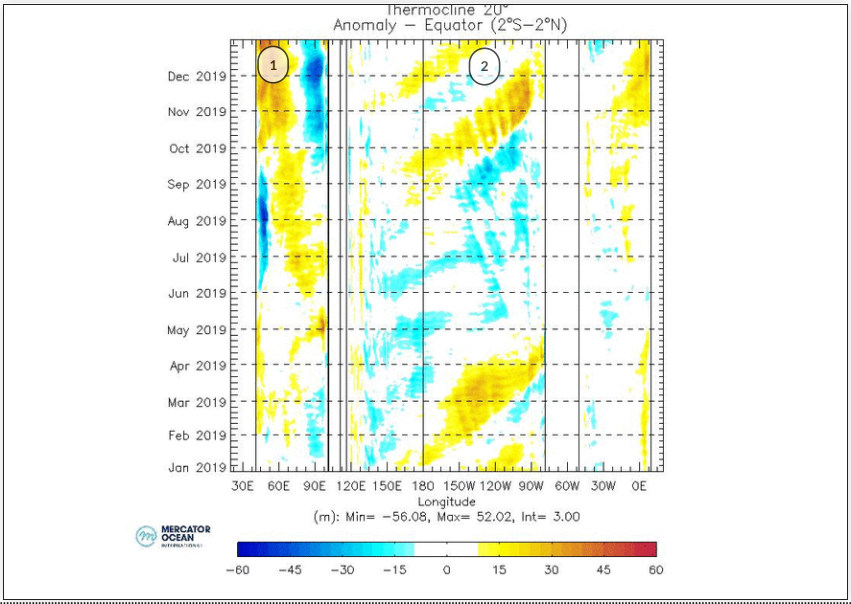
Oceanic analysis of December 2019 : vertical section

weak anomalies in subsurface



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

Oceanic analysis of December 2019 : Hovmüller diagram of the 20°C isotherm

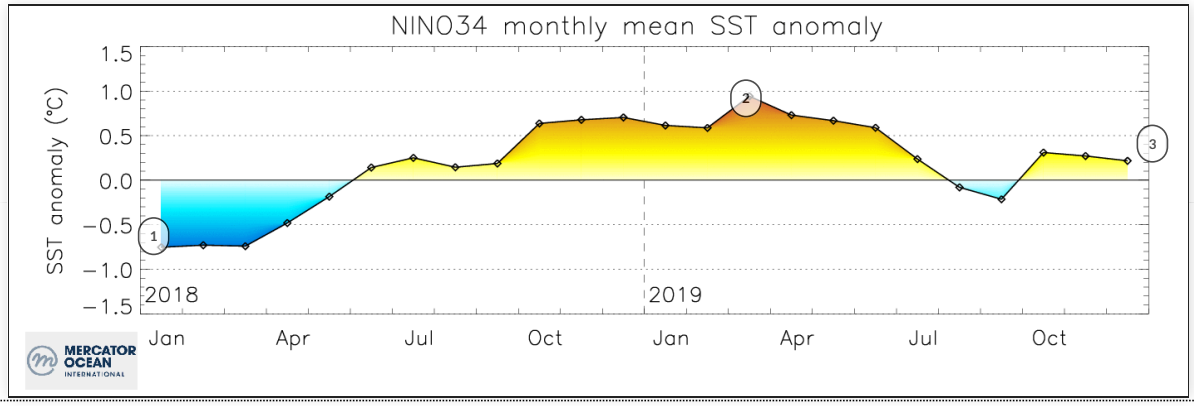


2- Weak waves in the Pacific Ocean

1- Strong IOD

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

Oceanic analysis of December 2019 : Pacific Ocean : Nino3.4 index history



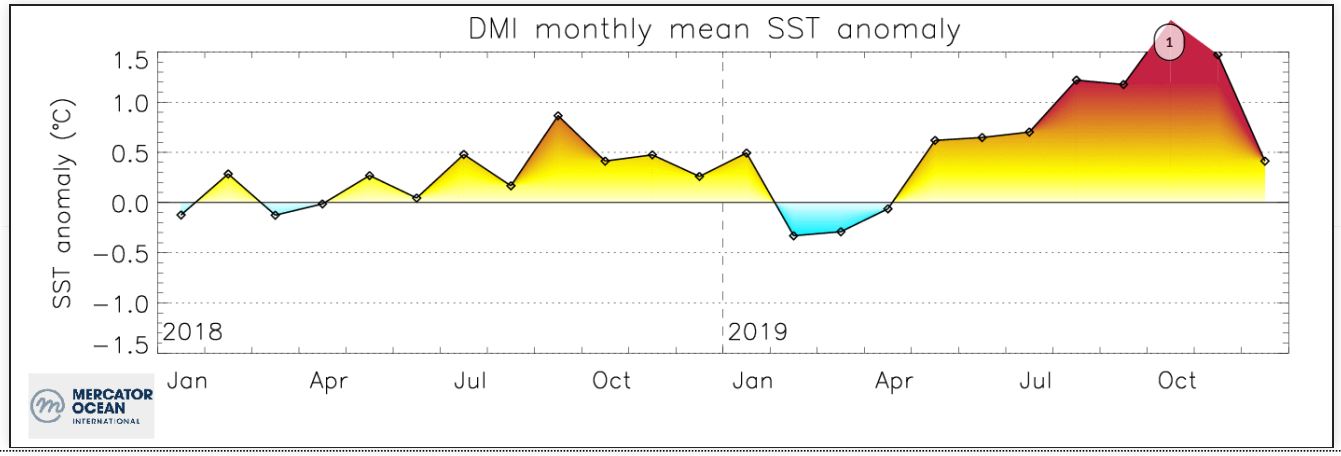
3- Neutral conditions

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

1- La Nina event of winter 2017-2018

Evolution of SST in the NINO3.4 box

Oceanic analysis of December 2019 : Indien Ocean - DMI index history



1- IOD on record in october

Evolution of SST in the DMI box

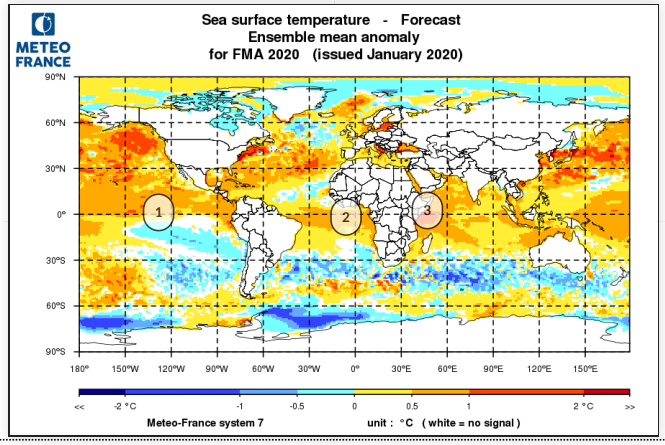
Oceanic forecast : SST anomaly

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.

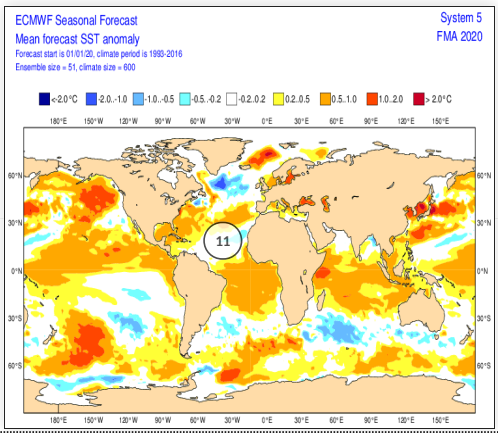
For the Atlantic, persistence of a large positive anomaly from the North American coasts and the Caribbean sea to the Iberian Peninsula. Persistence of the cold anomalies in southwest Iceland and off the African coast. Persistence of the positive anomaly south of the equator.



1- Neutral Niño conditions forseen by both models

2- Positive anomalies in both models

3- Strong warming near African Cost. The DMI index is calculated in a box further east. It is not affected by this warming

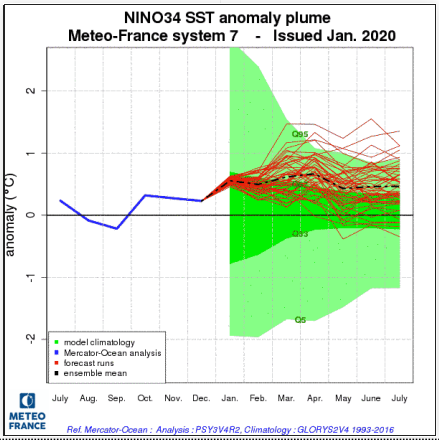


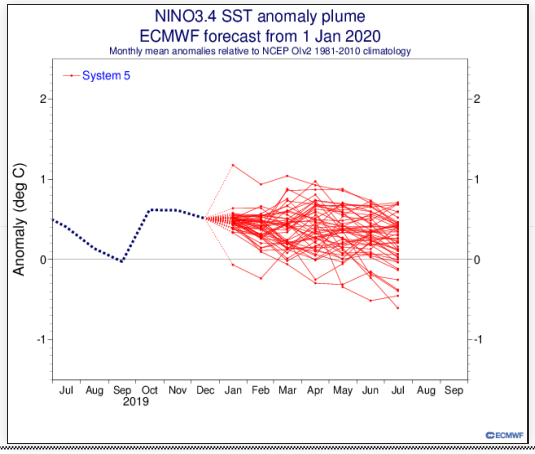
11- Large positive anomaly

Oceanic forecast : NINO3.4 Plume diagrams

Forecasted Phase : neutral conditions

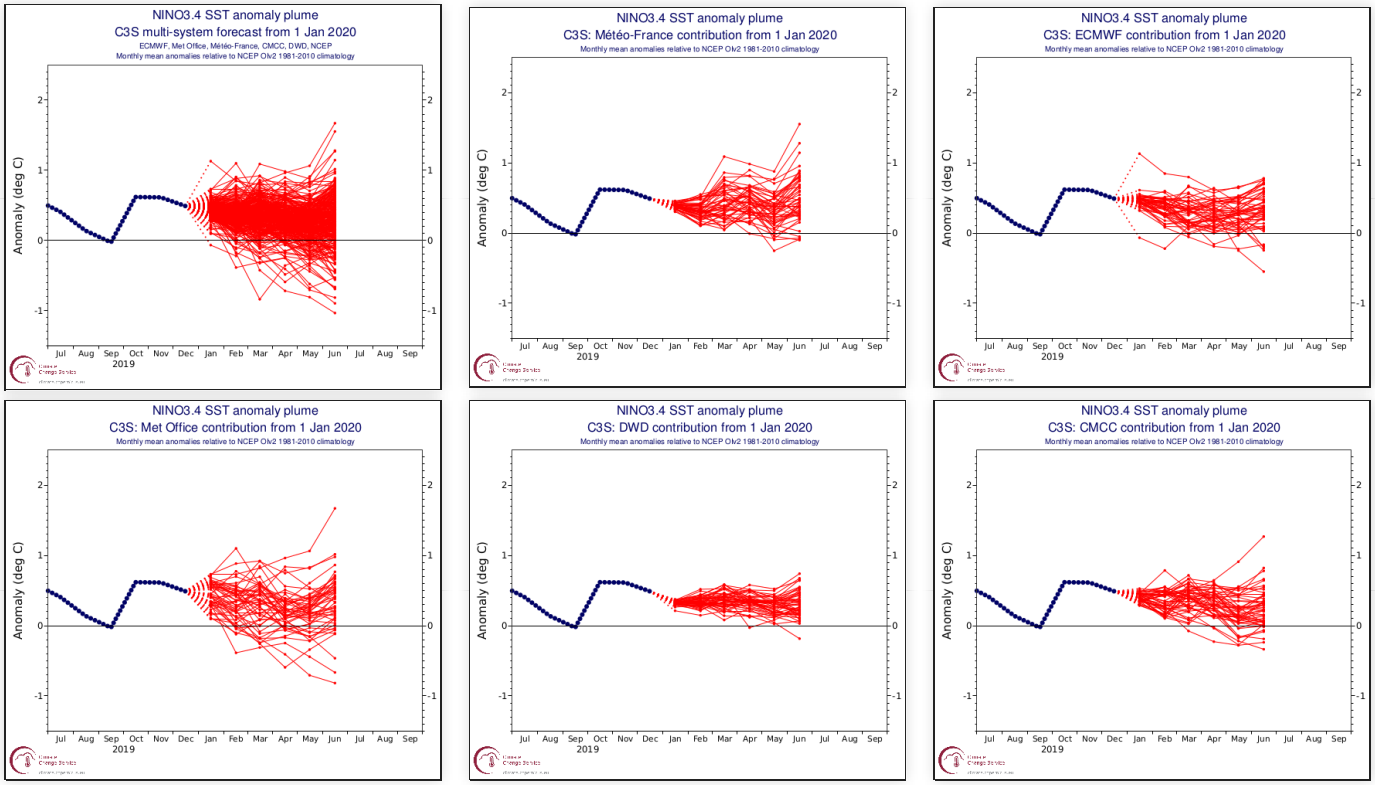
Large spread around +0.5°C. Neutral conditions should remain for the next three months.





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

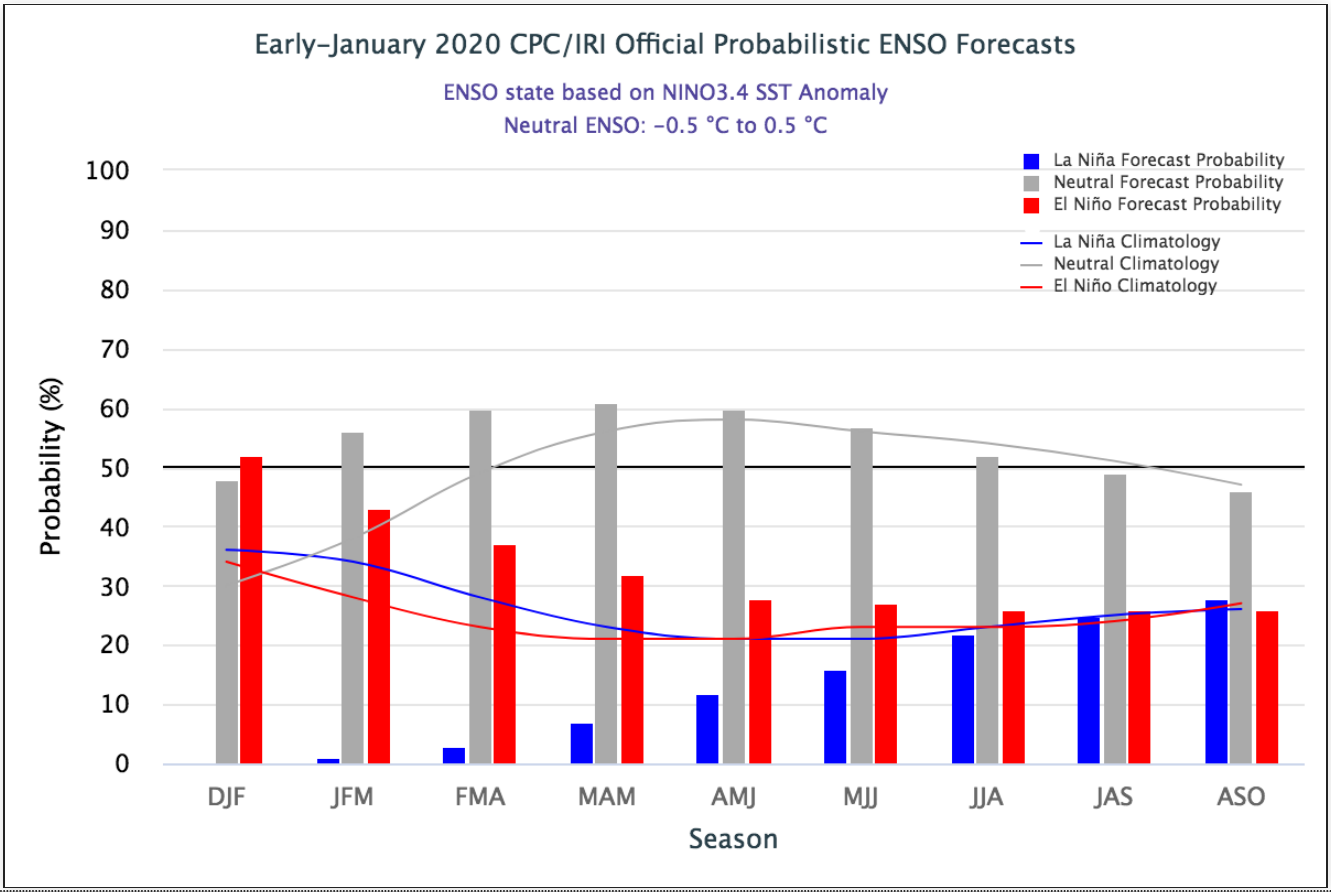
Very good agreement between models. Most members forecast a weak positive anomalie (between 0 and +0.5°C). Neutral El Nino conditions are therefore most likely for the coming months.



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

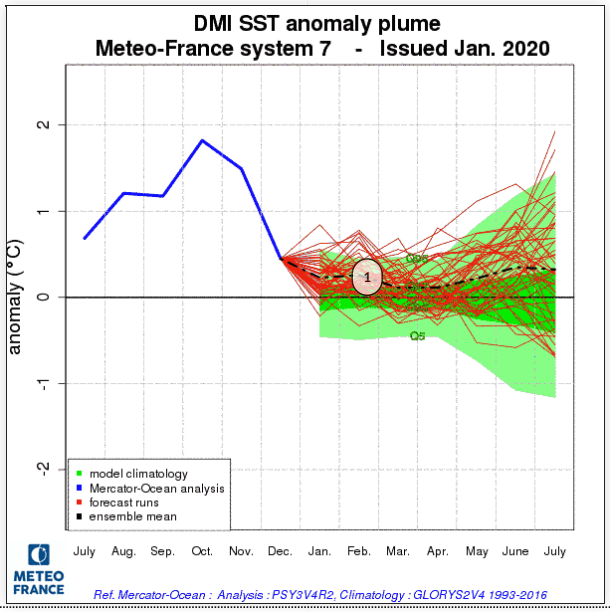
Neutral conditions are most likely (about 60 %) for the FMA period



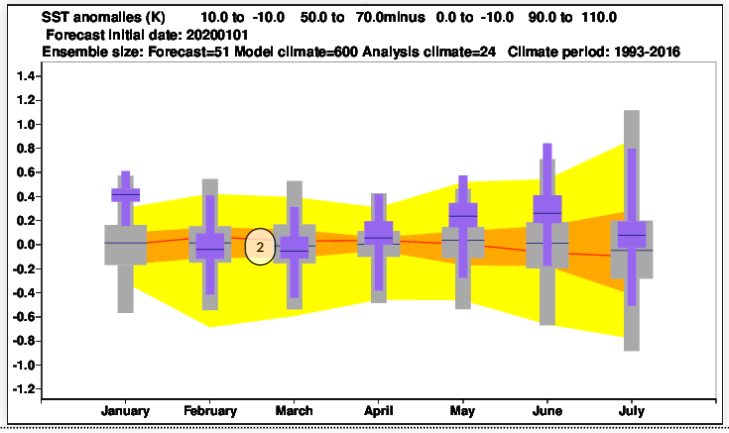
Probability of Niño, Niña, and neutral phases for the next 8 quarters. source *http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/*

Oceanic forecast : Indian ocean - DMI evolution

The expected DMI is slightly stronger with MF7 than with ECMWF. Both stay close to the normal.



1- weak positive anomaly for FMA

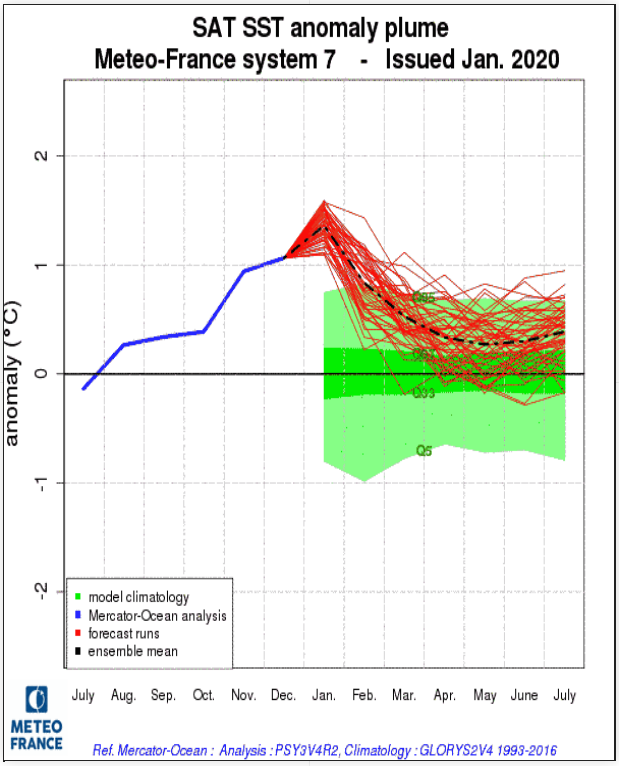


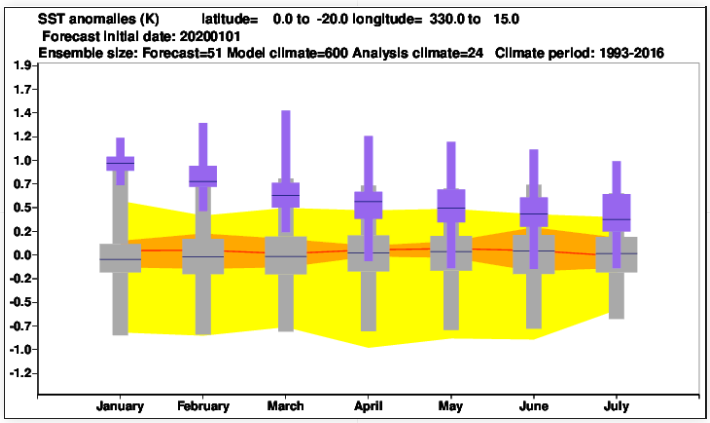
2- Weak negative anomaly in February and March

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

Oceanic forecast : Atlantic ocean - TAS 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).





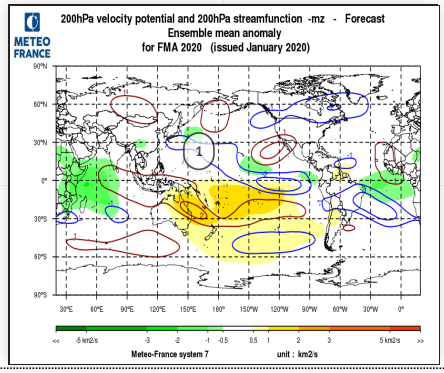
Anomaly on the SAT box : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

Drivers : undefined

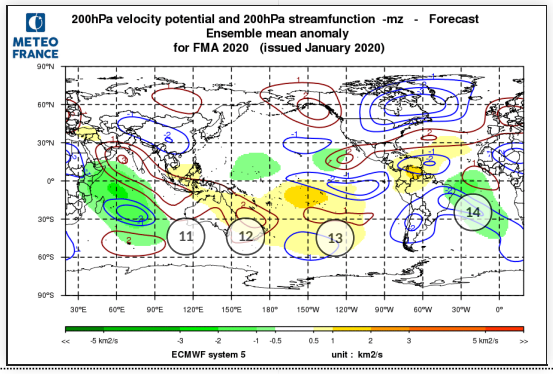
Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : The models converge for an area of upward motion over the western Indian Ocean and eastern Africa. They also agree on the downward motion area on the South Pacific. They diverge on the Maritime Continent and the Atlantic. DWD is most consistent with SST patterns.

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

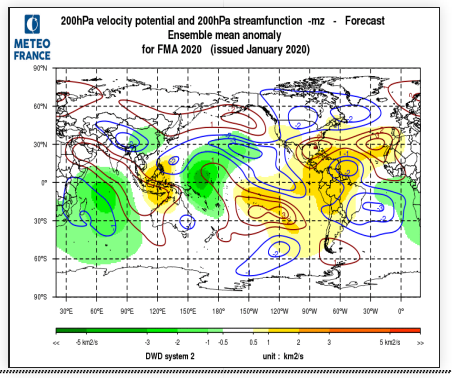


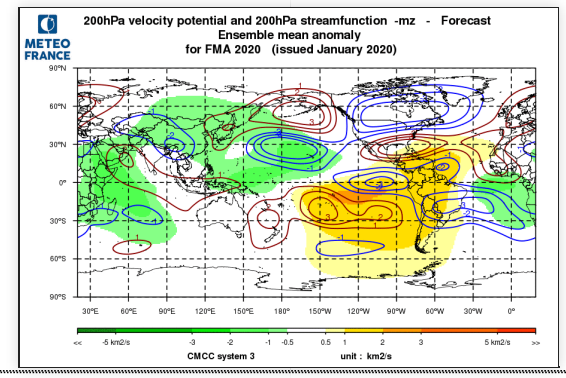
11- VP : Persistence of upward motion area linked to positive SST anomaly

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

12- The subsidence zone should continue to attenuate with the disappearance of the cold SST anomaly and the return of the IOD to neutral

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

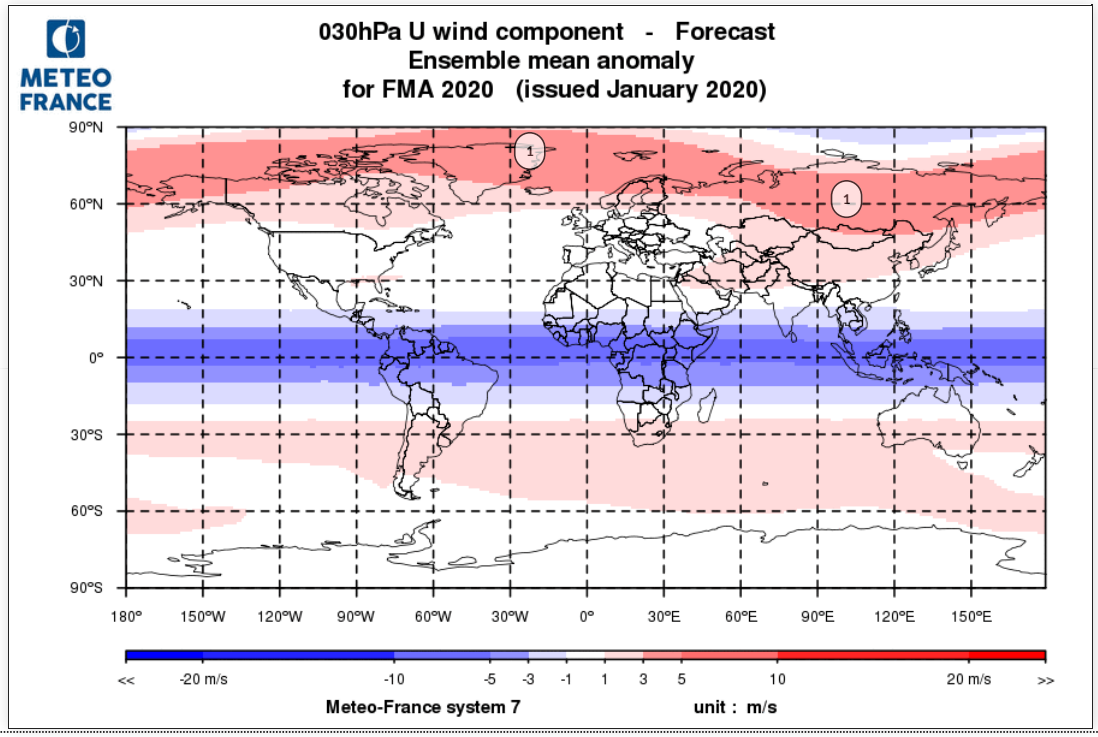




MF7,SEAS5, DWD and CMCC 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

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.

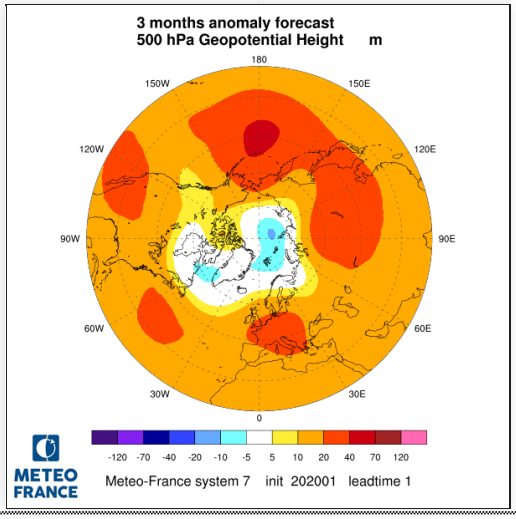


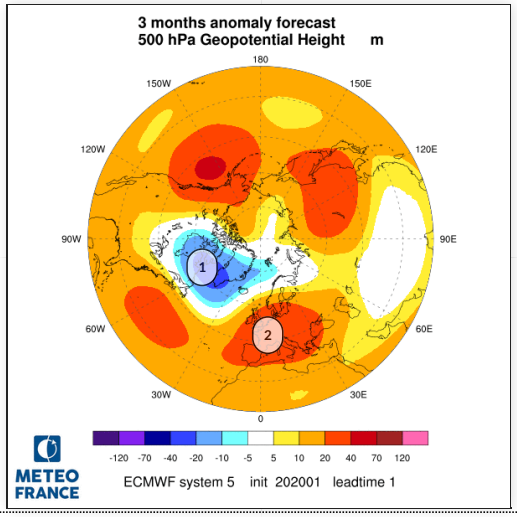
1- enhanced polar vortex

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 and Europe. ECMWF digs a minimum from the Middle East to China, which MF7 does not do.





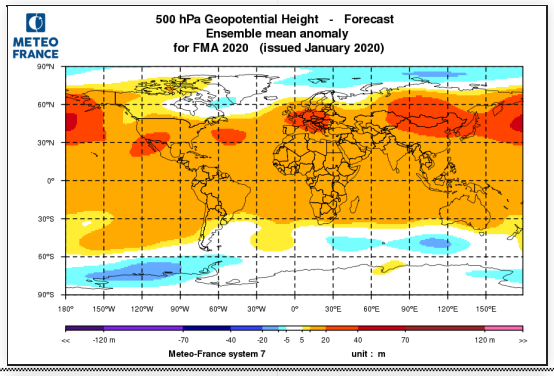
1- minimum more hollow

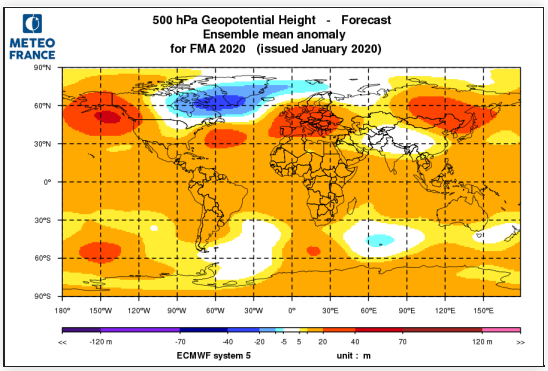
2- Larger maximum

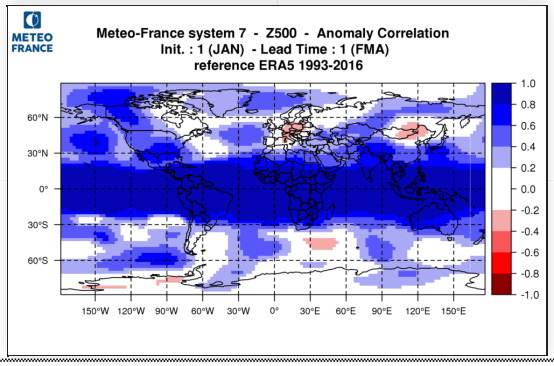
polar projection of MF7 and SEAS5 500hPa geopotential height anomalies.

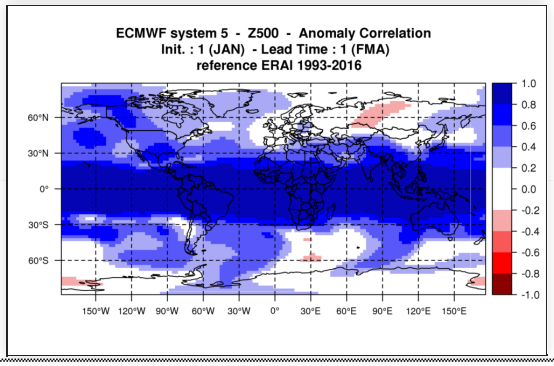
Atmospheric circulation forecasts : Z500 scores

Both models have little predictability at mid latitudes, especially from Europe to Siberia



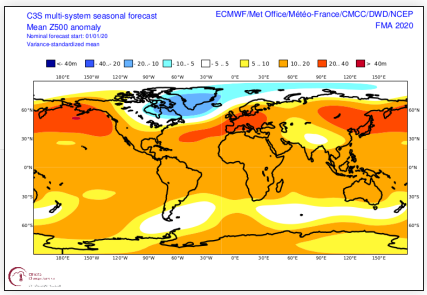


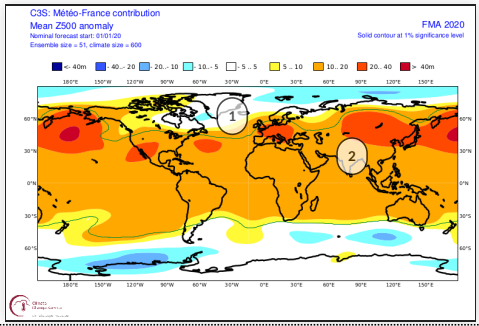




Atmospheric circulation forecasts : Z500 anomalies in C3S models

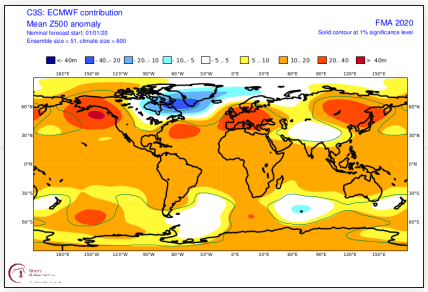
In the northern hemisphere, very good agreement between models regarding general situation for winter. Like the previous forecast, NAO+ and EA+ circulation types seem to be highly likely. A positive geopotential anomaly concerns a large part of Europe. The low from Middle East to China is the trace of the stream-function cyclonic anomaly (not seen by MF7).

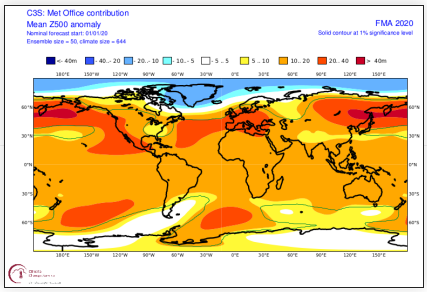


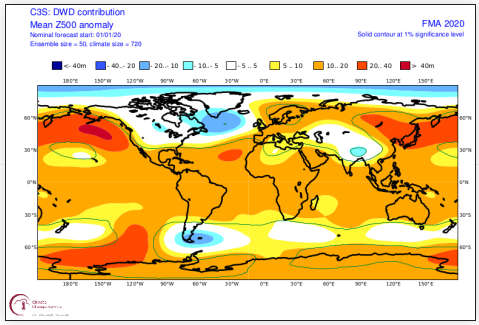


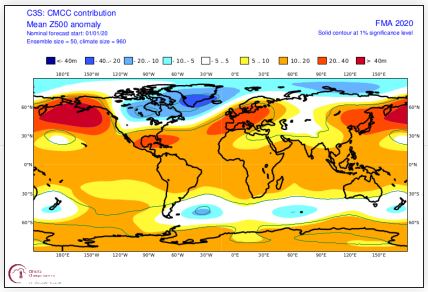
1- MF7 has a softer NAO+ pattern.

2- No minimum forecasted





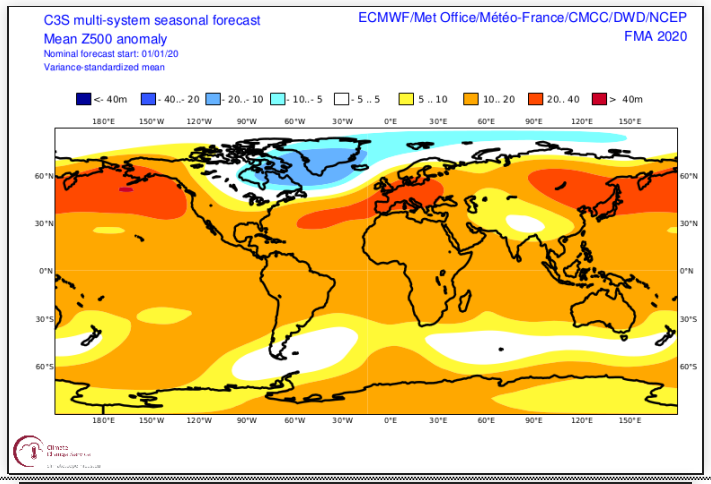


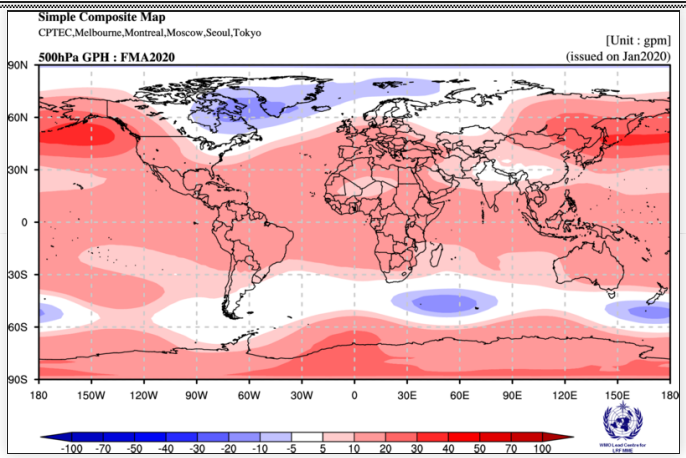


C3S multi-system, MF7, SEAS5, UKMO, DWD and CMCC 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

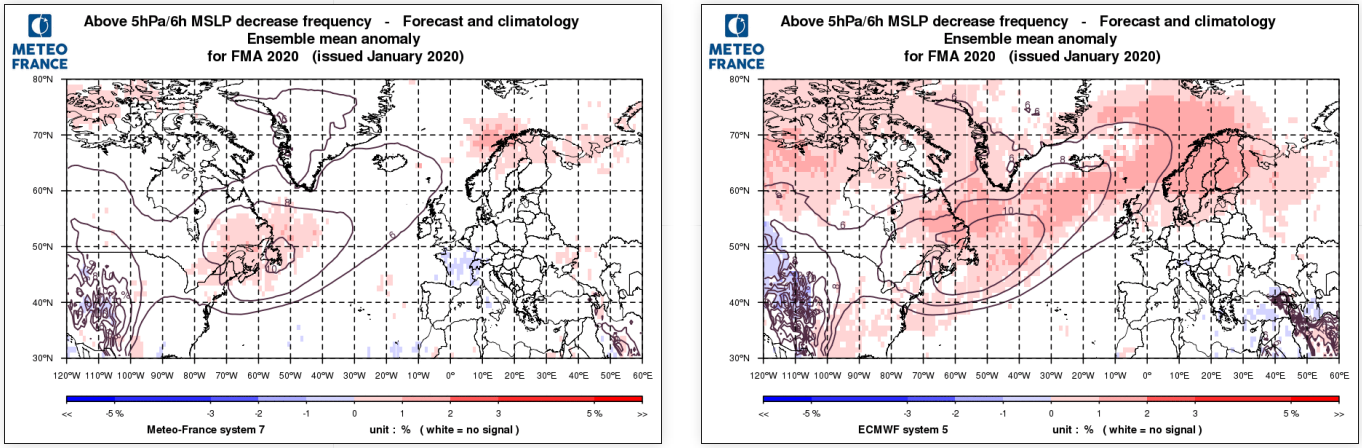
Remarkable consistency between the C3S multi-model and all but C3S multi-model (bottom map).





Atmospheric circulation forecasts : Strong MSLP decrease

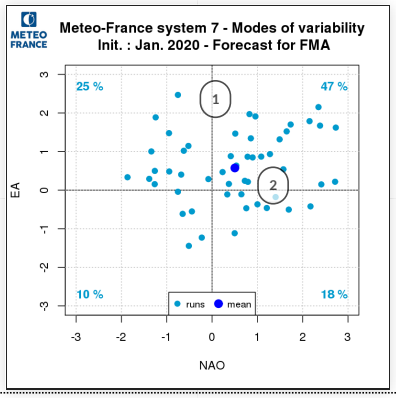
With ECMWF, the frequency of depressions is greatly increased in their North Atlantic rail. As noted earlier, MF7 has less contrasted fields and generates a weak signal.

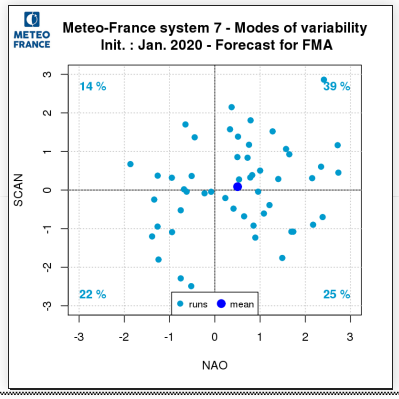


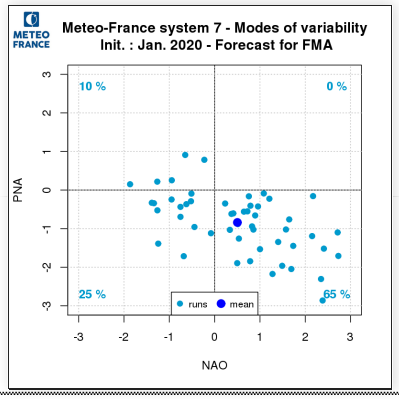
Frequency of more than 5hPa/6h MSLP decrease in MF7 (left) and ECMWF (right)

Modes of variability : forecast

Both models suggest a high probability of positive NAO and EA modes.

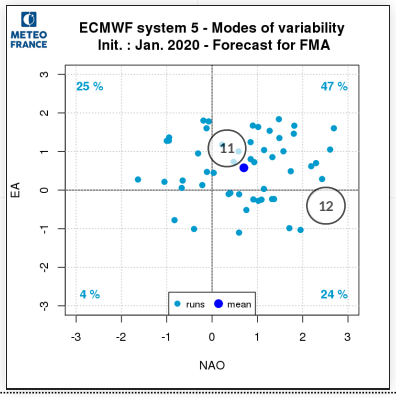


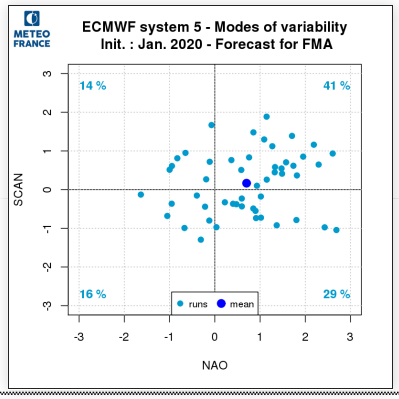


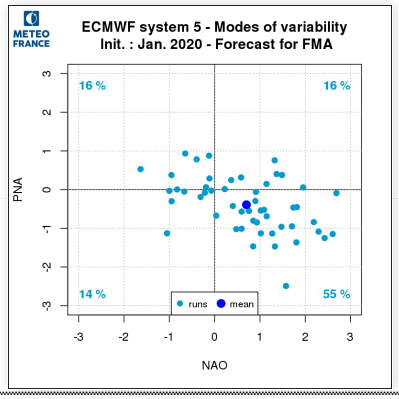


1- positive EA for 72% of runs.

2- positive NAO for 65% of runs.







12- Positive NAO 71% of the members.

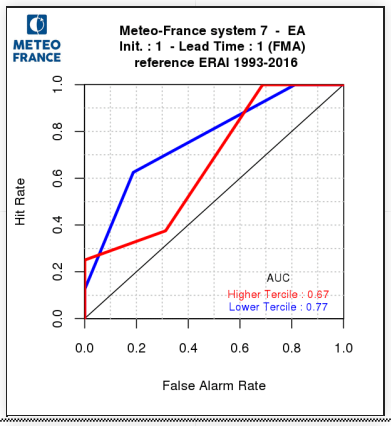
11- positive EA for 72% of runs.

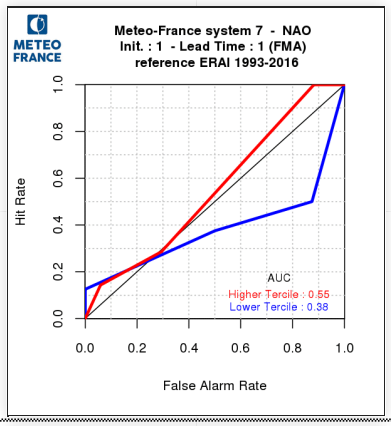
see the modes of variability patterns

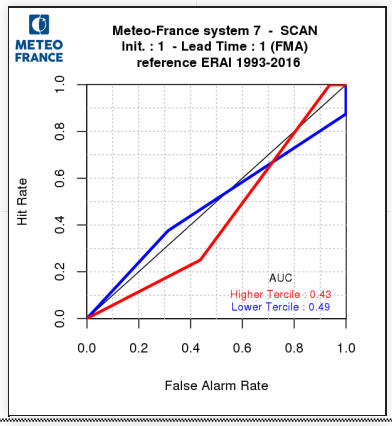
Modes of variability : scores

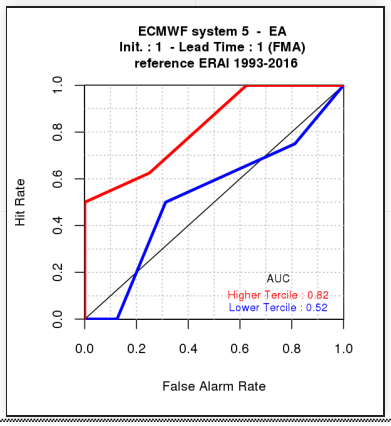
We focus here on the modes that concern North-Atlantic and Europe.

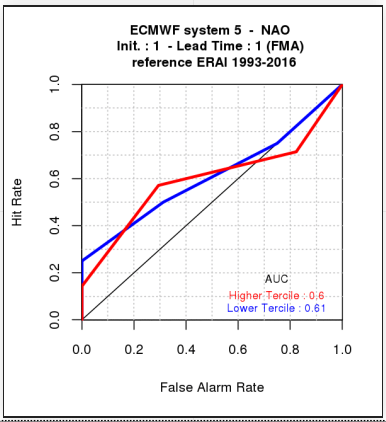
MF7 has some predictability for EA mode. Its score is poor for NAO. ECMWF has a better score for NAO but a lower one for EA.

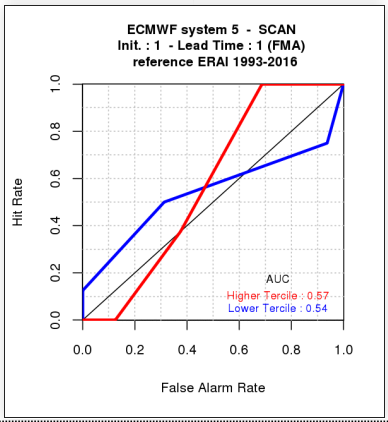








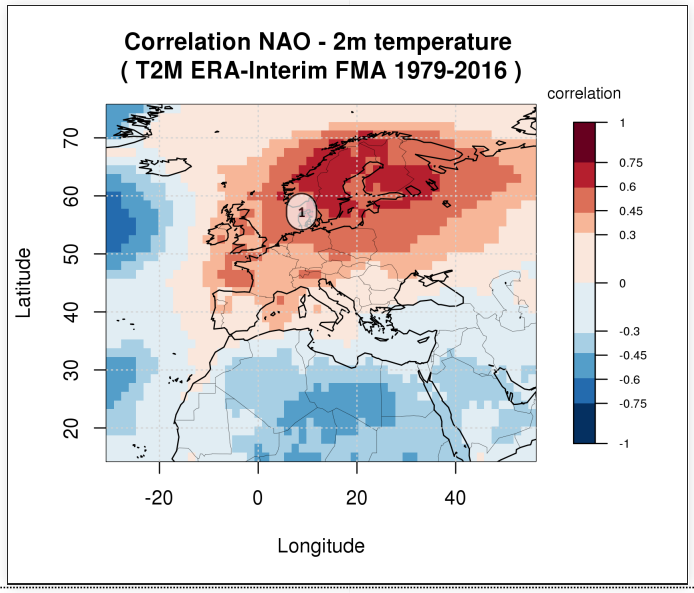




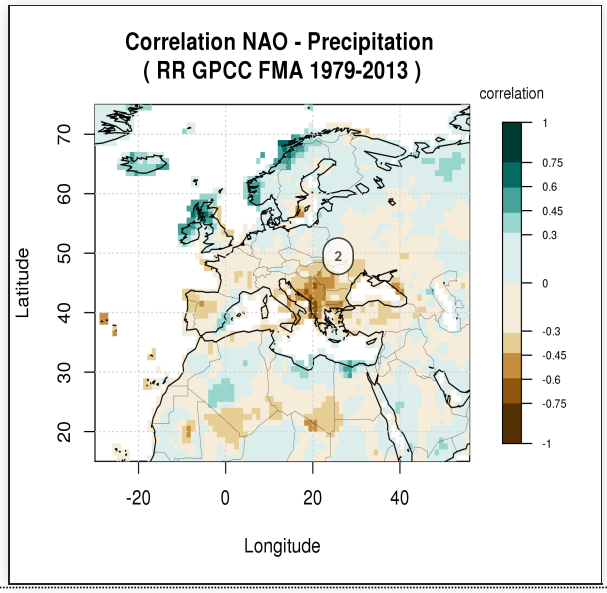
see the modes of variability patterns

Modes of variability : NAO impacts

NAO+ mode should be favoured



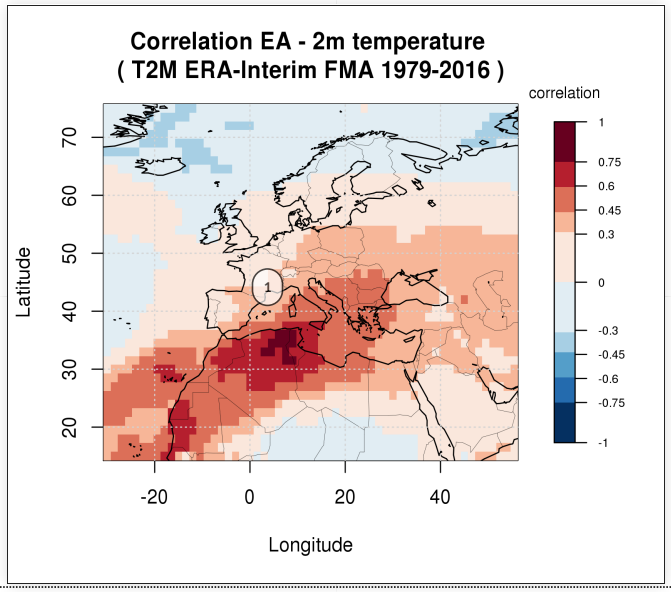
1- Warmer than normal over north-western Europe, and particularly over Scandinavia



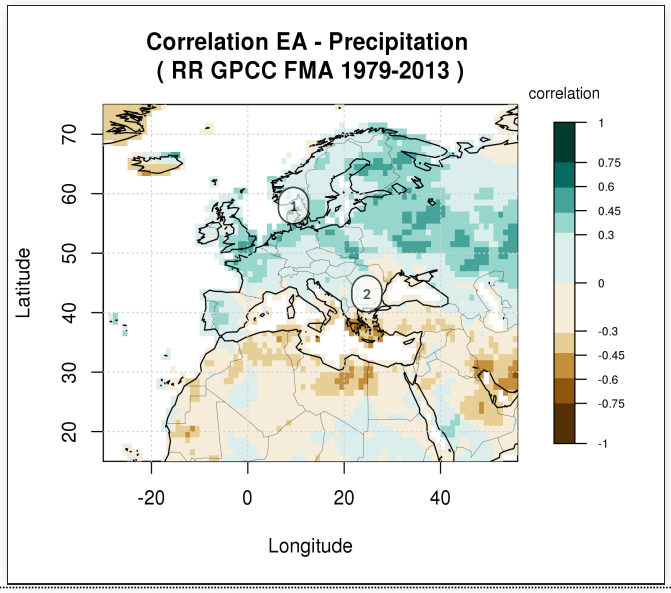
2- drier than normal for southern Europe; wetter for northern Europe.

Modes of variability : East Atlantic impacts

EA+ mode should be favoured



1- Warm signal over Europe

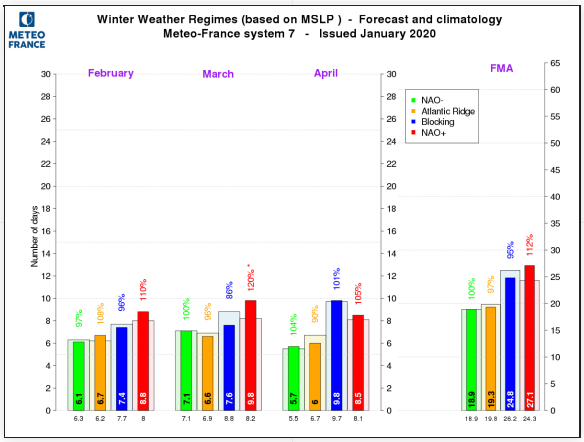


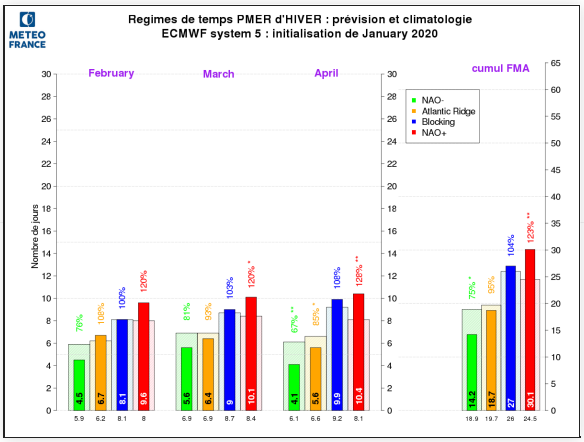
2- Dry conditions for south-eastern Europe

1- wet conditions over northern Europe

Weather regimes : winter Sea Level Pressure classification

ECMWF favors NAO+ to the detriment of NAO-. This trend is less marked in MF7

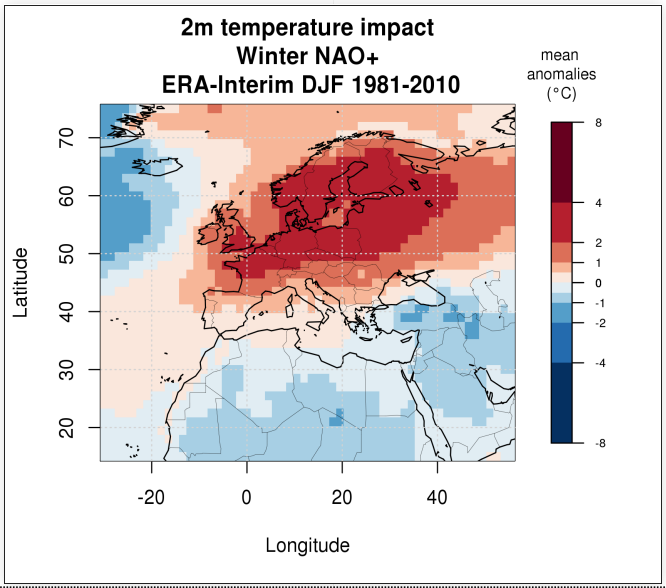


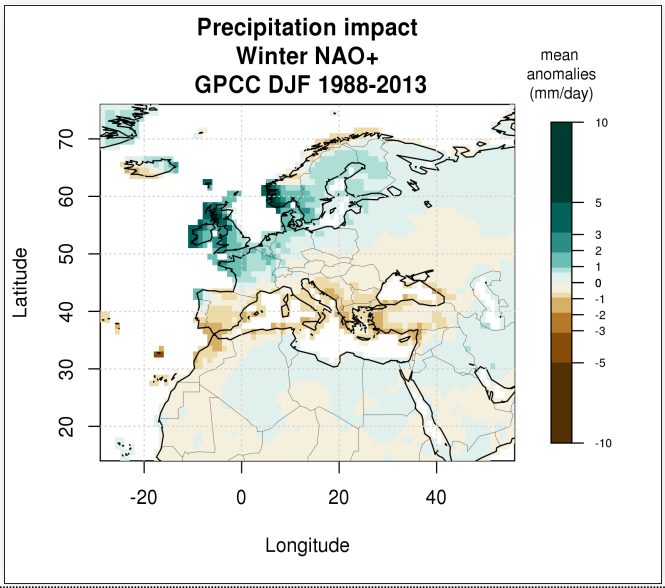


Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF7 (left) and SEAS5 (right).

See the winter weather regime patterns

Weather regimes : Impacts

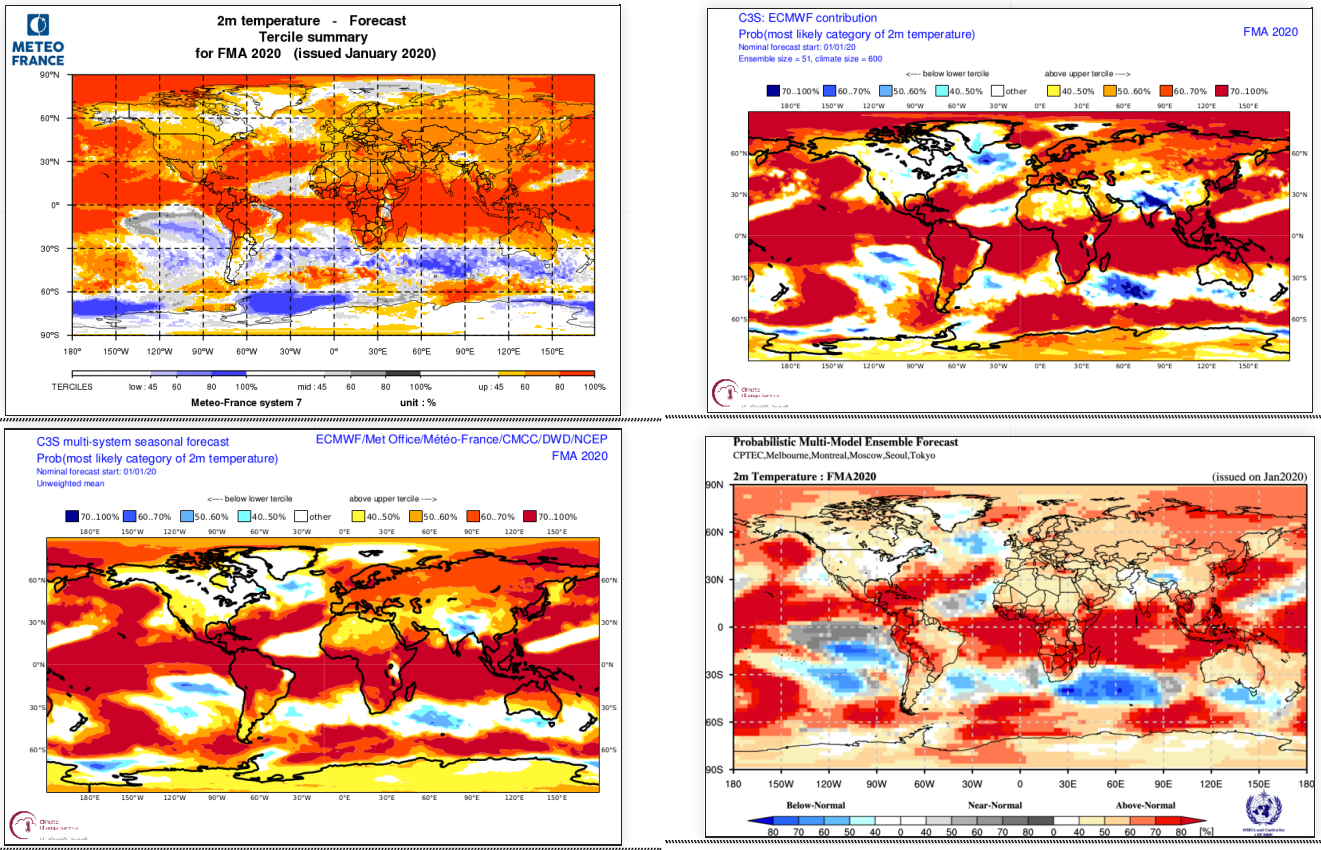




Impact of Winter NAO+ weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

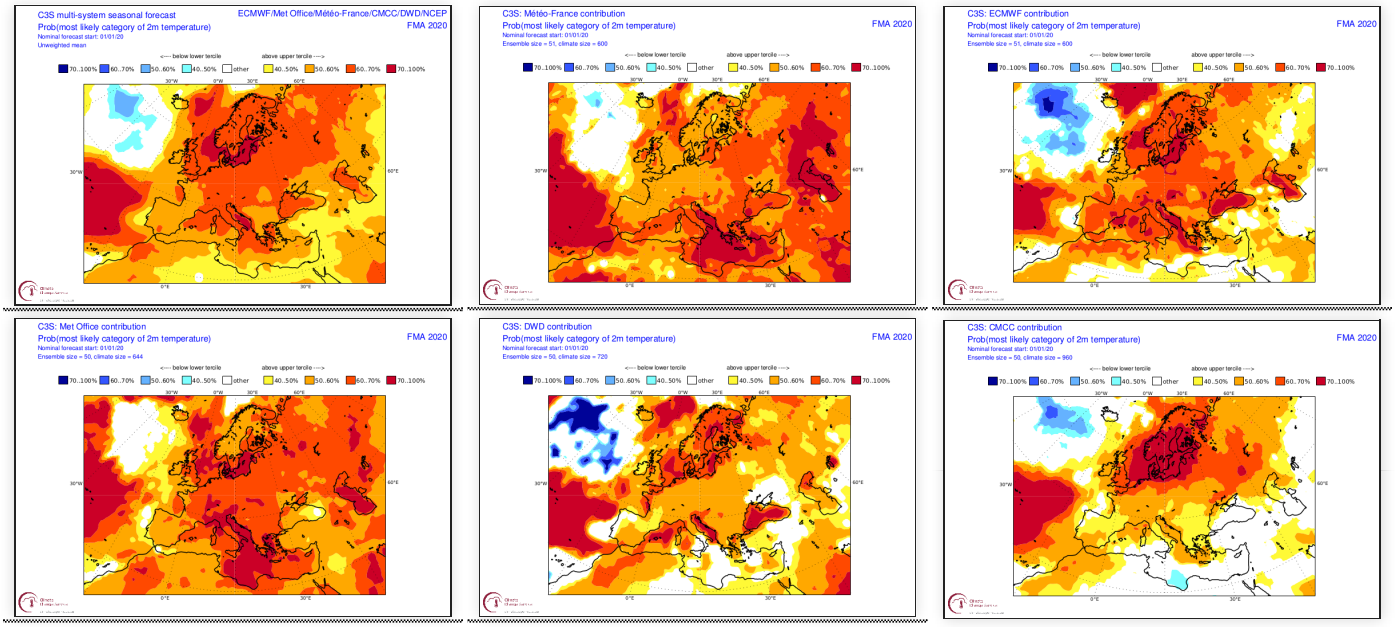
Remarkable good agreement between models all over the world.
Warm signal on most of the globe with 2 little exceptions in Eastern Africa and northeastern Brazil (wet conditions) and a more extended one in the Indian Subcontinent.
Forecasts are shared over North America and the warm signal is not dominant



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

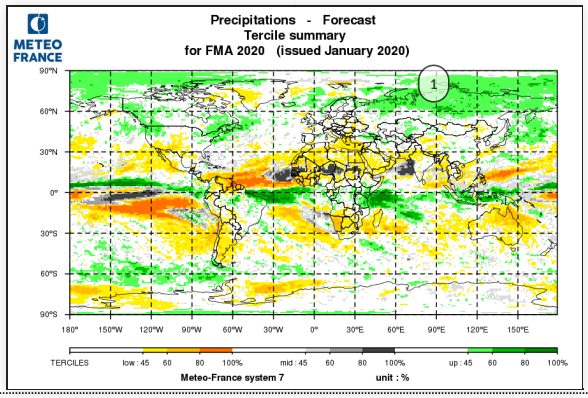
In agreement with their general circulation pattern, all the models favor a warm option over Europe and the Mediterranean basin.



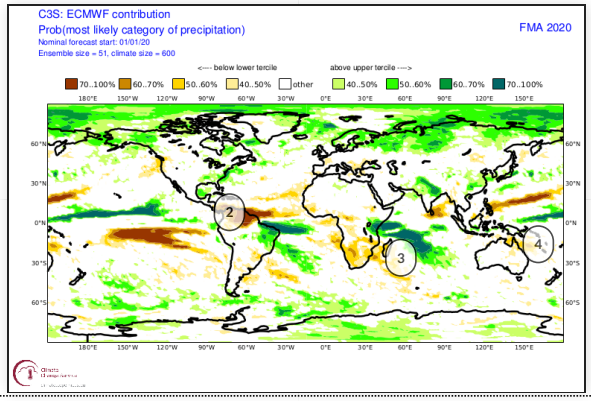
C3S multi-models probability map (top left) and MF7, ECMWF5, UKMO, DWD, CMCC models.

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.



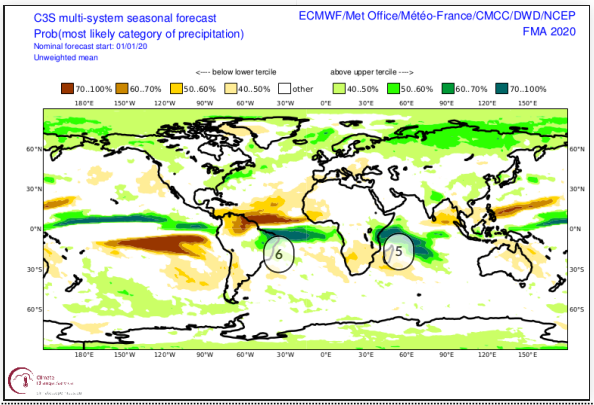
1- Wet conditions in high latitudes



3- Continuation of dry conditions

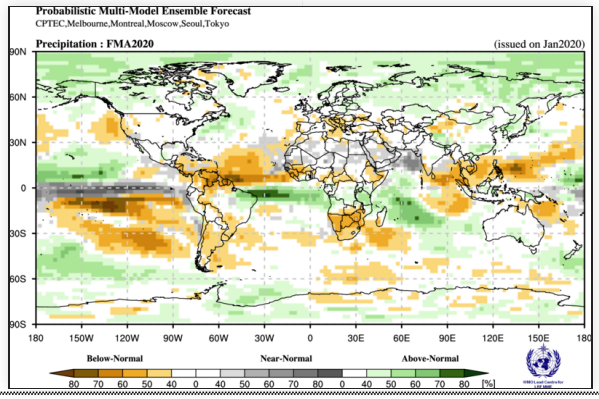
4- dry signal weakening over Australia

2- dry area linked with downward velocity potential



5- Wet area linked to SST of western Indian Ocean.

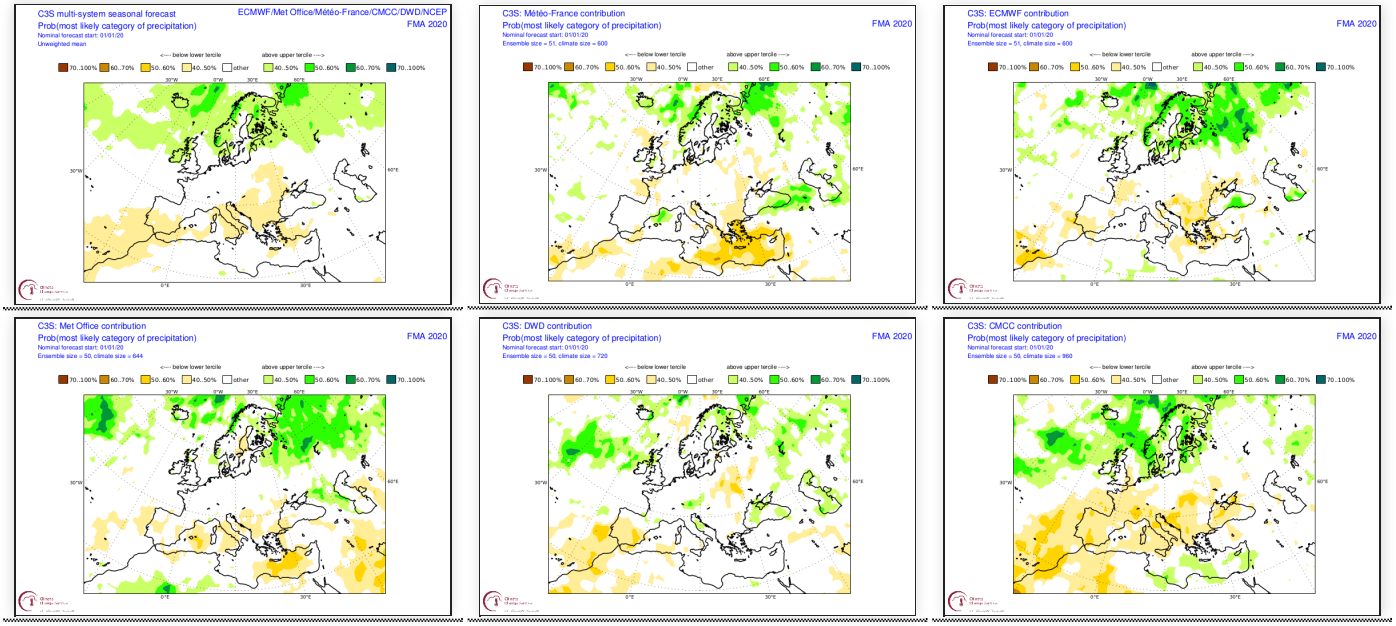
6- Wet area linked to SST of the South Tropical Atlantic



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

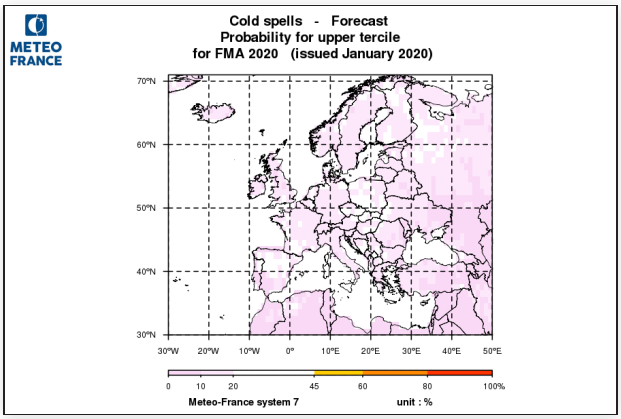
In agreement with positive NAO and/or EA modes, enhanced wet signal for northern Europe and dry signal for southern Europe and the Mediterrean basin.

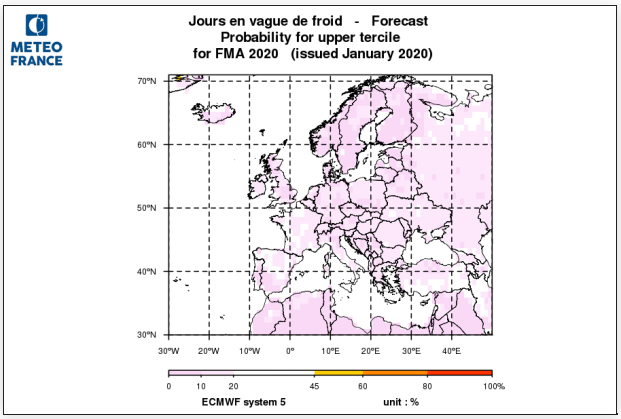


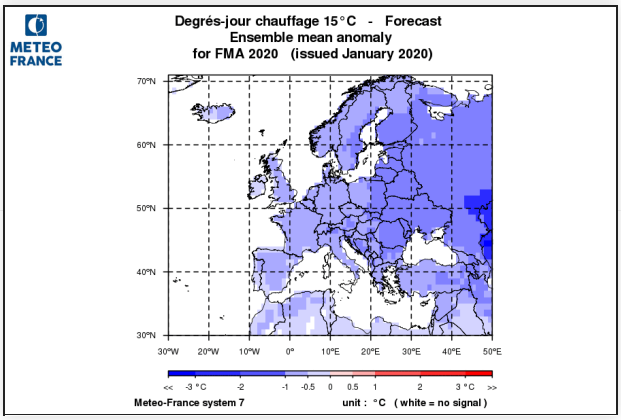
C3S multi-models probability map (top left) and MF7, SEAS5, UKMO, DWD, CMCC models.

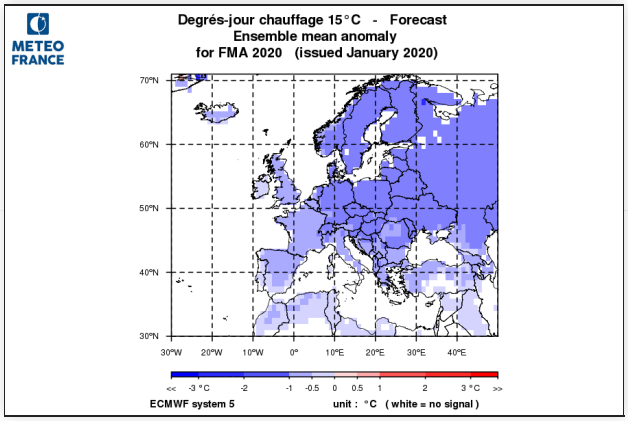
Forecast of climatic parameters : Nouveau sous-titre

The probability of a cold spell is very low in both models. The need for heating is also reduced especially in eastern Europe.







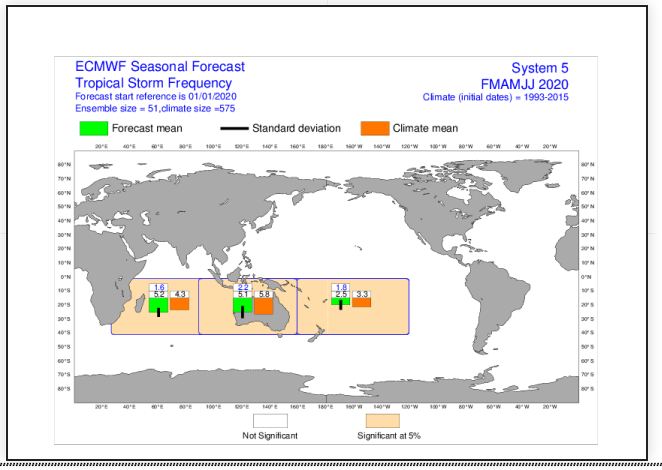


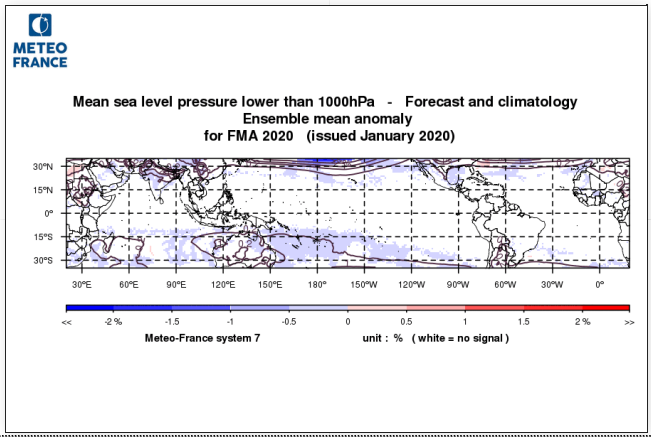
Above, cold wave probability and below, heating degree-days (base 15°C) for MF7 (right) and ECMWF (left)

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.

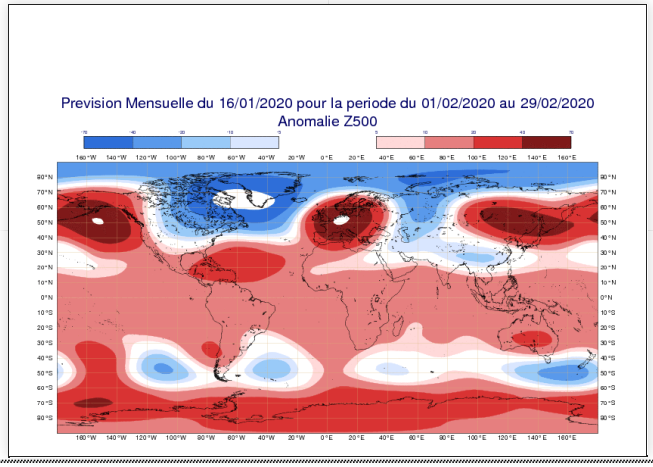
MF7 (index based on the frequency of low < 100hPa) shows also a reduction of stropical storm activity around Australia and over Southern Pacific.

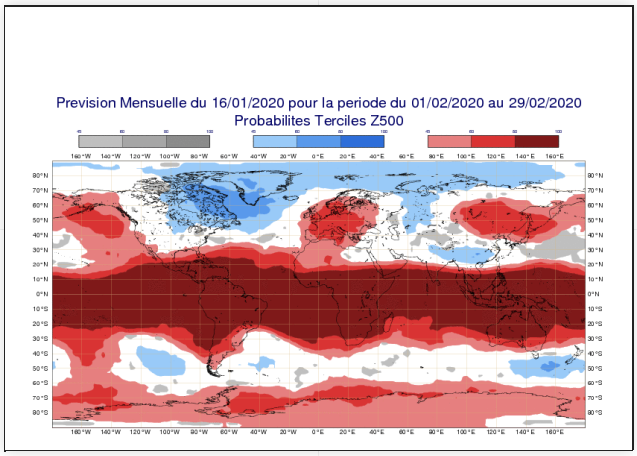




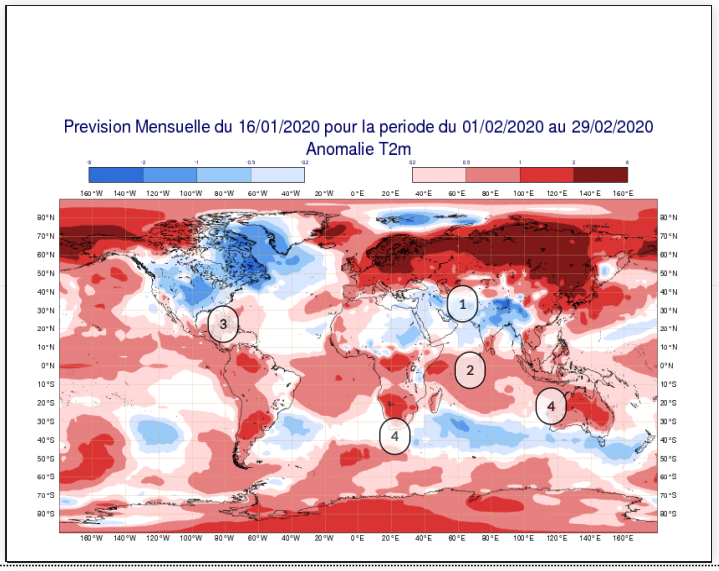
Monthly forecast of 20200116 : Z500

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





Monthly forecast of 20200116 : temperature



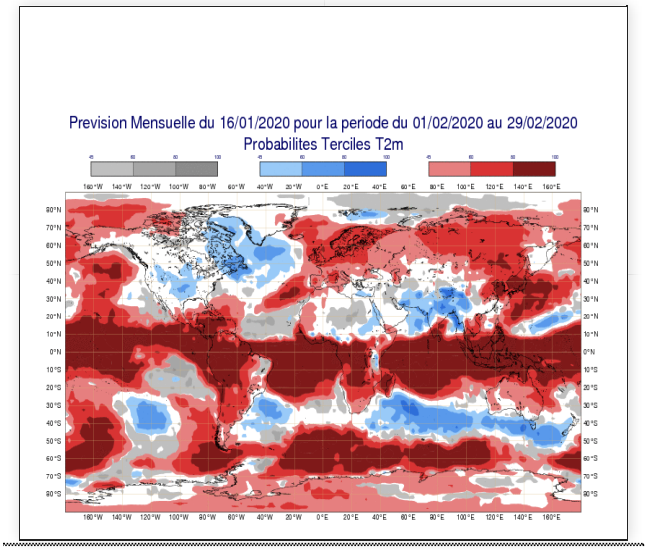
1- Very strong anomaly expected over Siberia and northern Europe.

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

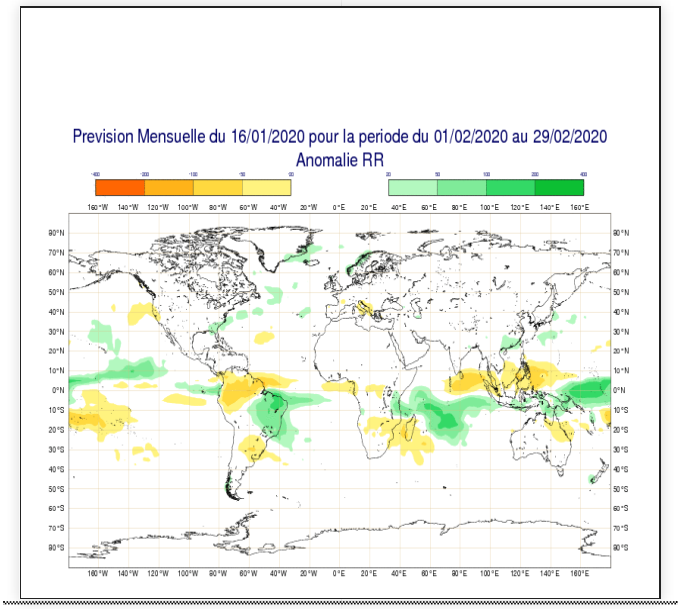
3- Marked cold anomaly which will strongly influence the rest of the quarter.

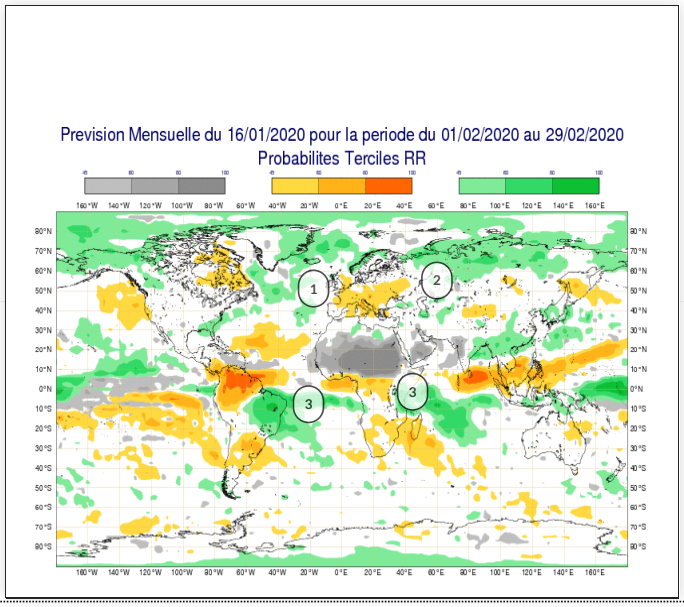
4- Probable continuation of the hot anomaly over southern Africa and Australia

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



Monthly forecast of 20200116 : precipitation





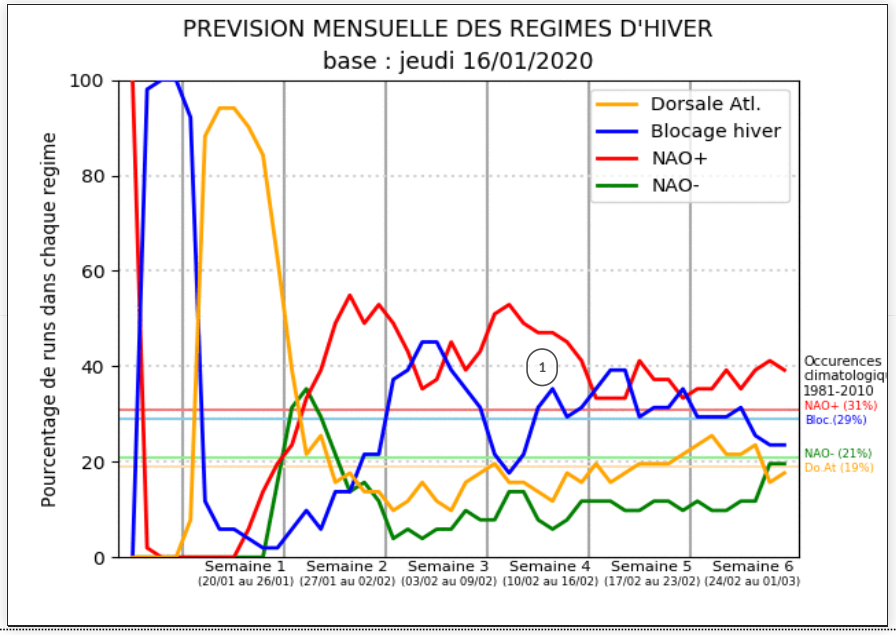
3- Wet anomaly consistent with the general situation described in the seasonal forecast.

3- Wet anomaly consistent with the general situation described in the seasonal forecast.

2- Wet anomaly linked to low geopotential values and high forecast temperatures.

1- dry signal over Europe due to the high geopotential.

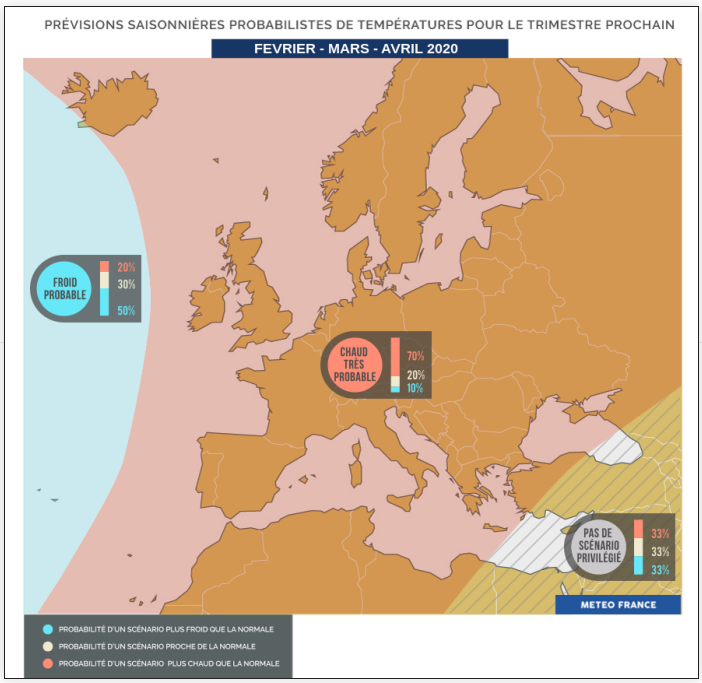
Monthly forecast of 20200116 : winter SLP weather regimes



1- Alternation of NAO+ and blockage due to probable displacement of the high geopotential during the month

Synthesis map for Europe : Temperature

The general circulation dominated by the NOA + or EA + modes and the strong pressure, in the extension of the Acores anticyclone, expected on average over Europe, give a high probability of temperature above normal for the next quarter.



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.