Météo-France Seasonal Forecast Bulletin

JUNE - JULY - AUGUST 2021

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General synthesis : JJ A 2021

Good agreement between models in the tropics. The impacts of La Niña would still be present, due to the persistance of dipole of SST anomaly close to La Nina pattern. A major pole of upward motion anomaly (see VP200) would dominate in the tropics over Africa, and its influence could spread up to the Mediterranean basin (see MSLP maps). On the North Atlantic and Europe, weak signal in terms of circulation (see preferentially MSLP, because Z500 anomly fields are too influenced by a positive trend due to climate warming)

A) Oceanic forecast :

- ENSO : weakening La Niña, evolution toward neutral phase.

- IOD : divergence between models

B) Drivers :

- La Niña impacts still present

- May SST not favourable to East Atlantic circulation

C) Atmospheric circulation :

- negative PNA

- over the North Atlantic and Europe : Summer Blocking and maybe zonal weather regimes are privileged.

D) Most likely conditions :

- West African Monsoon : wet signal on the coastal countries

- over Europe and the Mediterranean Basin : warm tercile privileged over western Europe, west of Mediterranean Sea and south of Scandinavia. Dry tercile privileged over western Europe and south of Scandinavia. Wet tercile privileged on the eastern side of the Mediterranean Sea.

Next bulletin : scheduled on June 18th

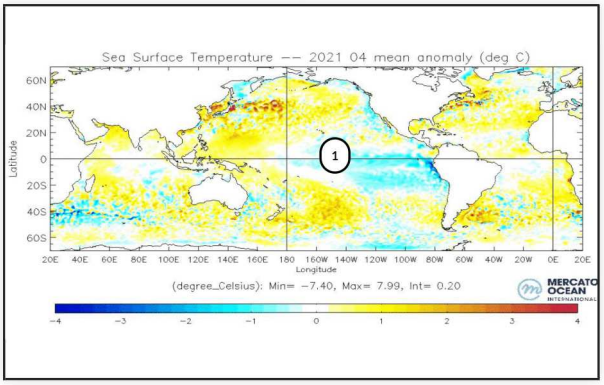
Oceanic analysis of April 2021 : SST anomalies

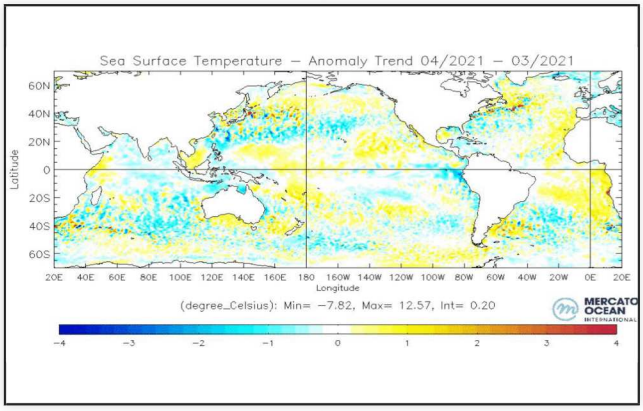
Current ENSO situation : weak "La Niña"

In the Pacific Ocean : The La Niña phenomenon is still present. The cold anomaly in the central Pacific persists (equator and South tropics), but the warm anomaly in the Western part is weakening.

In the Indian Ocean : neutral conditions in the tropics. Still warm anomalies in the Southern hemisphere, despite a general cooling.

In the Atlantic Ocean : neutral conditions in the tropics. In the Northern hemisphere, a large positive anomaly pattern between 20°N and 45°N.





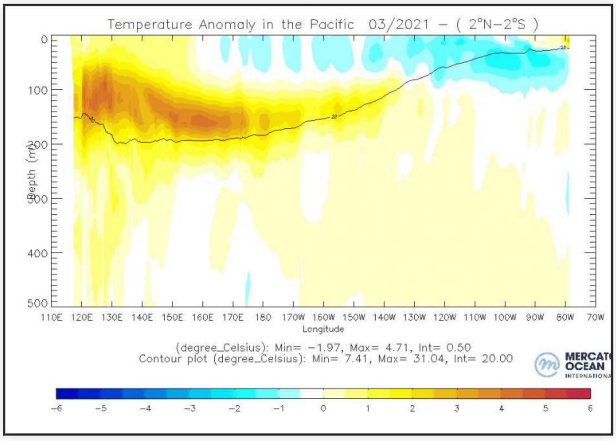
SST Anomalies and trend with the previous month (c) Mercator-Ocean

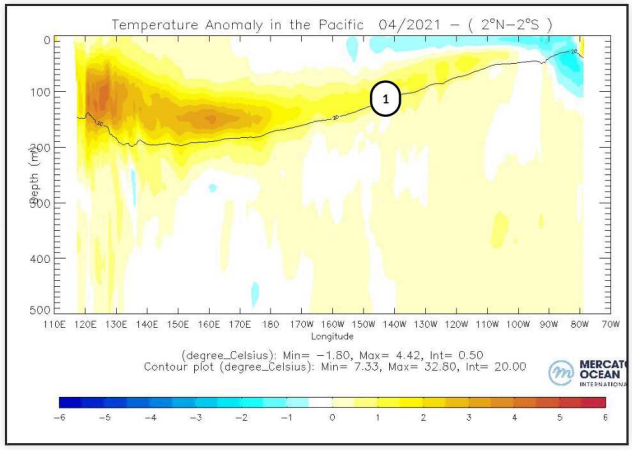
1 - La Nina cold anomaly

Oceanic analysis of April 2021 : Pacific vertical section

In subsurface, clear attenuation of the East-West contrast. The positive anomaly already visible in the middle of the basin in March, is progressing toward the Eastern part. The thermocline is less inclined in April than in March.

Near the surface, reduction of the thickness of the cold anomaly.



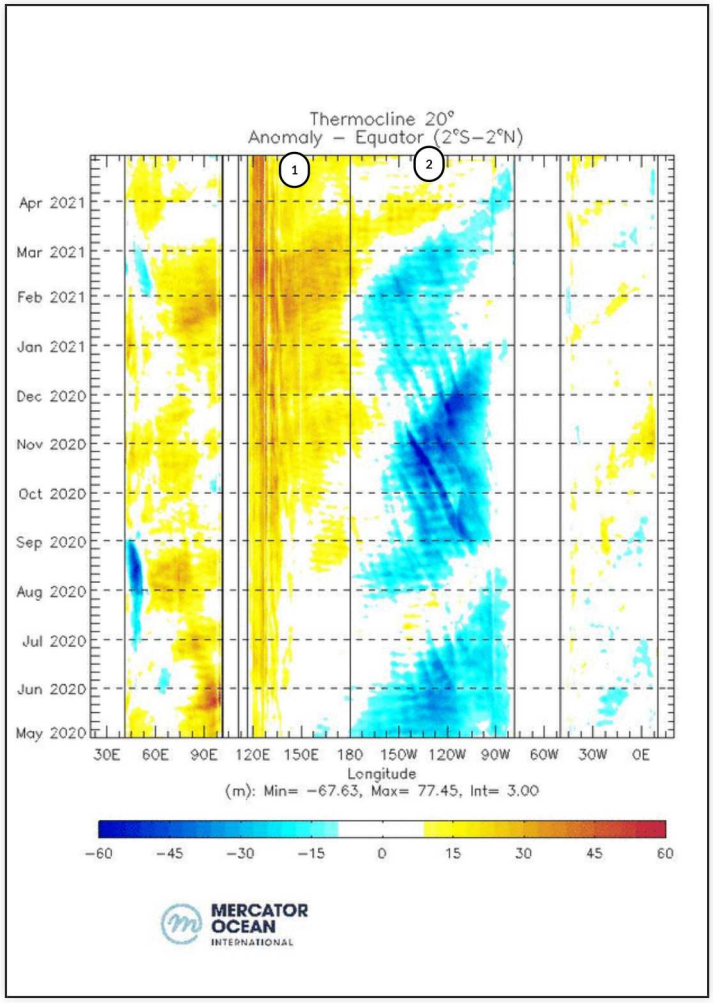


Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

1 - thermocline less inclined than in March

Oceanic analysis of April 2021 : Hovmüller diagram of the 20°C isotherm

In the Pacific Ocean, the thermocline has returned to a "close to normal" depth. The warm pool positive anomaly has weakened (compared to March)



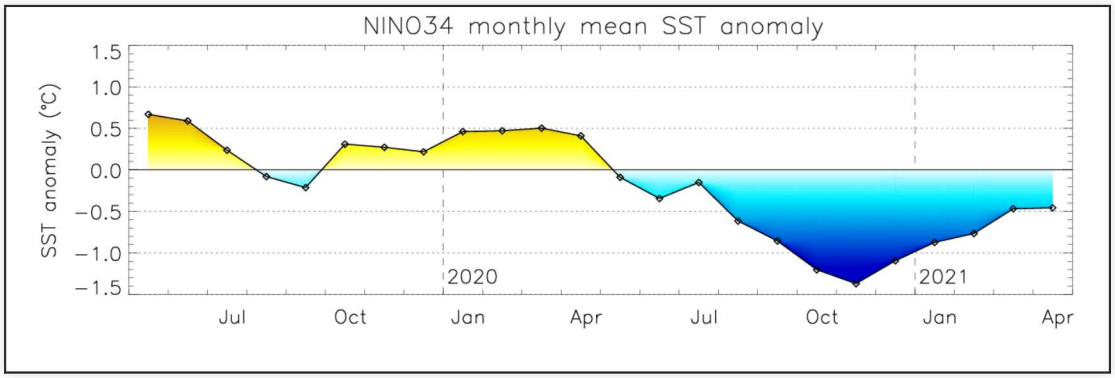
Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 ° C isotherm) (c) Mercator-Ocean

1 - Weakening of the warm pool anomaly
2 - Close to normal depth

Oceanic analysis of April 2021 : Pacific Ocean - Nino3.4 index history

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -0.45 °C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

Stability just below the "La Nina" threshold.

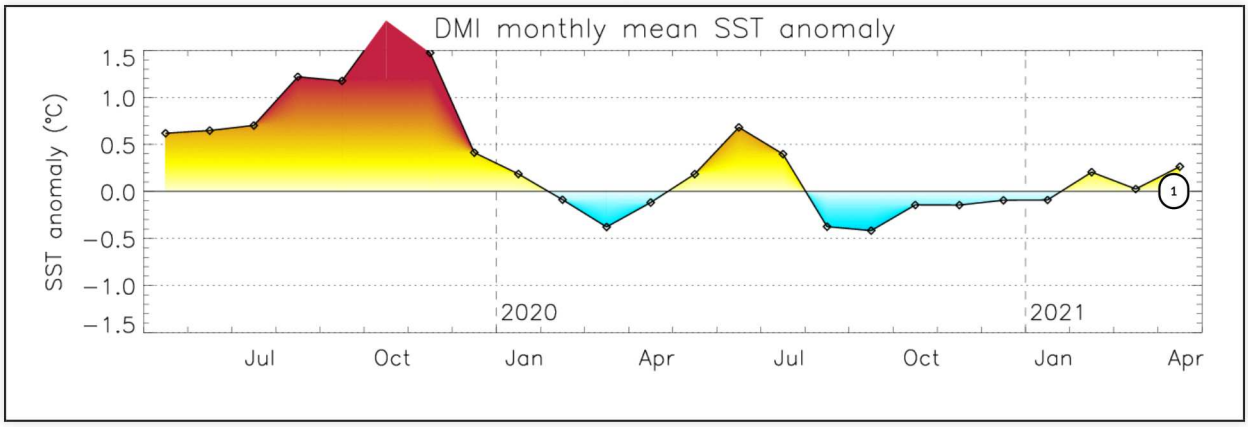


Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

Oceanic analysis of April 2021 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : 0.3°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/iod1.png)

Near neutral conditions



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

1 - Near neutral conditions

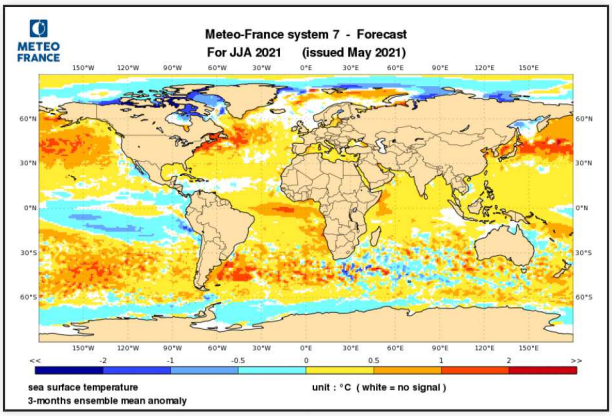
Oceanic forecast : SST anomaly

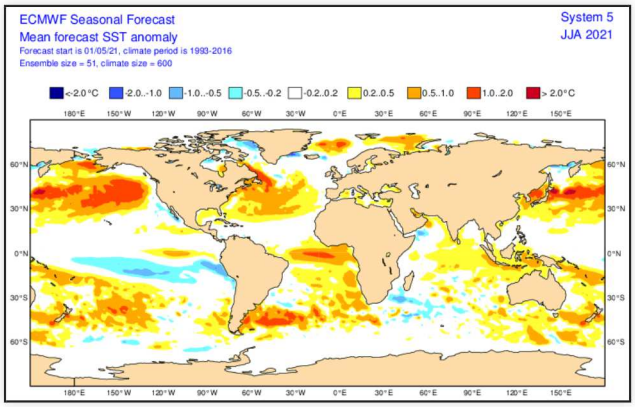
Good agreement between MF-S7 and ECMWF-SEAS5 in all oceans.

In the Pacific Ocean : the cold anomaly pattern associated to La Niña is still present in the forecasts. Its intensity is a little bit stronger in MF-S7 than in ECMWF-SEAS5. Its extension to the South-East (up to South America) is similar in both models. Good agreement on the warm anomaly patterns in mid-latitudes (Northern and Southern hemisphere)

In the Indian Ocean : little contrasts on the whole basin with predominance of positive anomalies. Along the equator, opposing value of the East-West gradient between the two models. Looking at all the C3S models, no solution clearly privileged

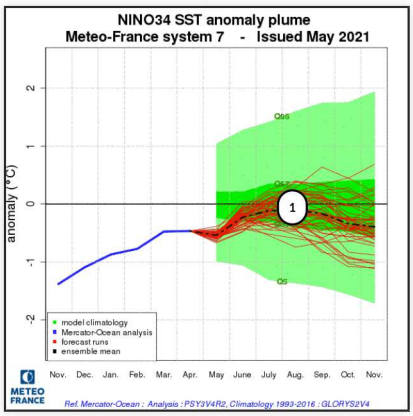
In the Atlantic Ocean : For both models, the warm anomaly off the North American coasts would decrease compared to its current value.

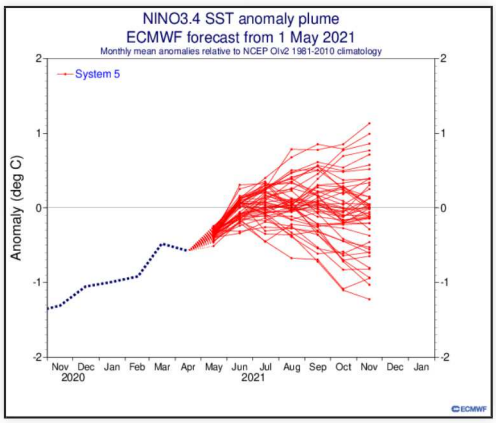




Oceanic forecast : NINO3.4 Plume diagrams

ECMWF-SEAS5 and MF-S7 : both models predict a gradual attenuation of the cold anomaly over the next months. MF-S7 predicts cooler anomalies than ECMWF-SEAS5.



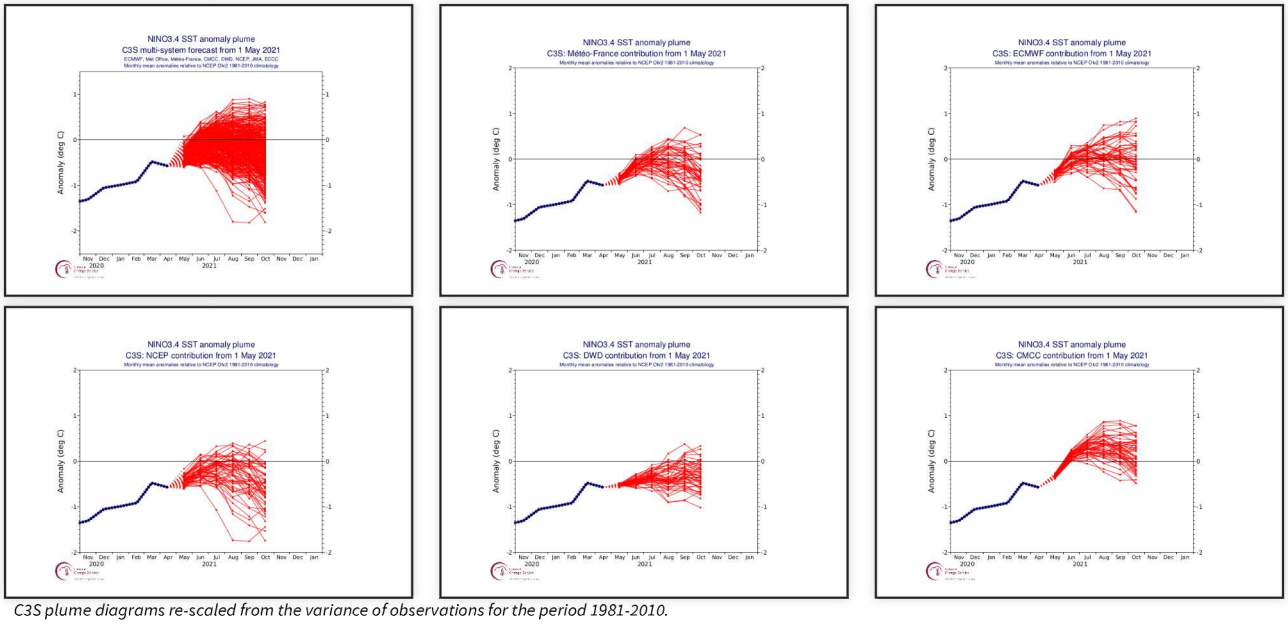


1 - Close to neutrality

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

All the models agree on a gradual warming.

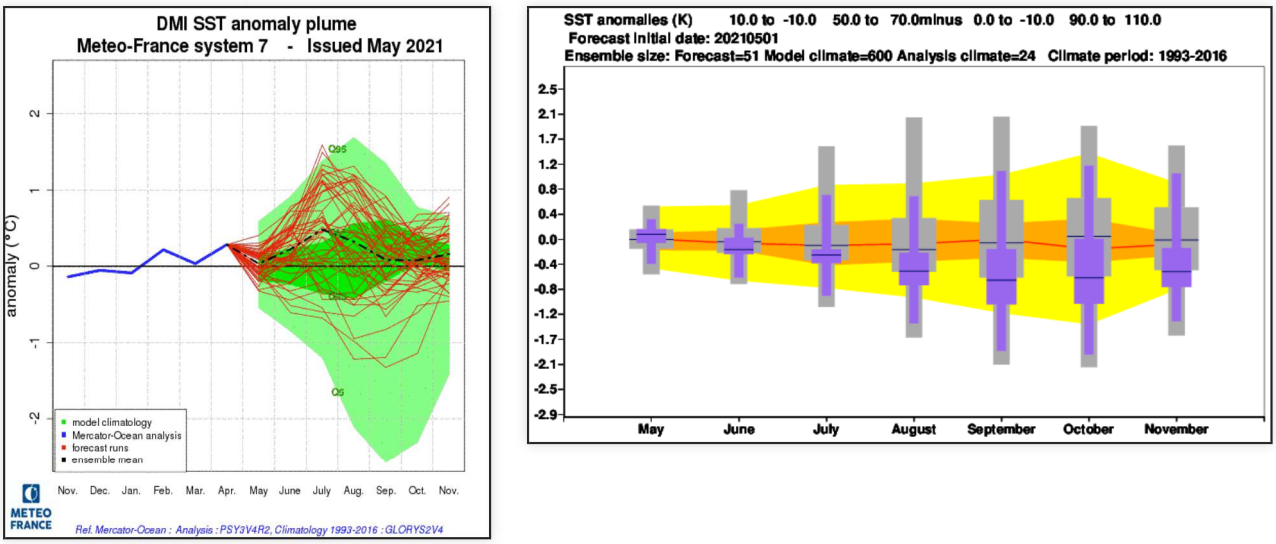
Expected Phase for the next three months : neutral.



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

Oceanic forecast : Indian ocean - DMI evolution

Noticeable differences between the two models: the DMI would stay positive (potentially strongly positive, but large spread) during the period with MF-S7 while it would become negative with ECMWF-SEAS5.

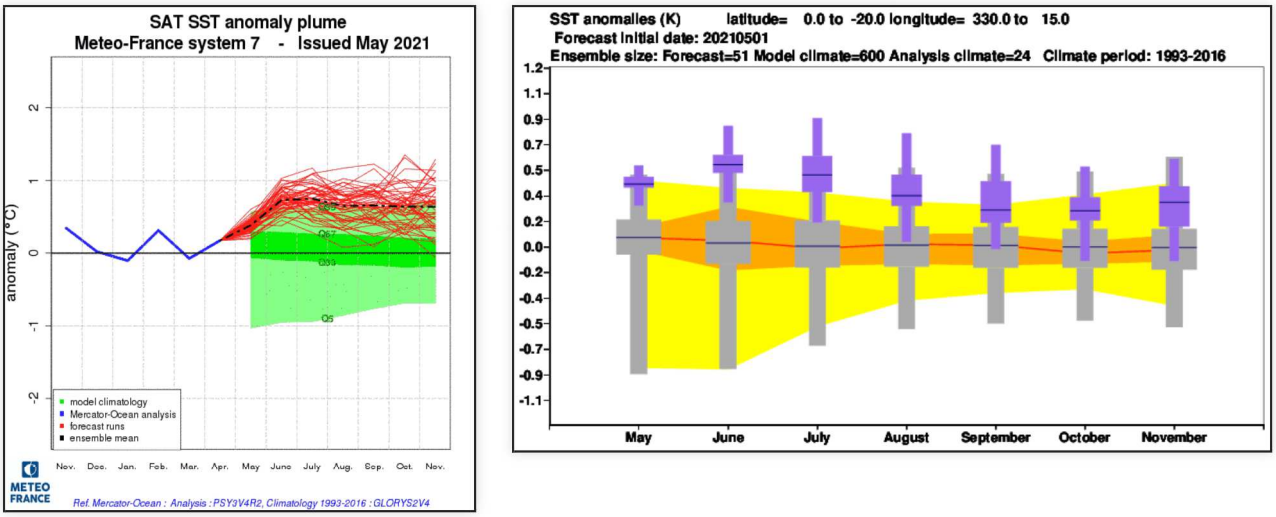


DMI index : analysis, forecasts and model climatology with MF-S7 on the left and ECM-SEAS5 on the right

Oceanic forecast : Atlantic ocean - SAT evolution

Both models predict a significant warming, which persists beyond the next quarter.

The TASI (see here MF-S7) would then be signicantly negative, a factor that is favourable to rainfal in coastal countries (north of Gulf of Guinea) and unfavourable to the activity of the west African monsson in the Sahel.

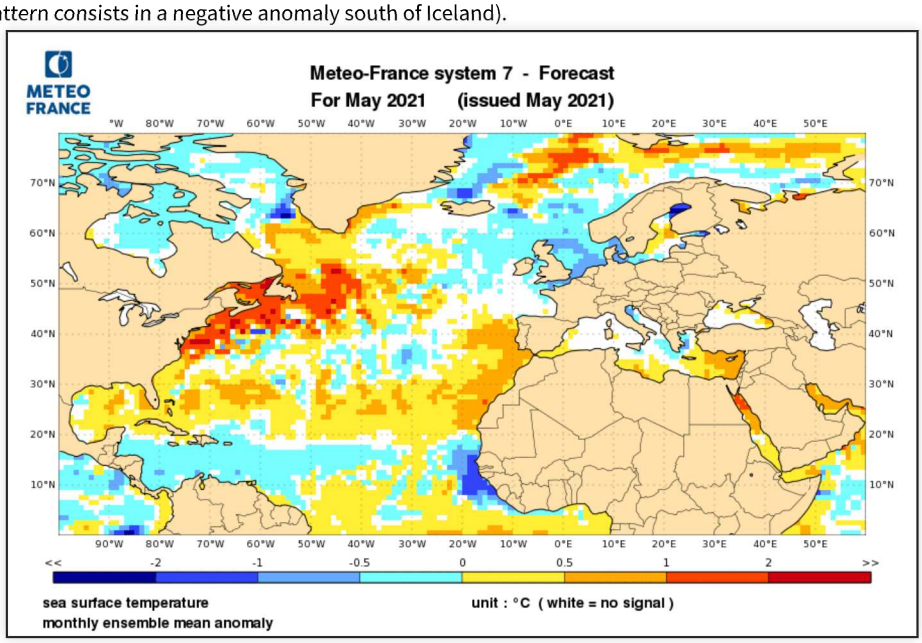


Anomaly on the SAT box : analysis, forecasts and model climatology with MF7 on the left and SEAS5 on the right

Drivers : Atlantic SST

This SST pattern of May is not favourable to East Atlantic circulation in JJA (Duchez et al., 2016, https://doi.org/10.1088/1748-9326/11/7/074004).

(the favourable pattern consists in a negative anomaly south of Iceland).

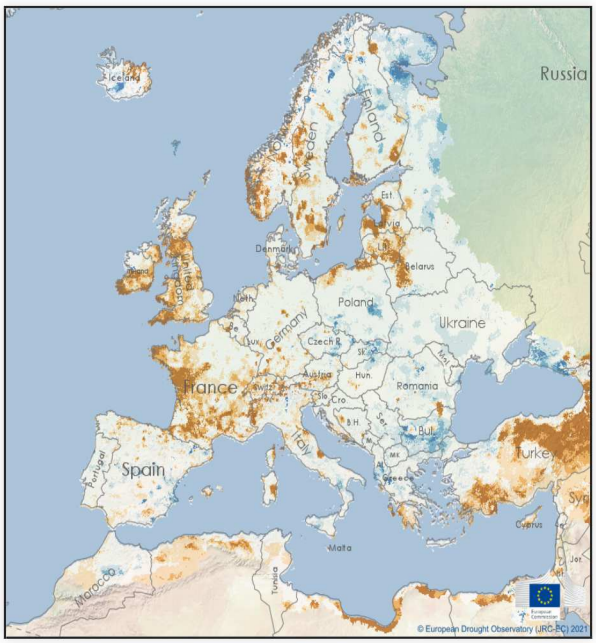


North Atlantic SST in May (forecast from MF model)

Drivers : soil wetness

Currently (end of April), some countries with dry conditions.

In case a favourable conditions (as durable anticyclonic periods), it may amplify positive tempertature anomalies (and risk of heat waves).



Soil Moisture Index (SMI) Anomaly for 10-day periods : April 2021 third ten-day period

https://edo.jrc.ec.europa.eu/

Drivers : Summary

- SST in May : not favourable to East Atlantic circulation in JJA

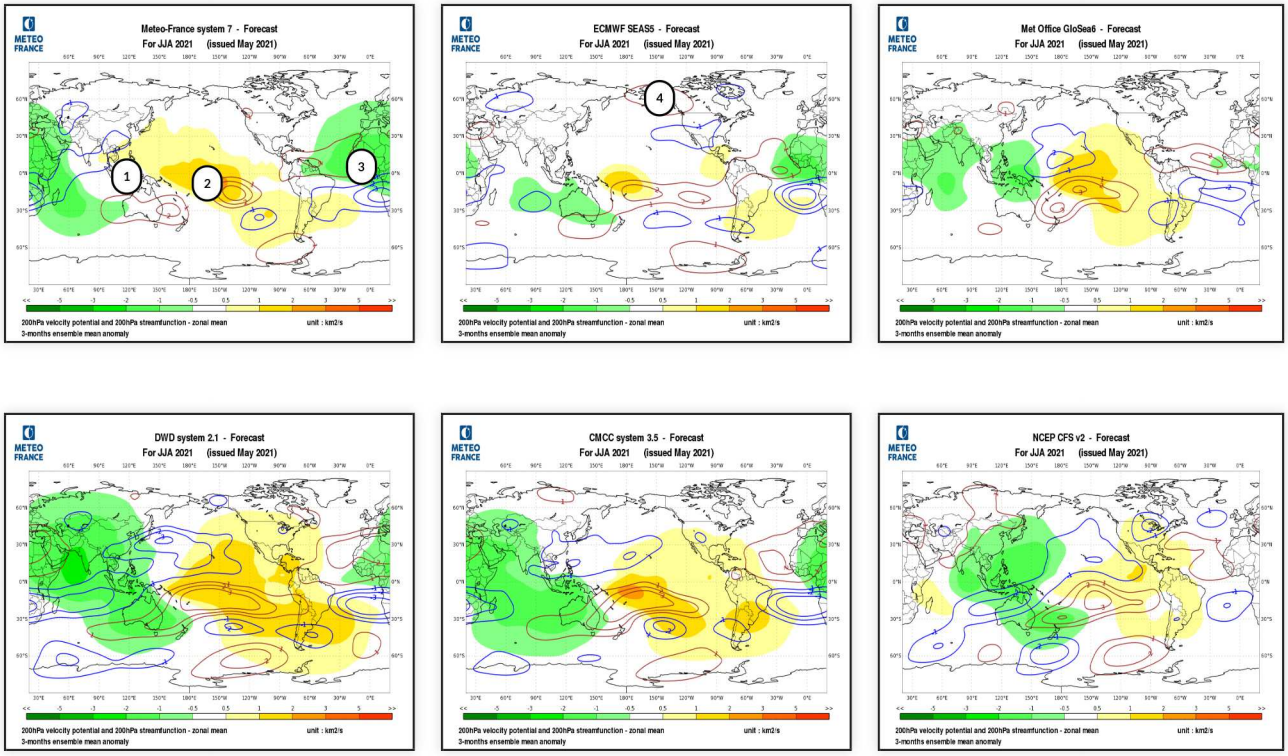
- Soil wetness : some countries with dry conditions, where it could enhance the risk of heat wave in case of persistant anticyclonic conditions during summer.

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

Good agreement between models in the tropics, low signals in mid latitudes, especially in the North Atlantic in SF.

Velocity Potential : despite the weaking of La Nina, there is still a dipole pattern in the models corresponding to a La Nina response. That means a downward motion anomaly over the Central Pacific and an upward motion anomaly over the Maritime Continent extending to the Indian Basin. There are some differences between models in the intensity of this dipole. Over Africa, 5 models over 6 forecast a upward motion anomaly : to be monitored for the African monsson activity.

Streamfunction : the signal seams to be trapped in the tropics, no trace of teleconnexion toward mid-latitudes in the models. The negative VP200 anomaly over Africa seems to generate a dipole of anticyclonic circualtion anomaly on both sides of the equator.



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

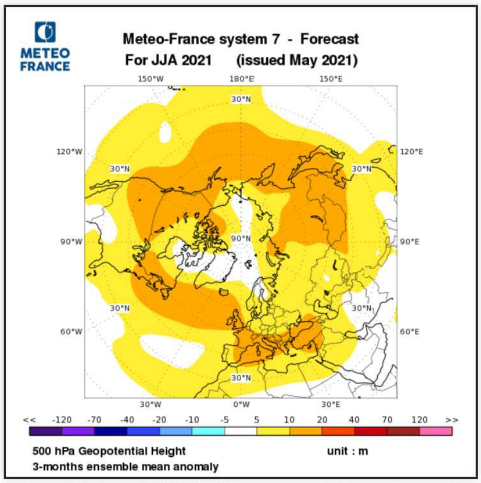
1 - VP : large area of upward motion anomaly
2 - VP : downward motion anomaly in link with La Nina
3 - VP : upward motion anomaly in almost all the models
4 - SF : pattern of negative PNA (absent or weak in the other models)

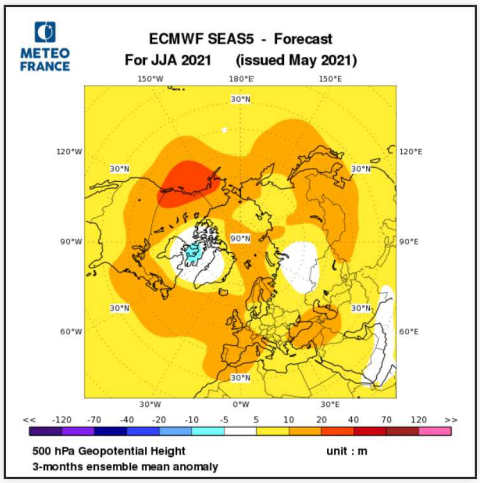
Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Postive anomalies are dominant, due to the positive trend induced by global warming.

For instance, the positive anomalies over North Atlantic (off Ireland) and the Mediterranean Basin are located in the areas where this positive trend is the strongest (see MF-S7 Z500 trend for JJA)

So the diagnostic is done on MSLP charts (see next slides).



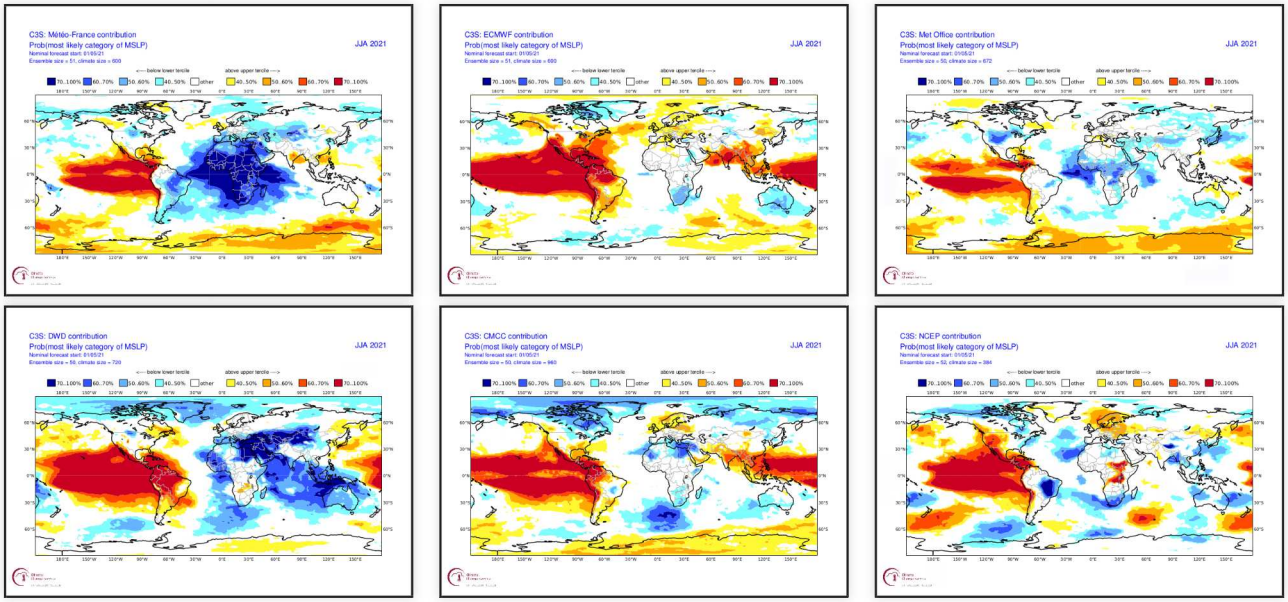


polar projection of MF7 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilities

In the tropics, in link with VP200 anomalies, impacts of la Nina are clearly visible : the highest tercile is almost certain accross the Pacific. In the Indian Ocean, in Africa and in Western Atlantic, the lowest tercile is the most probable but the signal is more or less marked according to the models.

In mid-latitudes in the northern hemisphere, quite a good agreement over North America for a pattern corresponding to negative PNA. In the North Atlantic and over Europe, the pattern looks like Zonal and/or SUmmer Blocking regimes. Over the Mediterranean basin, a negative signal tends to emergence, consistent with the large scale VP200 signal.

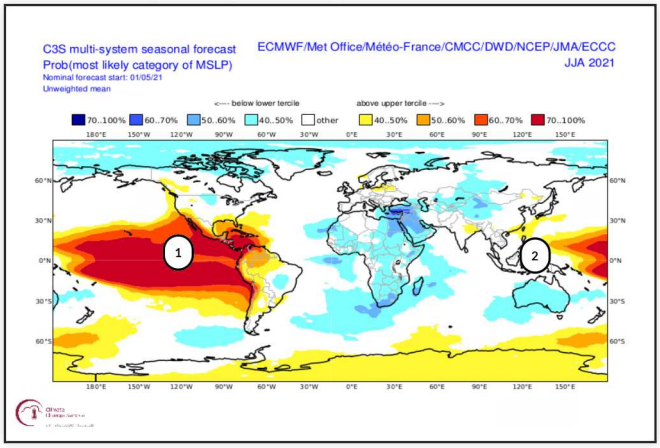


MF-S7, SEAS5, UKMO, DWD, CMCC and NCEP models probability maps.

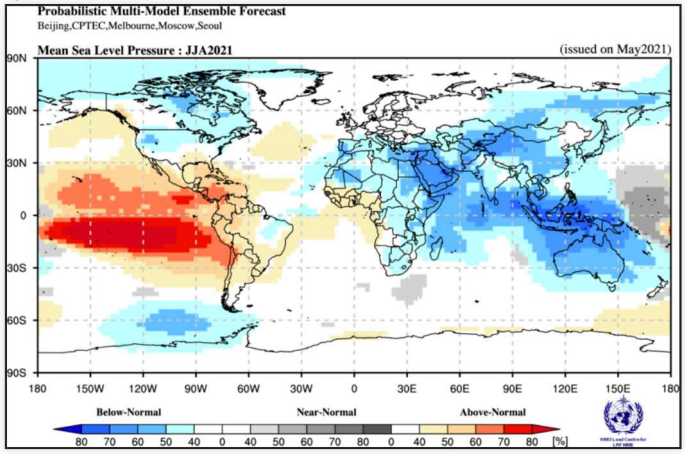
Atmospheric circulation forecasts : MSLP probabilites multi-systems

In the Pacific ocean, over Africa and over the Arabic Peninsula, good agreement between the two multi-models. Some noticeable differences over the Maritime Continent.

For Europe and the Mediterranean Basin, the negative signal is stronger in the "not C3S" multi-model.



C3S multi-models MSLP terciles probability.

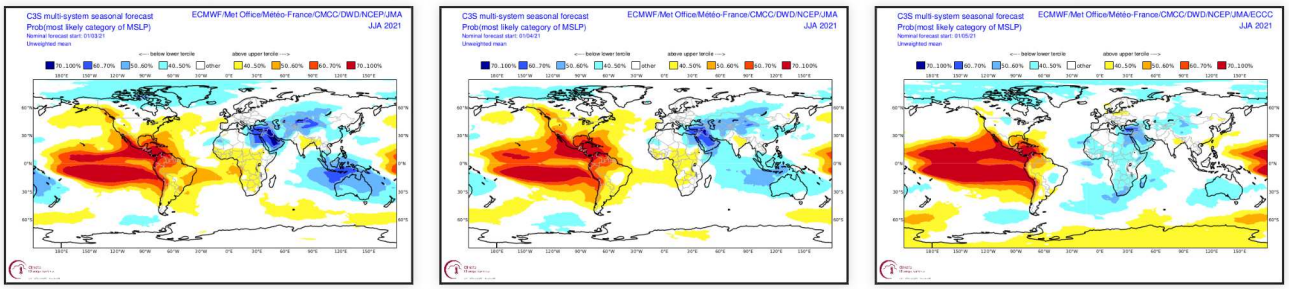


Others models of WMO multi-models MSLP terciles probability.

1 - High probable values related with La Nina situation
2 - low probable values related to La Nina

Atmospheric circulation forecasts : Forecast stability

The stability of C3S multi-model is quite good for JJA. However over North Atlantic the positive signal has disappeared in the last forecast *and* the negative signal covering the Arabic Peninsula and Central Asia has weakened.

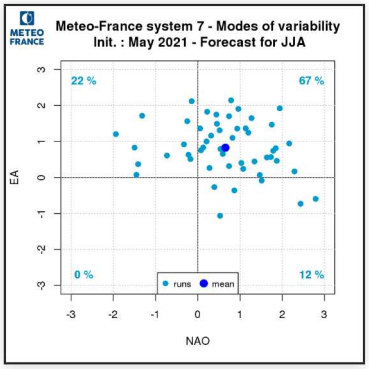


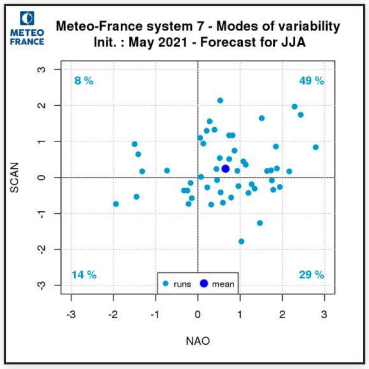
Successive forecasts of the C3S multi-model

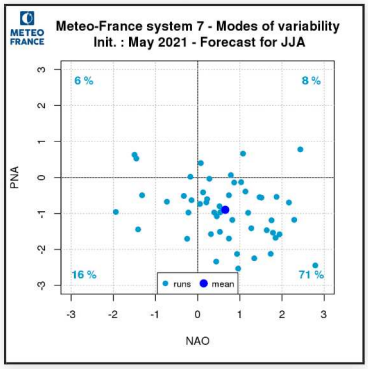
Modes of variability : forecast

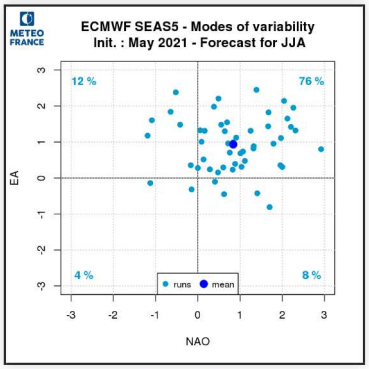
Good confidence in a negative PNA

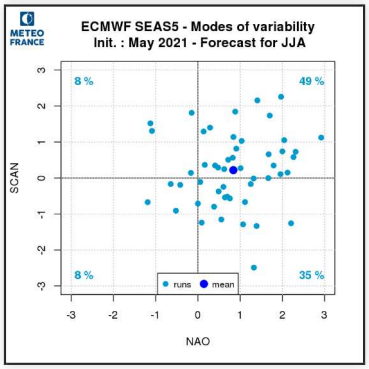
A positive NAO and positive EA are very probable. However, the impact of global warming on Z500 fields may have polluted the signal (positive inter-annual trend of EA for JJA that tends to "boost" the positive signal)

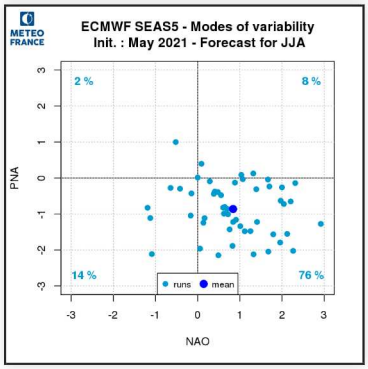












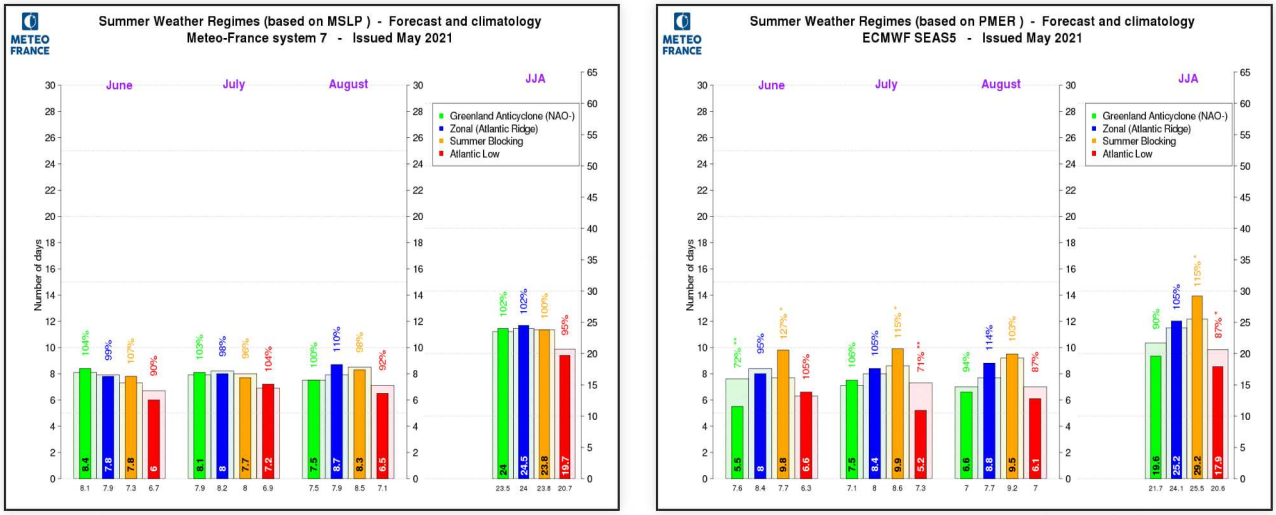
See the modes of variability patterns

Weather regimes : summer MSLP

No significant signal in MF-S7.

In ECMWF-SEAS5, significant higher frequencies of the Summer Blocking regime and lower frequency of Atlantic Low (consistent with the 3-month mean of MSLP).

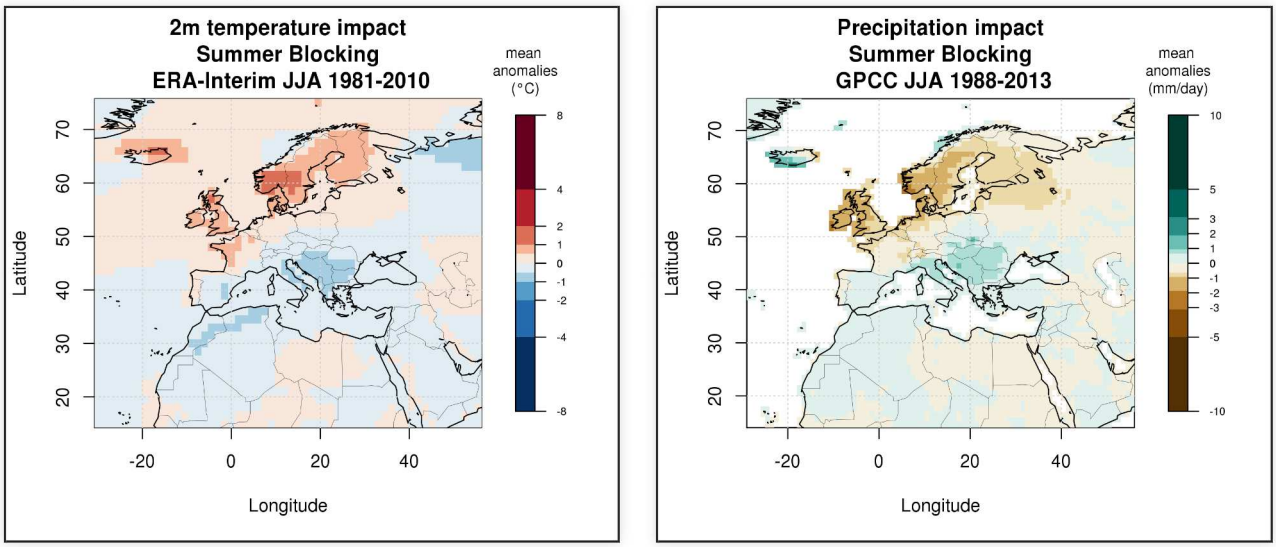
The Zonal-like pattern detected on MSLP probability maps is not significantly represented in the forecast of weather regime frequencies.



Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S7 (left) and SEAS5 (right).

Weather regimes : Impacts

This regime is significantly dominant in ECMWF-SEAS5 forecast.



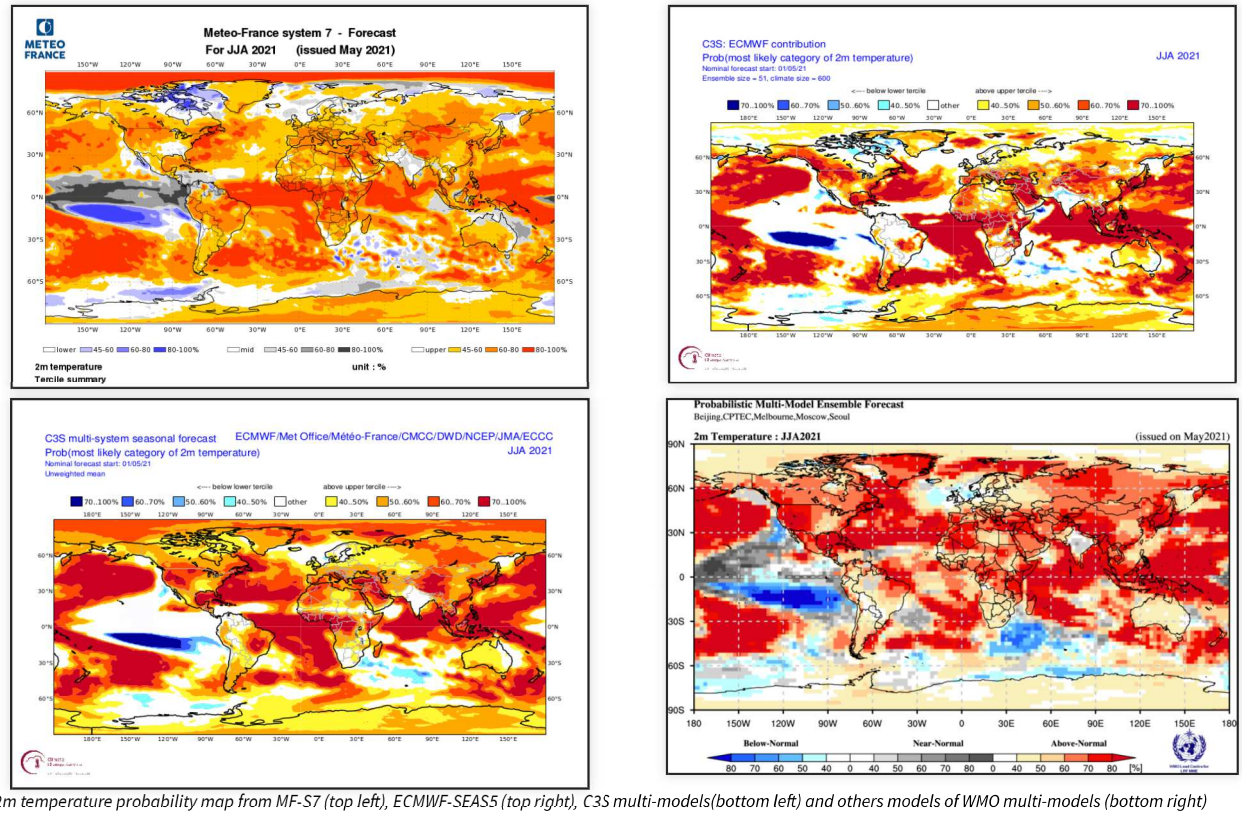
Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

Over the continents, positive anomalies almost everywhere, partly attribuable to global warming.

In North America, impact of La Niña on the West coast up to Alaska.

Over Europe and the Medtiterranean basin, North-South contrast consistent with the NAO+ signal but probably largely due to climate warming.



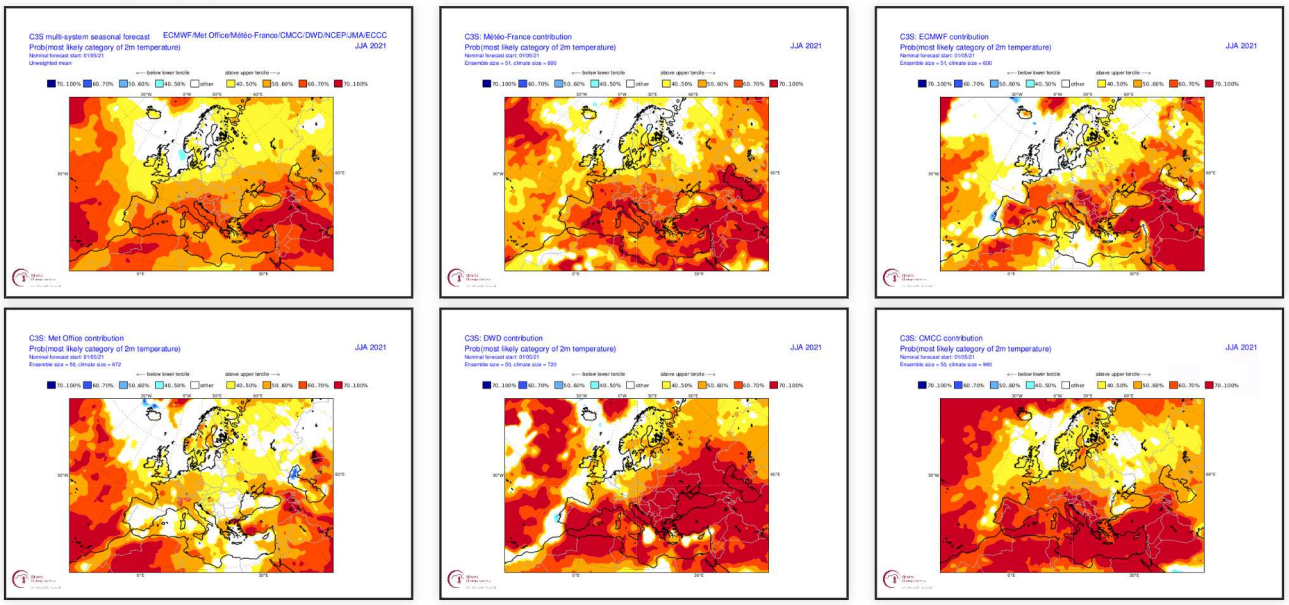
2m temperature probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

All the models forecast the highest probability for the "warmer than normal" tercile across Europe and the Mediterranean Basin, except for the British Isles and for Scandinavian countries where no clear signal emerges.

The North-South contrast is consistent with a NAO like impact in Europe, but over the Mediterranean basin it is difficult to attribute the "warm" signal to anything except climate warming.

Note that for ECMWF-SEAS5, the chart does not correspond to the impact of a predominance of Summer Blocking (see slide about Weather Regimes).

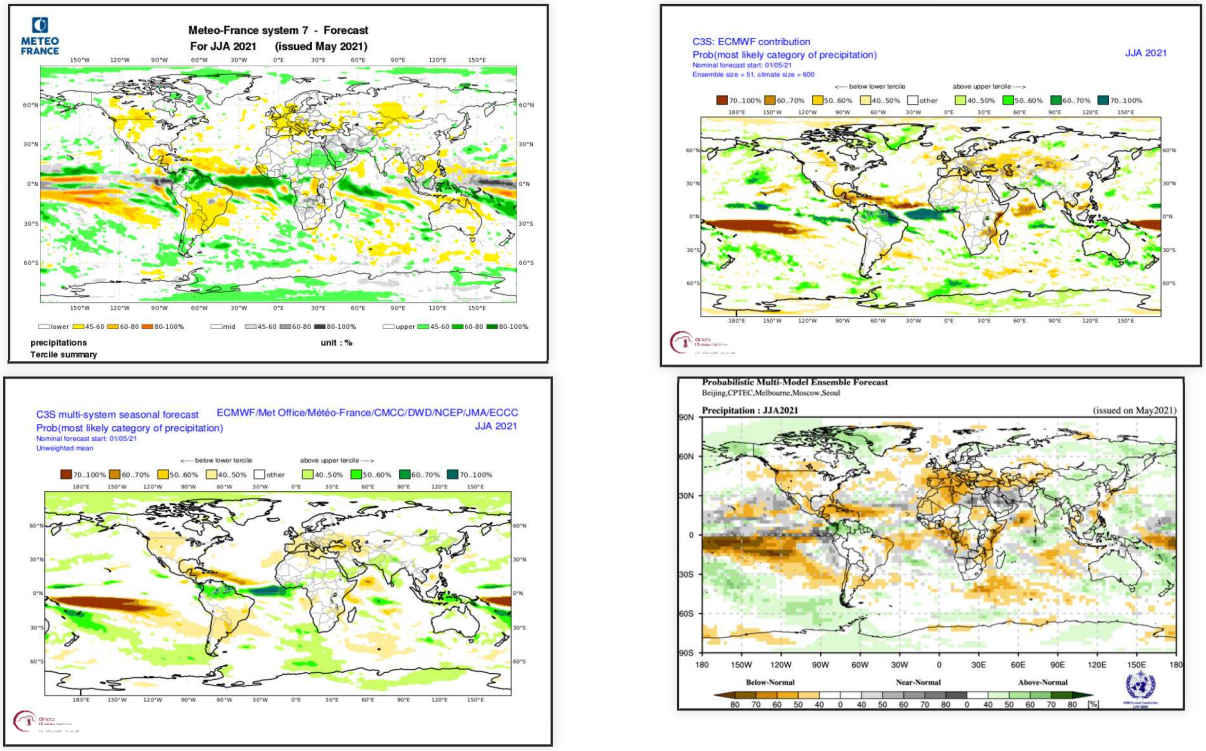


C3S multi-models probability map (top left) and MF-S7, ECMWF-SEAS5, UKMO , DWD, CMCC models.

Forecast of climatic parameters : Precipitation

Models are consistent in the tropics and up to mid-latitudes over North and South America, South Asia (wet pattern) and the Maritime Continent.

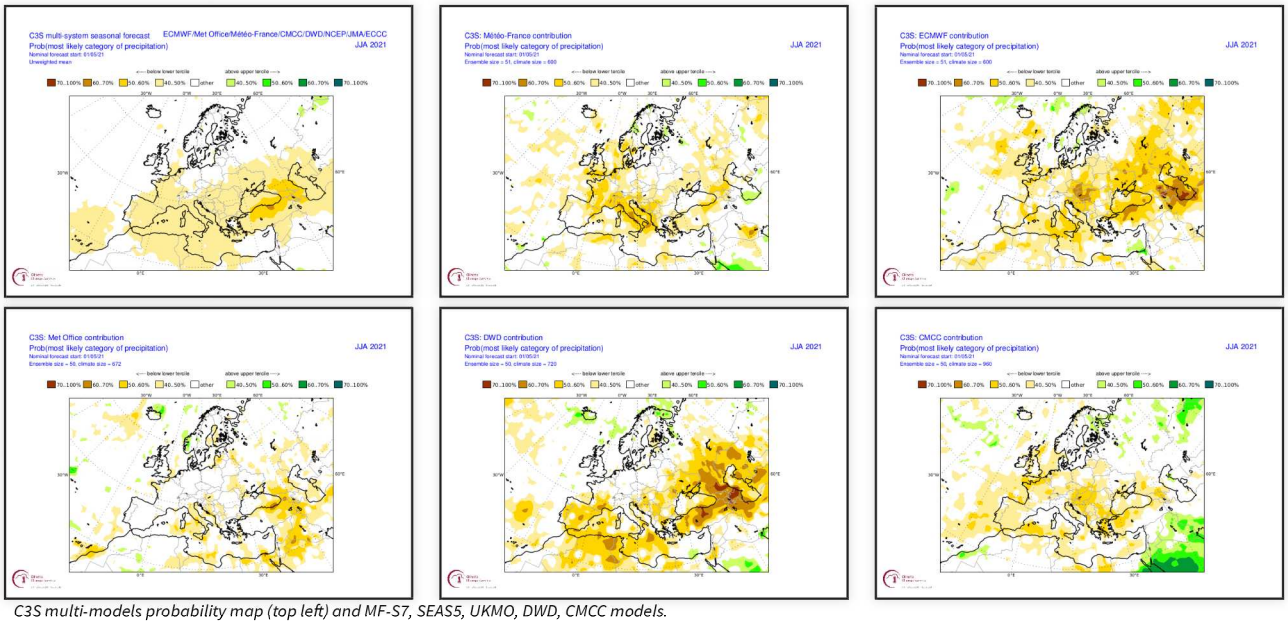
Some divergence over Northern Asia and Africa. Concerning the West African Monsoon, the wet signal on the coastal countries (C3S models) is consistent with the negative TASI, so can be considered as a robust signal.



precipitation probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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

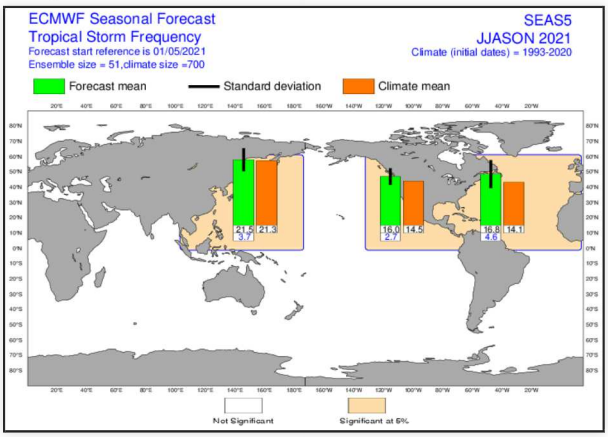
A "drier than normal" scenario dominates over Europe (except the Northern part) and the Mediterranean basin. Because of the negative signal in MSLP over the Mediterranean Sea, one could expect a wet signal. As for Z500 and T2m, the climate trend probably explains an important part of the dry signal (see here MF-S7 trend for JJA).

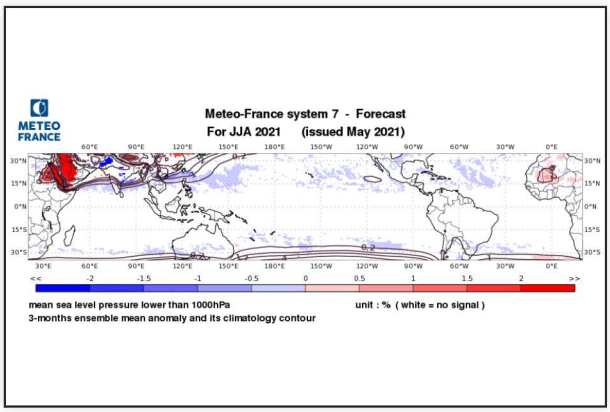


C3S multi-models probability map (top left) and MF-S7, SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Tropical Storm Frequency

The cyclone risk is likely to increase in eastern Pacific and Atlantic





Synthesis map for Europe : Temperature

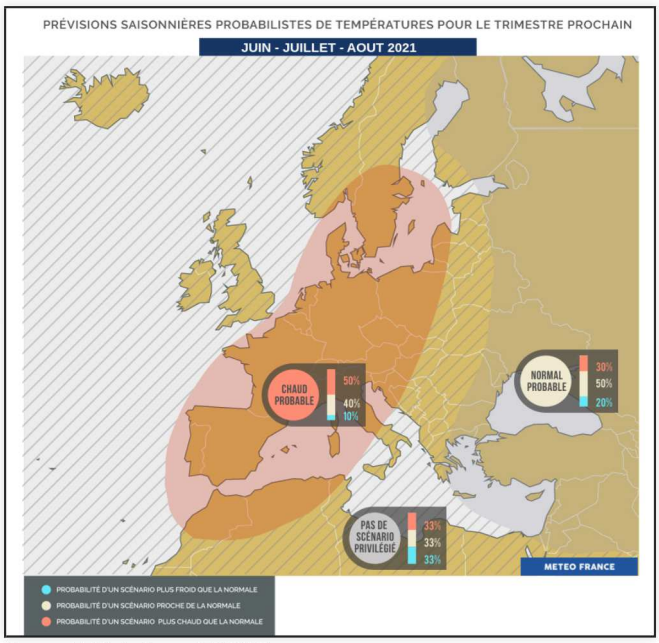
We take into account dominant MSLP signal, so predominance of Summer Blocking (confirmed by ECMWF-SEAS5 regimes) and potentially Zonal regime. We also rely on MF-S7 anomaly maps where the climate trend is removed, in order to enhance the signal induced by general circulation.

As a result :

- warm tercile privileged over western Europe, west of Mediterranean Sea and south of Scandinavia

- normal tercile privileged on the eastern part of the domain.

- no scenario elsewhere



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

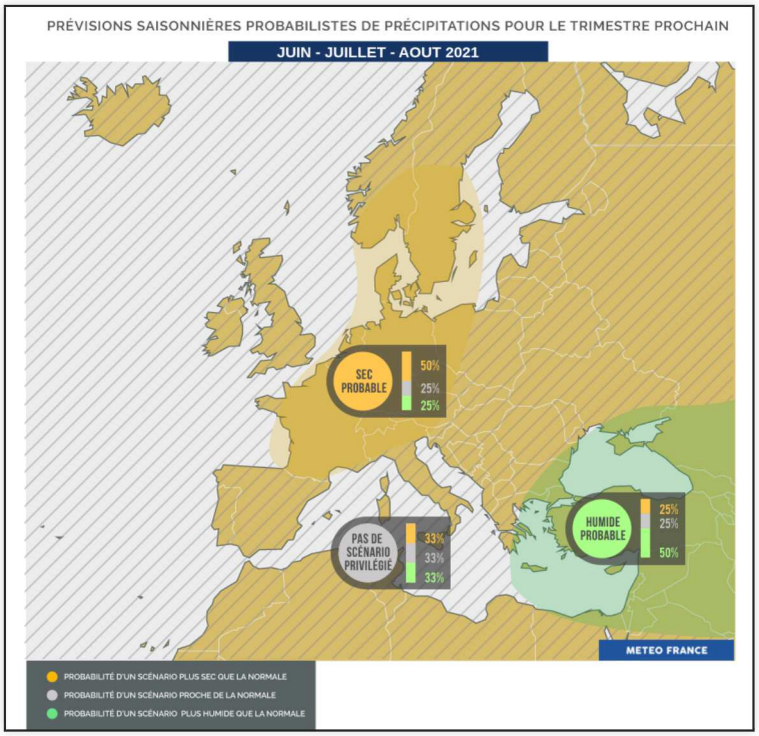
Synthesis map for Europe : Precipitation

For the same reason as temperature :

- dry tercile privileged over western Europe and south of Scandinavia

- wet tercile privileged on the eastern side of the Mediterranean Sea.

- no scenario elsewhere



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