Météo-France Seasonal Forecast Bulletin

NOVEMBER - DECEMBER - JANUARY 2019-2020

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General synthesis : NDJ 2019-2020

- good agreement between models for oceanic forecast.

- **neutral ENSO situation** for the coming 3 months.

- **Strong positive phase of IOD** (at least for November) which has a major influence on atmospheric circulation :

1) downward potential velocity and cold SST anomaly over western Maritime Continent. Consequently, **drier than normal signal over Maritime Continent and Australia.**

2) upward potential velocity over western Indian Ocean and Eastern Africa. Consquently, **wetter than normal on eastern Africa (rainy season - flooding risk enhanced)**

3) Strong **teleconnections with IOD** forecast by most models towards Middle East and Eurasia : EA+ and NAO+ largely favoured by most models =>

Most likely conditions :

- **For Western Europe : warmer than normal**
- **For Northern Europe : wetter than normal**
- **For Southern Europe : drier than normal**
- **For Middle East : colder than normal**

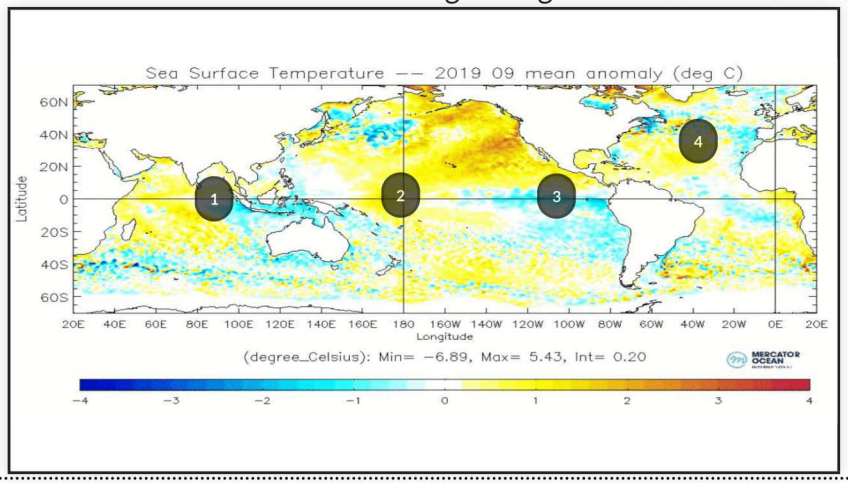
Oceanic analysis of September 2019 : SST anomalies

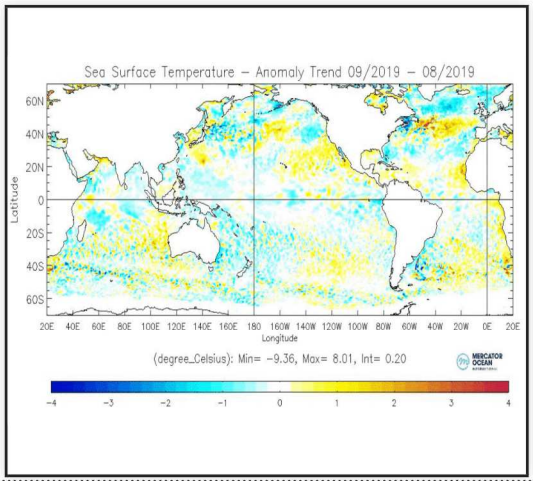
Current situation : Neutral ENSO conditions. Strongly positive IOD.

SEPTEMBER NINO3.4 INDEX : -0.1 °C (Mercator Ocean PSYV4R2 analysis) ; see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png

SEPTEMBER DMI INDEX : +1.2 °C (Mercator Ocean PSYV4R2 analysis); sharp increase in the first half of October (to + 2.2°C, highest since 1982!);
see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/iod1.png

PDO : close to zero over 12-month running average (JMA : http://ds.data.jma.go.jp/tcc/tcc/products/elnino/decadal/pdo.html)





1- No significant changes compared to August in the Indian Ocean : warm anomalies to the West ; cold anomalies to the East (positive IOD index)

2- still warmer than normal in the western equatorial Pacific

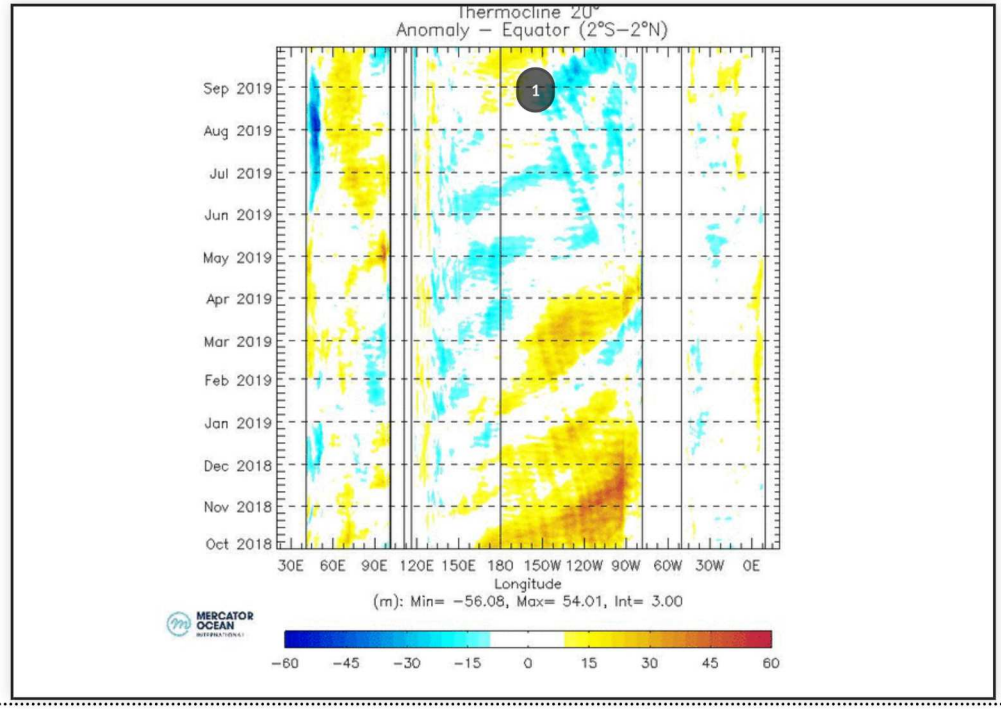
3- cold surface anomaly slightly increasing in the eastern basin

4- NAO- like pattern (warm/cold/warm) weakening (NAO index returning to neutral in September).

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

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

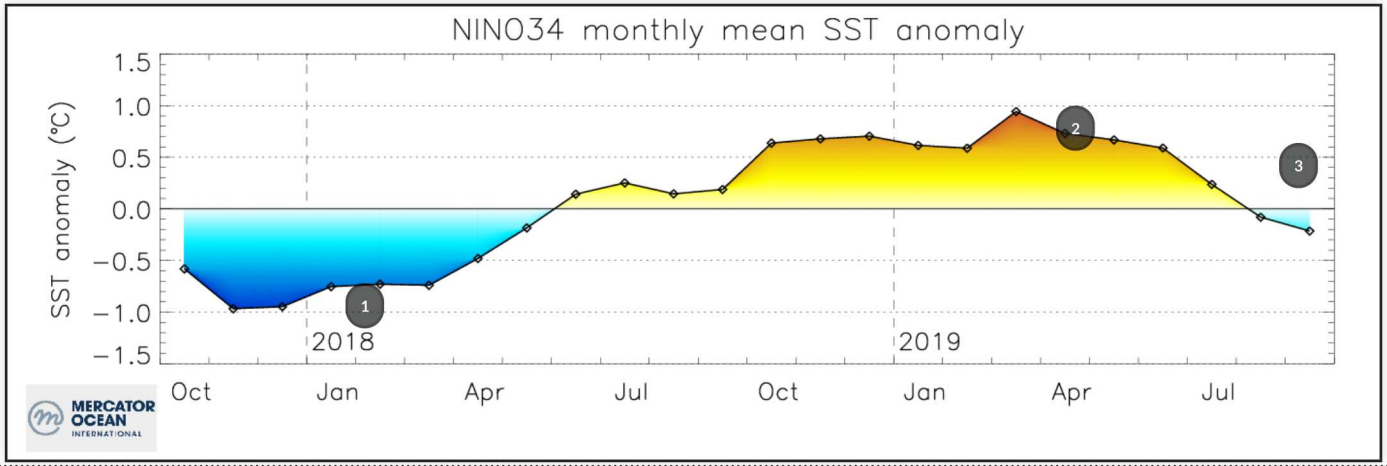
no significant El Niño or La Niña signal.



1- succession of weak Kelvin waves ; the latest being a warm one...

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

Oceanic analysis of September 2019 : History of Nino3.4



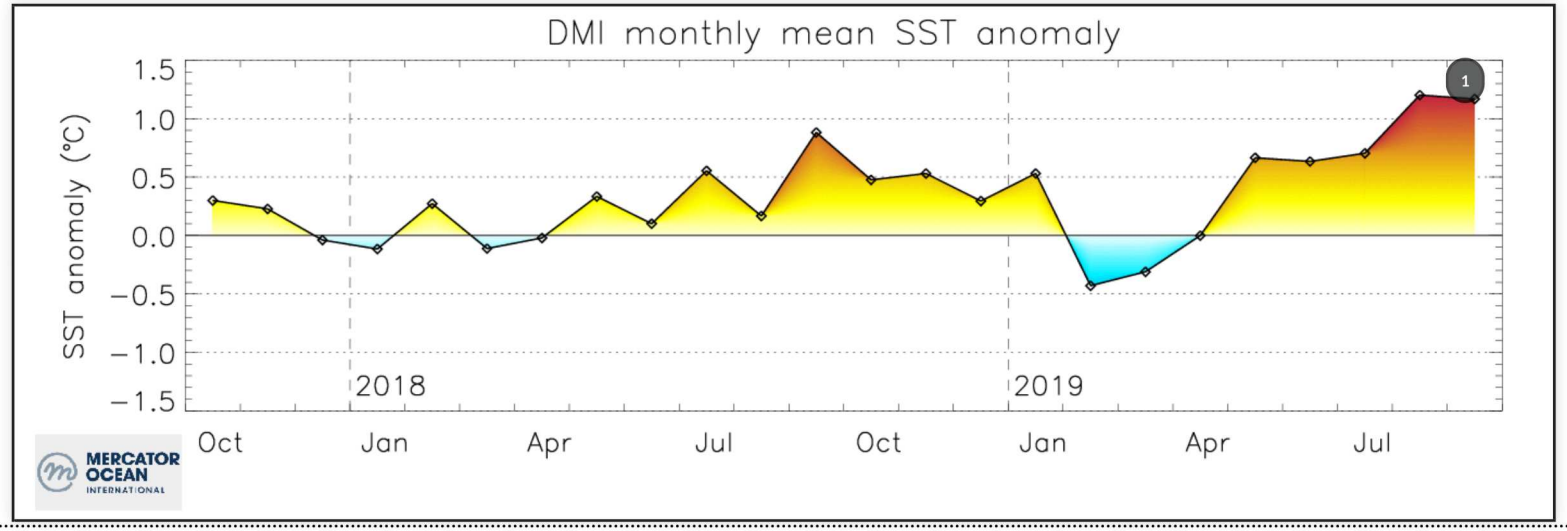
1- La Nina event of winter 2017-2018

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

3- Persistence of neutral conditions in September

Evolution of SST in the NINO3.4 box

Oceanic analysis of September 2019 : Indien Ocean - DMI evolution

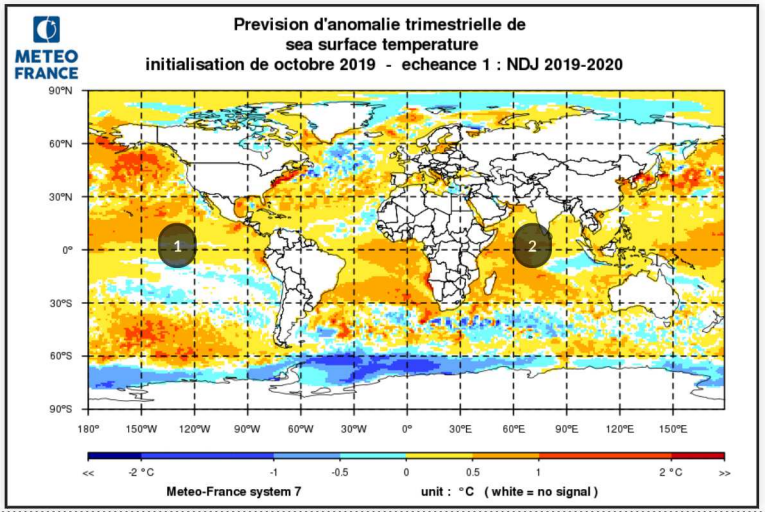


1- DMI Index remaining strongly positive in September (with further warming in October)

Oceanic forecast : SST anomaly

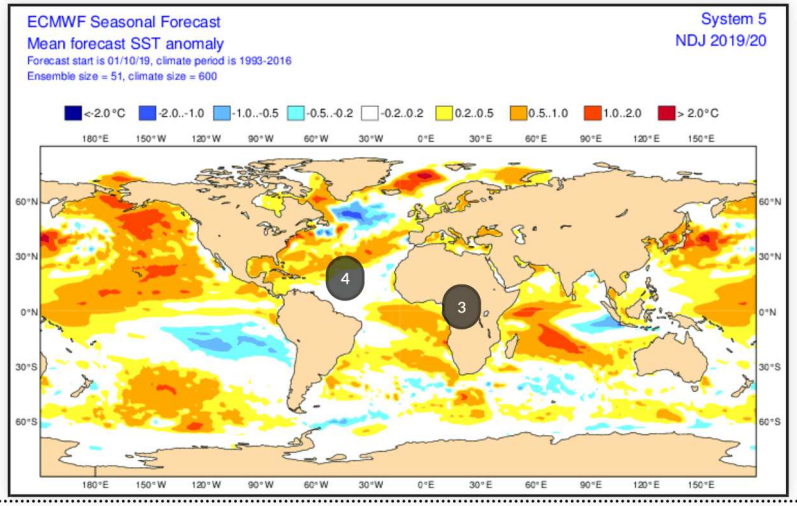
Neutral conditions should continue along the Equatorial Pacific. Positive IOD is forecast, especially for the beginning of the period (November). Enhanced signal for ECMWF. See further slide for IOD diagrams.

For the Atlantic : cold/warm/"cool" pattern, response to forecast positive NAO.



1- Positive PDO and neutral Niño conditions forecast by both models

2- Strong positive IOD in both models

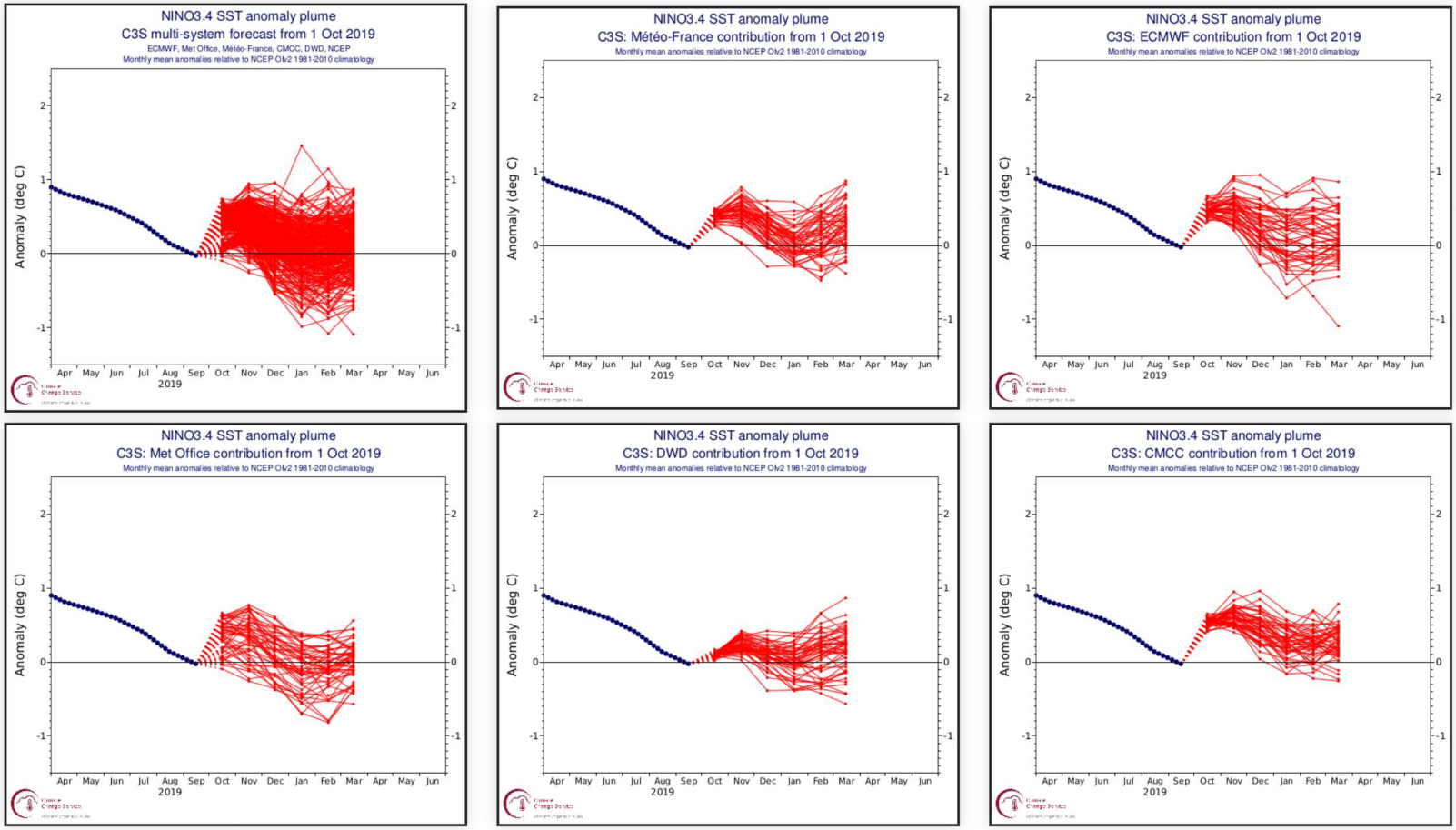


3- warm anomaly in the Gulf of Guinea

4- cold/warm/"cool" pattern (NAO+ like)

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

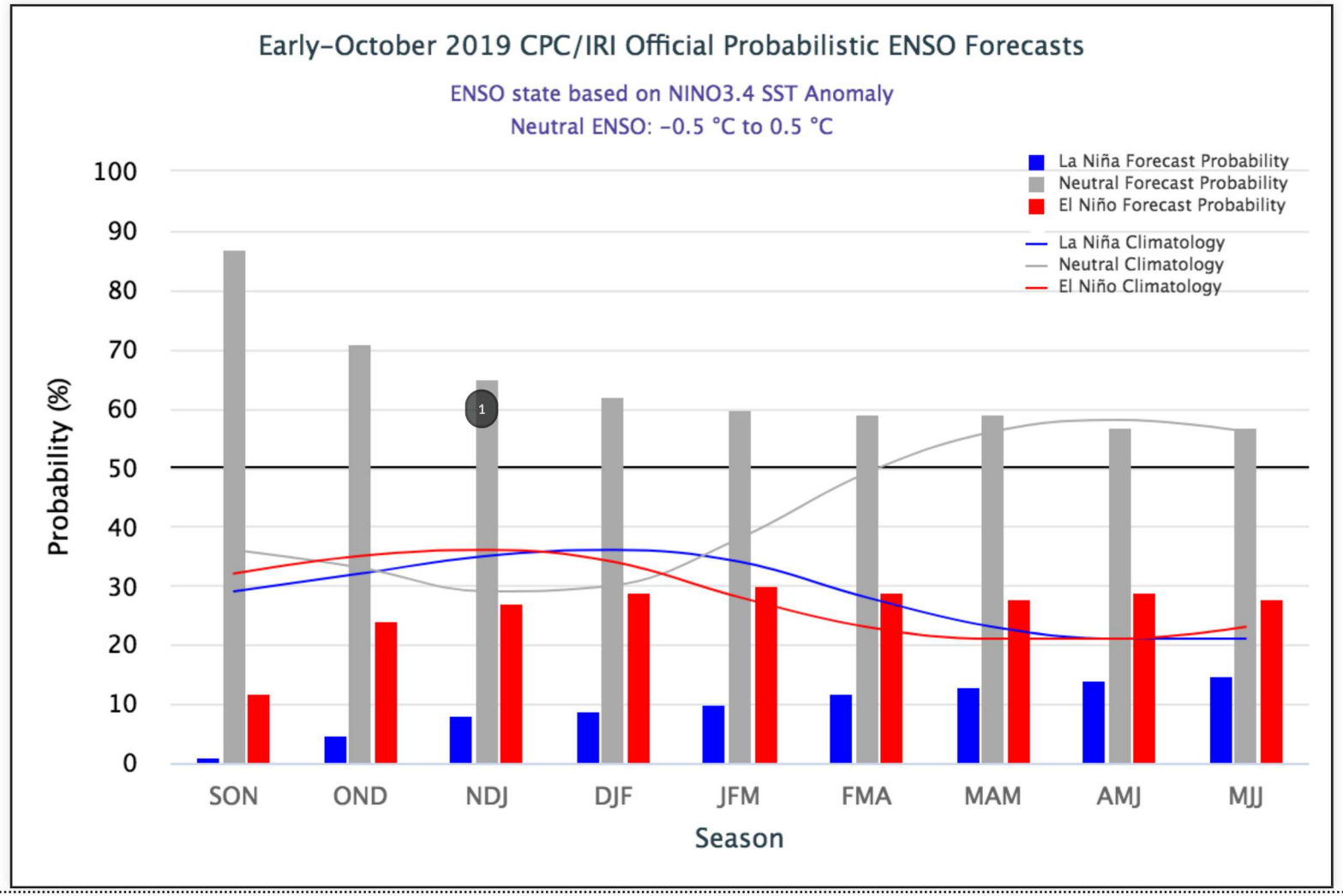
Larger spread for ECMWF but neutral conditions should remain for the next three months (with a weak warm signal typical of the time of year, and probably enhanced by global warming compared to 1981-2010 climatology).



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 very likely (up to 65 %) for the quarter NDJ period

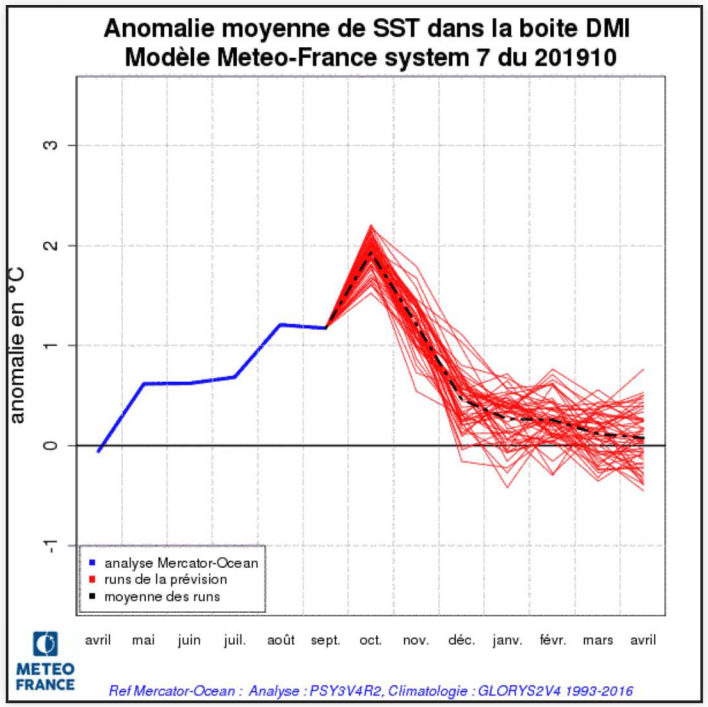


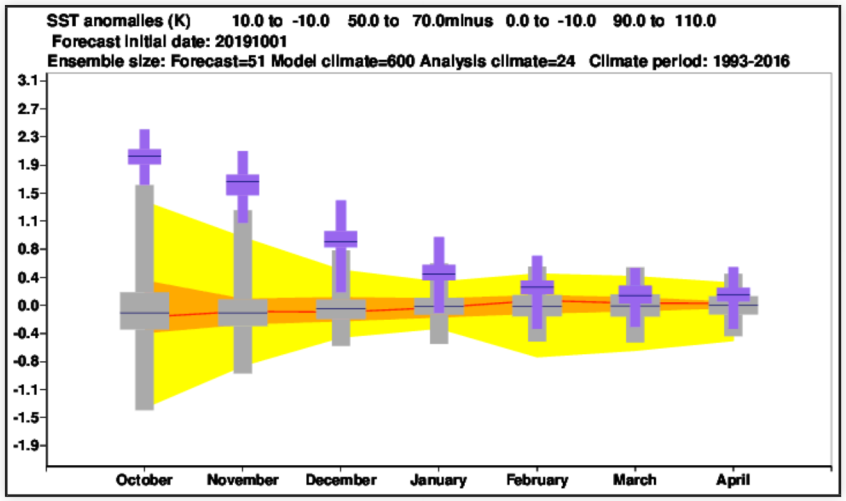
1- About 65% probability for neutral

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

Highly positive index at the beginning of the period (November) then sharp decrease with MF7 (left image), slower with ECMWF (right image). Other models closer to ECMWF.





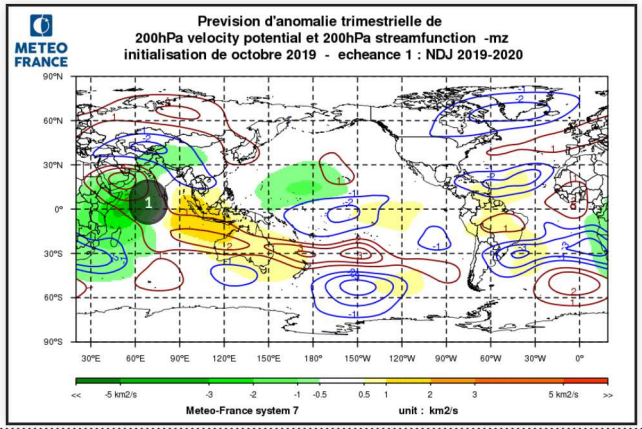
Drivers : Summary

- No significant late-summer SST pattern in northern Atlantic
- Eusarian snow cover slightly above normal as of mid-October (NAO- supposedly enhanced, but not observed during recent winters)
- high IOD index has been shown to favour EA+ mode
- Conclusion : **EA+ mode to be favoured** by record-high IOD

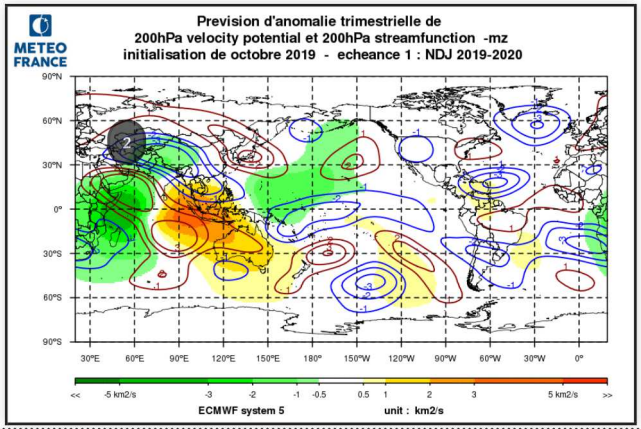
Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : good agreement between models with a strong response to positive IOD ; strong subsidence for Maritime Continent / Australia and strong ascents anomalies for Eastern Africa and the Arabian Peninsula.

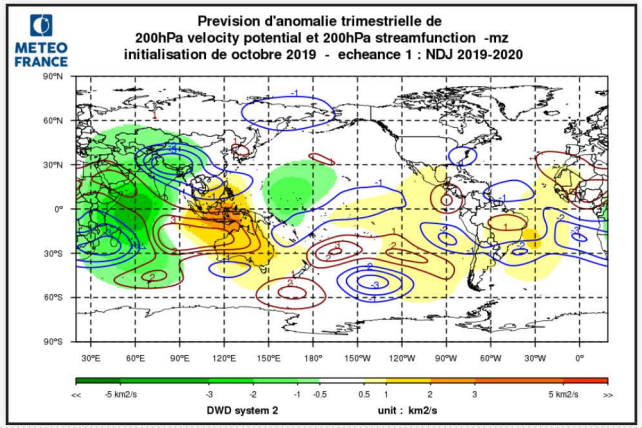
Streamfunction : Most models (except DWD) suggest a teleconnection between the IOD dipole and the mid-latitudes with a cyclonic circulation for Middle East / Central Asia and an anticyclonic circulation for Eurasia extending towards eastern Europe.

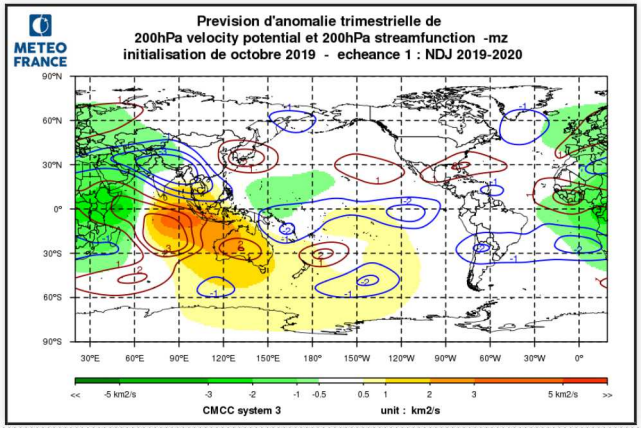


1- VP200 : main active dipole associated with the strongly positive DMI index, especially for LT1 (November); signal decreasing thereafter.



2- Enhanced teleconnection (strongest signal with ECMWF) with mid-latitudes, especially for LT1 (November). This certainly accounts for the 500 hPa geop. height forecast anomalies (see further slides).

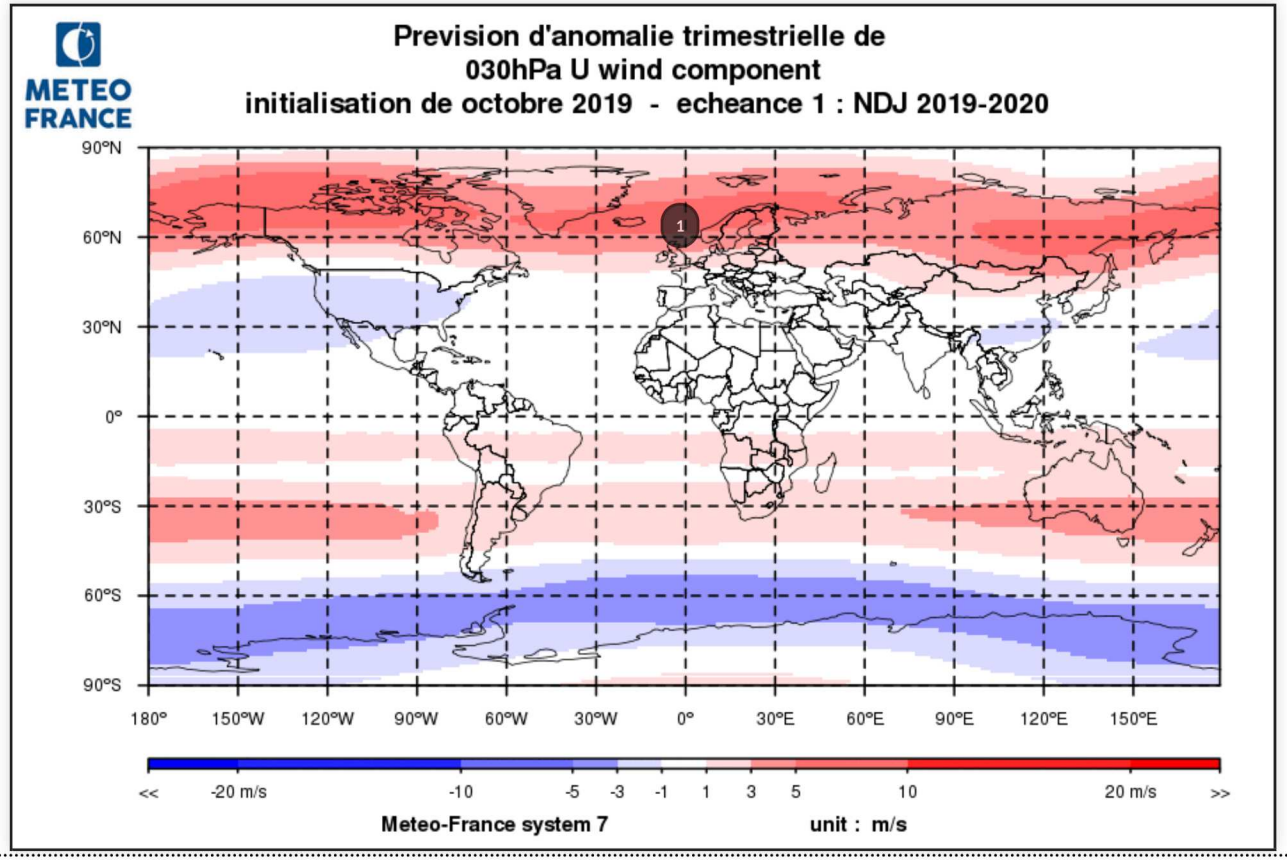




MF7,SEAS5, DWD and CMCC 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

Atmospheric circulation forecasts : polar vortex

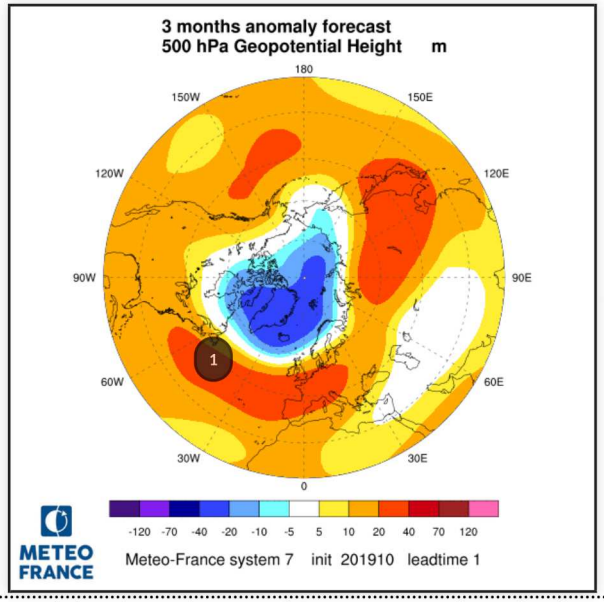
30 hPa zonal wind anomaly shows enhanced polar vortex for the coming 3 months. This should favour AO+ and NAO+ modes.



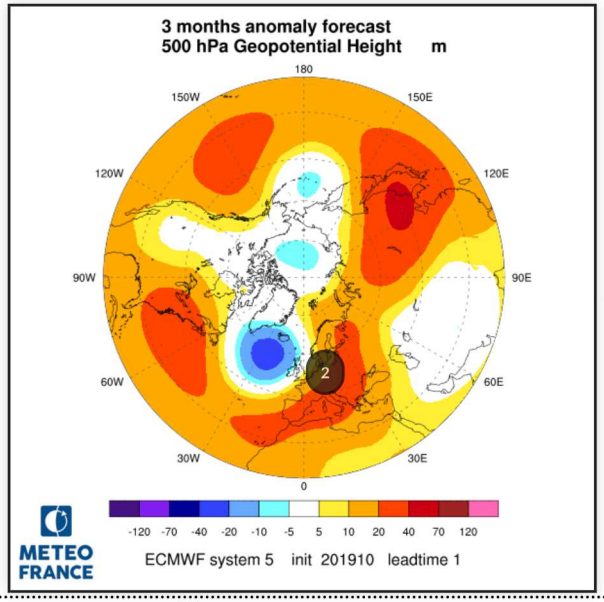
1- enhanced polar vortex

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Pretty remarkable agreement between MF7 and ECMWF : enhanced polar vortex and zonal circulation for the North Atlantic basin. Looking in details shows that ECMWF suggests a EA+ like pattern whereas MF7 accounts for a more typical NAO+ pattern. It seems that the teleconnection with PSI200 (see previous slides) is the main driver for the models this month.



1- zonal flow (NAO+) for northern Europe and North Atlantic.

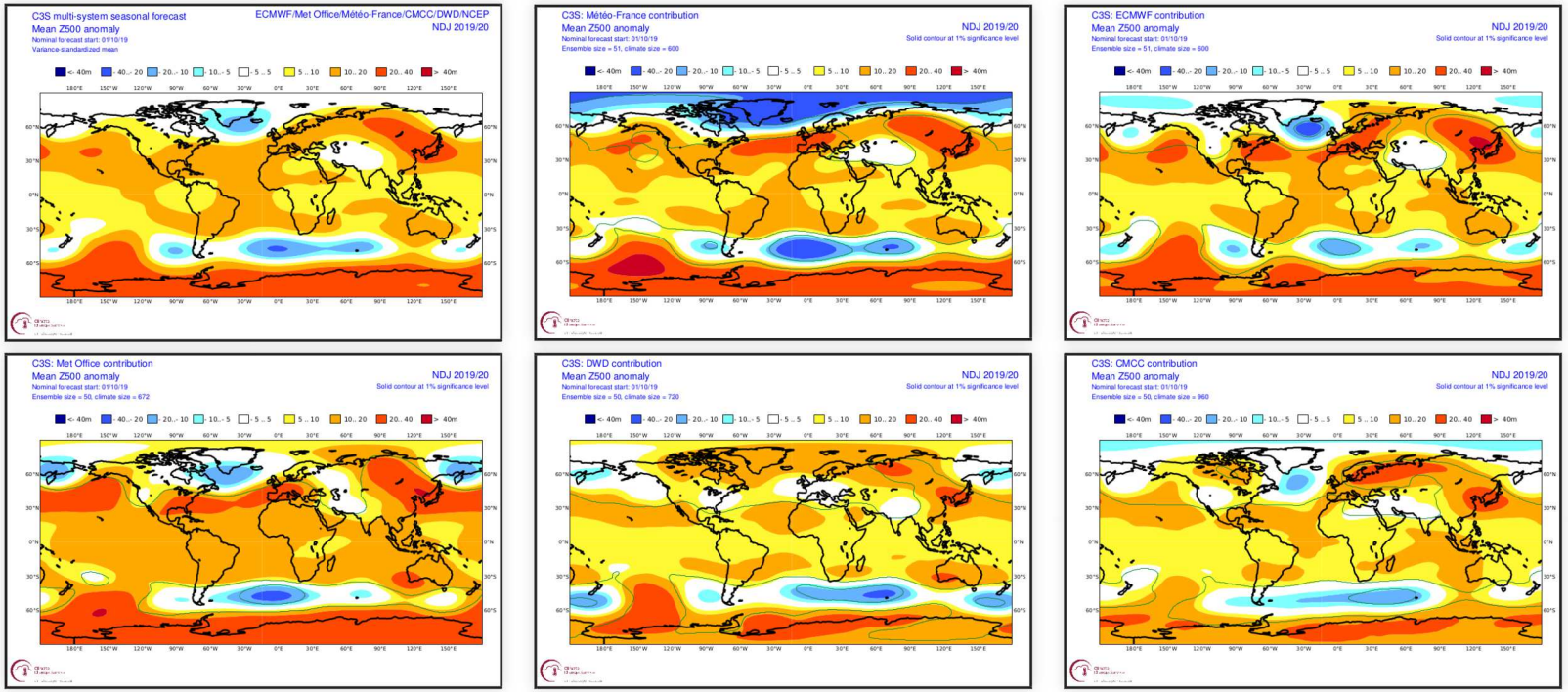


2- EA+ like pattern for ECMWF SEAS5

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

Atmospheric circulation forecasts : Z500 anomalies in C3S models

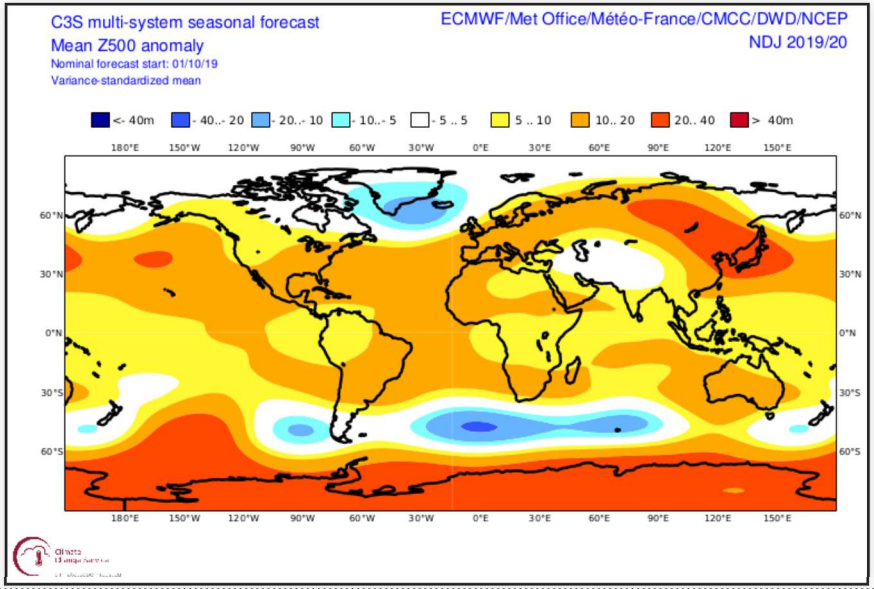
As mentioned before, there is a pretty good (and not that frequent) agreement between models regarding general situation for early winter : EA+ and/or NAO+ circulation types seem to be highly likely. The DWD model is the only one being significantly different. When looking in details, some models favours EA+ for western Europe and blocking for eastern Europe and Middle East (ECMWF, CMCC), while others suggest a more zonal NAO+ pattern (MF7, Met Office, and, not shown, NCEP).

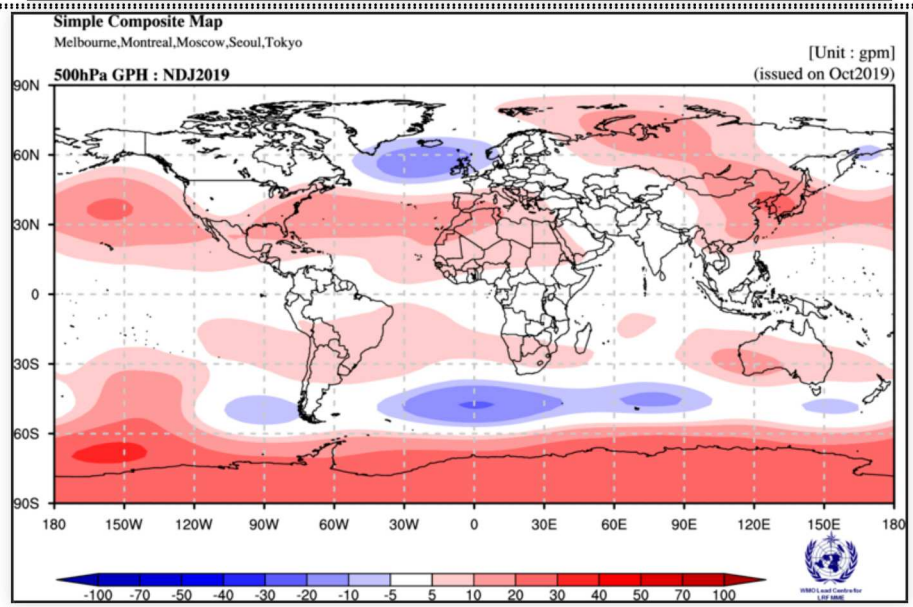


C3S multi-system, MF7, SEAS5, UKMO, DWD and CMCC 500hPa geopotential height anomalies.

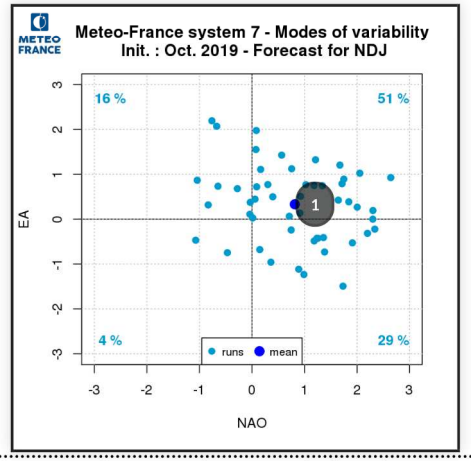
Atmospheric circulation forecasts : Z500 anomalies multi-systems

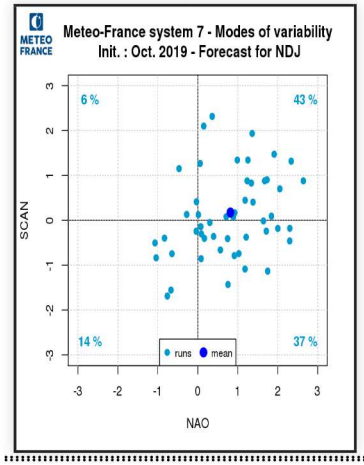
When looking at all models but C3S (see second figure down below), the forecast pattern is quite similar : zonal circulation favoured, but somehow shifted to the south.

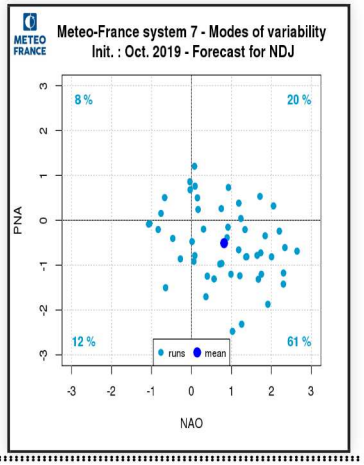




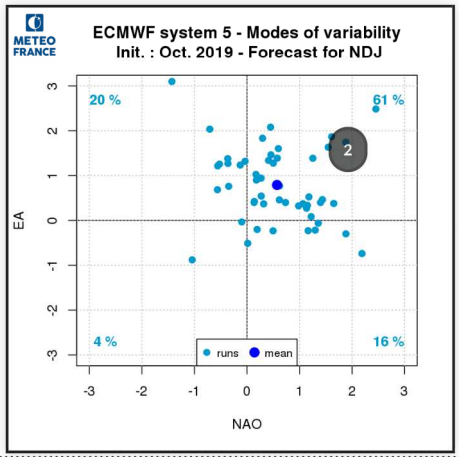
Modes of variability : forecast

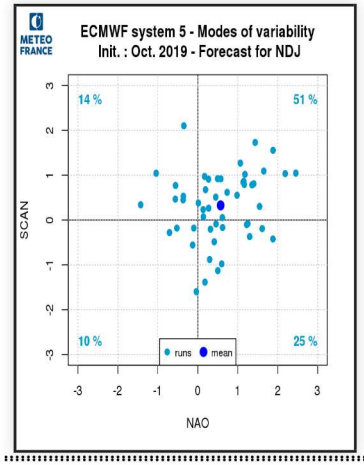


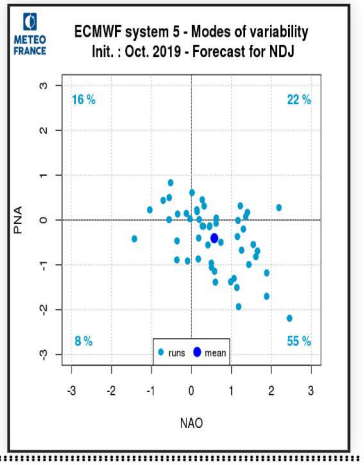




1- positive NAO for 80% of runs and average index close to +1 (strong signal)







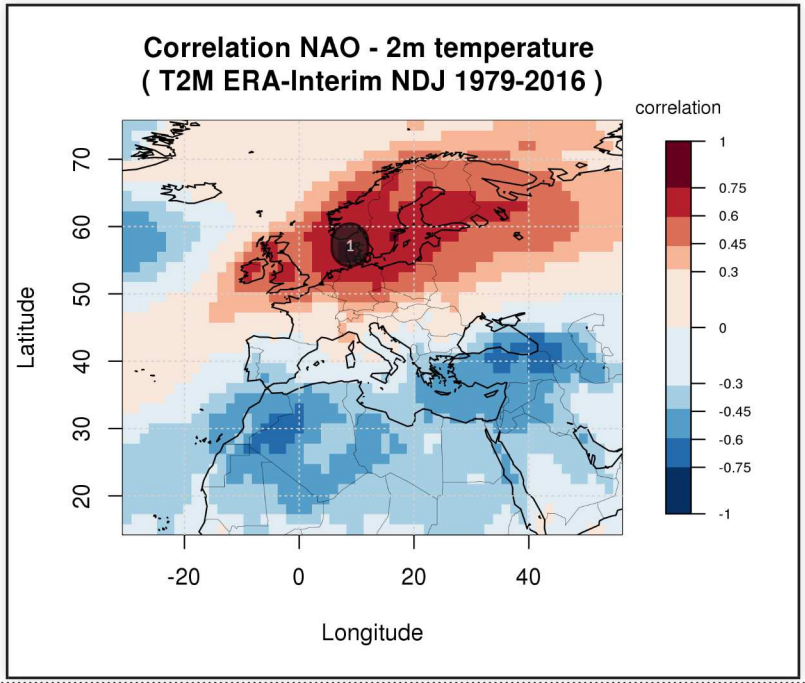
2- Positive NAO and EA modes for 61% of the members. Average EA index close to +1 (strong signal).

see the modes of variability patterns

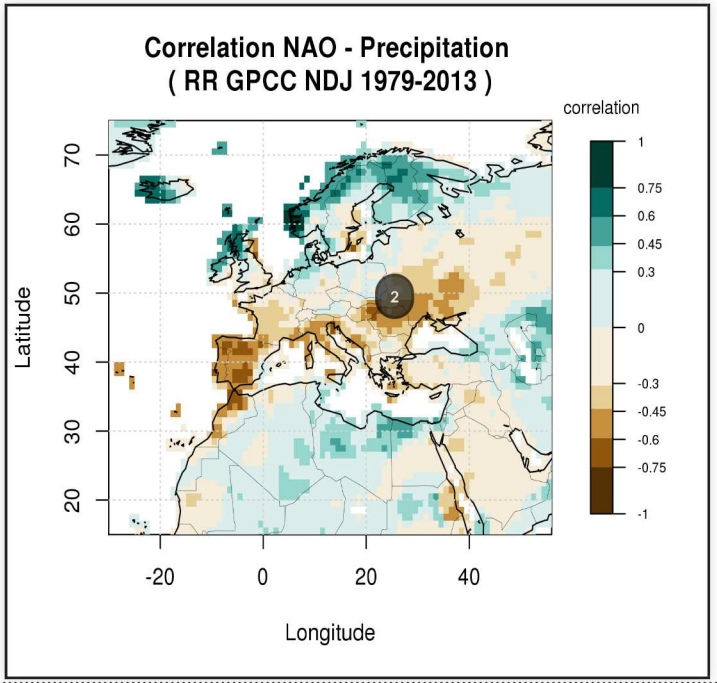
As expected, both models suggest highly positive NAO : as seen on 500 hPa geop. height anomalies, the signal is stronger for MF7, while ECMWF corresponds rather to a mix of NAO+/EA+. No such clear signal for SCAND mode, which in addition has a low predictability.

Modes of variability : NAO impacts

NAO+ mode should be favoured.



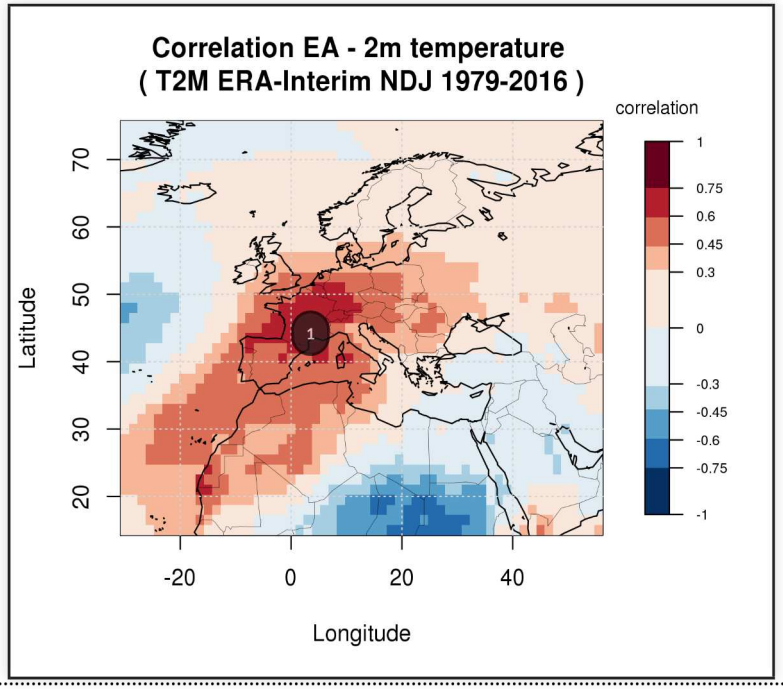
1- Warmer than normal over north-western Europe, and particularly over Scandinavia



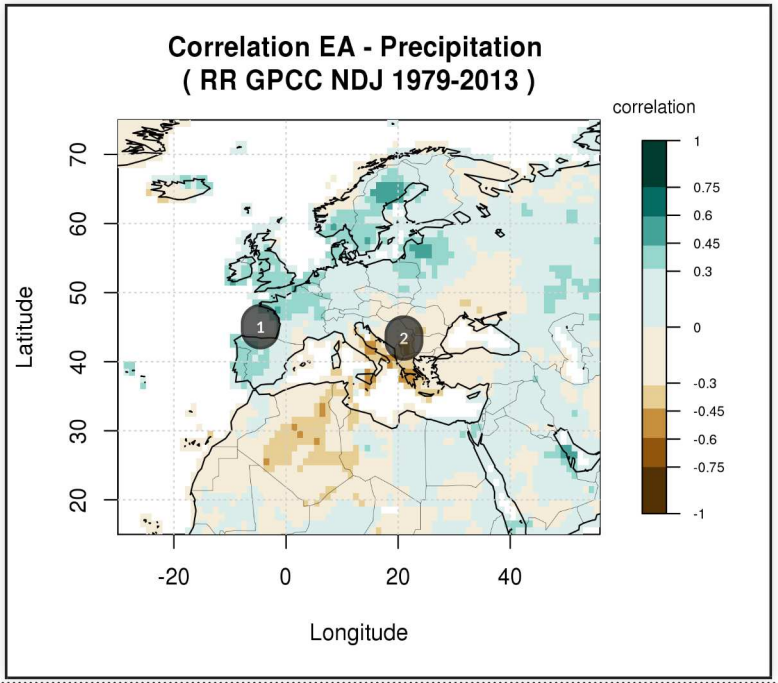
2- drier than normal for southern Europe; wetter for northern Europe.

Modes of variability : East Atlantic impacts

EA+ mode should be favoured along with NAO+



1- Warm signal over Europe

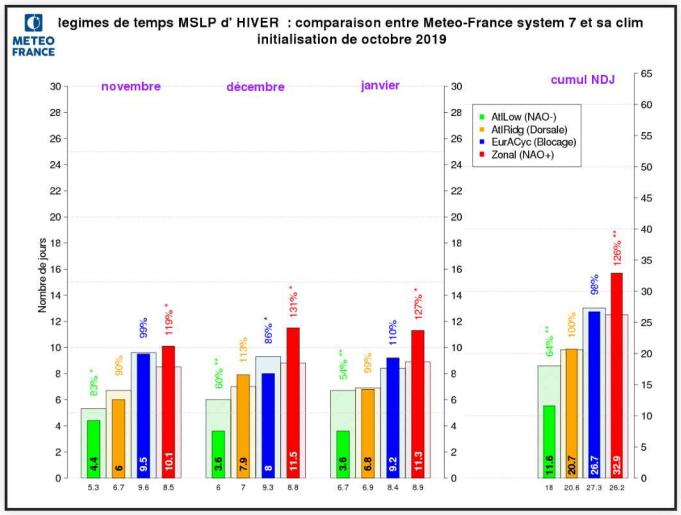


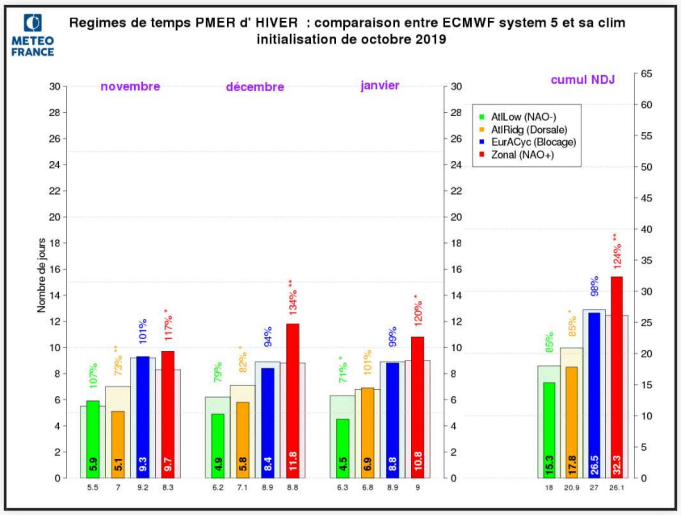
1- wet conditions over western Europe

2- Dry conditions for south-eastern Europe

Weather regimes : winter Sea Level Pressure classification

It is no surprise that both models suggest a strong preeminence of positive NAO and a significant deficit of negative NAO. Signal is less clear regarding blocking and atlantic ridge regimes





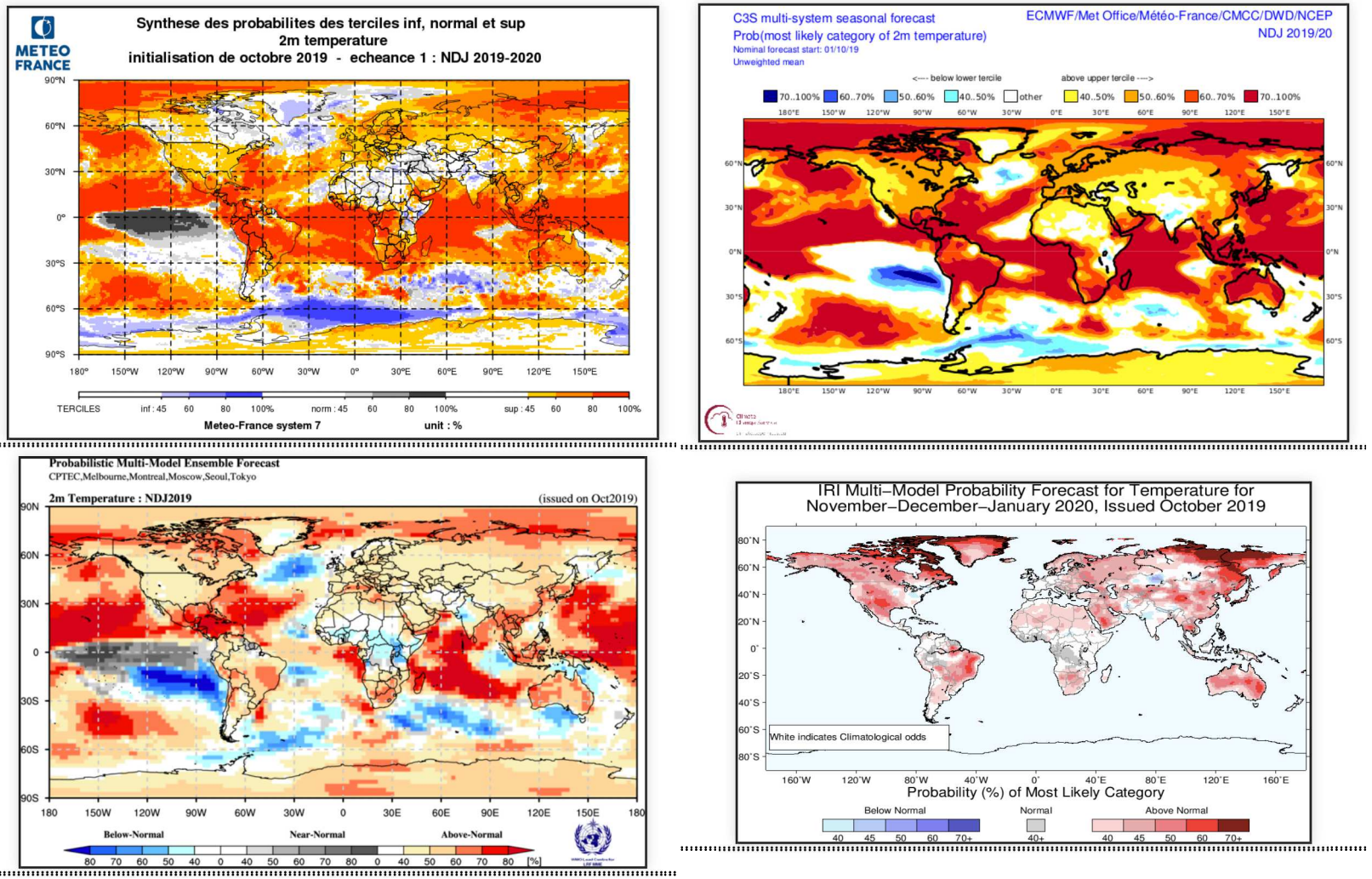
Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF7 (left) and SEAS5 (right).

See the winter weather regime patterns

Forecast of climatic parameters : Temperature probabilities

good agreement over oceans except for MF7 which does not simulate the cold anomaly off the western coasts of Chile / Peru. Widespread warm signal with the exception of Eastern Africa (consistent with positive IOD and wet conditions) and the Indian Subcontinent, and, to a lesser extent Middle East and North Africa (consistent with positive NAO/EA).

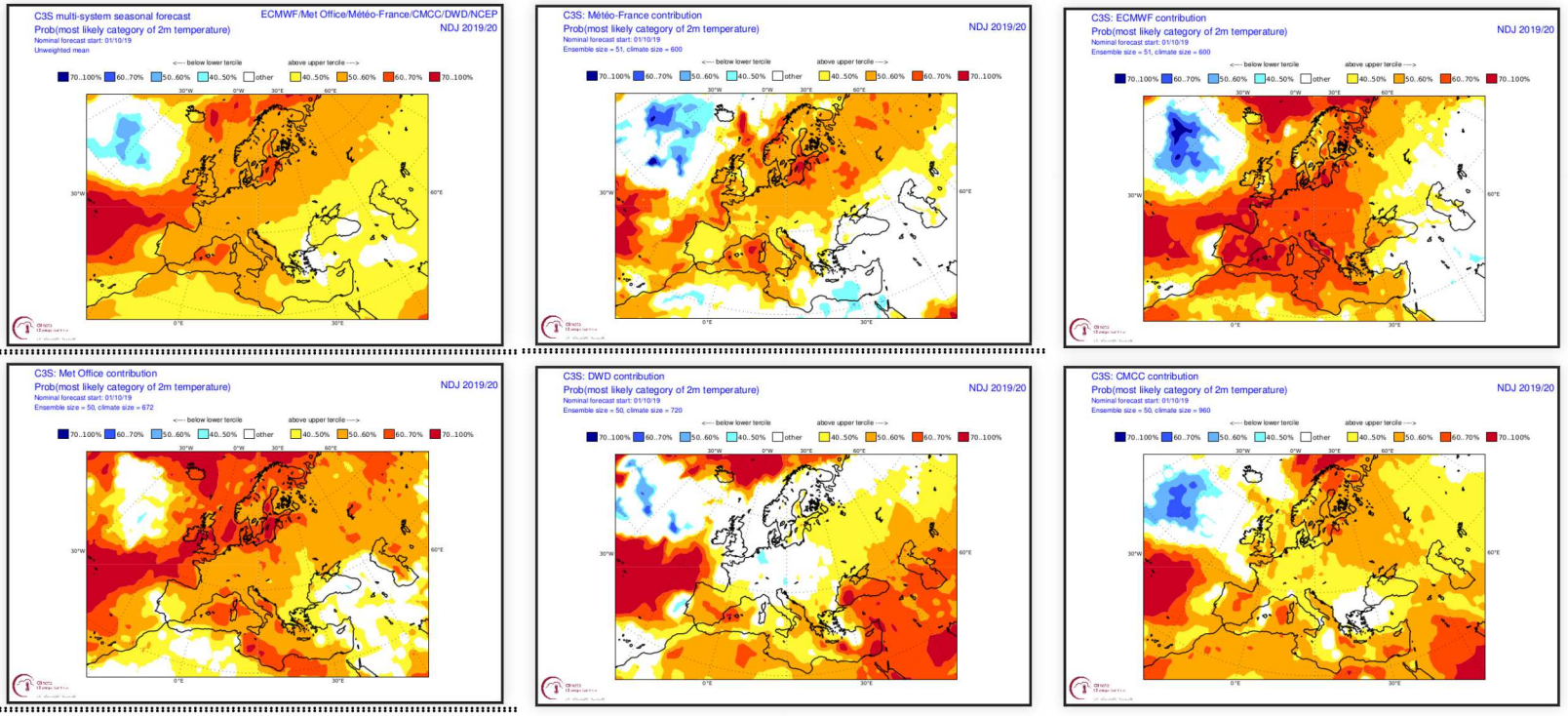
For western Europe, only IRI multi-model system does not predict warmer than normal conditions.



2m temperature probability map from MF7 (top left), C3S multi-models (top right), others models of WMO multi-models (bottom left) and IRI multi-models synthesis (bottom right)

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

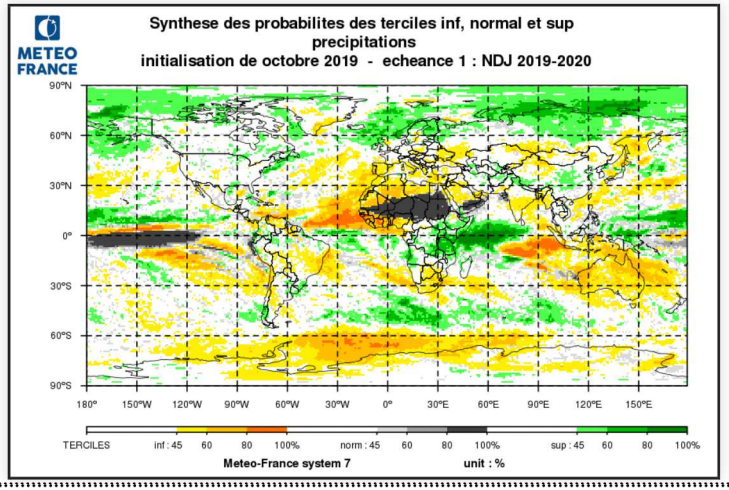
In agreement with their general circulation pattern for NDJ (NAO and/or EA positive), all the systems but the DWD forecast mild conditions for Western Europe. For South-Eastern Europe and Middle East, normal or colder than normal conditions seems to be likely (consistent with NAO+ circulation)

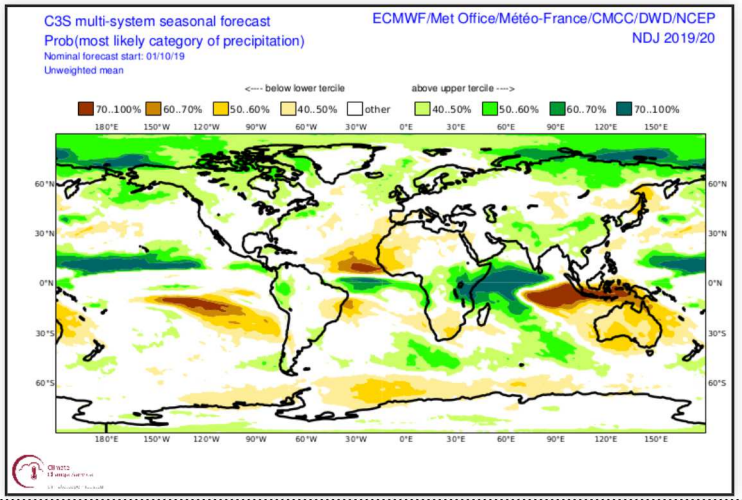


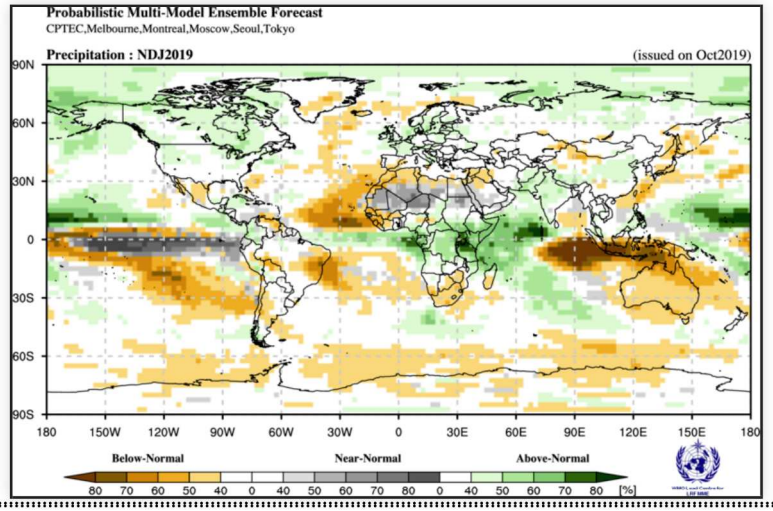
C3S multi-models probability map (top left) and MF7, ECMWF5, UKMO, DWD, CMCC models.

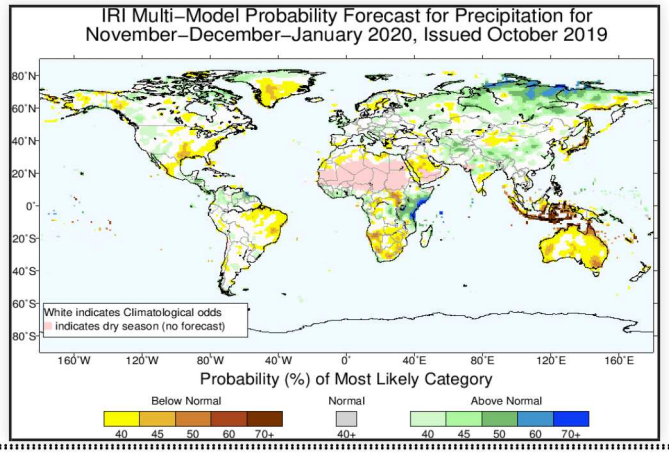
Forecast of climatic parameters : Precipitation

Main features are the strong dry signal for Australia and Maritime Continent and the strong wet signal for Eastern Africa, both consistent with the highly positive forecast IOD (especially in November). Also of note are the dry conditions forecast for Brasilian "nordeste". No consensus for Canada and US, except wet conditions for Alaska (although IRI quite different). For Europe, see next slide.





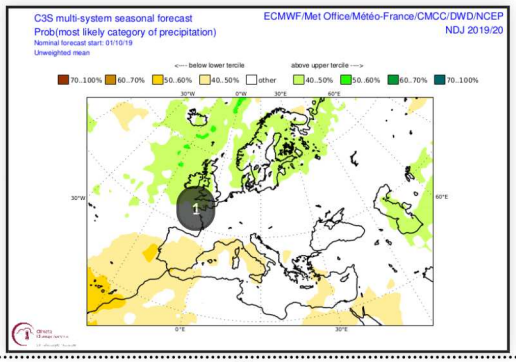




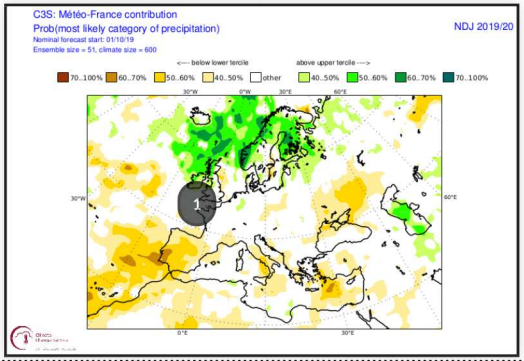
precipitation probability map from MF7 (top left), C3S multi-models (top right), others models of WMO multi-models (bottom left) and IRI multi-models synthesis (bottom right)

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

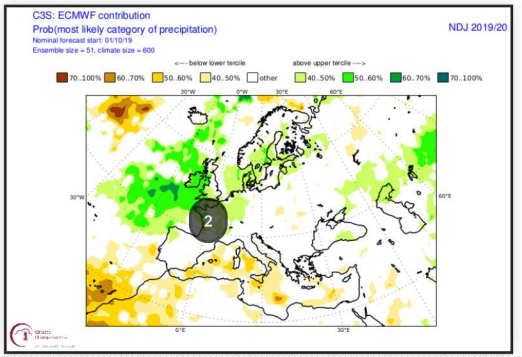
In agreement with positive NAO and/or EA modes, enhanced wet signal for northern Europe and dry signal for southern Europe (including NCEP, not shown). Once again, only DWD is radically different from other models.



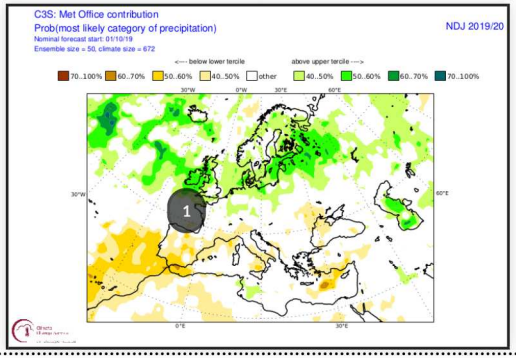
1- NAO+ like response



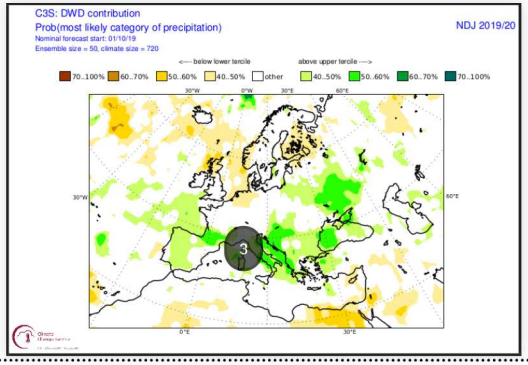
1- NAO+ like response



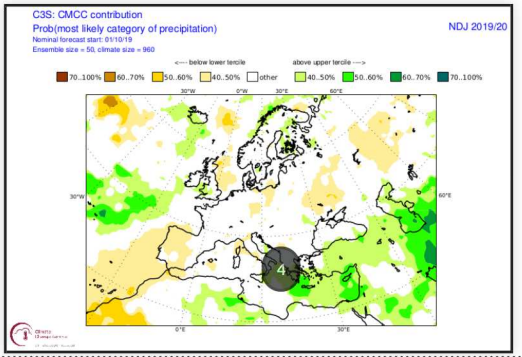
2- NAO+ / EA+ like response



1- NAO+ like response



3- Very different response compared to other models (see also 500 hPa geop heght anomalies)

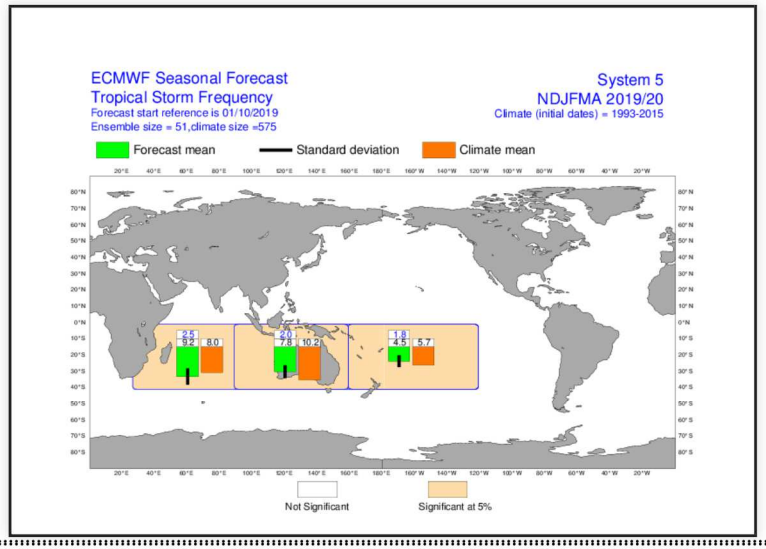


4- Mix of EA+/NAO+ response

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

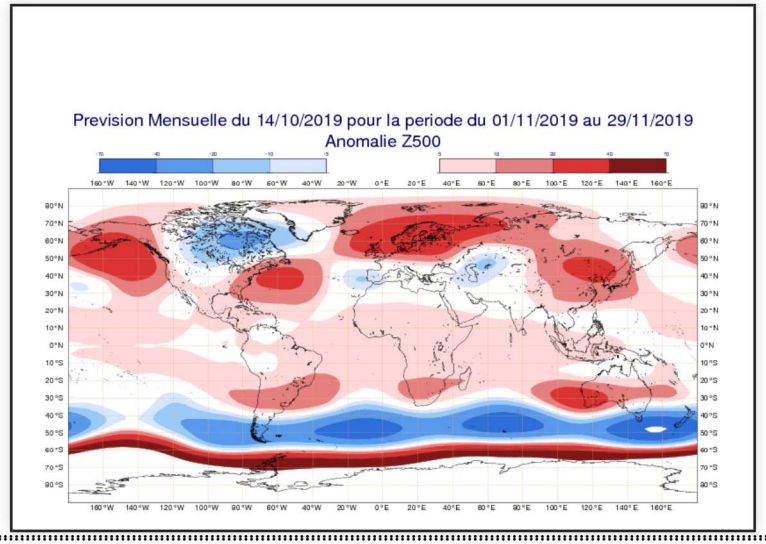
Forecast of climatic parameters : Tropical Storm Frequency

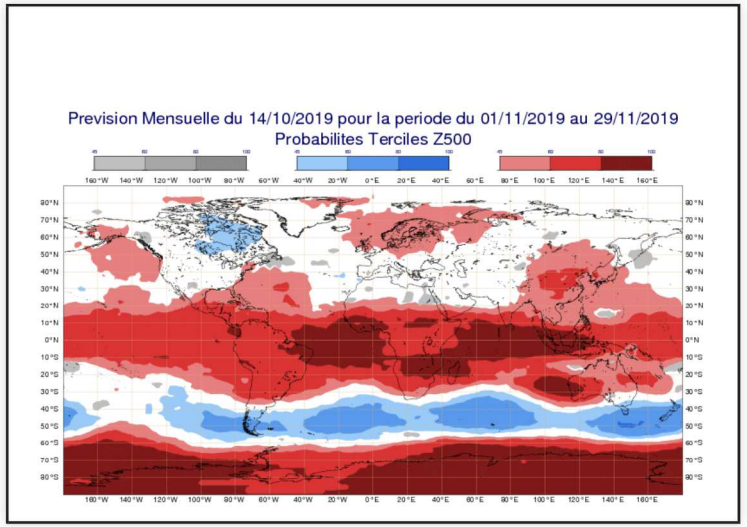
According to IOD and VP200 anomalies, above normal activity is forecast for Western Indian Ocean and below normal activity is forecast around Australia and over Southern Pacific.



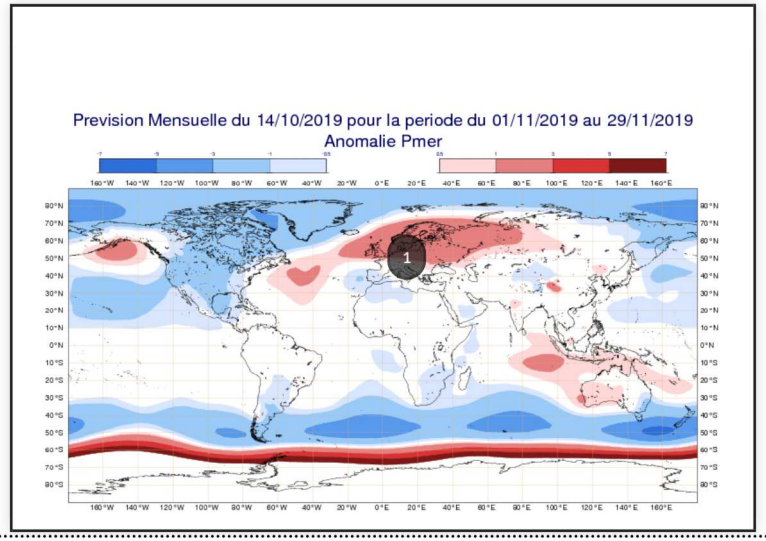
Monthly forecast of 20191014 : Z500

Blocking pattern forecast for Europe in November, which is not consistent with NDJ seasonal forecasts.

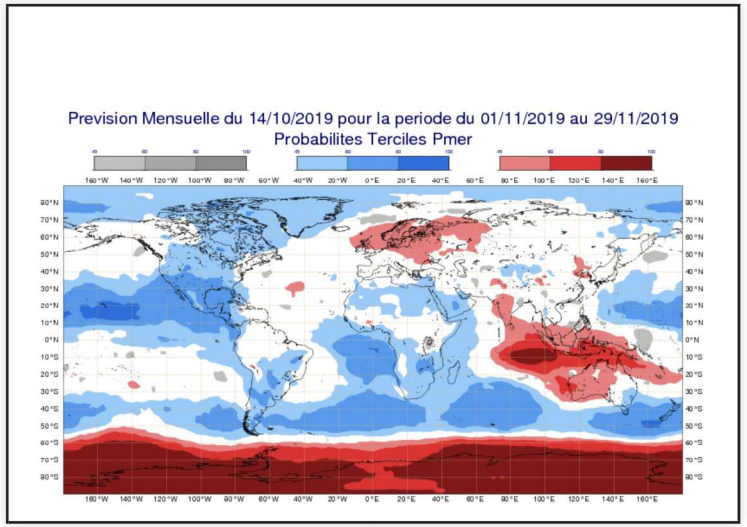




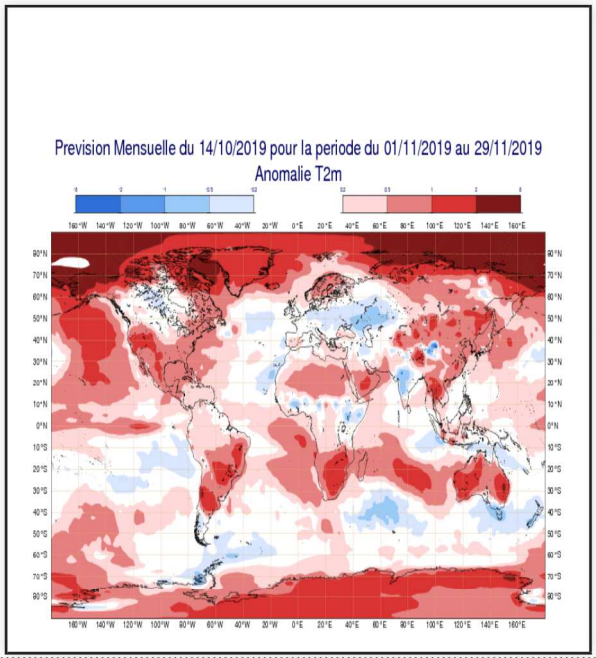
Monthly forecast of 20191014 : MSLP

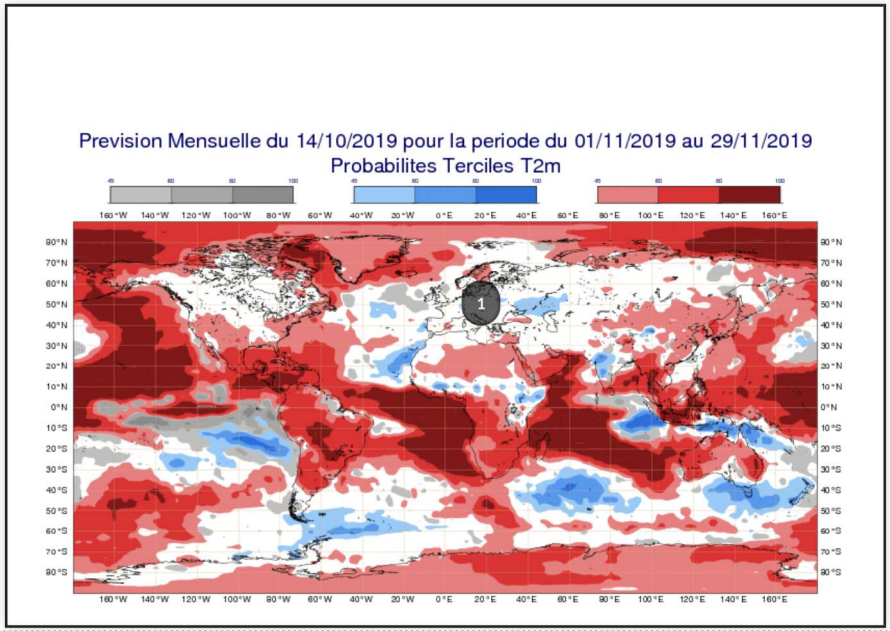


1- Blocking pattern, not consistent with NDJ seasonal forecast



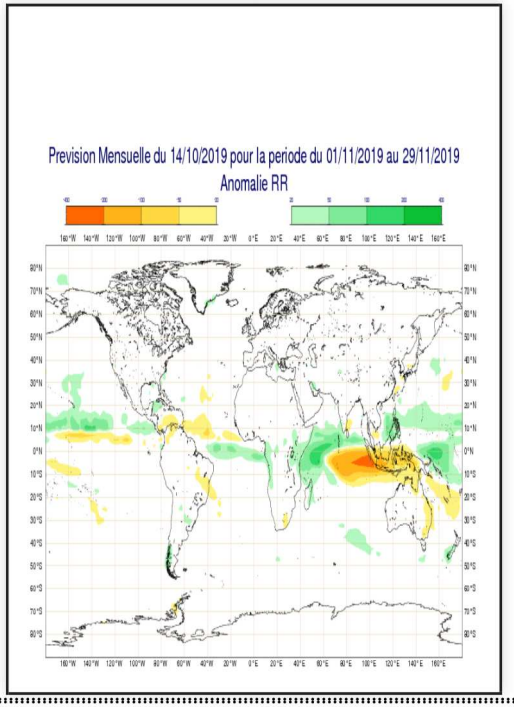
Monthly forecast of 20191014 : temperature

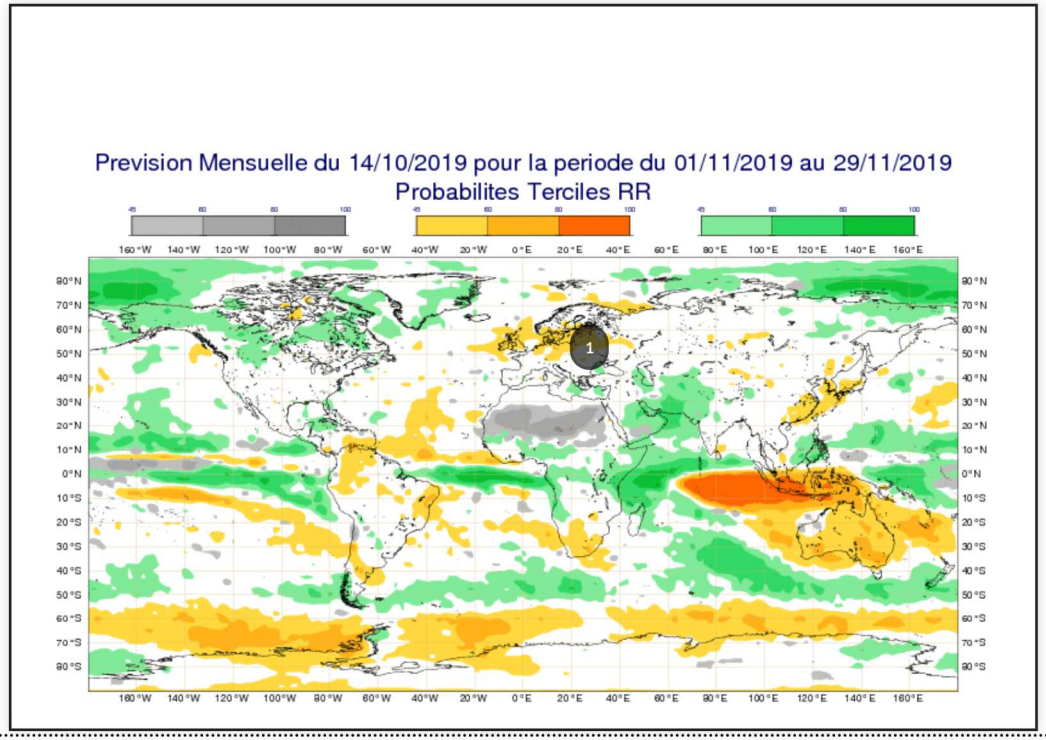




1- In agreement with the blocking pattern, cold conditions are forecast for November. This is not consistent with seasonal forecasts.

Monthly forecast of 20191014 : precipitation

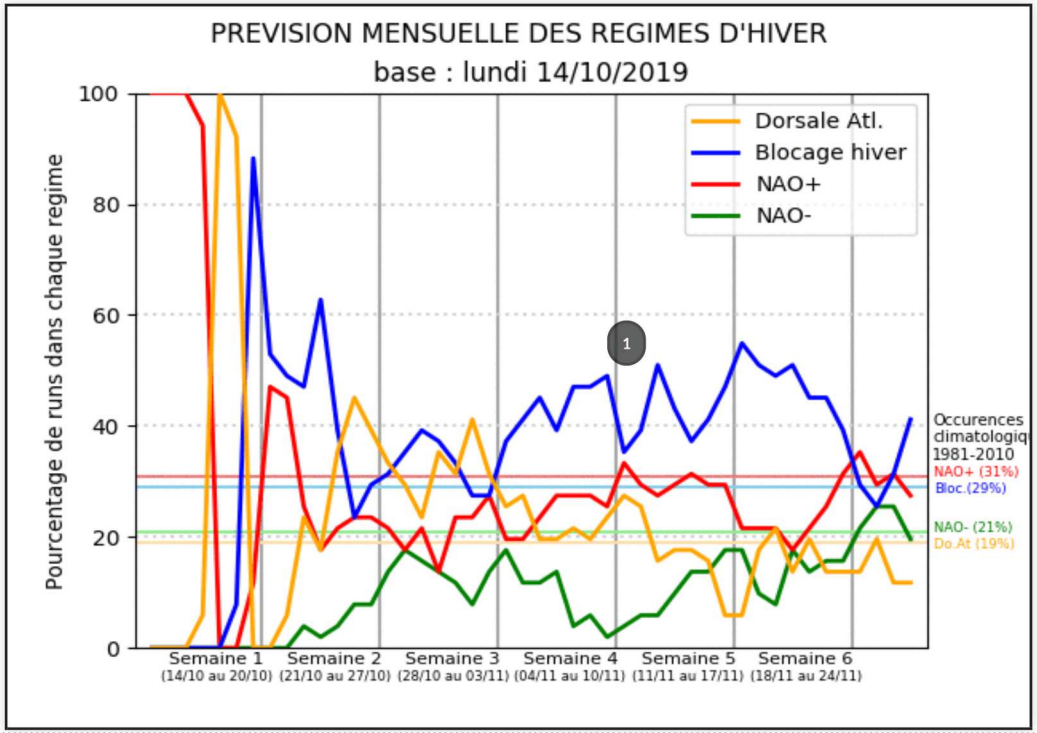




1- In agreement with the blocking pattern, wetconditions are forecast for southern Europe and dry conditions for Northern Europe. This is not consistent with seasonal forecasts.

Monthly forecast of 20191014 : winter SLP weather regimes

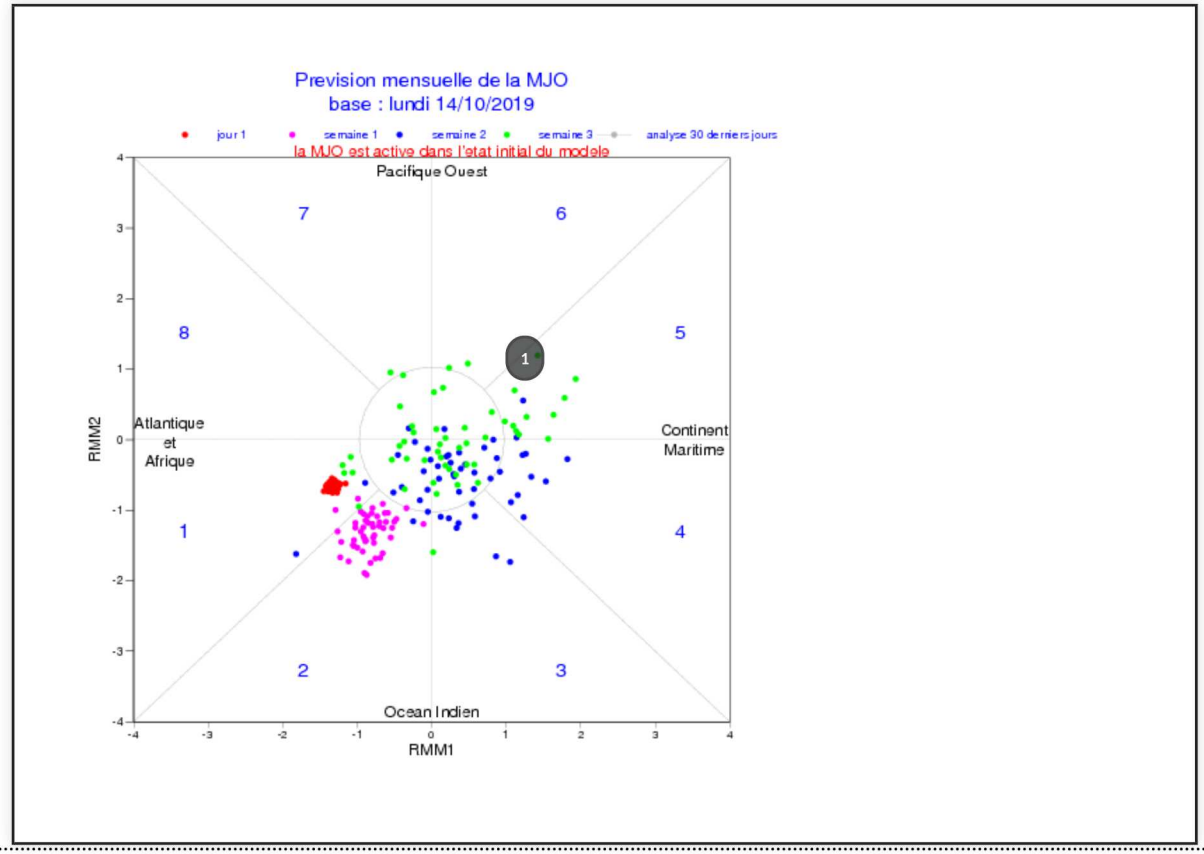
Overwhelming blocking *regime* forecast for November (in sharp contrast to NAO+ seasonal forecasts).



1- Prevailing blocking regime (not consistent neither with seasonal forecasts nor with MJO)

Monthly forecast of 20191014 : MJO

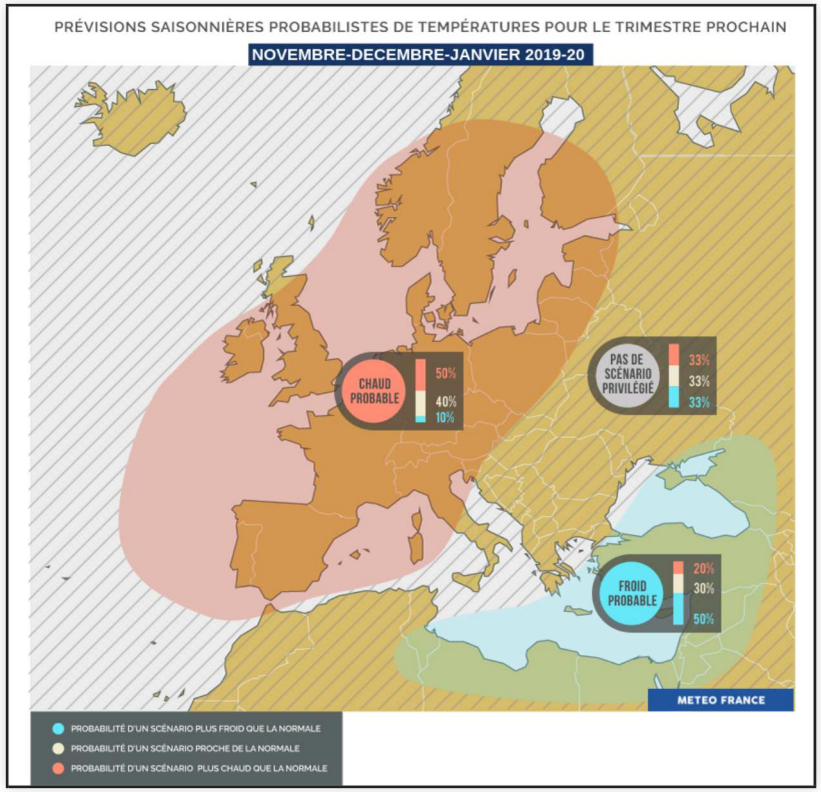
Although there is a weak signal of MJO activity in sectors 5 and 6 for week 3, it seems too weak to account for the strong blocking signal that appears in the ECMWF system as soon as late October / early November.

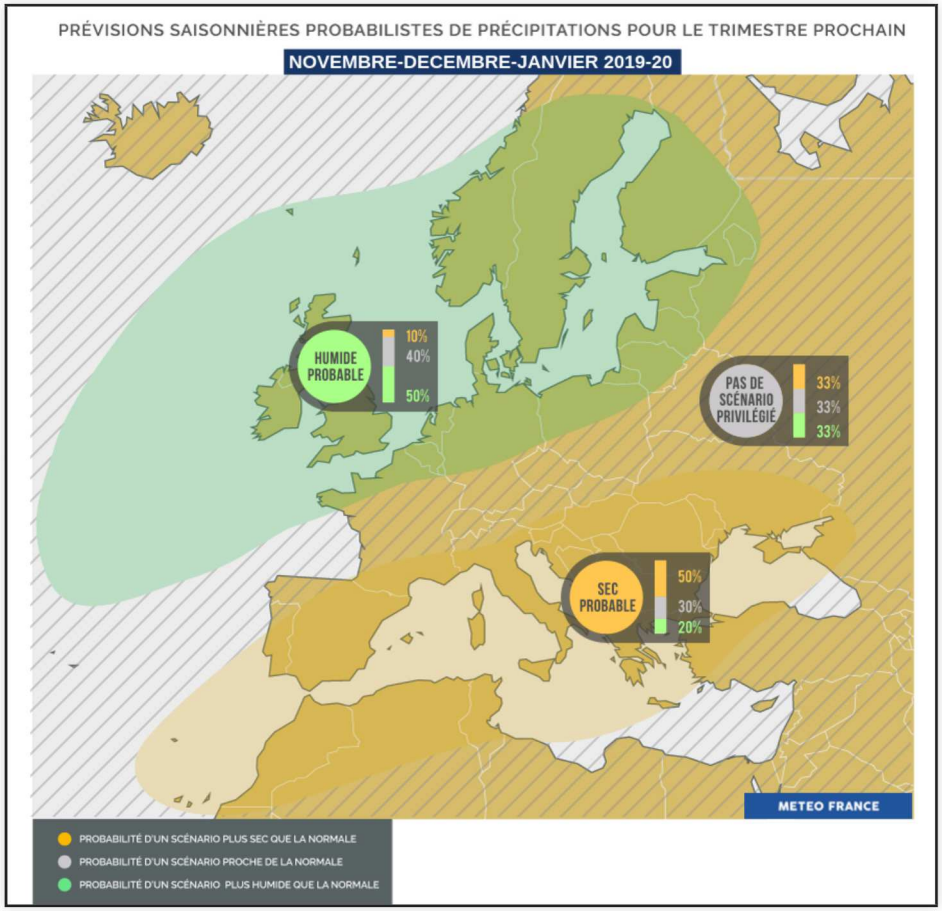


1- weak sectors 5 and 6 signal for week 3 (28/10 to 4/11; favourable for blocking over Europe 5 to 10 days later)

Synthesis map for Europe : Temperature

Along with the mixture of EA+ and NOA+ modes, warmer than normal conditions are expected over a large north-western half of Europe while colder than normal conditions could prevail accross Middle East and Northern Africa.



Synthesis map for Europe : Precipitation

As expected with a mixture of EA + and NAO + modes, drier than normal conditions should prevail over Southern and South-Eastern Europe while wetter than normal conditions should prevail over North-Western Europe. No clear signal elsewhere.