

# Météo-France Seasonal Forecast Bulletin

MAY - JUNE - JULY 2022

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## General synthesis : MJJ 2022

In the Pacific Ocean, the ever-present "La Niña" phenomenon is only slowly weakening. Associated with a negative phase of the PDO, these two forcings influence climatic conditions in this basin.

### **A) Oceanic forecast :**

- ENSO : La Niña
- IOD : negative
- Equatorial Atlantic : warm anomaly

### **B) Drivers :**

- "La Niña" and the PDO- impacts

### **C) Atmospheric circulation :**

The expected atmospheric circulation is characterized by a positive Z500 anomaly stretching from the United States to Europe and a neutral zone further North. This pattern is closed to a NAO+ situation.

### **D) Most likely conditions :**

The warm tercile is preferred over Europe (except the United Kingdom and Scandinavia) and the Mediterranean Basin. No scenario elsewhere.

The dry tercile is most likely around the Mediterranean Basin and southern Europe. Wet conditions are favored from Iceland to Scandinavia. No scenario elsewhere.

**Next bulletin : scheduled on May 20nd**



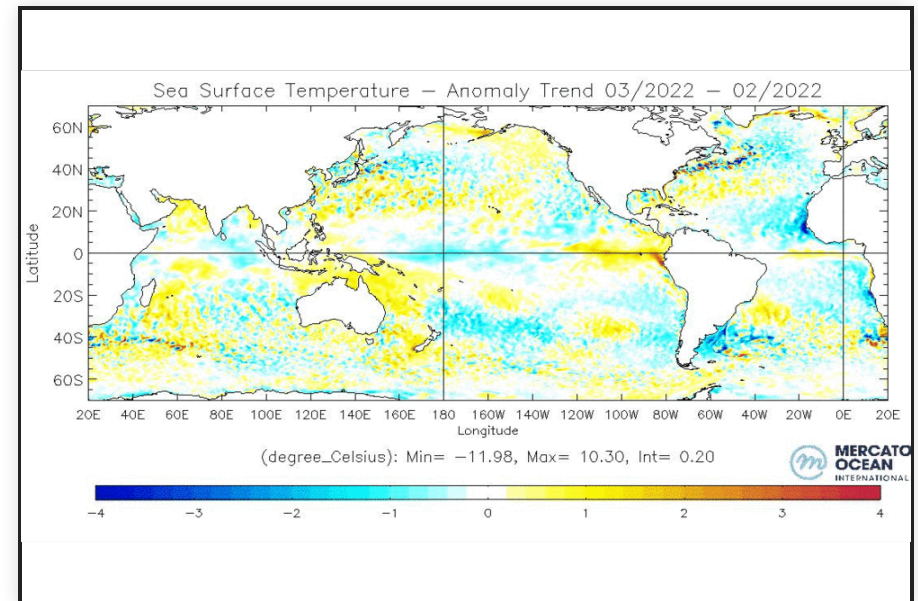
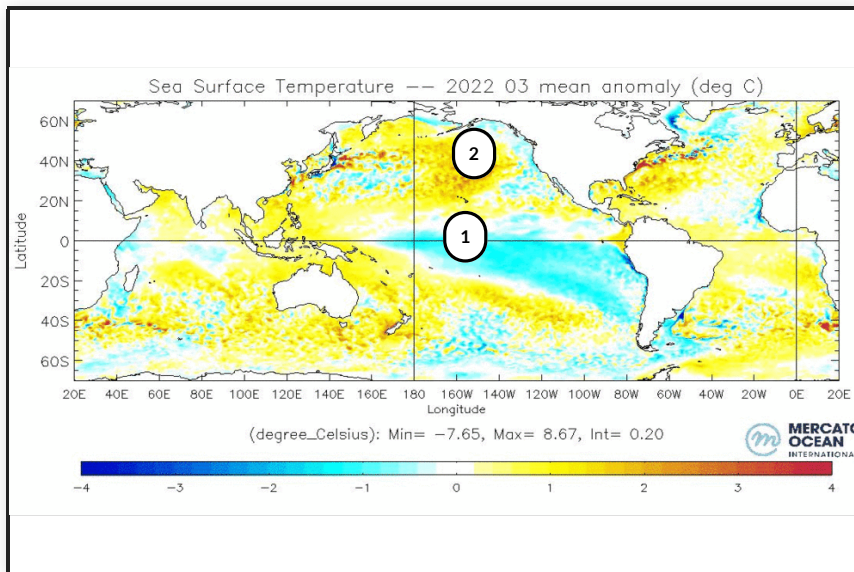
## Oceanic analysis of March 2022 : SST anomalies

### Current ENSO situation : moderate La Niña

In the Pacific Ocean : the cold anomaly in the Central East Pacific, typical of the "La Niña" phenomenon, continues without much change compared to last month. In the North Pacific, the PDO- Pattern is still very present.

In the Indian Ocean : Weak anomalies with no noticeable contrast between west and east.

In the Atlantic Ocean : Warm anomalies are widespread in the South Atlantic or in the equatorial zone. Substantial cooling over the tropical North atlantic

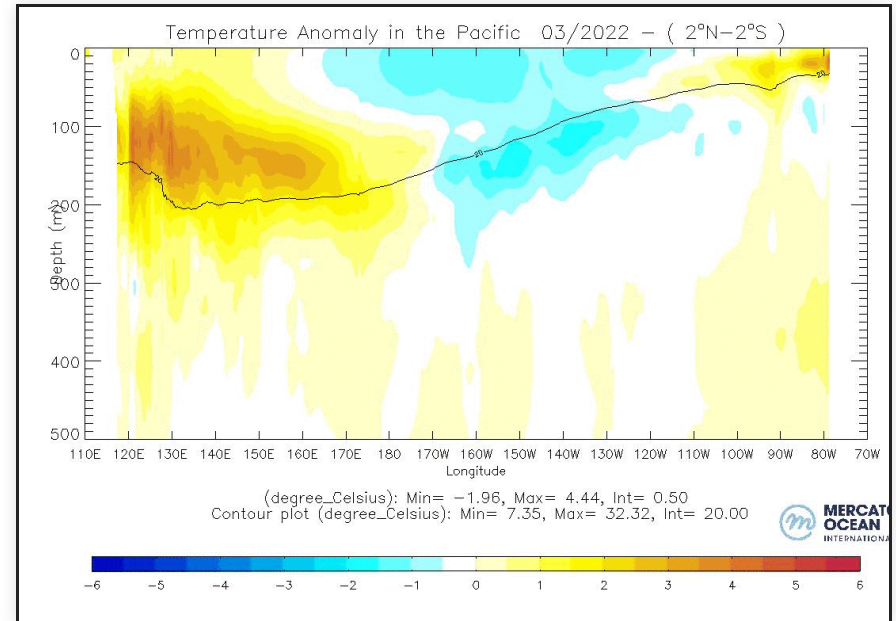
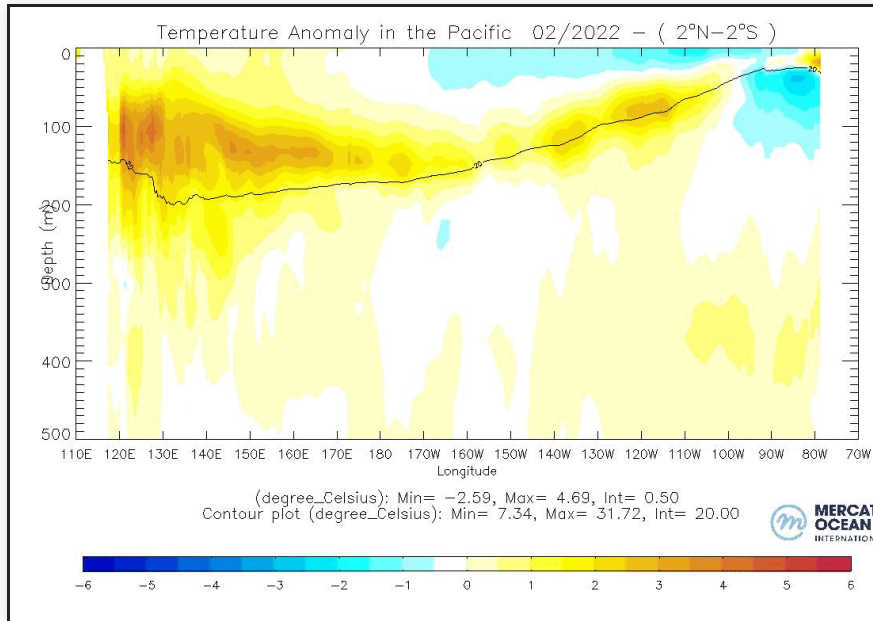


*SST Anomalies and trend with the previous month (c) Mercator-Ocean*

- 1 - La Niña pattern
- 2 - Negative PDO pattern

## Oceanic analysis of March 2022 : Pacific vertical section

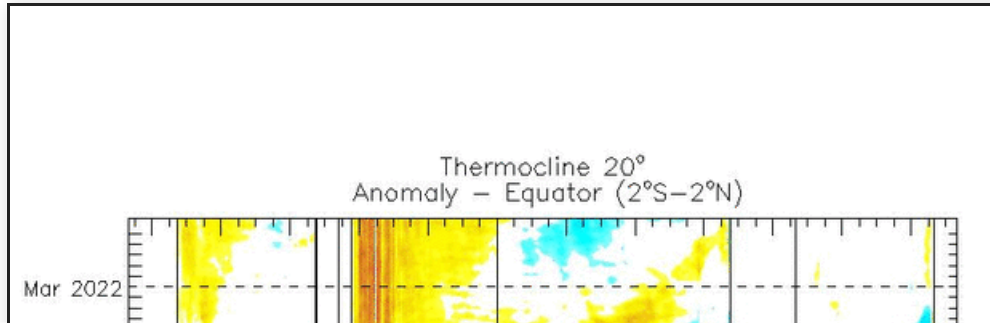
At depth over the center and east of the basin the anomaly has changed sign becoming negative. On the surface a warm anomaly appeared on the extrem west of the basin while the cold anomaly accentuated on the center.



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

## Oceanic analysis of March 2022 : Hovmöller diagram of the 20°C isotherm

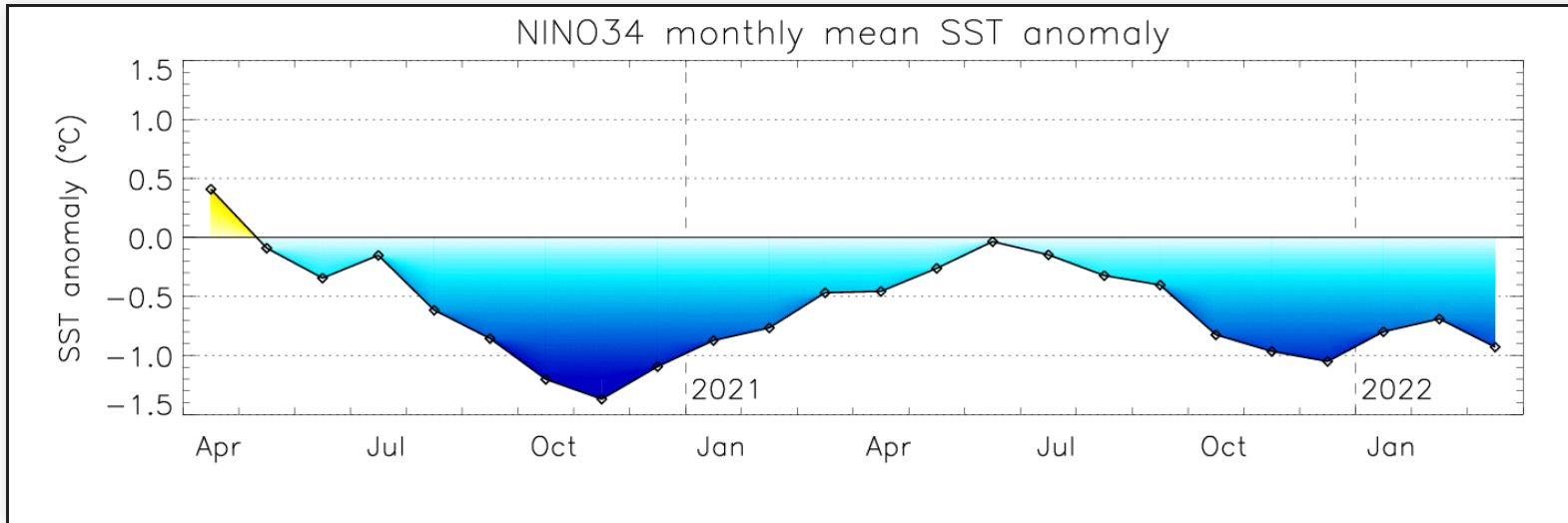
In the Pacific Ocean, a Kelvin wave reached the west of the basin while another appeared on the center.



## Oceanic analysis of March 2022 : Pacific Ocean - Nino3.4 index history

**Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis :  $-0.9^{\circ}\text{C}$**

(see BOM site for weekly values : [http://www.bom.gov.au/climate/enso/monitoring/nino3\\_4.png](http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png) )

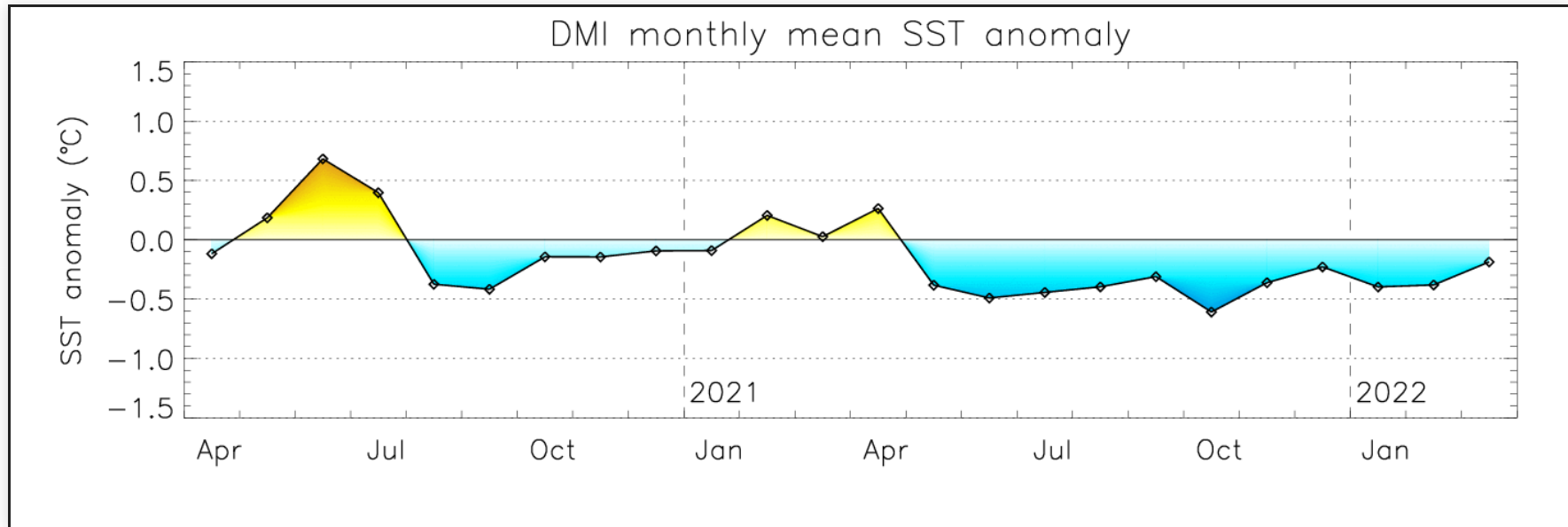


*Evolution of SST in the NINO3.4 box (c) Mercator-Ocean*

## Oceanic analysis of March 2022 : Indien Ocean - DMI index history

**DMI Index issued from Mercator Ocean PSYV4R2 analysis :  $-0.2^{\circ}\text{C}$**

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



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

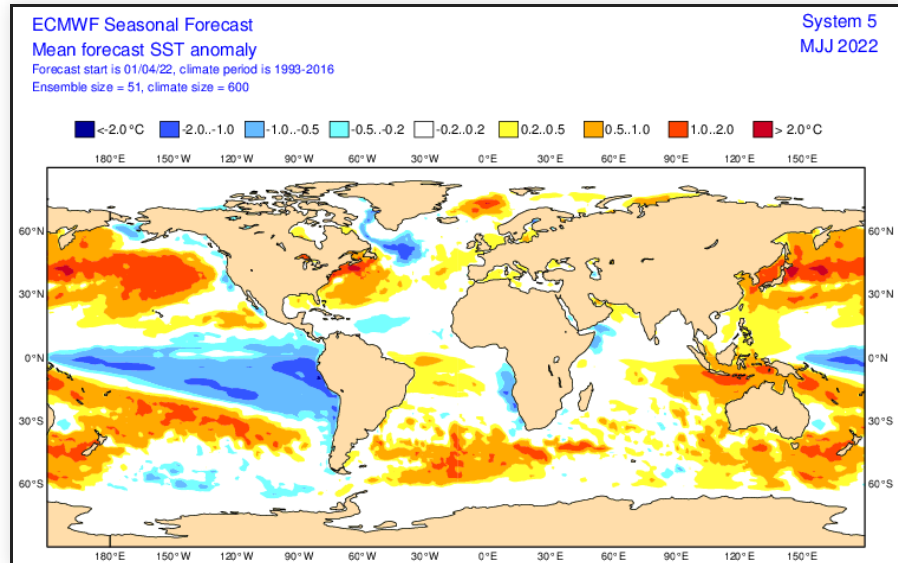
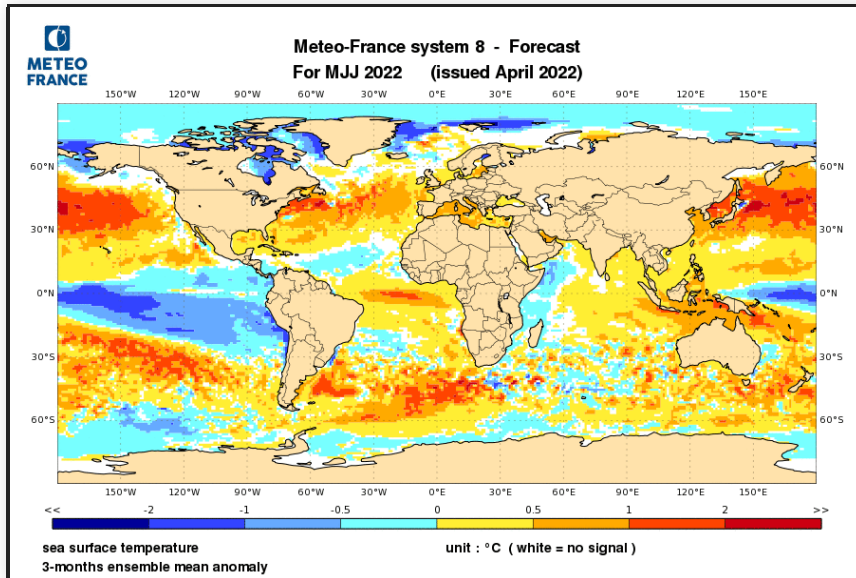
## Oceanic forecast : SST anomaly

Very good agreement between MF-S8 and ECMWF-SEAS5 in the main anomaly patterns.

In the Pacific Ocean : very few changes compared to last month. The cold anomaly over the eastern Equatorial Pacific, typical of the "La Niña" episode, is stable. Similarly, good agreement at mid-latitudes on anomaly patterns (for example, the PDO- pattern in the North Pacific).

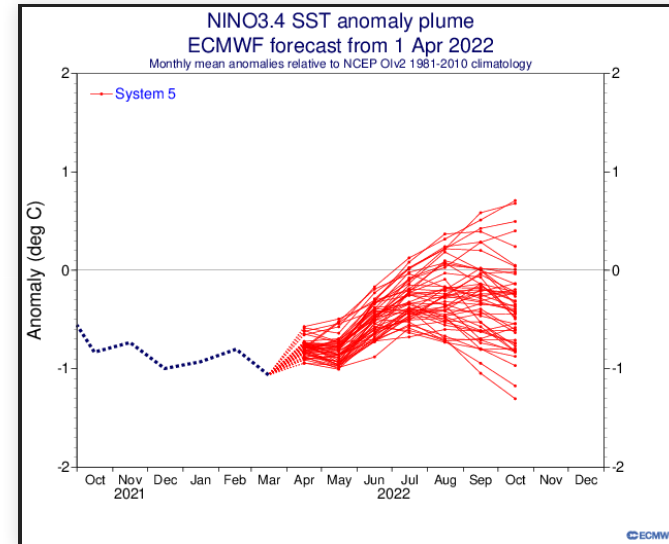
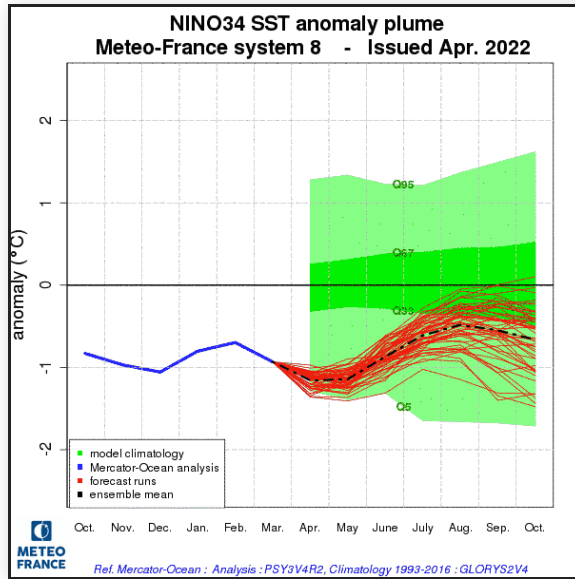
In the Indian Ocean : weak anomalies. East/West contrast more marked with MF8.

In the Atlantic Ocean : persistence of a warm anomaly west of the Equatorial Atlantic with SEAS5 extend over the entire equatorial zone with MF8. in the North Atlantic, at mid-latitudes, the warm anomaly stretching from the Gulf of Mexico to Europe is accentuated with MF8.



## Oceanic forecast : NINO3.4 Plume diagrams

The return to neutrality is delayed compared to previous forecasts. We remain in "La Niña" conditions during the next quarter.

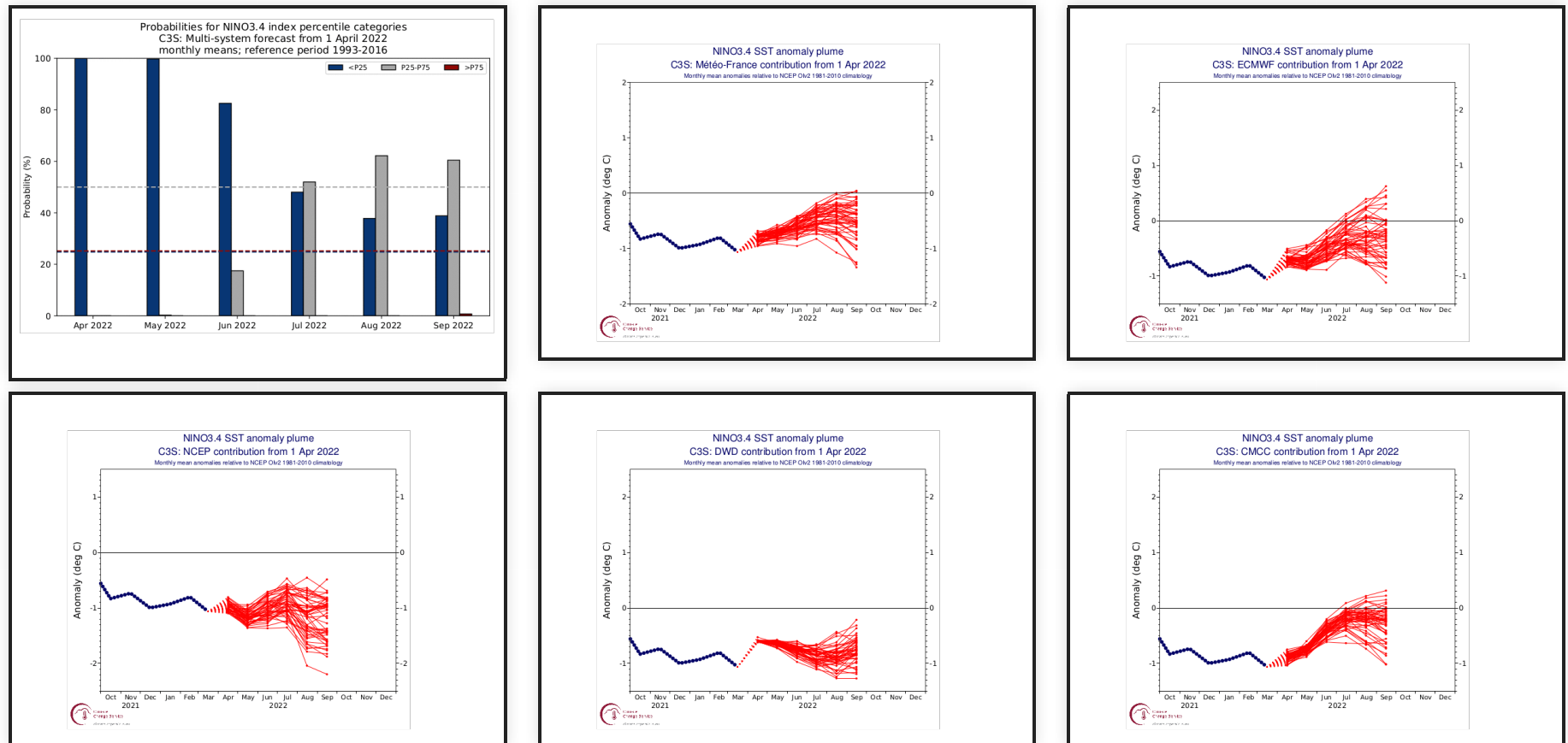




## Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

Good agreement between the models for the continuation of a weak "La Niña" next months. The return to neutrality is delayed compared to last month's forecast compared to last

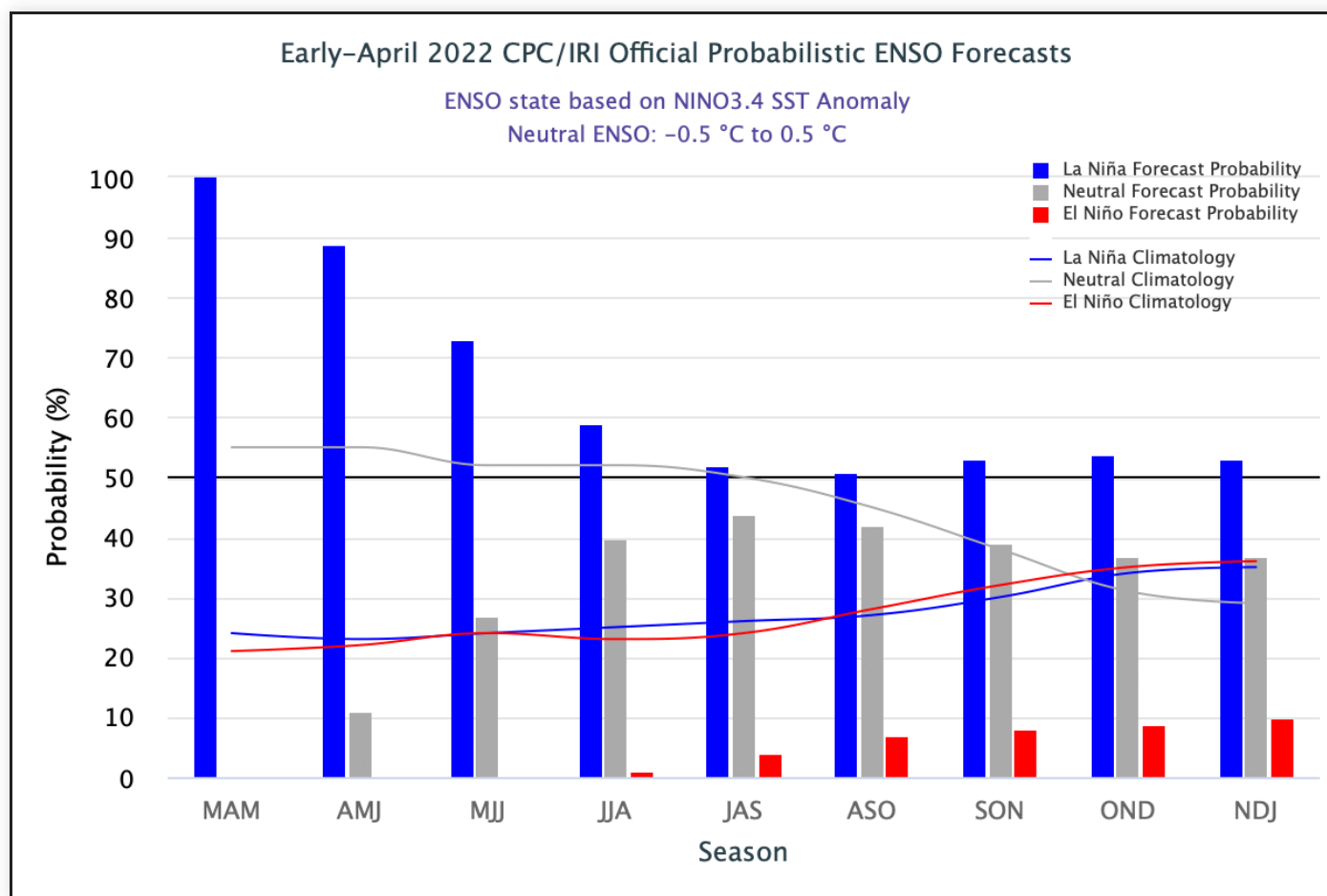
**The most likely phase for the next three months : La Niña.**



C3S multi-system probability forecast (top left figure) and C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

## Oceanic forecast : Synthesis from IRI

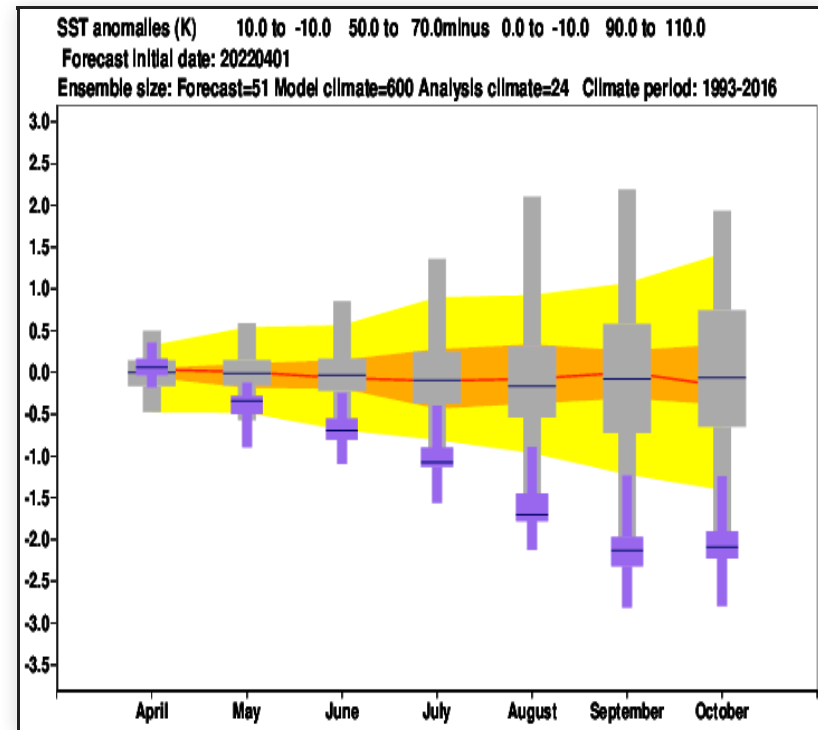
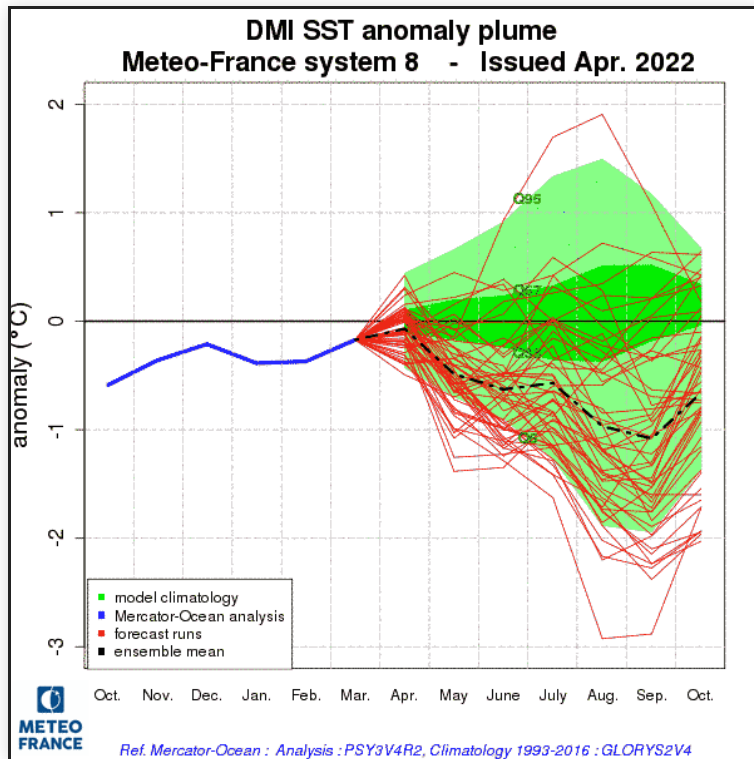
IRI forecast : about 70% chance of "La Nina" for MJJ



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 most likely is that the IOD goes into negative phase during the next quarter.

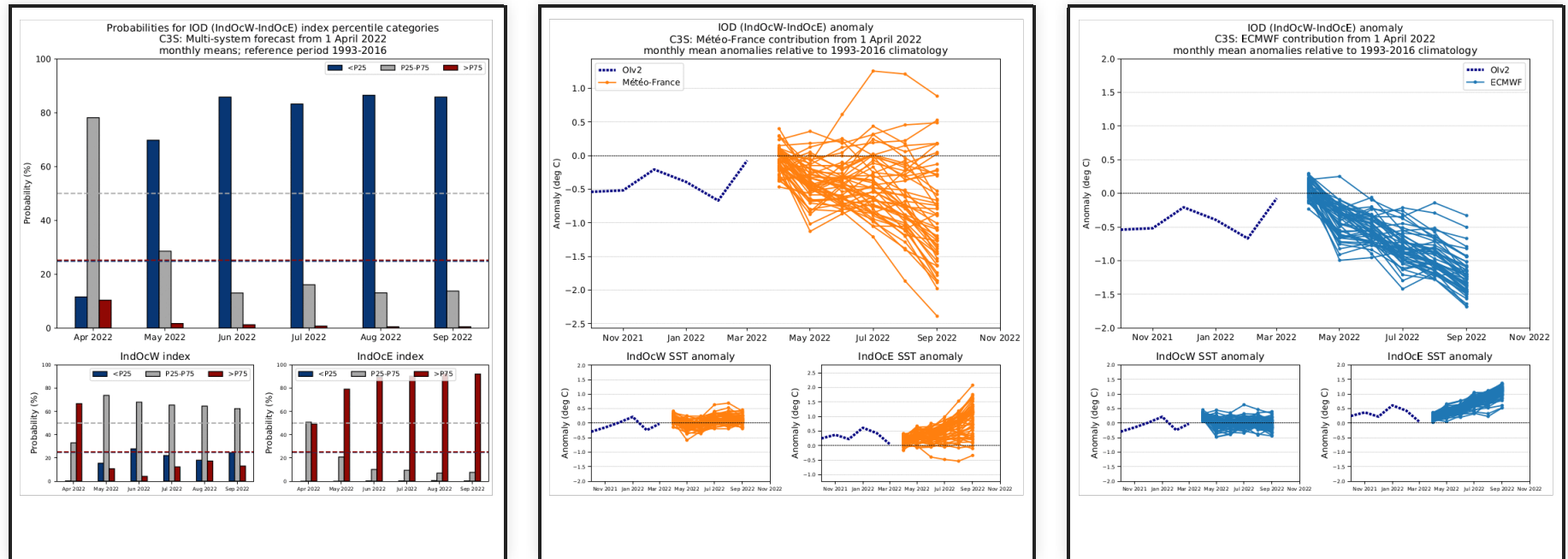


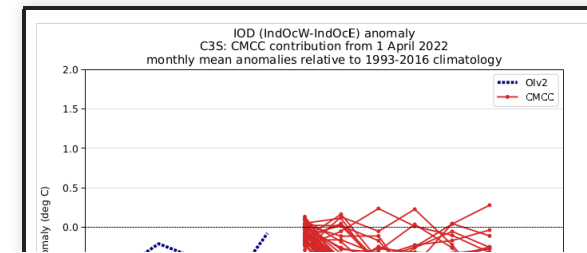
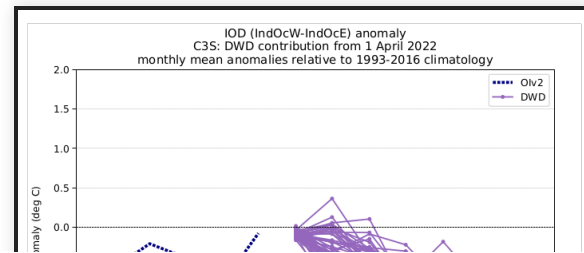
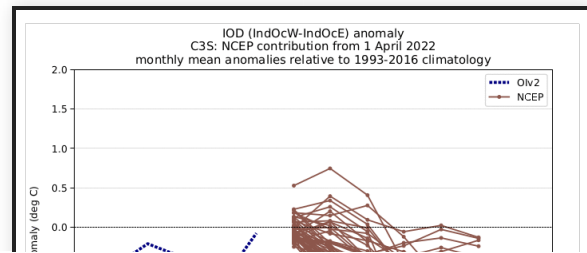
DMI index : analysis, forecasts and model climatology with MF-S8 on the left and ECM-SEAS5 on the right

## Oceanic forecast : C3S IOD re-scaled plume diagrams

Good agreement between C3S models on a marked warming in the east box responsible for a the negative IOD .

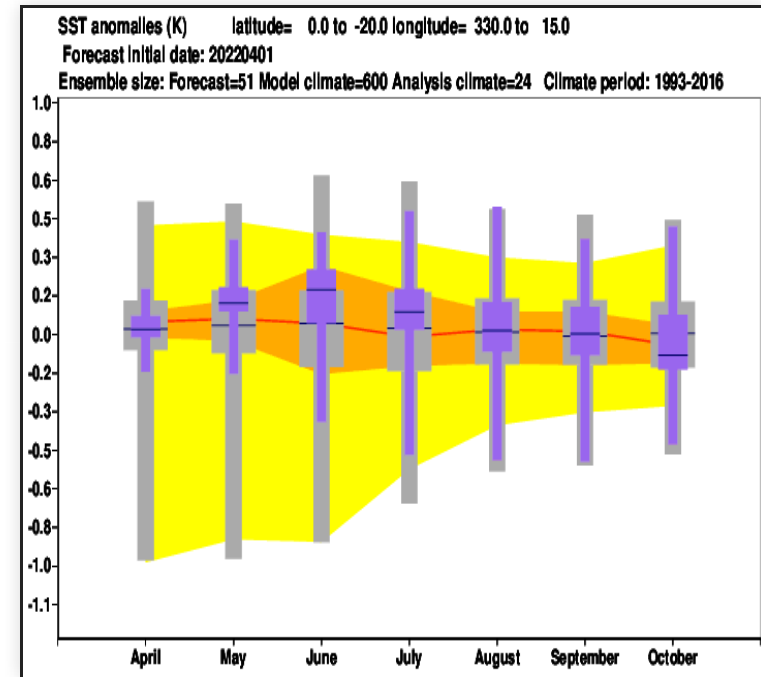
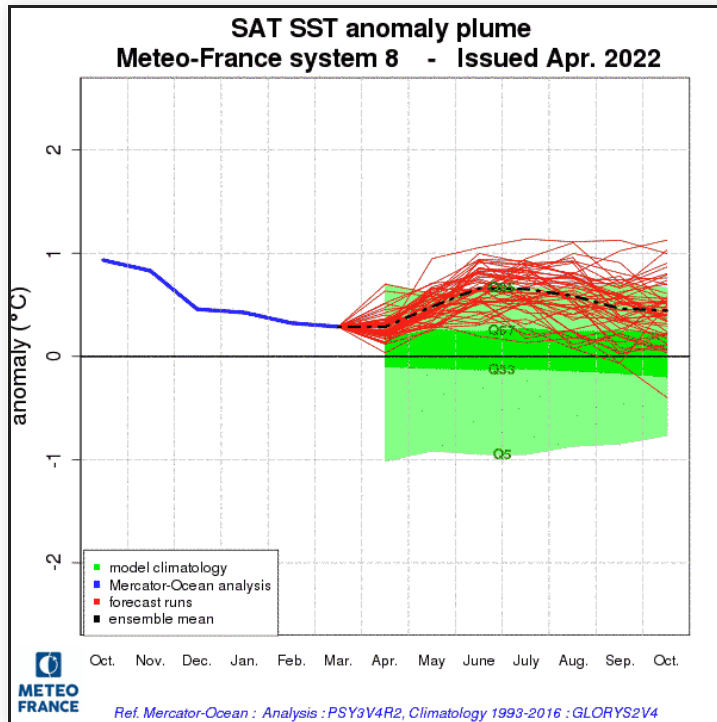
**Expected Phase for the next three months : negative.**





## Oceanic forecast : Atlantic ocean - SAT evolution

The two models forecast warmer than normal conditions with a more marked amplitude for MF8.



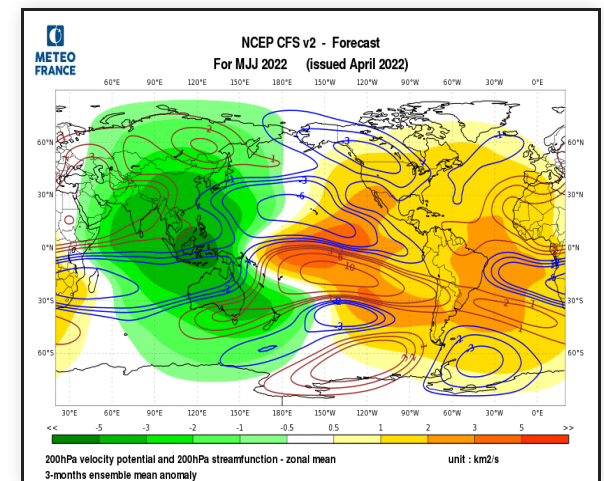
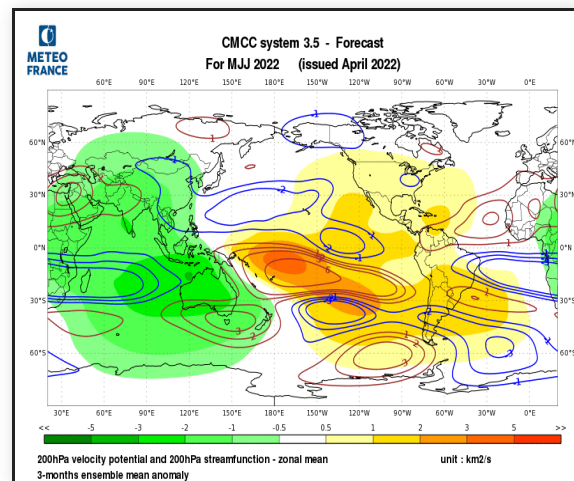
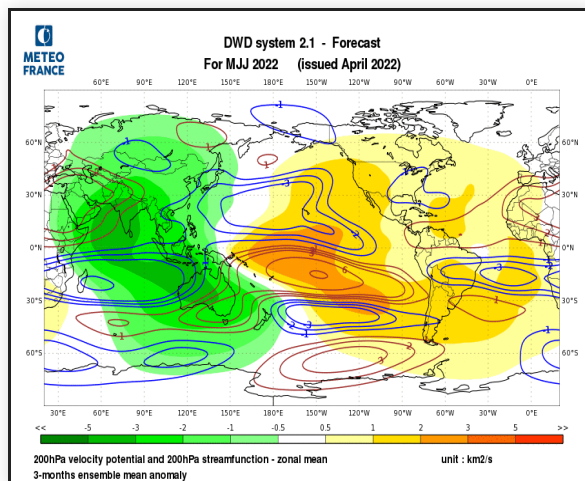
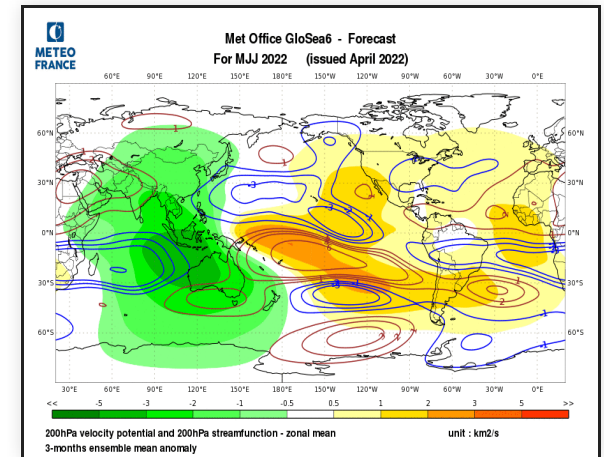
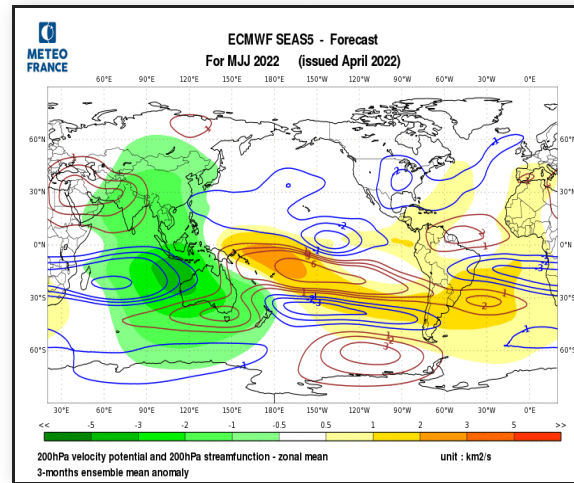
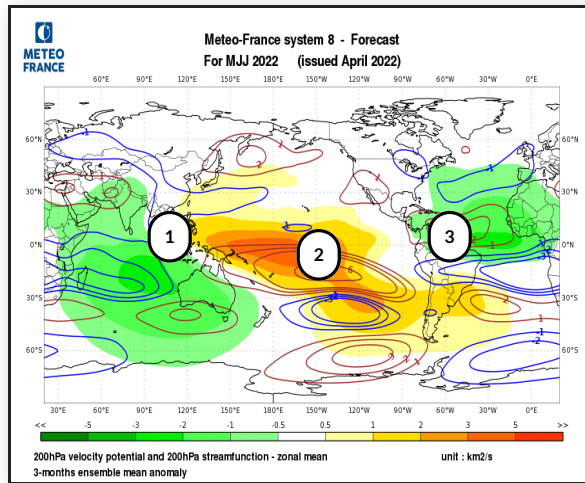
Anomaly on the SAT box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

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

Good agreement between models over the Pacific and Indian Oceans.

Velocity Potential : the pattern linked to "La Niña" and negative IOD is still clearly visible, with a downward motion anomaly over the Central Pacific and an upward motion anomaly from the Maritime Continent extending to the east of the Indian Ocean . Over the Atlantic, only MF8 predict an upward motion anomaly centered on the equator linked to the positive SST anomaly, other models are shared between downward motion anomaly or no signal.

Streamfunction : strong dipole around the equator over the Pacific and Atlantic Oceans, weaker over the Indian Ocean. In the Pacific, teleconnections to mid-latitudes are still very present in the southern hemisphere unlike the latitudes of the northern hemisphere.



MF8, 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).

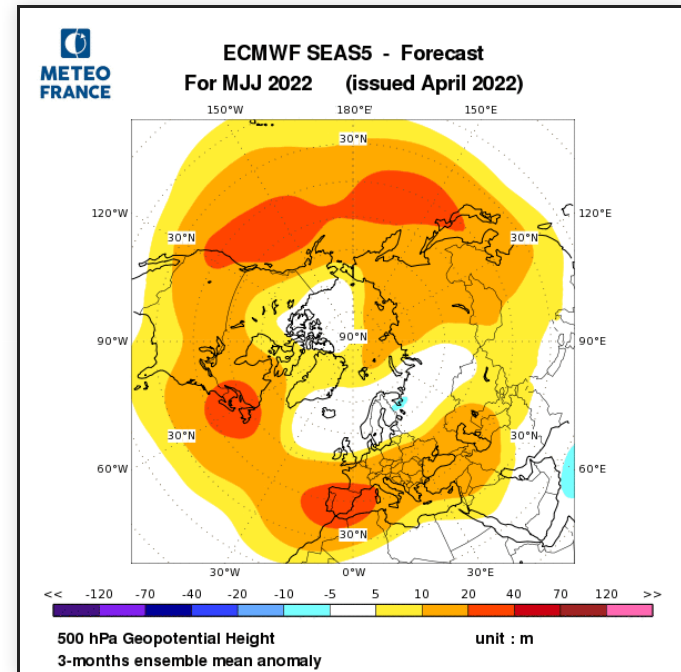
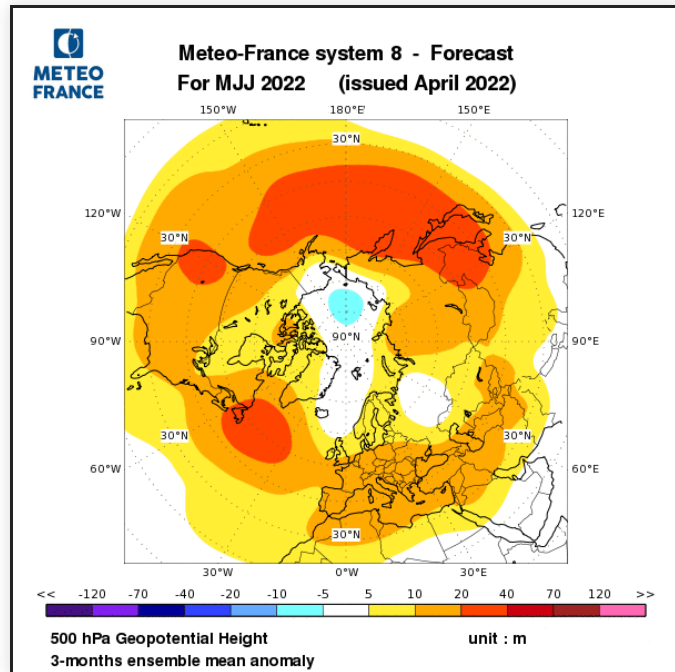
- 1 - VP : upward motion anomaly related to La Nina
- 2 - VP : downward motion anomaly related to La Nina
- 3 - VP : upward motion anomaly linked to the positive SST anomaly around the equator



## Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Good agreement between the 2 models :

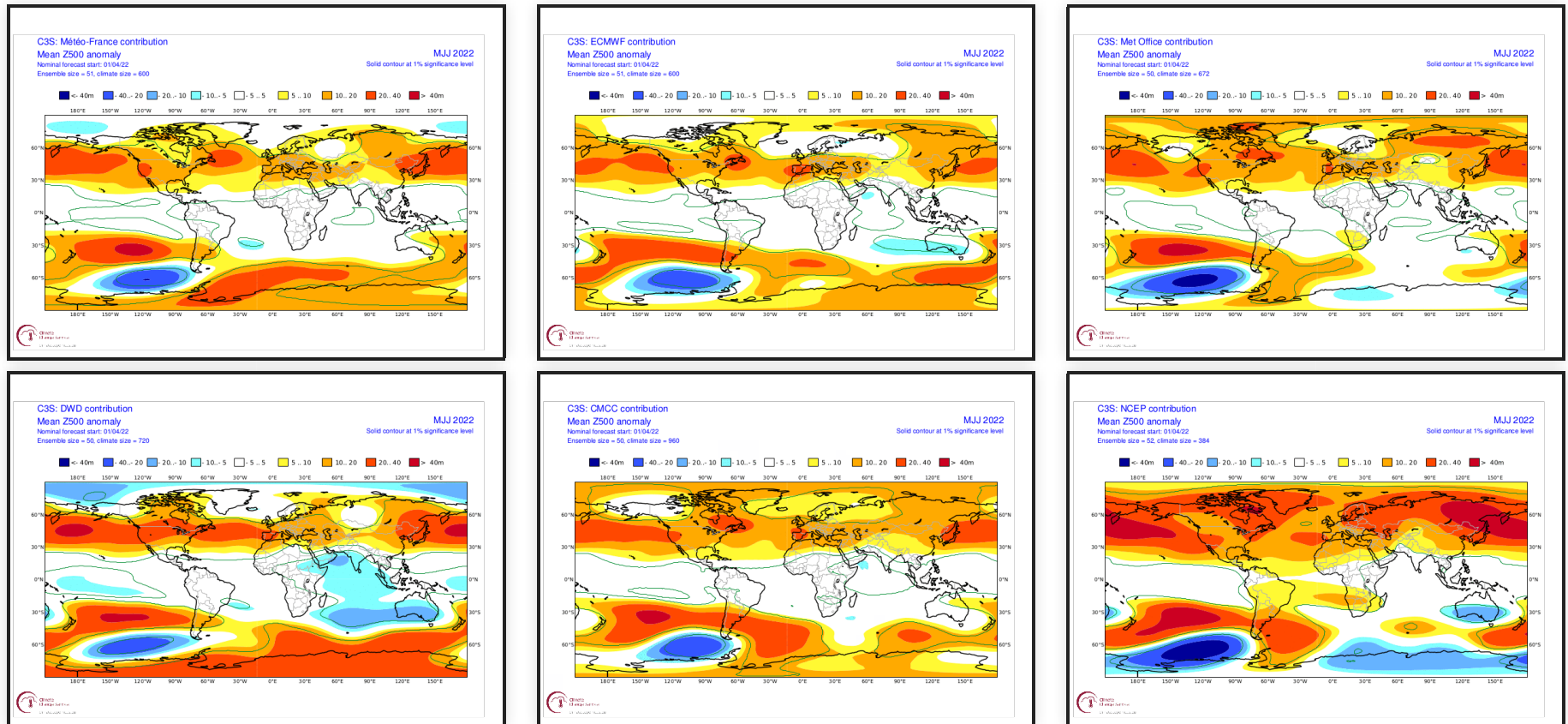
- around the Pacific with a PNA- pattern, up to the Gulf of Mexico with a positive anomaly.
- from the Eastern Canada Coasts to Europe, with a positive anomaly, and over the Barents Sea with a relative negative anomaly.



*polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.*

## Atmospheric circulation forecasts : Z500 anomalies in C3S models

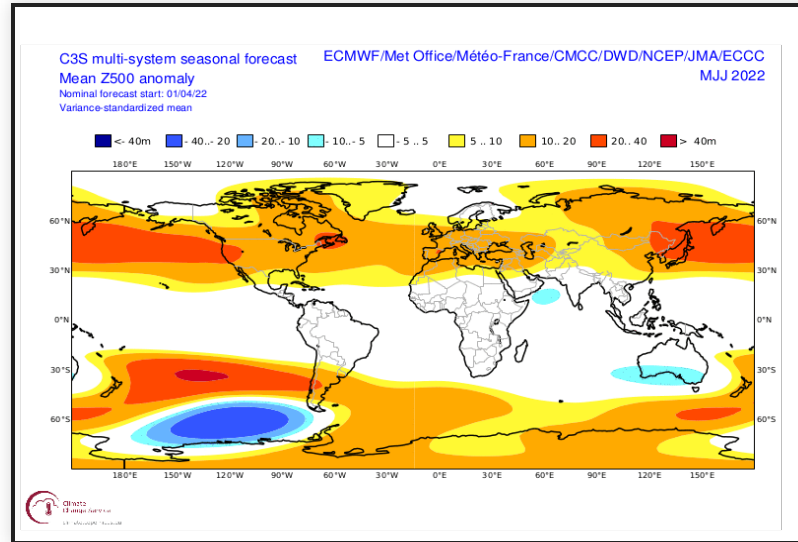
All models agree in placing a zone of positive anomaly from Quebec to southern Europe



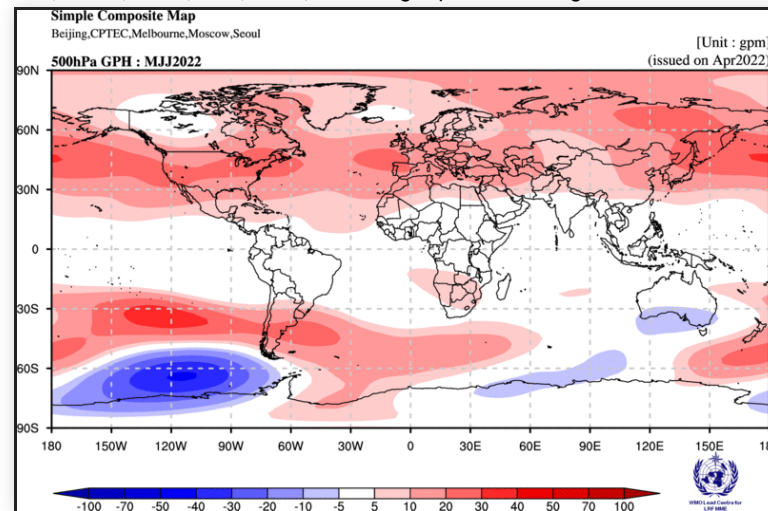
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

## Atmospheric circulation forecasts : Z500 anomalies multi-systems

Similarities between models, in the southern hemisphere due to teleconnections and in the northern hemisphere where the signal is shifted towards positive anomalies du to climate change.



C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.

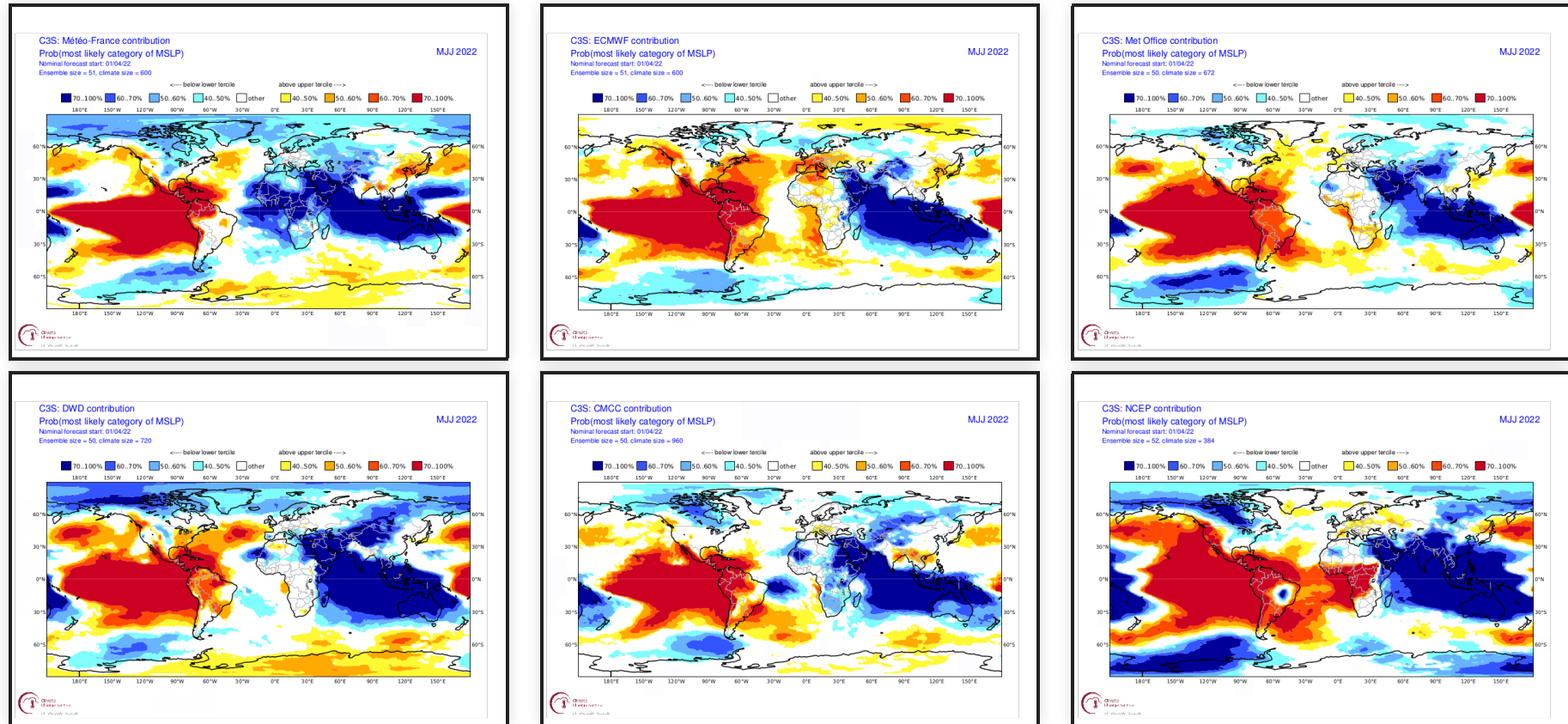


Others models of WMO multi-models 500hPa geopotential height anomalies.

## Atmospheric circulation forecasts : MSLP probabilities

In the intertropical regions, the signals are clear on the Pacific and Indian Ocean, in connection with the phenomenon "La Niña" and negative phase of IOD. Conversely the signal changes from one model to another over Africa

In mid-latitudes, most models consider an east/west dipole over North America. Over Europe, the signal is less distinct

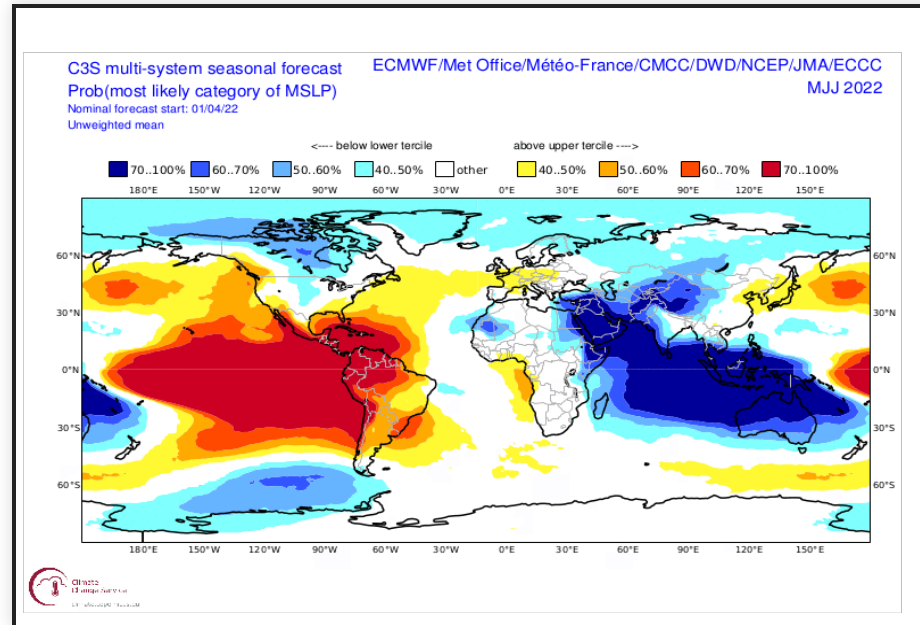


MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP models probability maps.

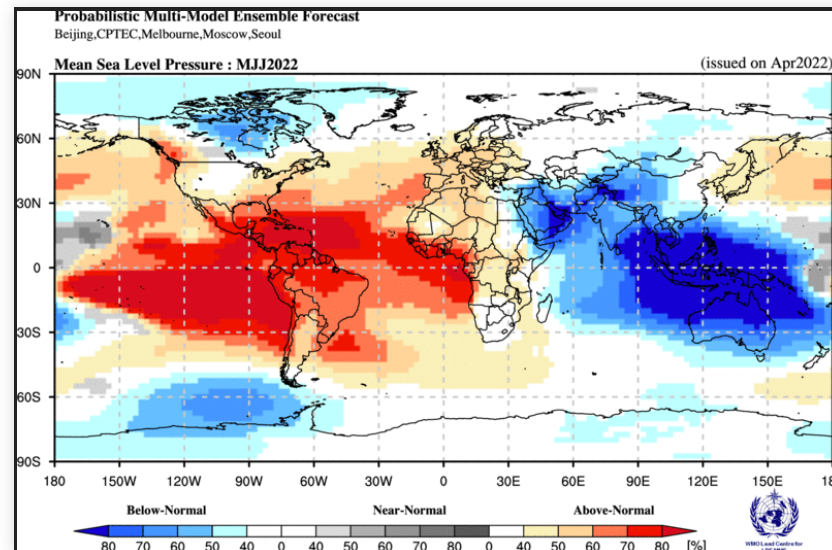
## Atmospheric circulation forecasts : MSLP probabilities multi-systems

Good agreement between the two multi-models in the tropical zone.

At mid-latitudes in the Northern Hemisphere, good agreement over North America and Europe.



C3S multi-models MSLP terciles probability.



Others models of WMO multi-models MSLP terciles probability.



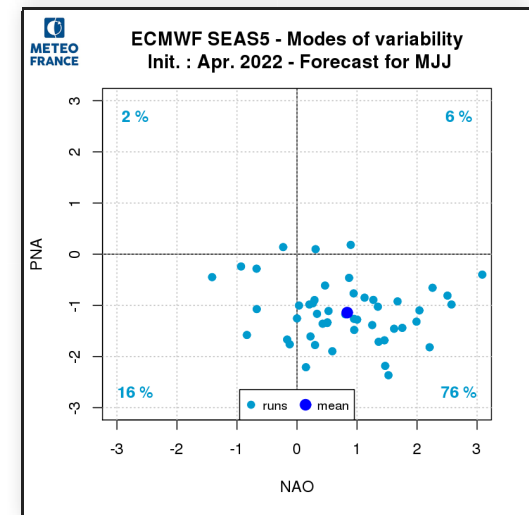
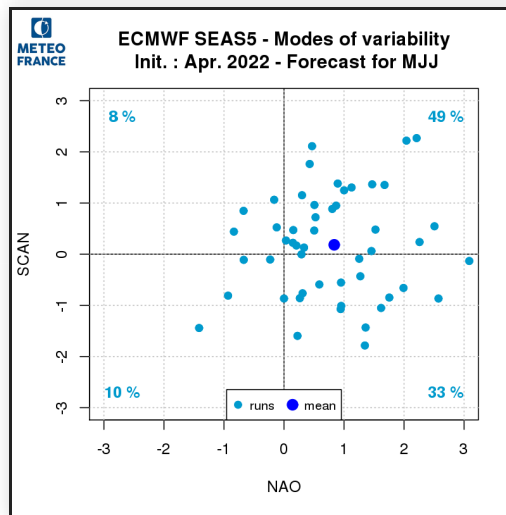
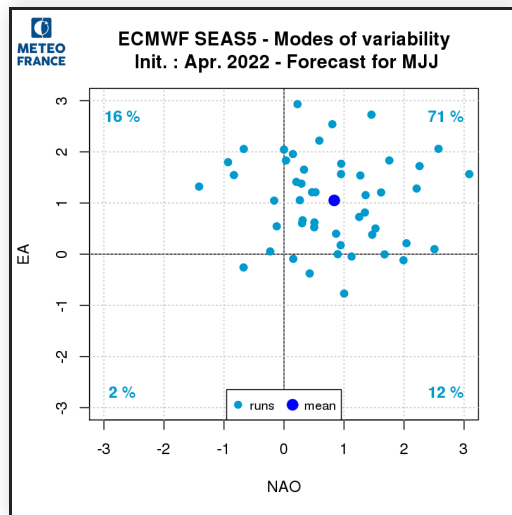
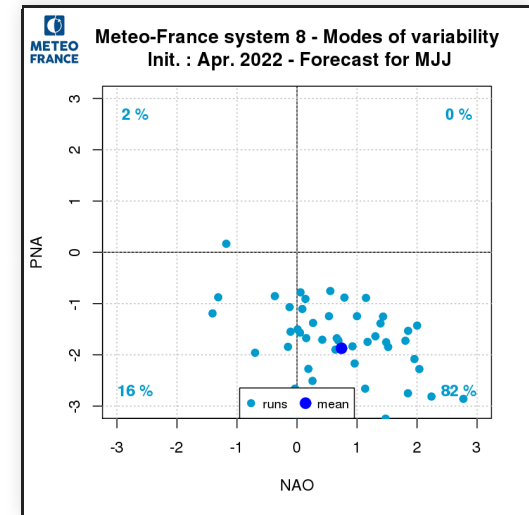
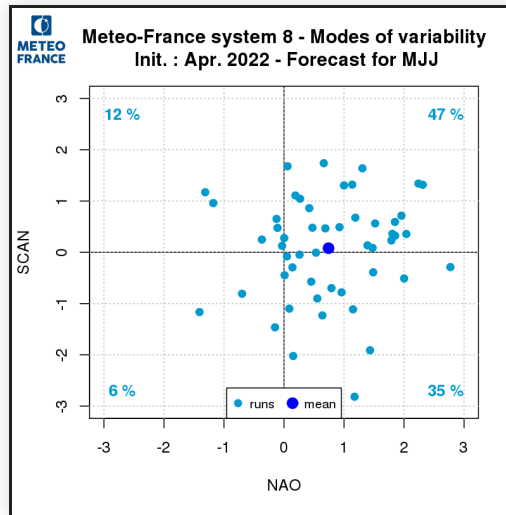
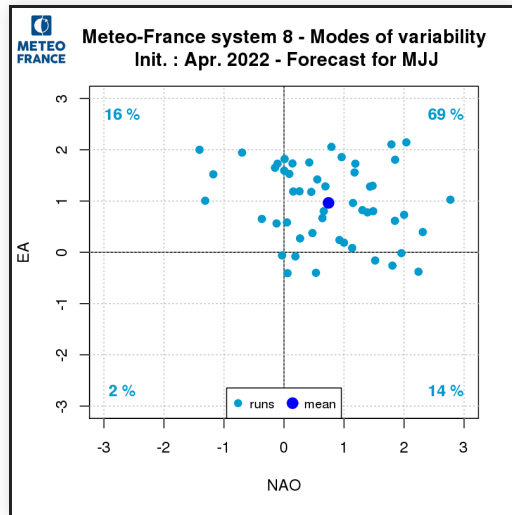


## Modes of variability : forecast

High confidence in a negative PNA despite the fact that teleconnexion don't seem active (see PV200)

Strong signal for positive NAO and EA.

No clear signal for SCAN.



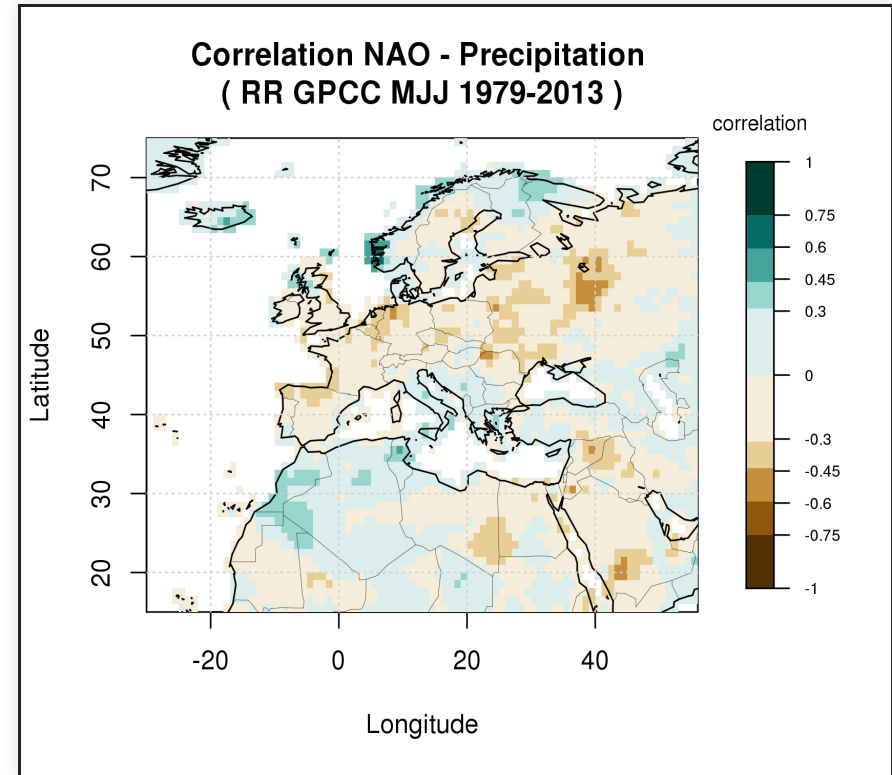
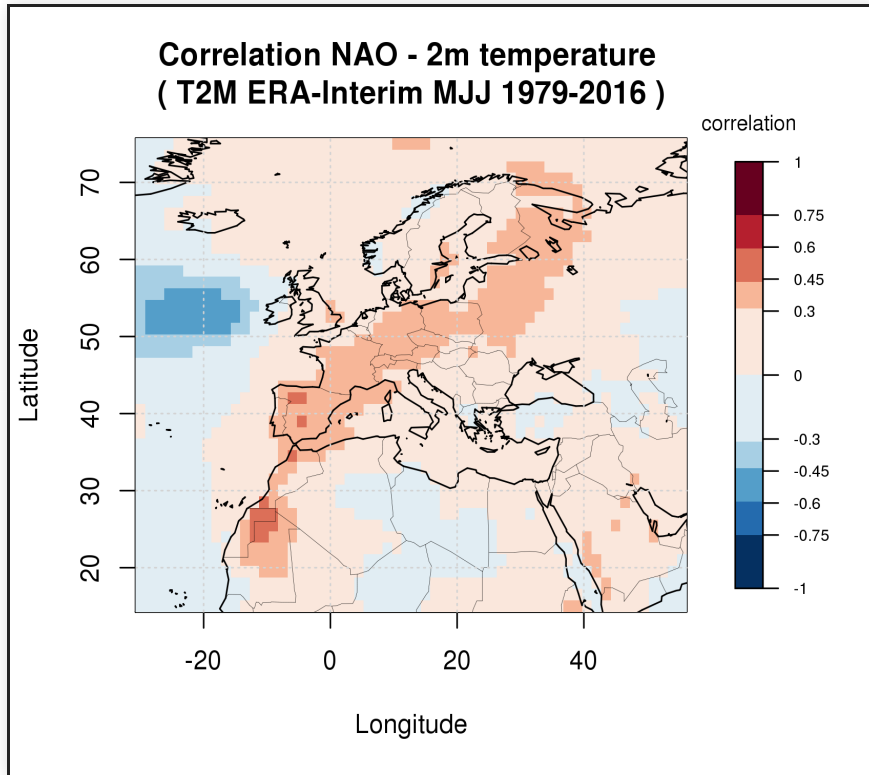
See the modes of variability patterns





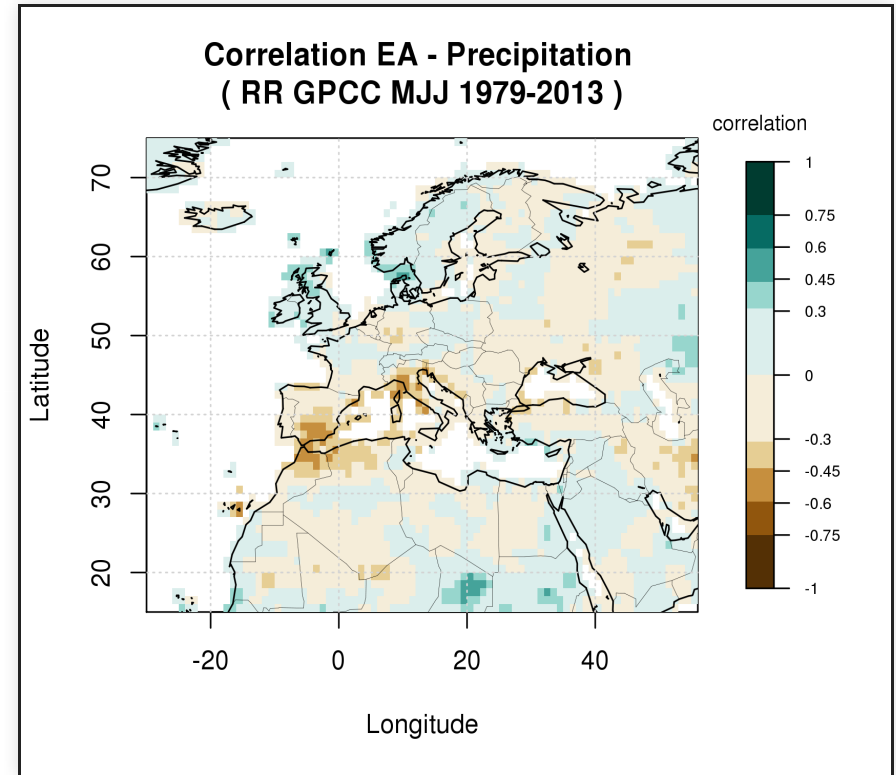
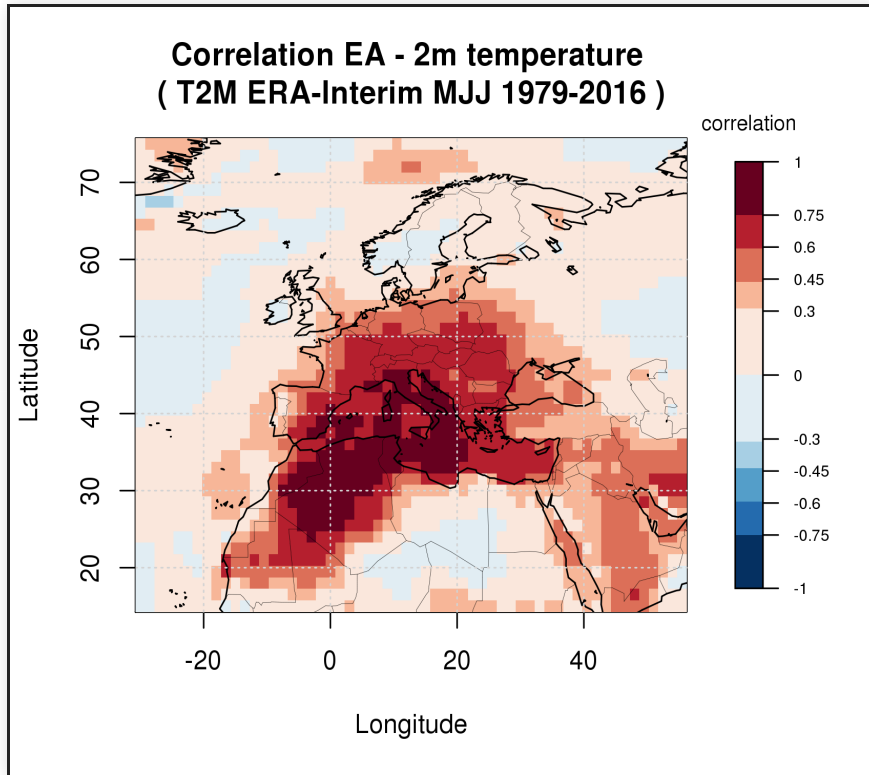
## Modes of variability : NAO impacts

Positive phase of the NAO next quarter



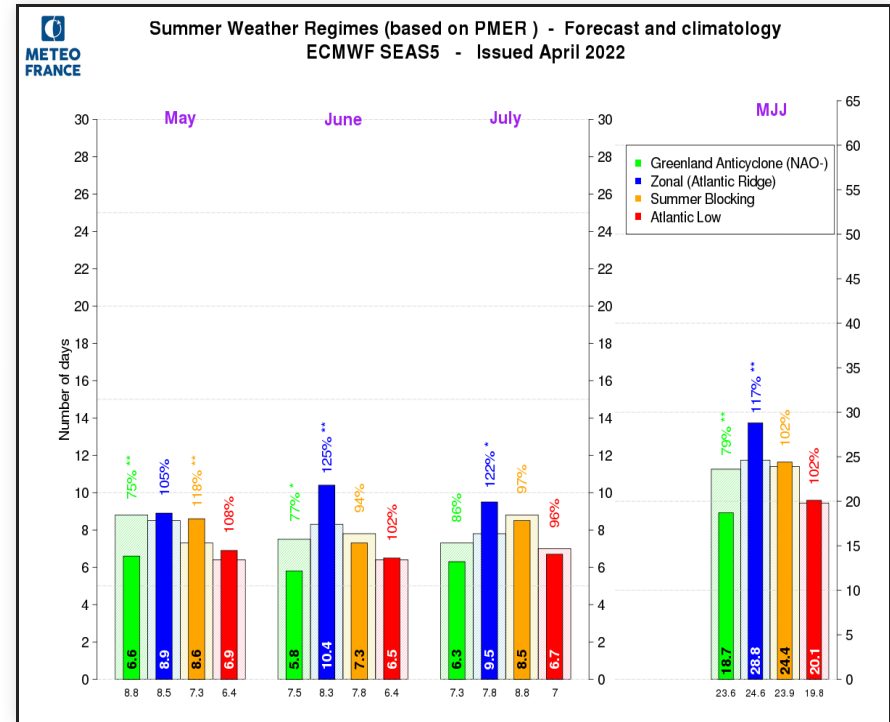
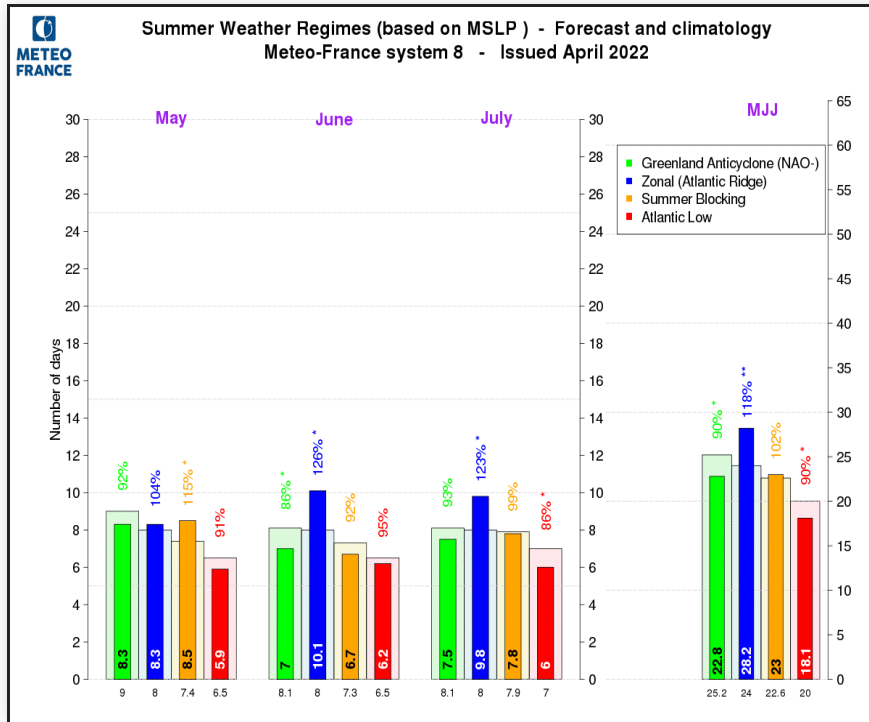
## Modes of variability : EA impacts

Positive EA is expected last quarter. This mode has a strong influence in particular on the temperature on the south of Europe.



## Weather regimes : summer MSLP

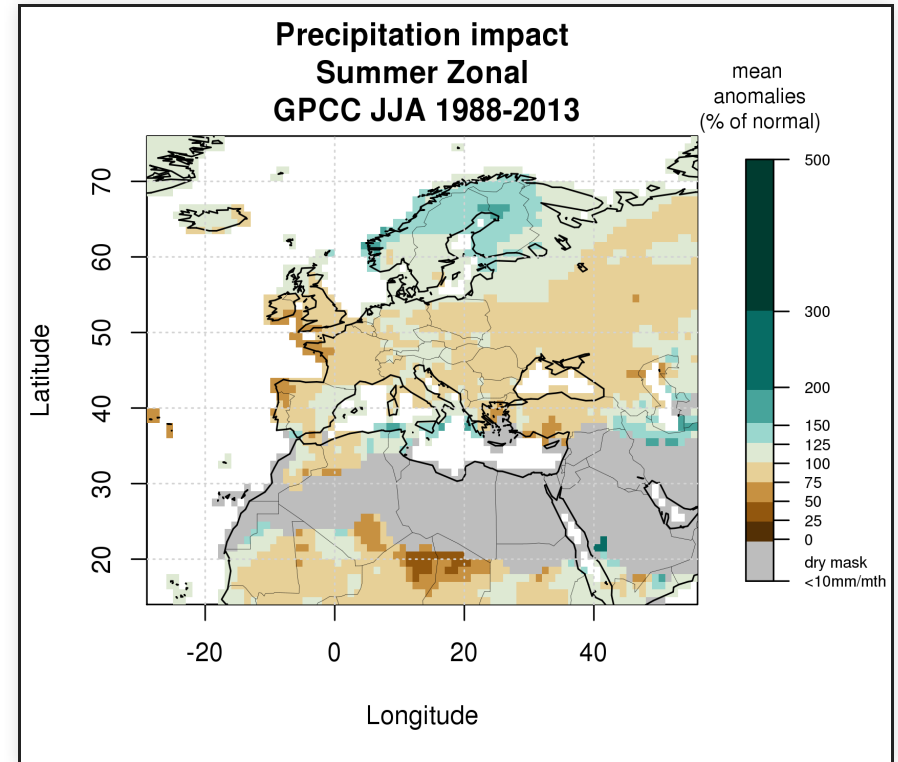
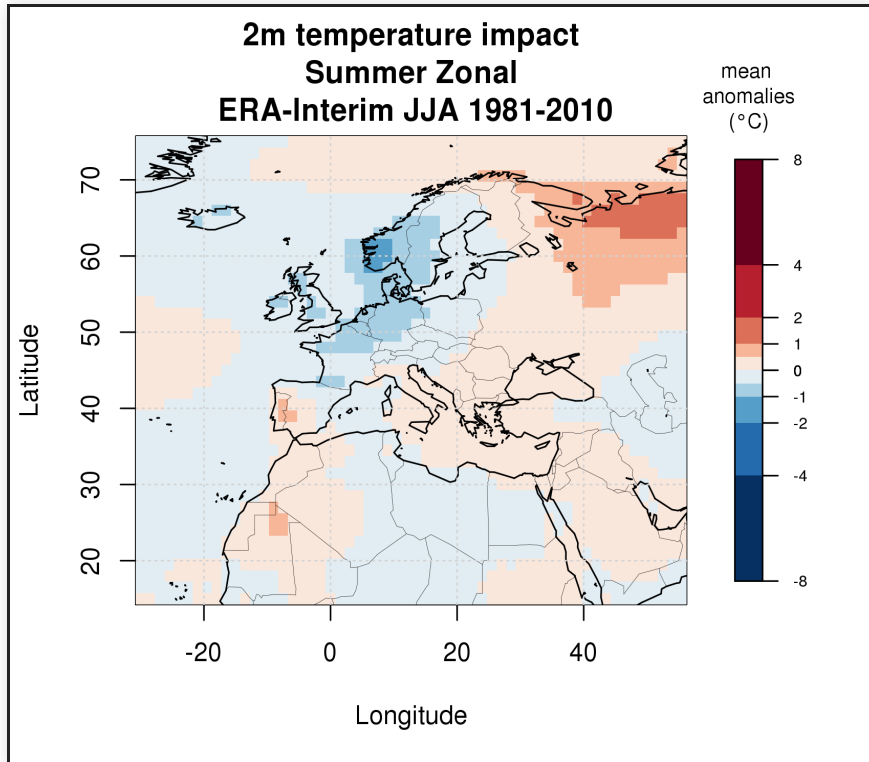
Good agreement between models for a positive anomaly of Zonal regimes all along the 3-month period.



Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S8 (left) and SEAS5 (right).

## Weather regimes : Impacts

Summer Zonal weather regime is favored. Over western Europe it is favourable to dry conditions and cool temperature.

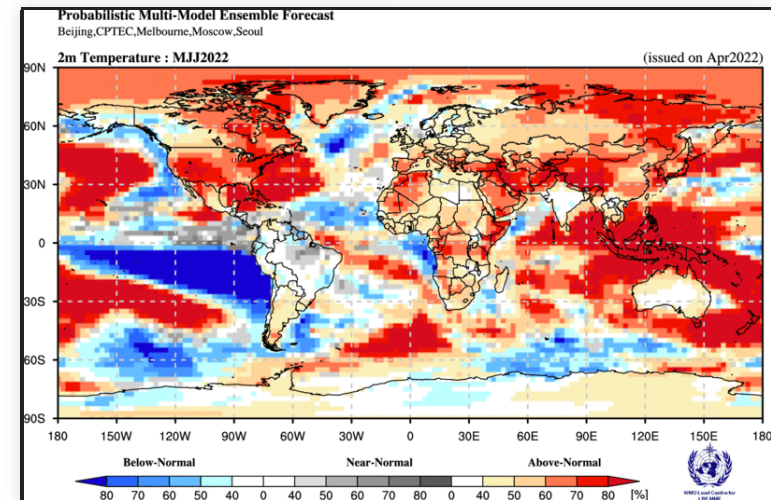
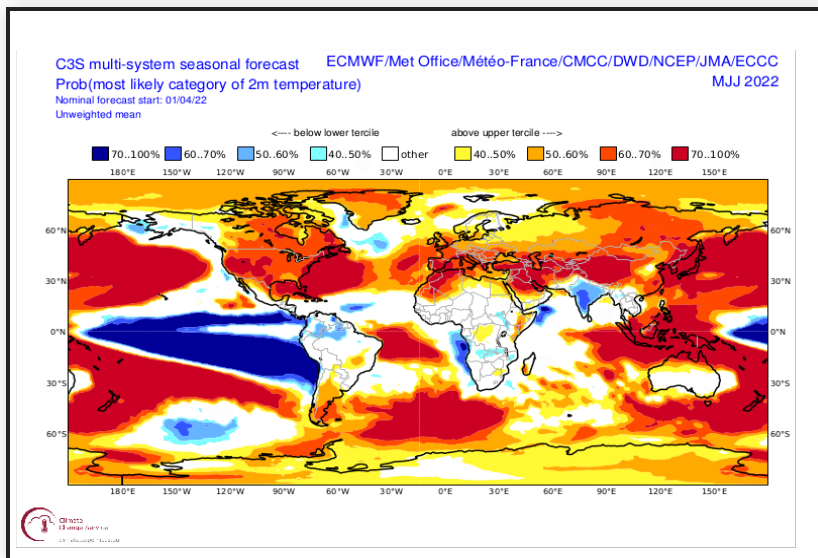
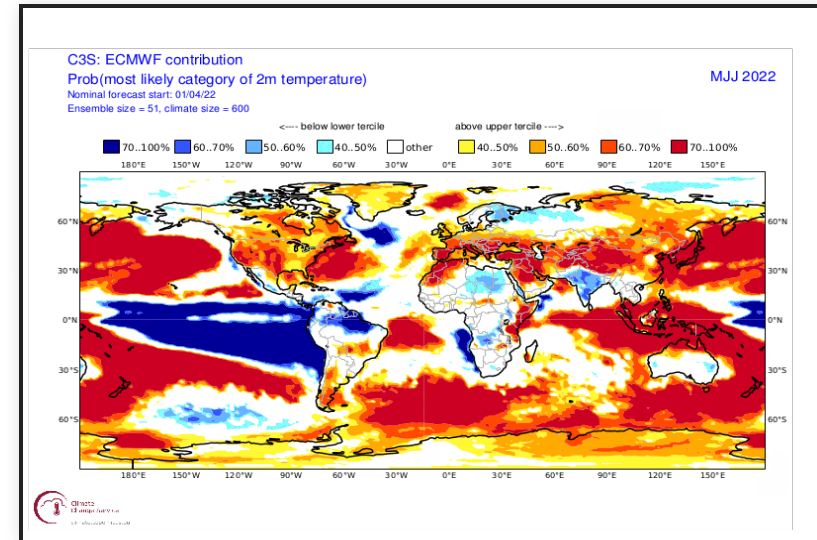
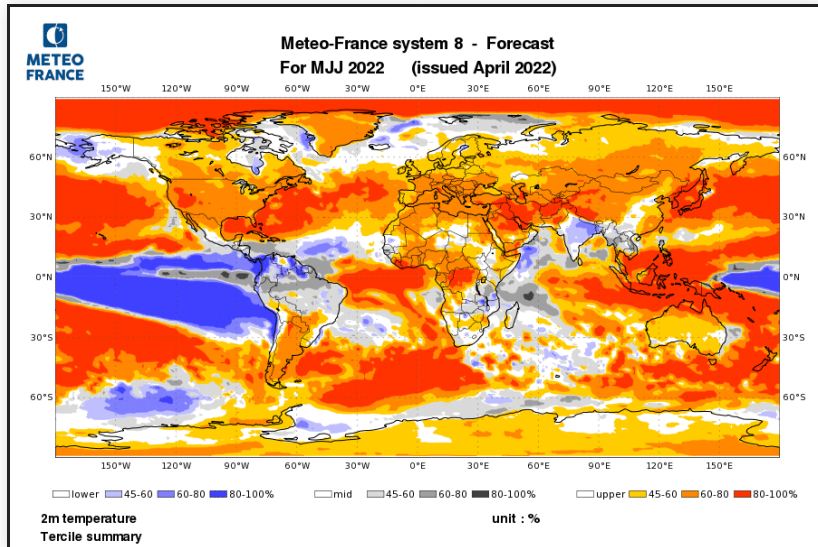


*Impact of Summer Zonal weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)*

## Forecast of climatic parameters : Temperature probabilities

Good agreement between models.

The forecasts are similar both in the intertropical regions and in the middle latitudes.

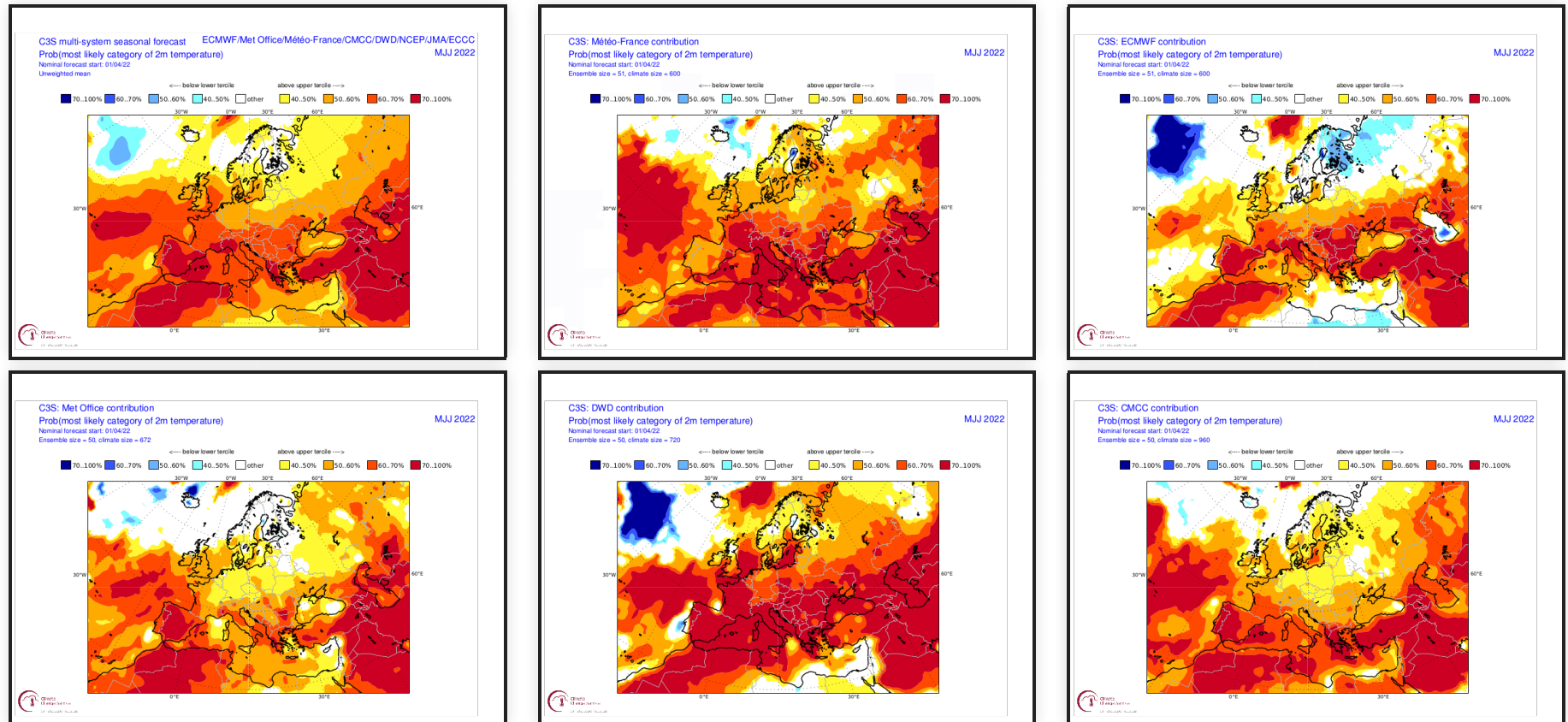


2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)



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

According to the NAO+ and EA+ circulation, a warmer than normal signal is the most probable on a large southern half of Europe



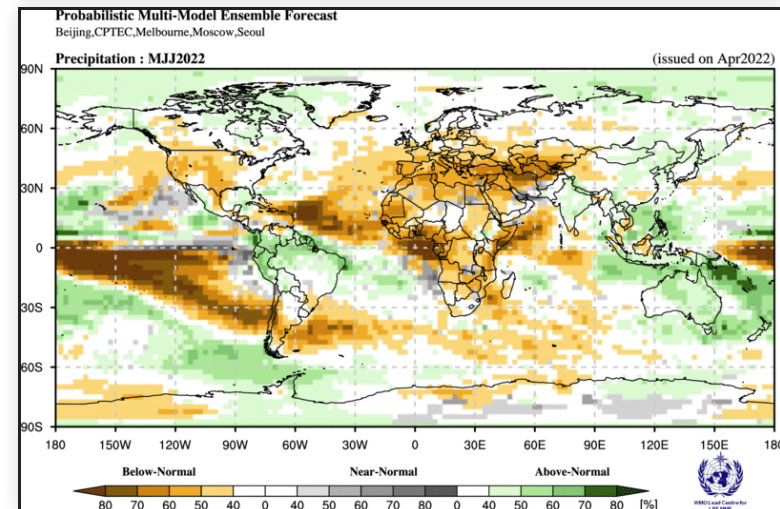
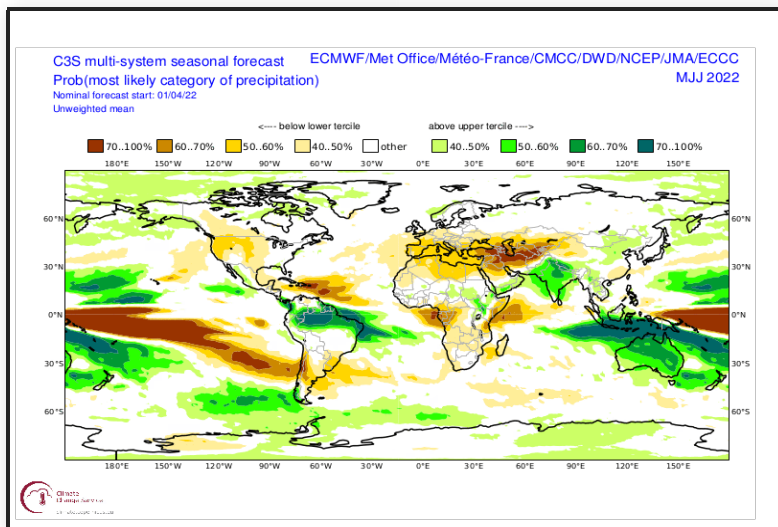
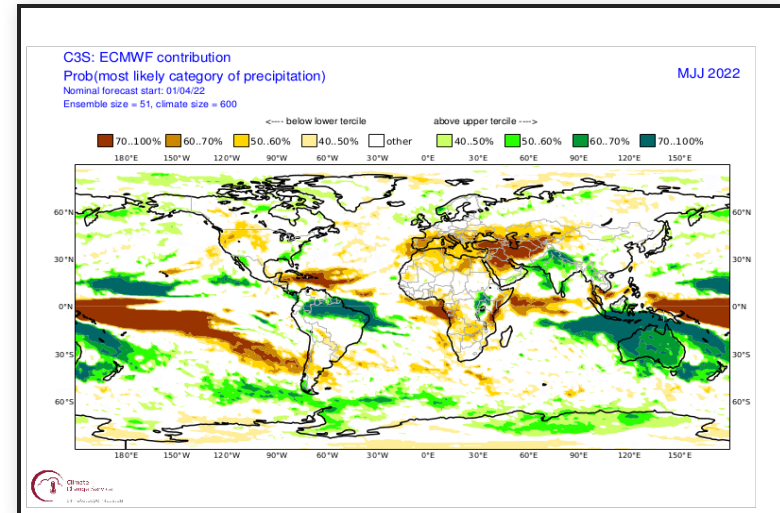
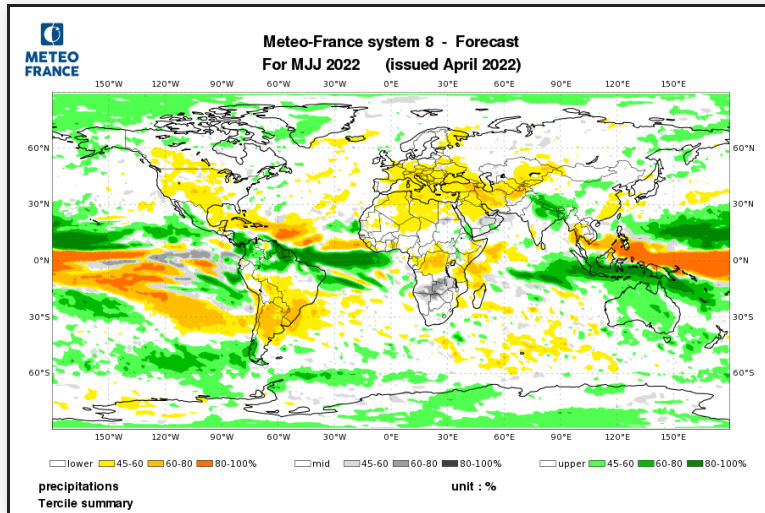
C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC models.



## Forecast of climatic parameters : Precipitation

Again very good agreement between models.

Classical effects of La Niña over the American continent, Africa, around the Maritime Continent. Consistent signal from Europe to the Caspian Sea and over Northern America.



precipitation probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

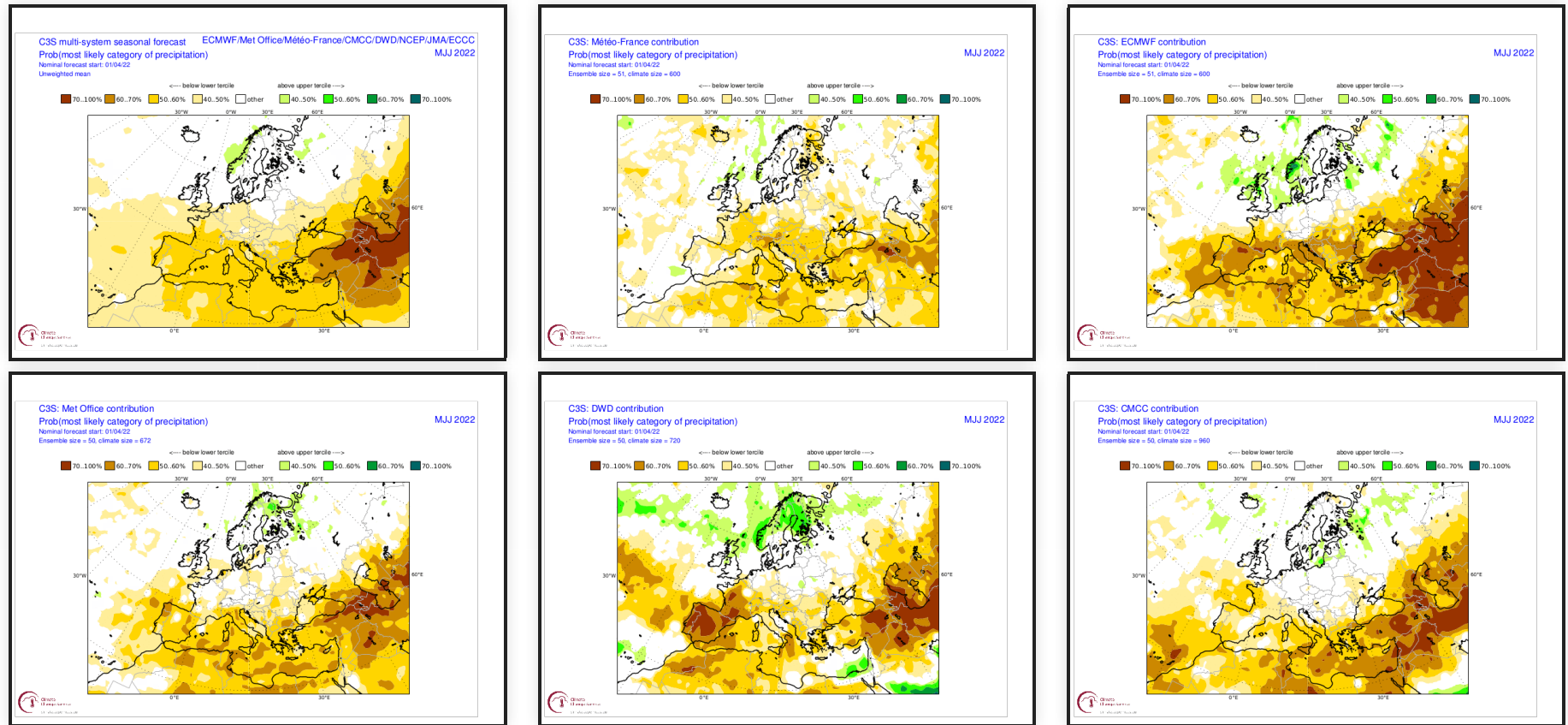




## Forecast of climatic parameters : Precipitation probabilities over Europe in C3S models

All the models forecast conditions consistent with the impacts of the NAO+ circulation :

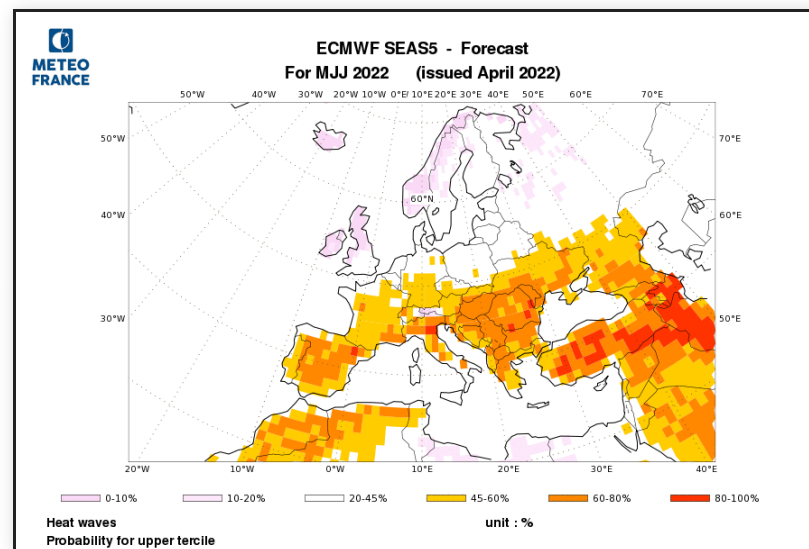
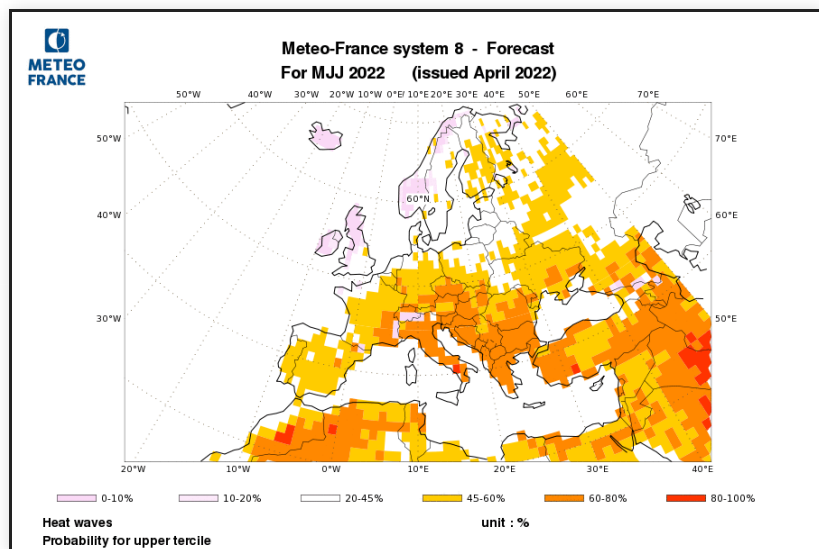
- a drier than normal signal over Southern Europe and Central Europe.
- a wetter than normal signal around Scandinavia.



C3S multi-models probability map (top left) and MF-S8, SEAS5, UKMO, DWD, CMCC models.

## Forecast of climatic parameters : Heat waves

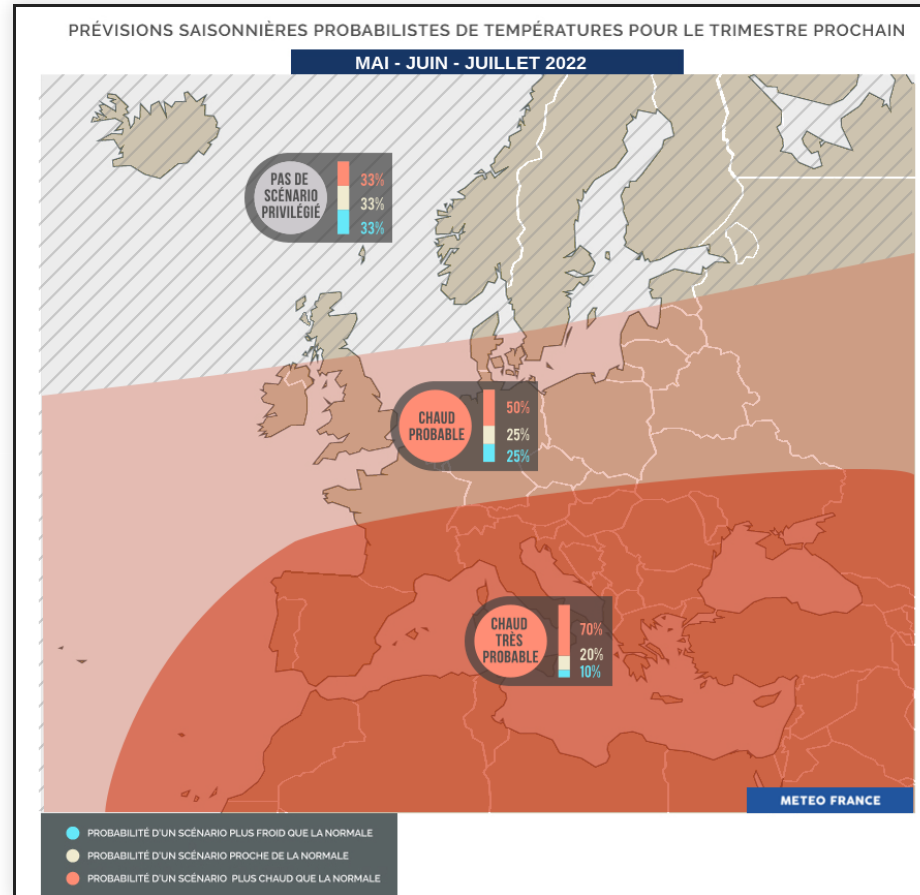
The enhanced probability of heat waves is similar in the 2 models, it would affect the continental countries below the 50th North.



Heat wave probability for MF8 (right) and ECMWF (left). A heat wave is detected if the corrected  $T2M$  is above the daily 90th percentile and a fixed  $20^{\circ}\text{C}$  threshold. [more details here](#)

## Synthesis map for Europe : Temperature

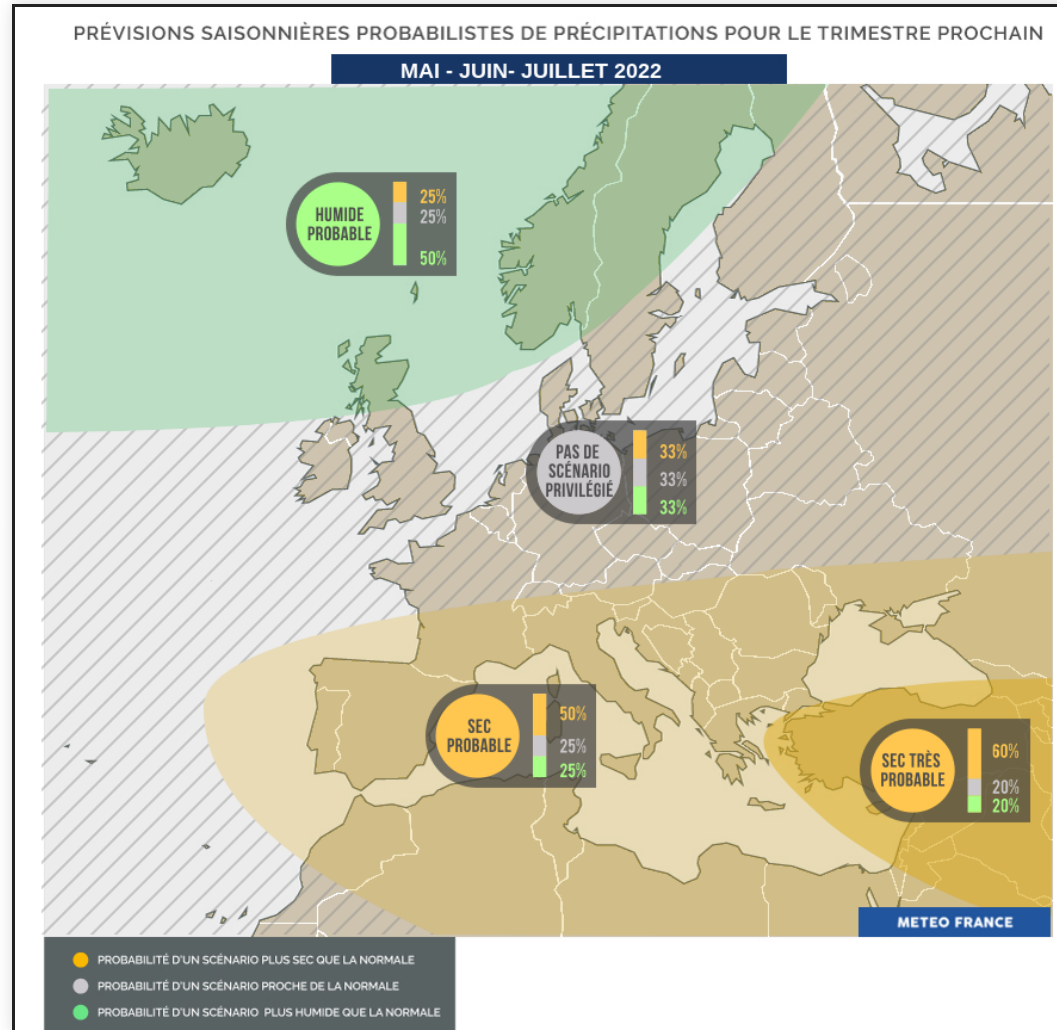
Preponderant NAO+ is expected over the Atlantic and Europe. The different models agree in predicting a fairly high probability of temperature conditions in the upper tercile over the southern domain.



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

## Synthesis map for Europe : Precipitation

Still in agreement with a NAO+ type circulation, the models predict dry conditions from the Mediterranean basin to southern Europe and rather wet conditions from Iceland to Scandinavia



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