Météo-France Seasonal Forecast Bulletin

JUNE - JULY - AUGUST 2020

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General synthesis : JJA 2020

A) Oceanic forecast :

- **neutral ENSO situation** for the coming 3 months, but clear trend toward negative anomalies.

- **IOD** : close to normal in June and then rapidly decreasing in July toward a strong negative IOD situation

B) Atmospheric circulation :

- Upward velocity potential anomaly over the Indian Ocean Pacific. Downward potential velocity anomaly over Western Pacific. Response in Stream-function, but trapped in the tropics for the Northern hemisphere.

- over the North Atlantic and Europe, Z500 difficult to analyze. In MSLP, the dominant pattern is a positive anomaly over Europe (strengthening of the Azores high).

=> Most likely conditions :

- Wet conditions over Maritime Continent and Australia. Dry over southern Africa. Likely dry over West Africa (Atlantic side).

- **over Europe** : warm and dry signal over south of Europe, rather wet and normal temperature over northern Europe.

Next bulletin : scheduled on June 22th

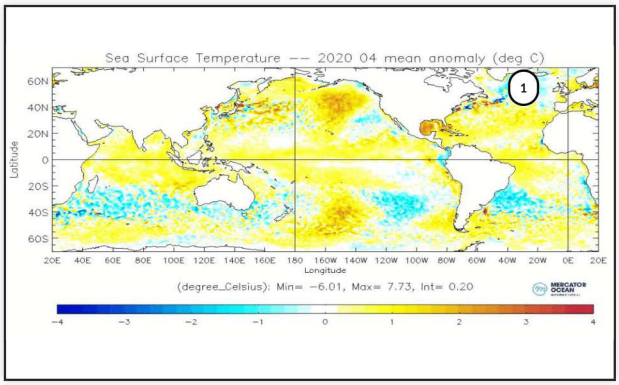
Oceanic analysis of April 2020 : SST anomalies

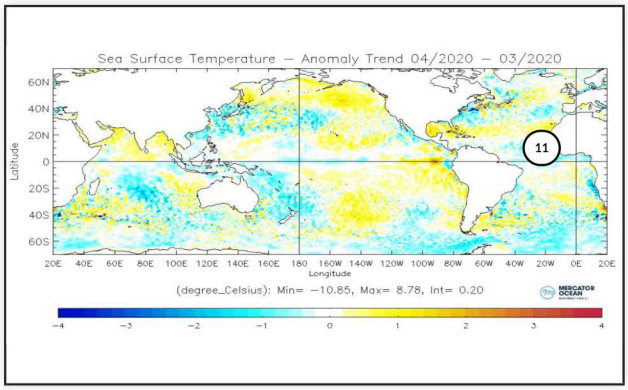
Current ENSO situation : neutral conditions.

The tropical oceans present weak anomalies, generally warm with the exception of the very eastern Pacific (Peruvian coast) where the cooling in progress leads to a weak cold anomaly.

The tropical part of the Indian Ocean is still warmer than normal, with a slight East-Ouest gradient. Contrast with the cold anomaly extending from the south of Africa to the south of Australia.

In the Atlantic, cooling trend in the northern tropics (especially close to the African coast). In northern Atlantic, dipole of anomaly between the north (negative north of 45°N) and the south (positive).



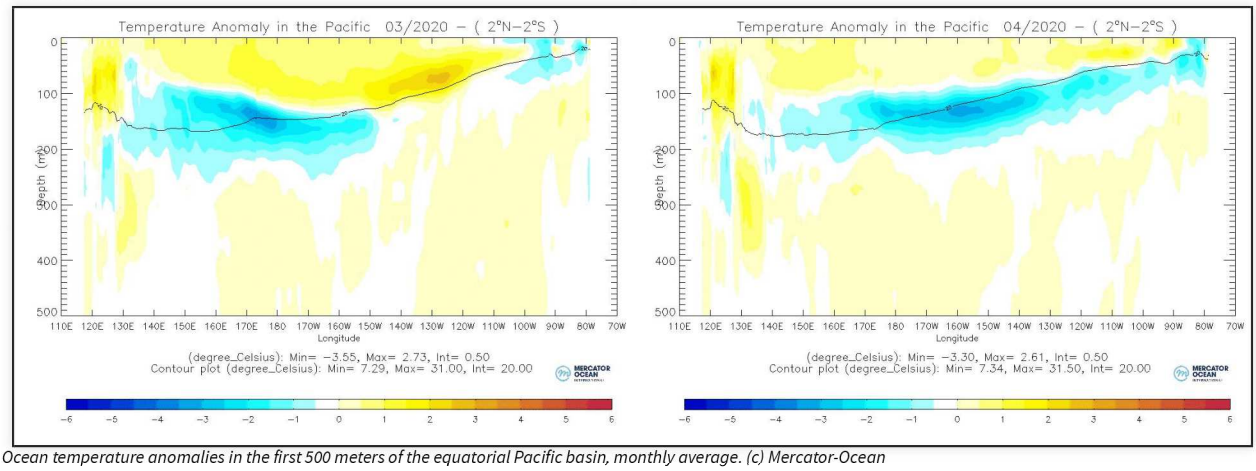


SST Anomalies and trend with the previous month (c) Mercator-Ocean

1 - slight strengthening of the cold anomaly
11 - quite strong cooling in April

Oceanic analysis of April 2020 : Pacific vertical section

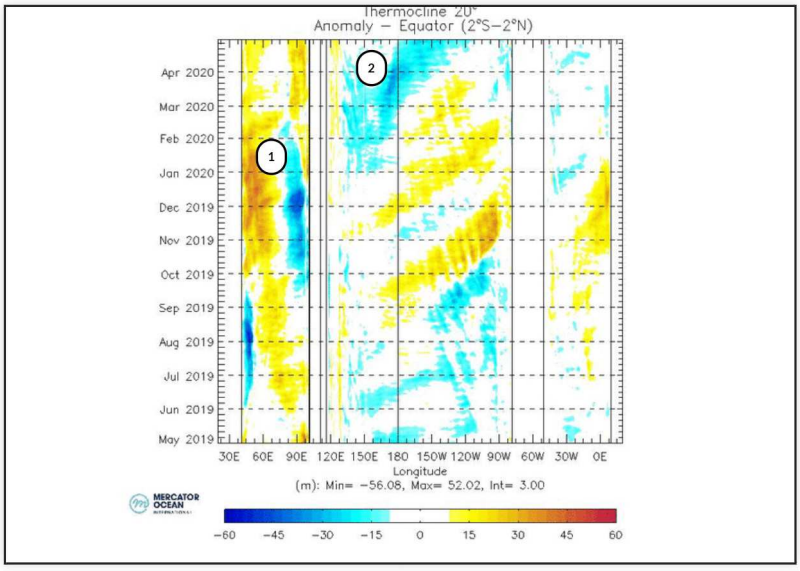
The March cold anomaly between 100 and 200m deep has moved toward the east. It is a precursor of a later evolution towards la Niña situation.



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

Oceanic analysis of April 2020 : Hovmüller diagram of the 20°C isotherm

In the Pacific, one can clearly follow the propagation of the cold anomaly from the West to the Central part of the basin.



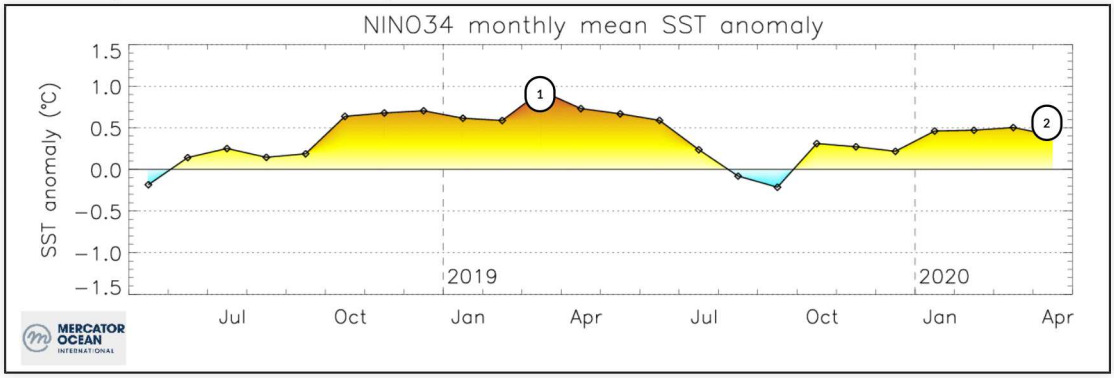
Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 ° C isotherm) (c) Mercator-Ocean

1 - Strong IOD of the end of 2019
2 - Establishment of a deep cold water reservoir in the western part of the Pacific basin

Oceanic analysis of April 2020 : Pacific Ocean - Nino3.4 index history

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : +0.4 °C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

Weak warm anomaly in Nino3.4 box. The index is just below El Niño threshold. ENSO remains in neutral conditions.

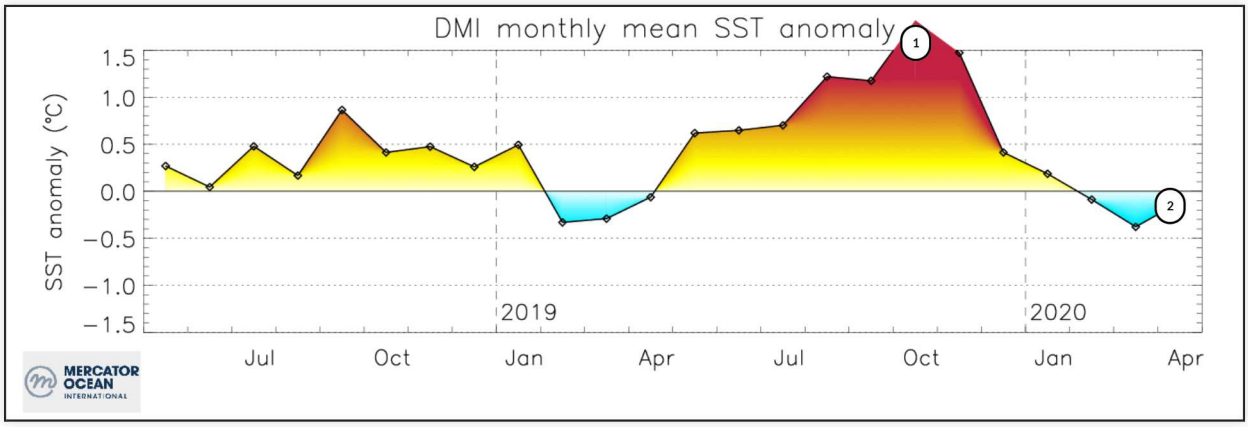


Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

1 - Weak El Niño during winter 2018-2019 and spring 2019
2 - Current neutral conditions

Oceanic analysis of April 2020 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.1°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/iod1.png)



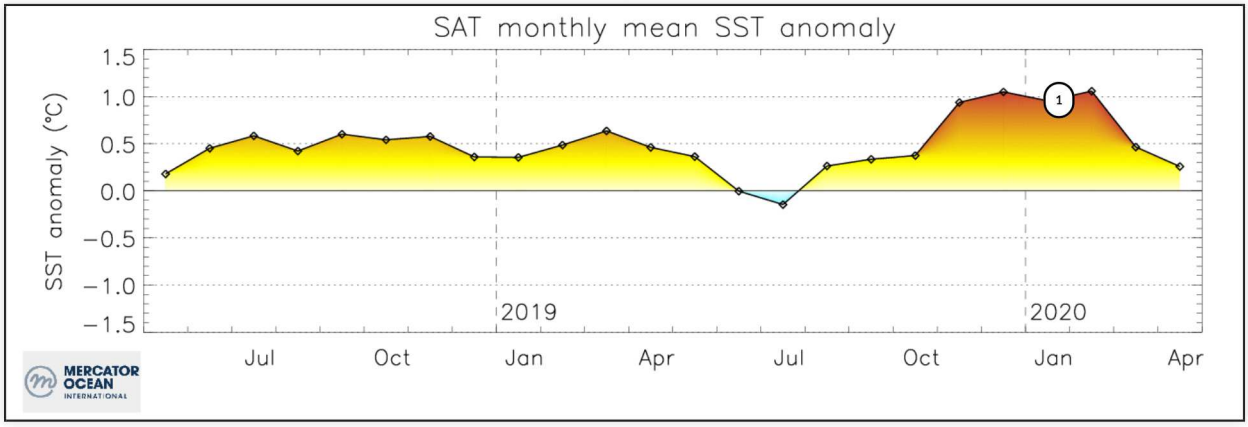
Evolution of SST in the DMI box (c) Mercator-Ocean

1 - IOD on record in october
2 - Return to neutral in April

Oceanic analysis of April 2020 : Atlantic Ocean - SAT index history

SAT index issued from Mercator Ocean PSYV4R2 analysis : +0.2°C

Return to less intense anomalies after a long period of strong deviation from normal.



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

1 - Very strong deviation from normal

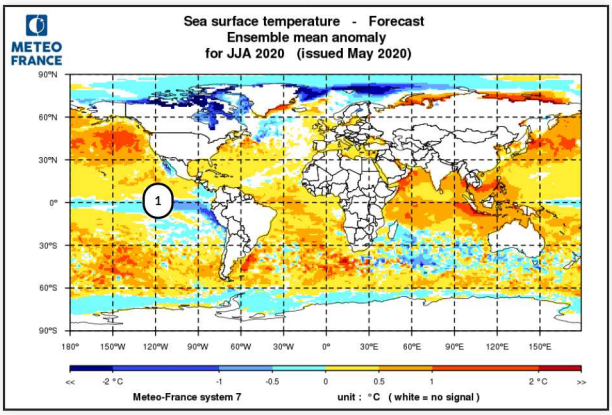
Oceanic forecast : SST anomaly

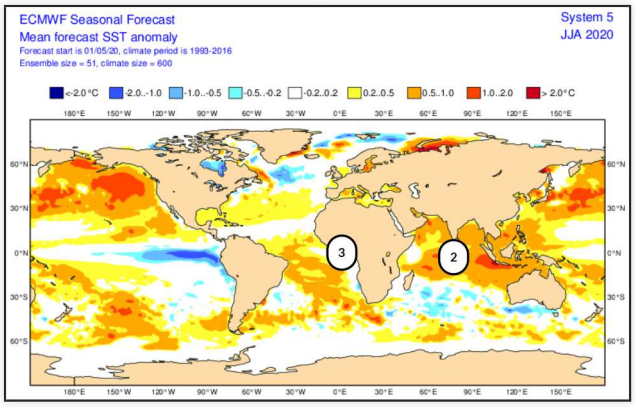
Good agreement between MF-S7 and ECMWF-SEAS5, some slight differences (see below).

In the Pacific Ocean : confirmation of the cooling in Eastern equatorial Pacific, similar in the two models. Anomalies remains weak in Central Pacific. Anomaly patterns over the southeast quarter are different (colder with SEAS5 than MF-S7). Elsewhere the ocean is expected to be warmer than normal (very warm in Northern Pacific).

In the Indian Ocean : Generalized warm anomaly forecasted north of 25°S. Very warm anomalies are forecasted along the equator, with a West-East gradient (see DMI index in a next slide). Persistance of colder than normal south of 25°S.

In the Atlantic Ocean : Generally warmer than normal except North of 45°N (like in April).
MF-S7 is still warmer than ECMWF-SEAS5 in the Gulf of Guinea.

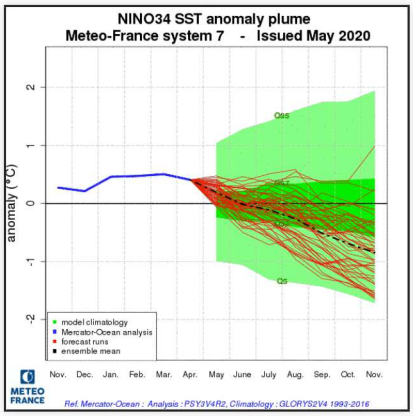


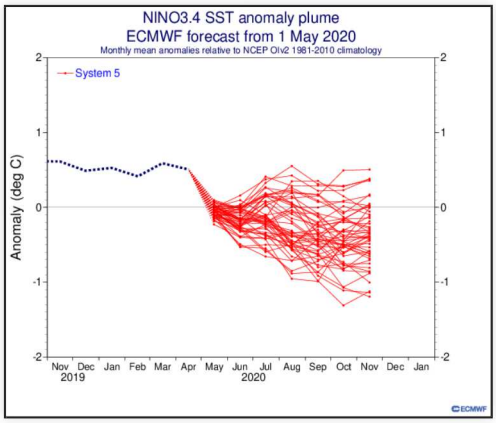


1 - Extension of the cold anomaly
2 - very hot anomaly along the equator
3 - ECMWF-SEAS5 colder than MF-S7

Oceanic forecast : NINO3.4 Plume diagrams

Significant negative trend in the two models, anomalies are likely to become negative within the next months. Anyway ENSO conditions are expected to be reamin neutral for the next 3 months (in the -0.5 / +0.5 °C interval).

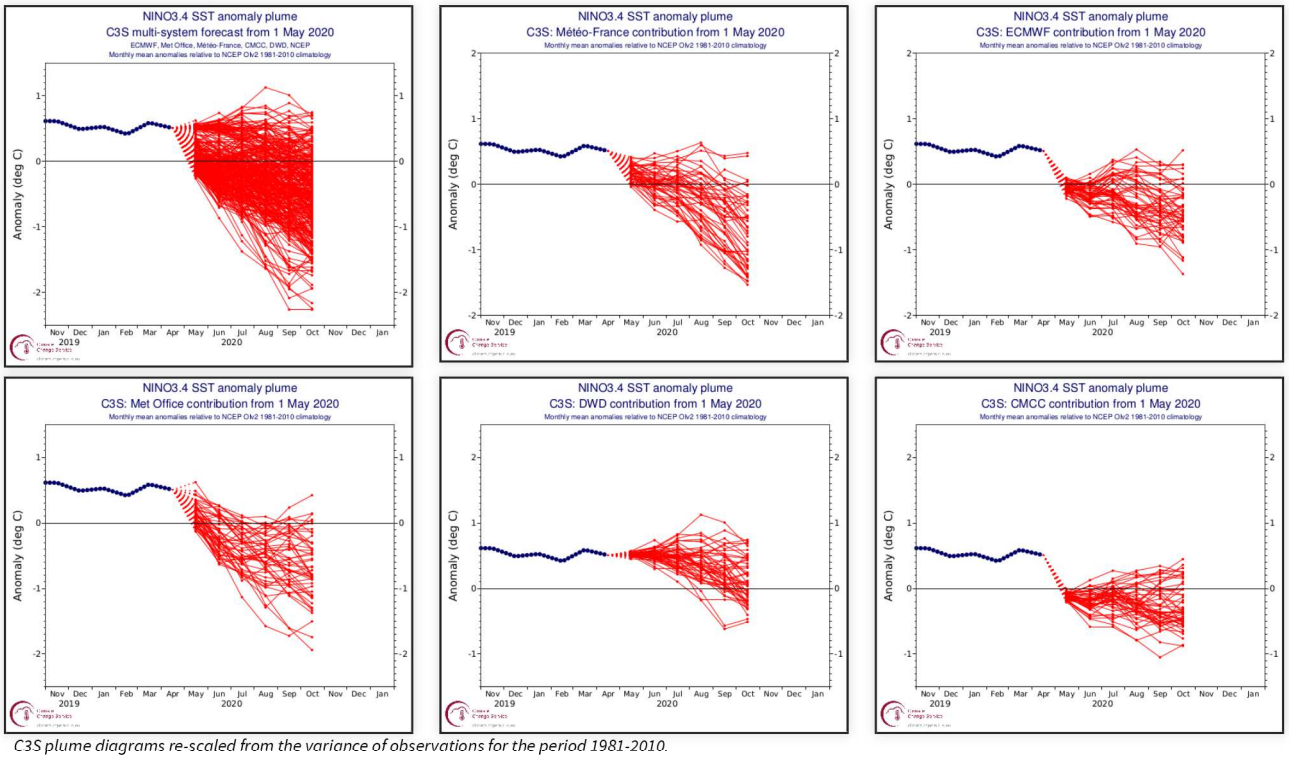




Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

Good agreement between the models concerning the negative trend. Some differences in the anomaly values, so a very large C3S plume. Neutral ENSO conditions are the most likely for the coming months.

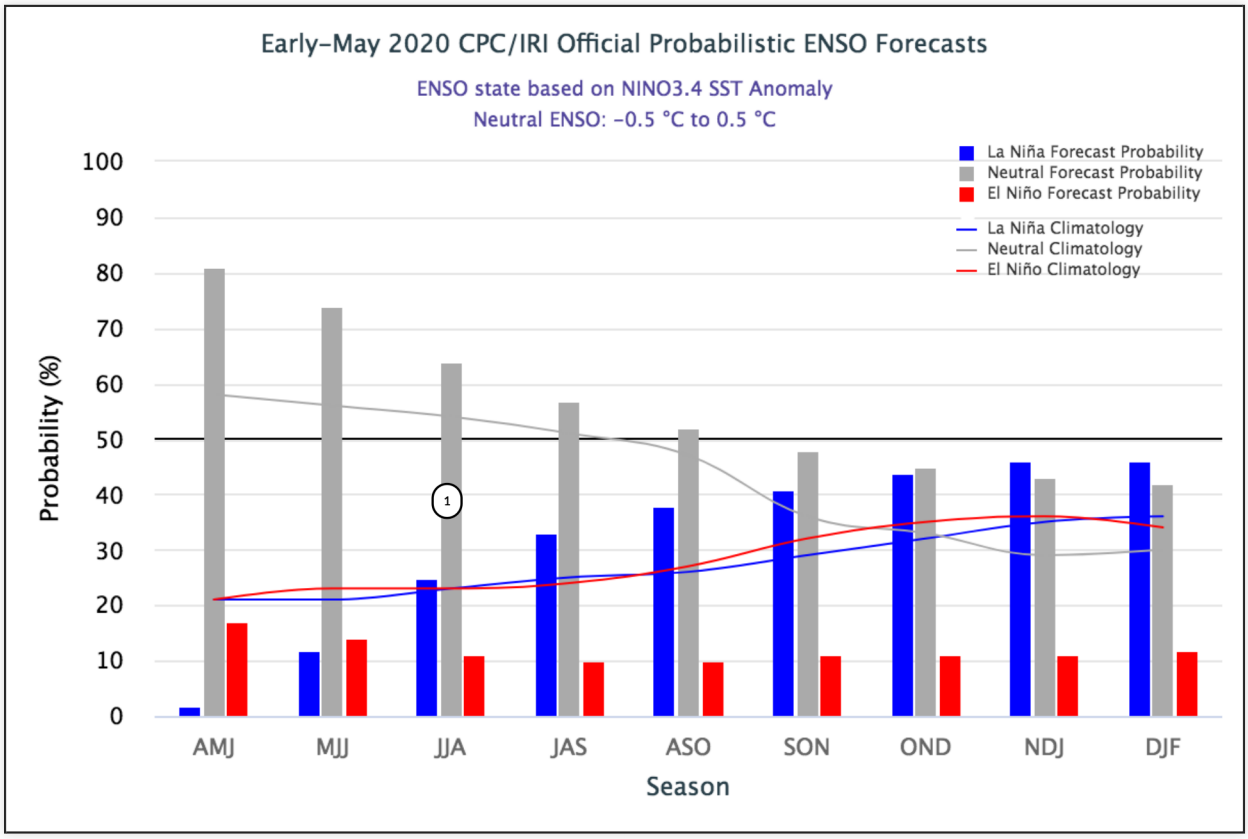
Forecasted Phase : neutral conditions



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

Oceanic forecast : Synthesis from IRI

Neutral conditions are most likely (above 60 %) for JJA. La Nina or neutral conditions equally likely for the next quarters.

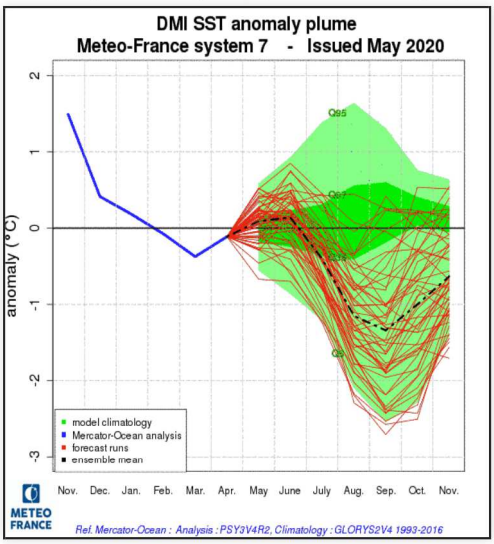


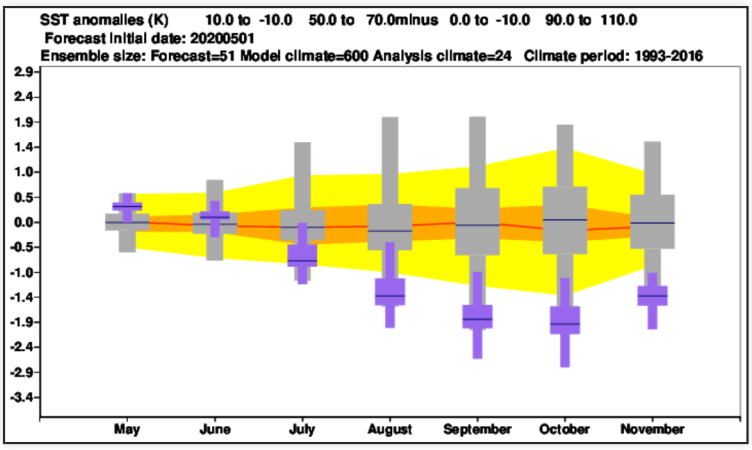
Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

1 - neutral forecast above 60%

Oceanic forecast : Indian ocean - DMI evolution

Very good agreement between both models in the Indian Ocean. The DMI is expected to stay close to the normal in June and then start to rapidly decreasing in July toward a strong negative IOD situation.

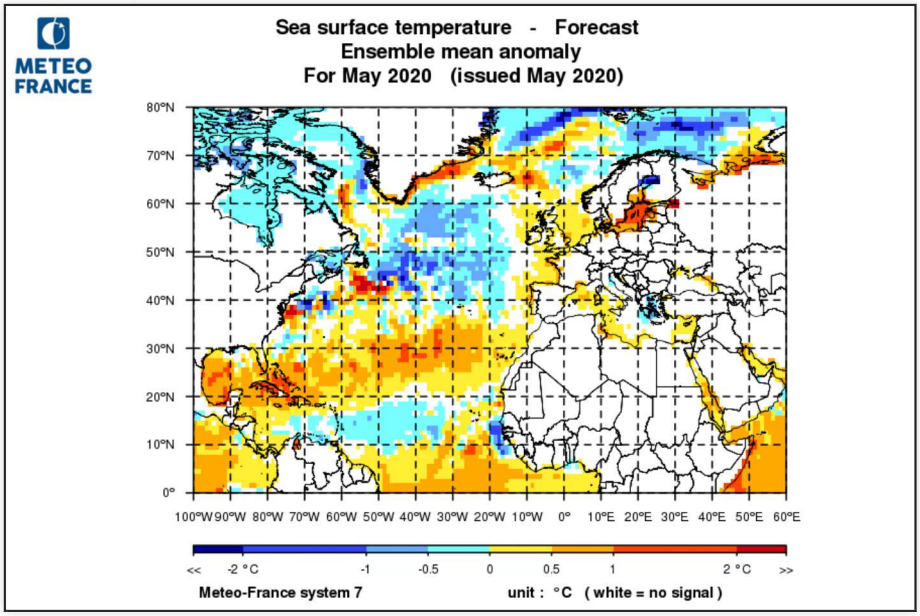




DMI index : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

Drivers : Atlantic SST

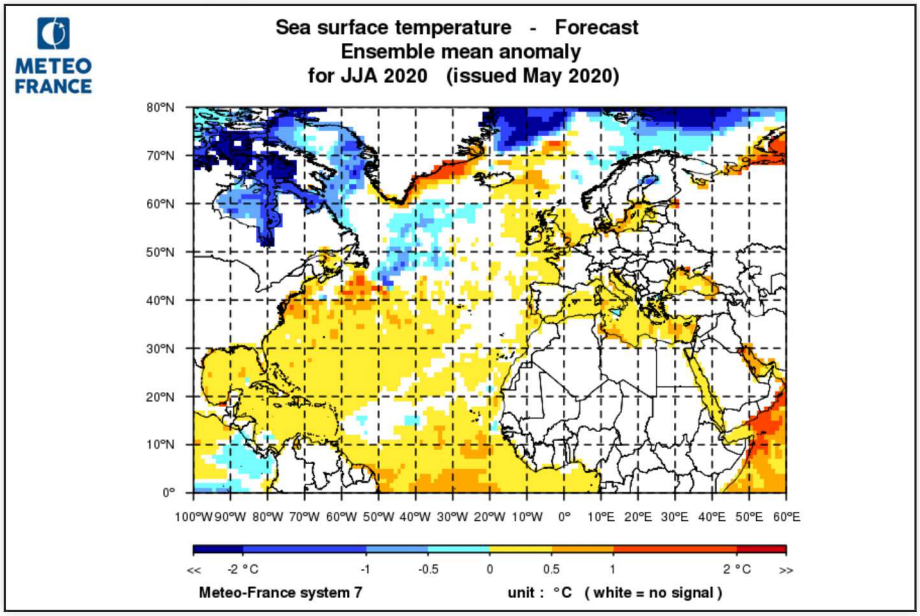
This SST pattern of May, with negative anomalies south of Iceland, tends to favour East Atlantic circulation (Duchez et al., 2016).



North Atlantic SST

Drivers : Atlantic SST

This SST pattern *tends to favour* blocking regimes (Guemas et al., 2010).

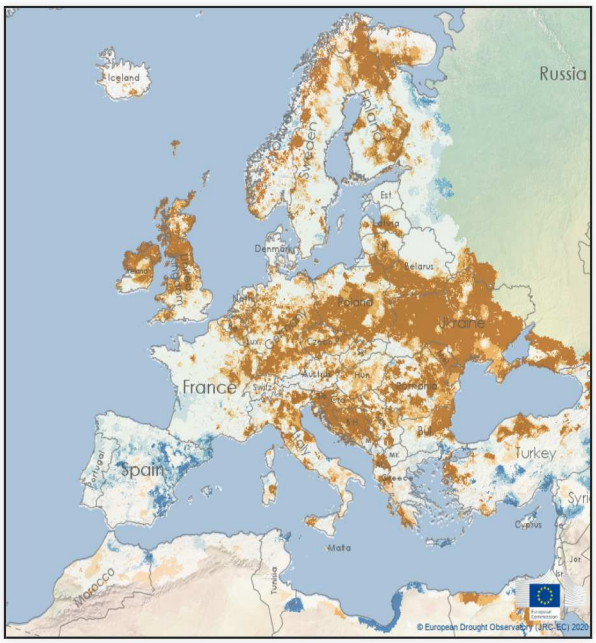


North Atlantic SST

Drivers : soil wetness

Currently (beginning of May), dry conditions over many European countries.

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 : May 2020 first ten-day period

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

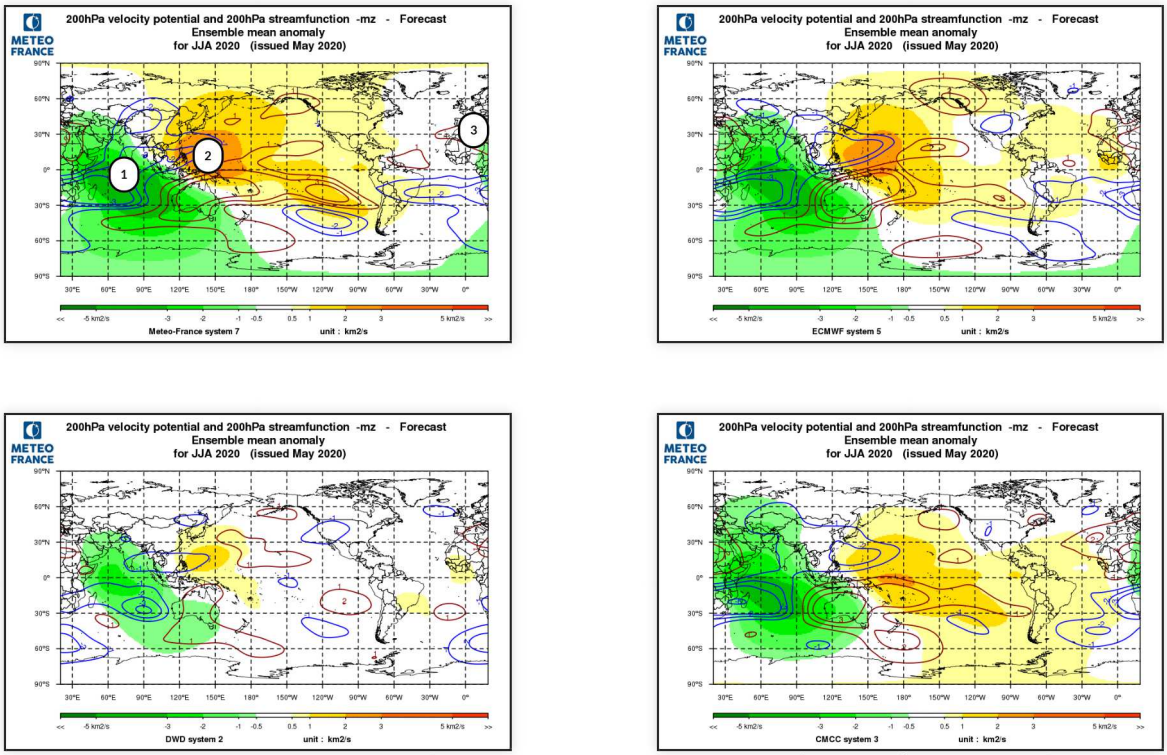
Drivers : Summary

- SST conditions in May tends to favour positive East Atlantic circulations in JJA
- SST forecasts for JJA tends to favour Blocking regimes
- In case of anticyclonic conditions, the current dry soil conditions that concern many European countries could reinforce the risk of heat waves during the summer.

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

Velocity Potential : The models are in good agreement concerning the main anomalies, on the Indian Ocean and the Pacific Ocean (west half). Anomalies are extremely weak elsewhere, especially over the Altantic. DWD forecasting is less dynamic than other models, but its patterns are well correlated with the 3 others. Note that the upward motion anomaly area over the Indian Ocean is consistent with the warm SST anomaly, and a downward motion anomaly pole over the Eastern Maritime Continent and the Western Pacific.

Streamfunction : The quadripole of anomalies around the Indian Ocean is consistant with the dipole anomaly pattern of VP 200.

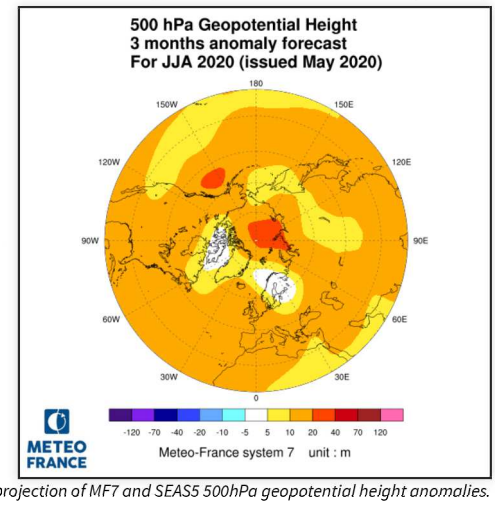


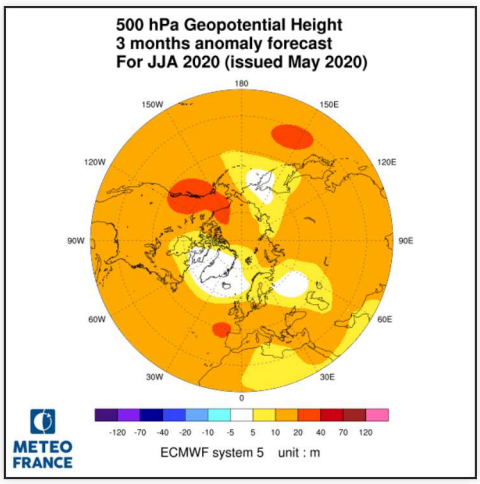
MF7,SEAS5, DWD and CMCC 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

1 - VP : Huge area of upward motion anomaly
2 - VP : downward motion anomaly
3 - FC : anticyclonic anomaly, in link with the upward anomaly in the Indian Ocean

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Rather good consistency between the 2 models over the Atlantic, EUrope, North of Africa and Middle-East. But the signal is "polluted" by the climatic trend (positive values almost everywhere).



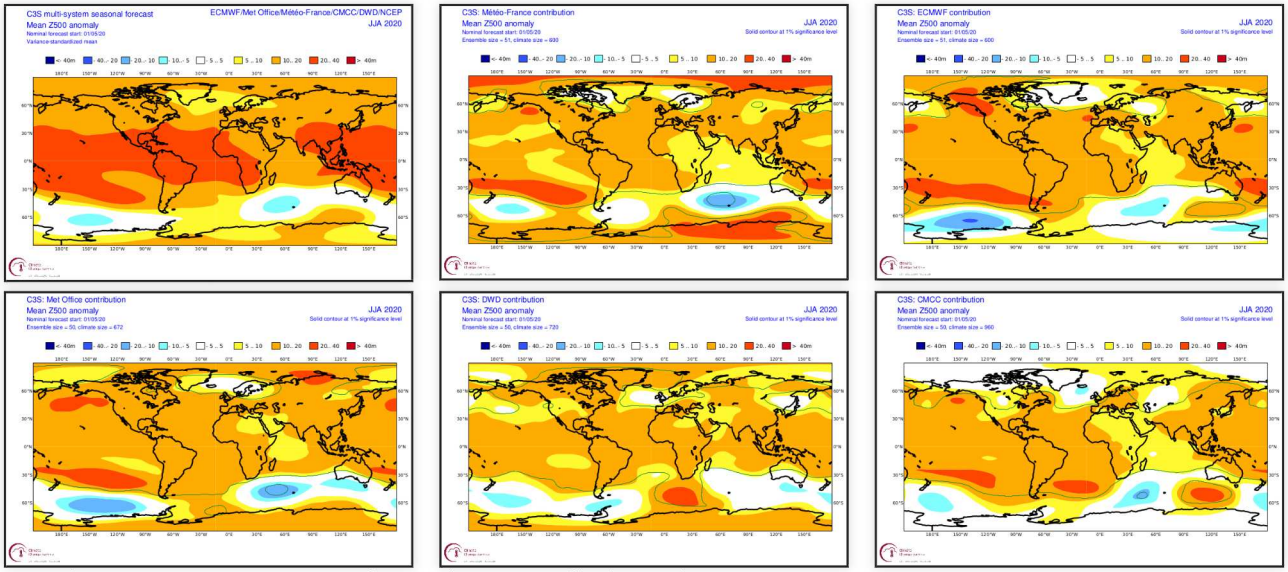


polar projection of MF7 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

Little signal in the northern hemisphere, with positive values almost everywhere. An area of relatively low or neutral anomaly is visible in the models over North Atlantic and/or Northern EUrope, but iys position is different from one model to another.

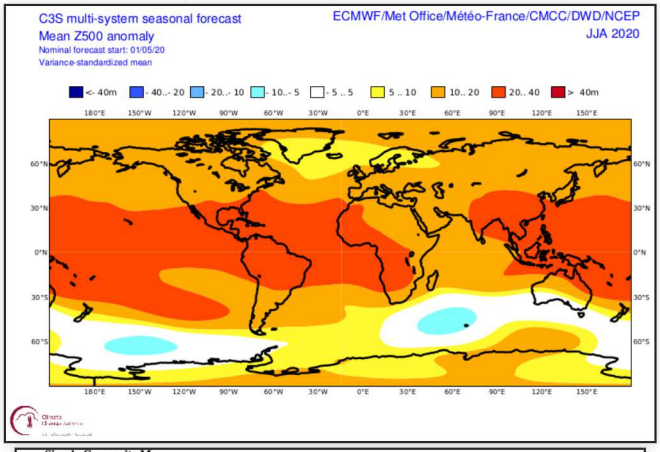
In the Southern hemisphere, there is a better consistency, with stronger anomalies.

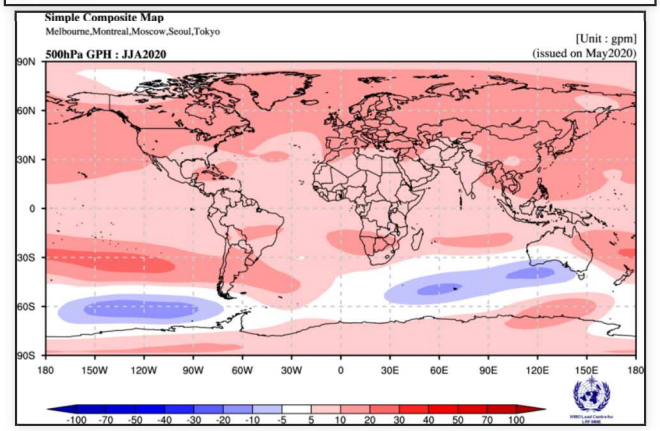


C3S multi-system, MF-S7, SEAS5, UKMO, DWD and CMCC 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

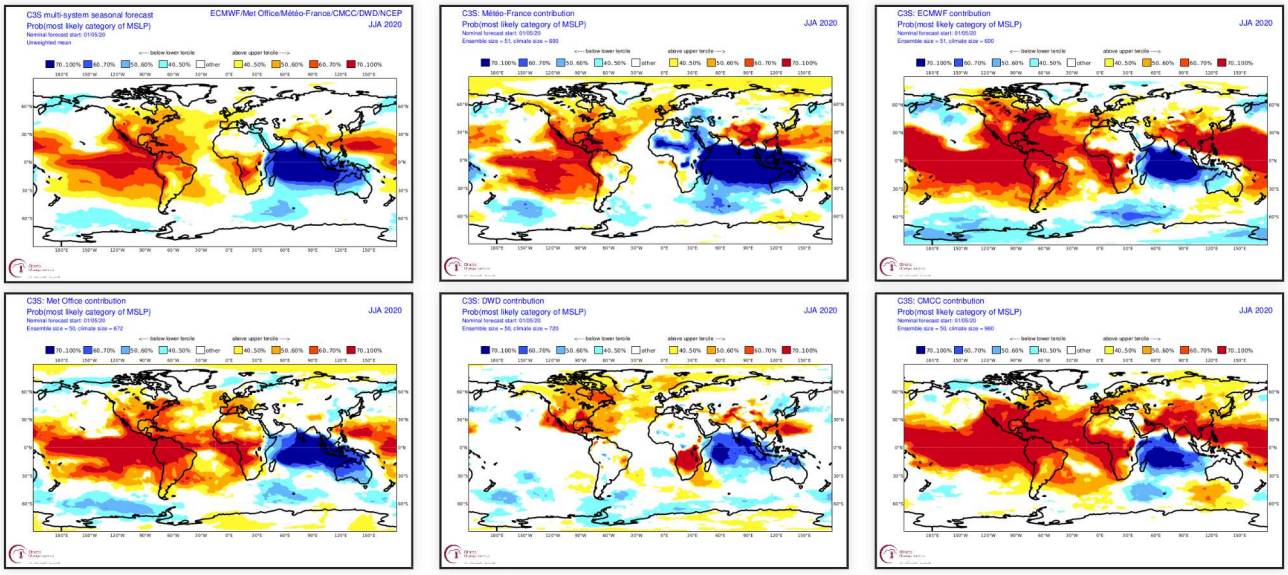
Good consistency in the SOuthern hemisphere, but poor consistency in the SOuthern Hemisphere.





Atmospheric circulation forecasts : MSLP probabilities

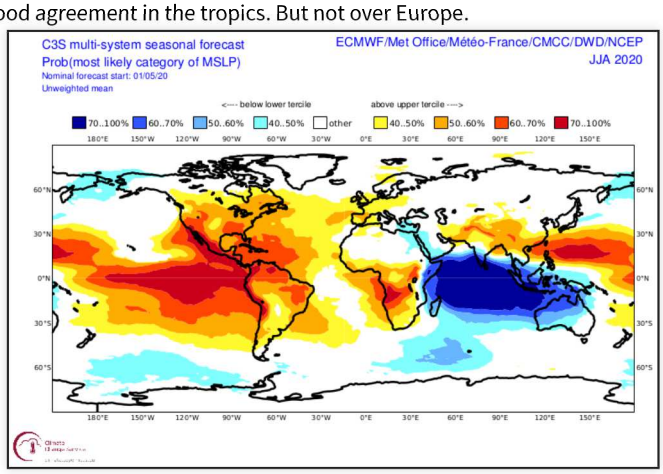
Strong dipole between the Indian Ocean and the Pacific is the tropics, in links with the VP200 anaomalies. Rather good agreement between models for a positive anomaly over Wester Europe (with differences in latitude), and a East-West gradient over the Mediterranean sea.



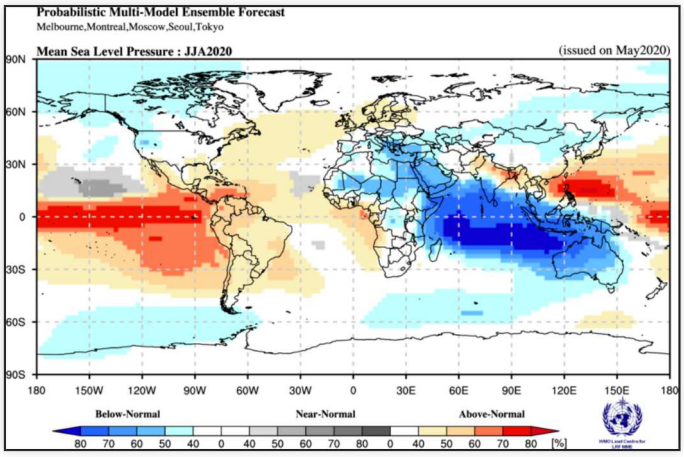
C3S multi-models probability map (top left) and MF-S7, SEAS5, UKMO, DWD, CMCC models.

Atmospheric circulation forecasts : MSLP probabilites multi-systems

The multi-models are in fairly good agreement in the tropics. But not over Europe.



C3S multi-models.

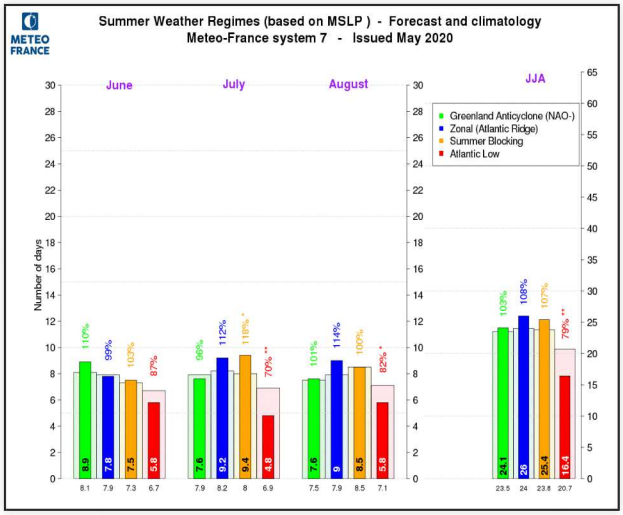


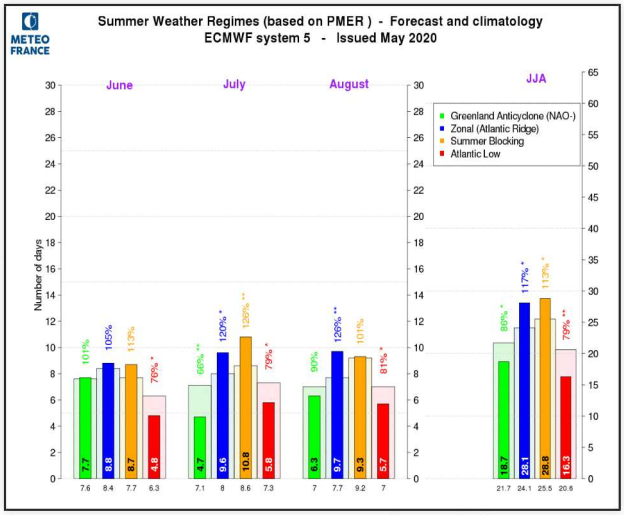
Others models of WMO multi-models.

Weather regimes : summer MSLP

Both models disadvantage the Atlantic low regime.

Note that looking at MSLP anomalies of other C3S models, the deficit of Atlantic Low would probably not be shared by a majority of models. And it is opposite to the indications given by the drivers.

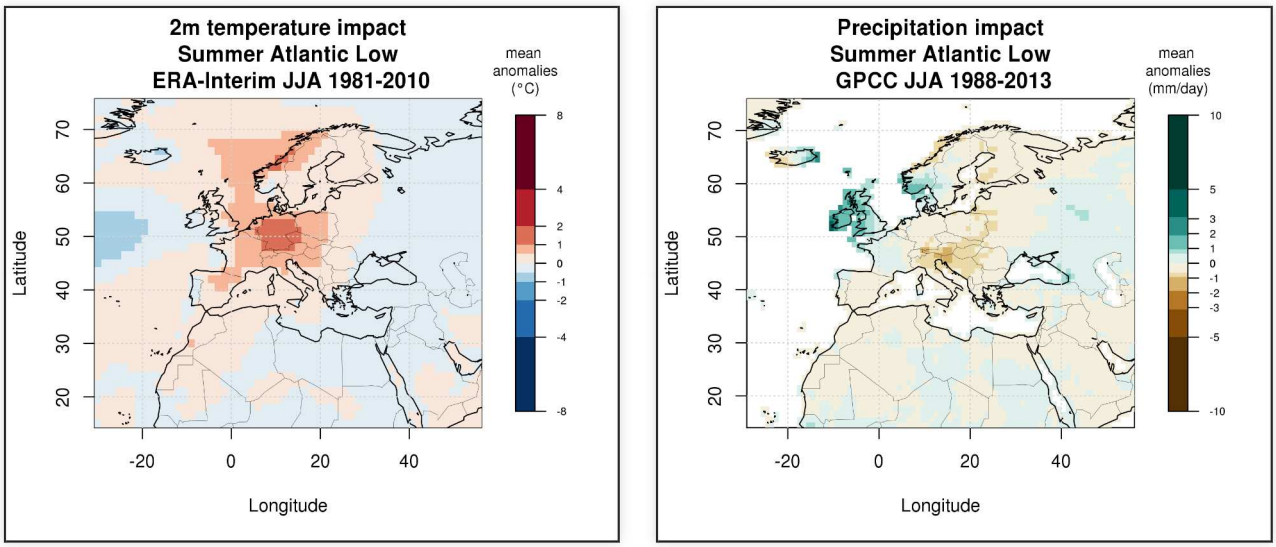




Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S7 (left) and SEAS5 (right).

Weather regimes : Impacts

Atlantic Low weather regime should be less frequent than normal favoring the opposite of these charts.

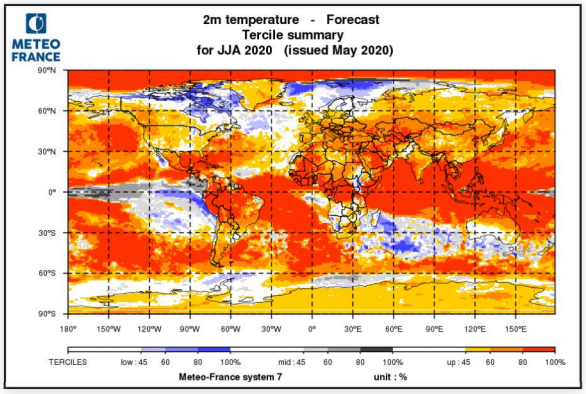


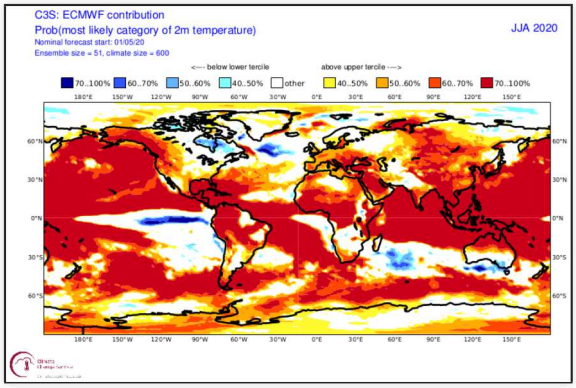
Impact of Summer Atlantic Low weather regime on temperature and precipitation. (ref ERA-interim 1981-2010 and GPCC 1988-2013)

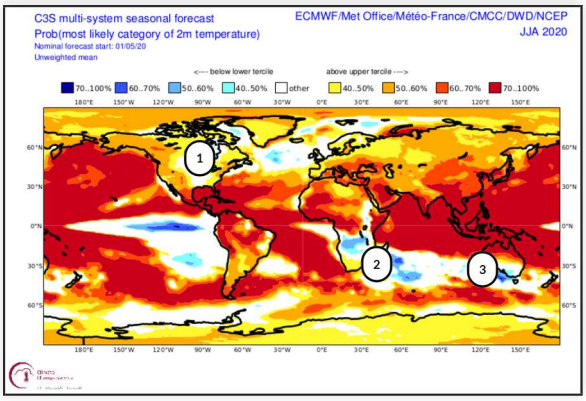
Forecast of climatic parameters : Temperature probabilities

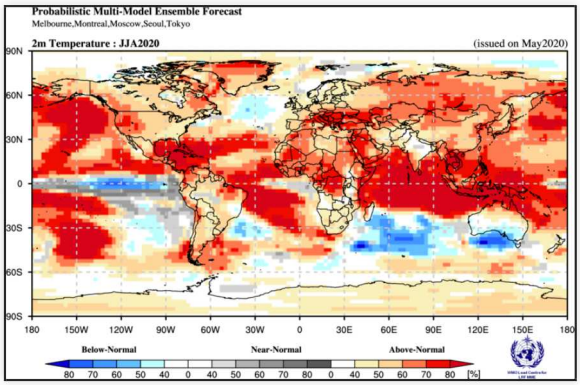
Because of the positive trend due to climate change, many regions are covered by positive anomalies.

The negatice signals correspond to cold SST anomalies (South Indian Ocean, Eastern Pacific, North Altlantic) and nearby regions (mainly Australia, South of Africa)







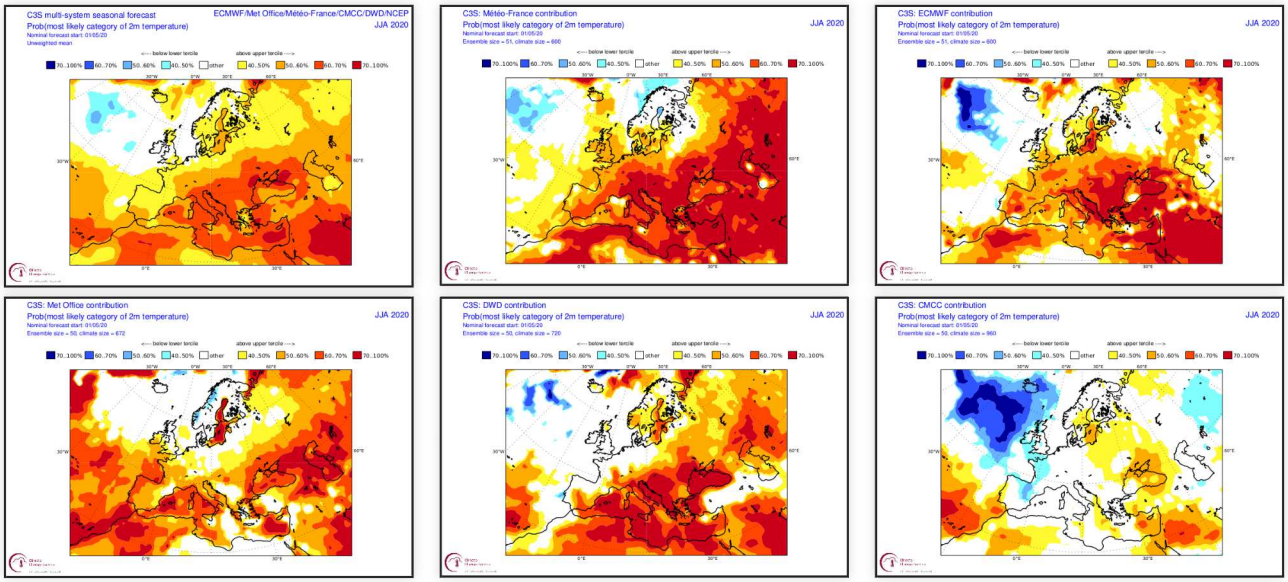


2m temperature probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

1 - No consistency between models
2 - cold signal
3 - cold signal

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

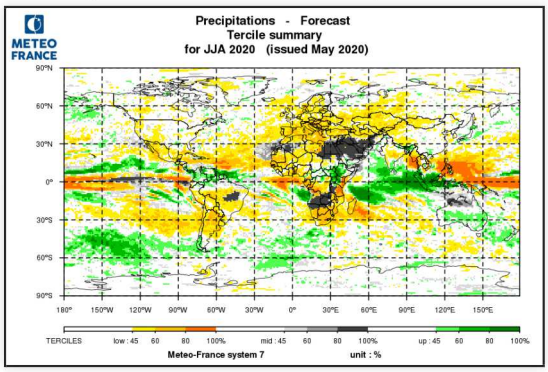
Several models favor a warm option over Europe, especially over South-Eastern Europe and Middle-East where the probabilities are the highest. Note that one model suggest a negative scenario over Werstern Europe. Over Scandinavia, probabilities of a warm scenario are weak : this is consistent with the dominant West circulation proposed by most of the C3S models.

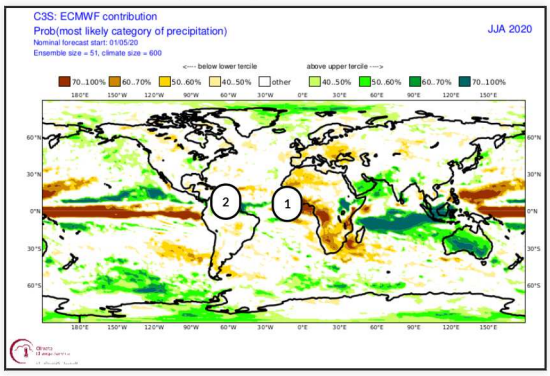


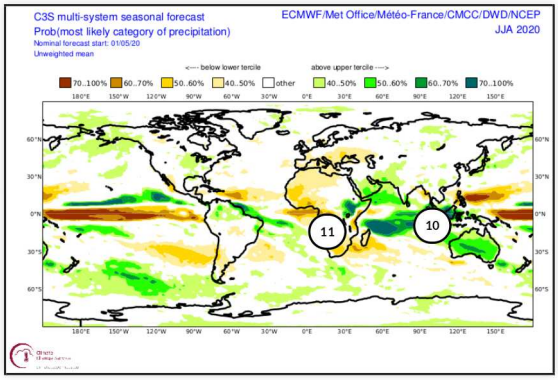
C3S multi-models probability map (top left) and MF-S7, ECMWF-SEAS5, UKMO (bottom left), DWD, CMCC models.

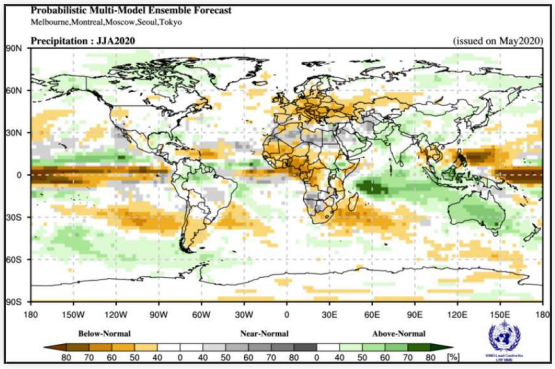
Forecast of climatic parameters : Precipitation

Consistent signal over the Indian Ocean tropics and the Pacific Ocean tropics. Note the strong wet signal over Australia (negative IOD).







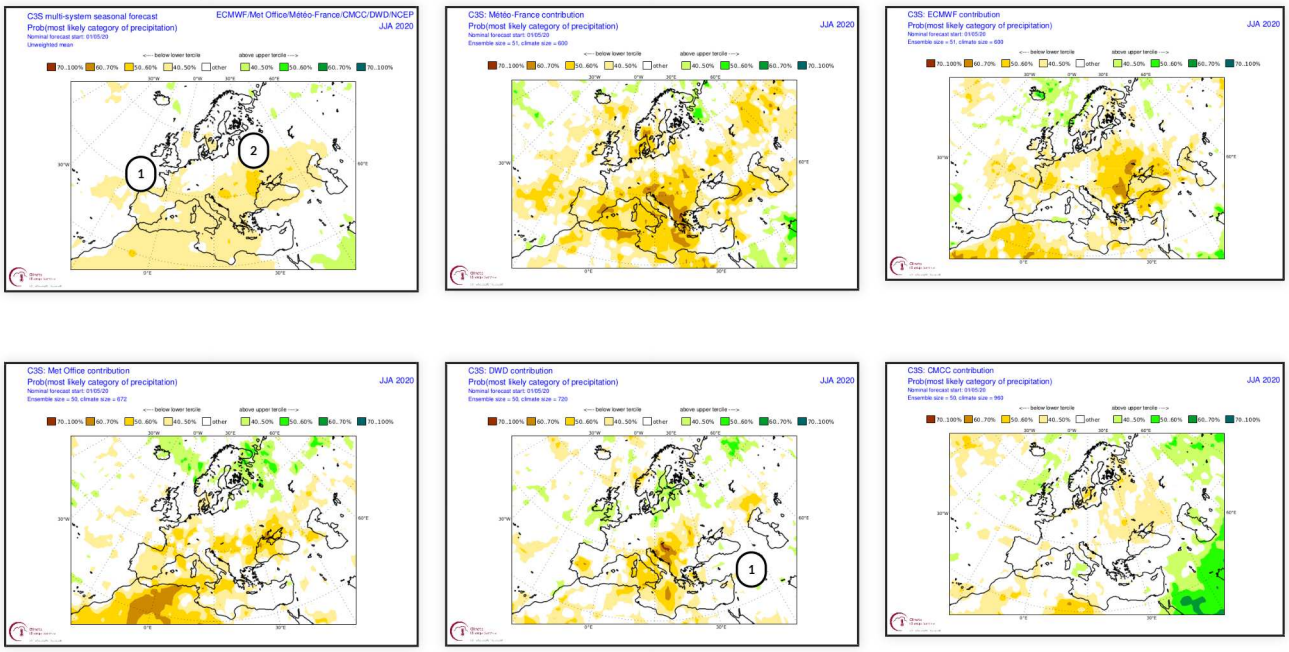


precipitation probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

1 - dry signal
2 - wet signal
10 - Strong wet signal
11 - dry signal

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

The models are rather consistent : a dry signal over the continent, neutral or wet over Northern Europe. This is what we could expect from the MSLP analysis.

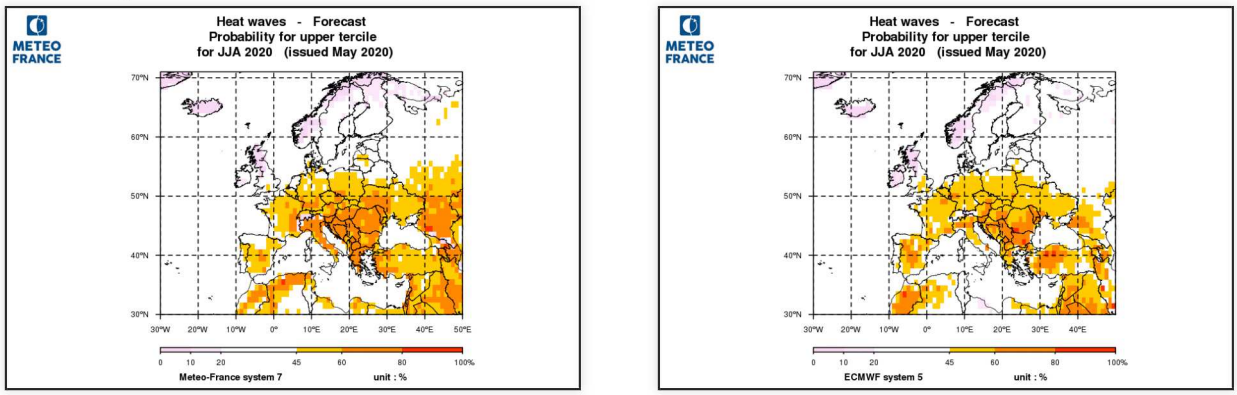


C3S multi-models probability map (top left) and MF-S7, SEAS5, UKMO, DWD, CMCC models.

1 - weak dry signal
1 - this wet forecast seems unrealistic and strongly influences the multi-model
2 - weak dry signal

Forecast of climatic parameters : Heat waves

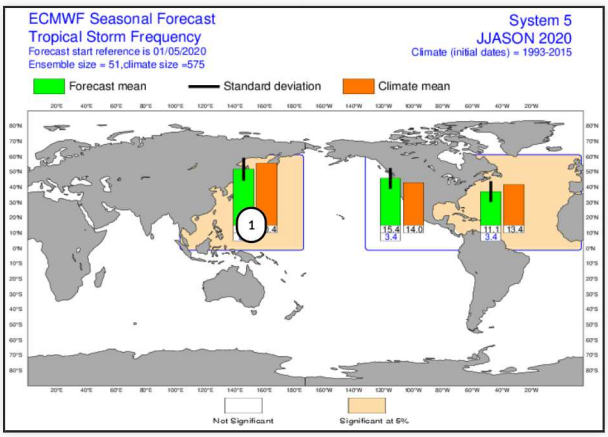
The probability of heat waves is very high in MF-S7 for the southeastern Europe.
At the contrary, it is low over Northern Europe (lower than normal).

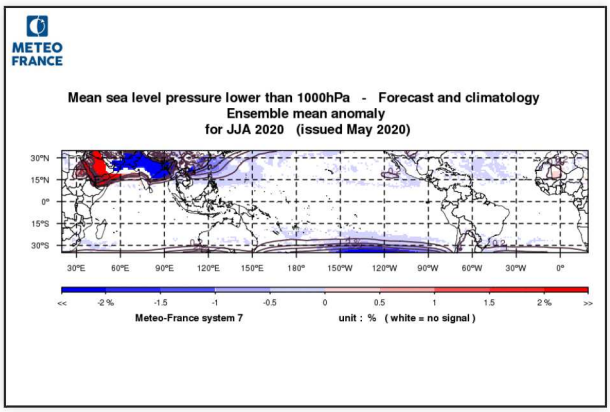


Heat wave probability for MF7 (right) and ECMWF (left). A heat wave is detected if the corrected T2M is above the daily 90th percentile and a fixed 20°C threshold. more details here

Forecast of climatic parameters : Tropical Storm Frequency

Cyclone season activity may be less intense than normal in the West Pacific and the west Atlantic.

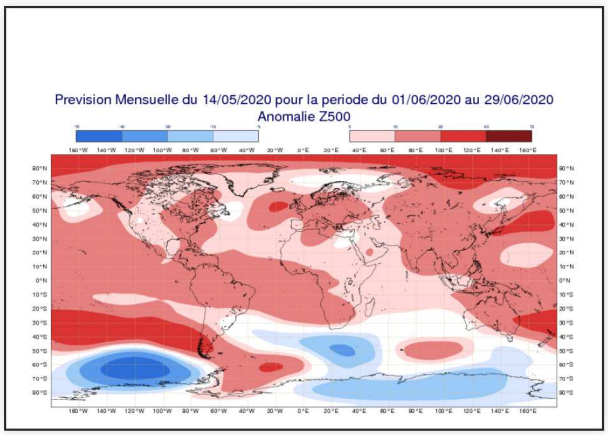


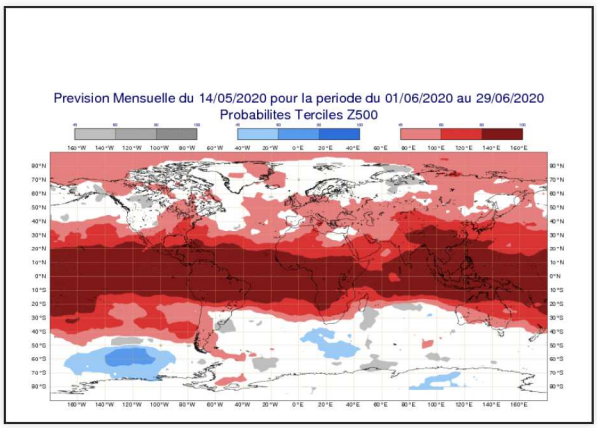


1 - less intense than normal

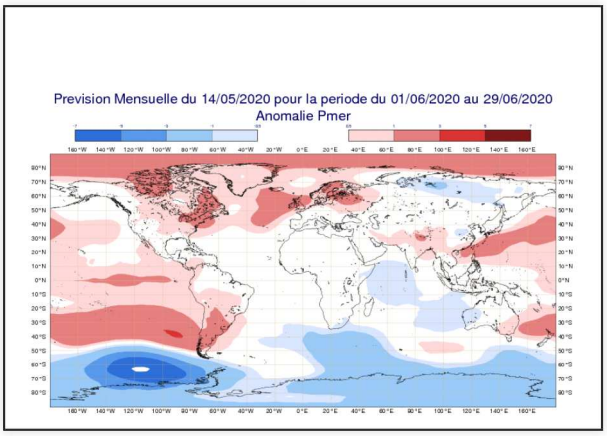
Monthly forecast of 20200514 : Z500

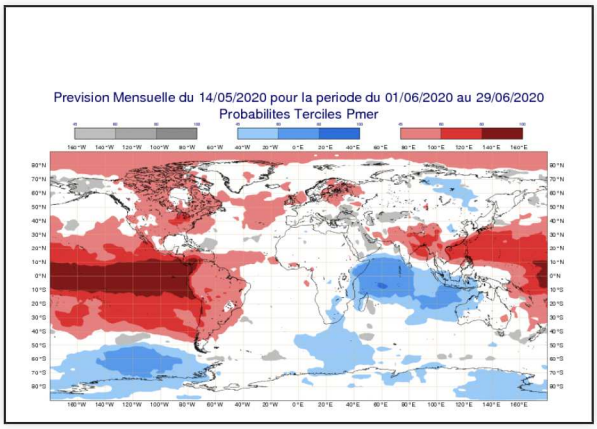
A positive anomalie pattern covering Europe for the first month of the period, and a relative low anomalie over the Northen half of Scandinavia.





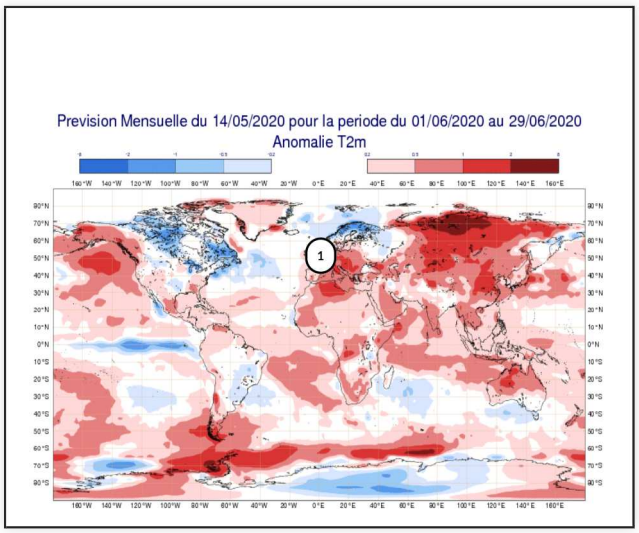
Monthly forecast of 20200514 : MSLP

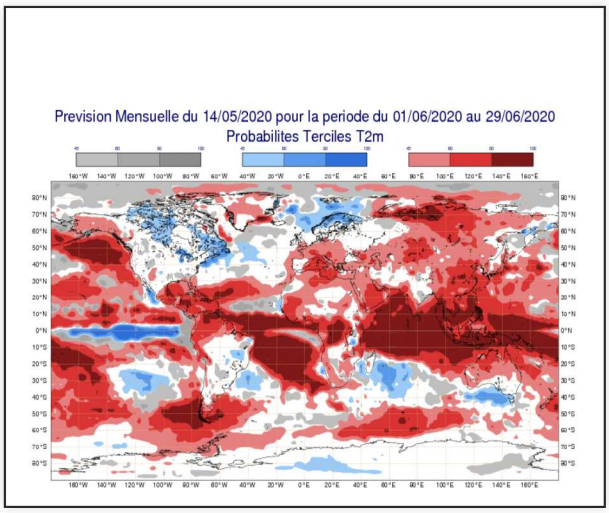




Monthly forecast of 20200514 : temperature

The pattern of the first month in Europe looks like the seasonal forecasts.

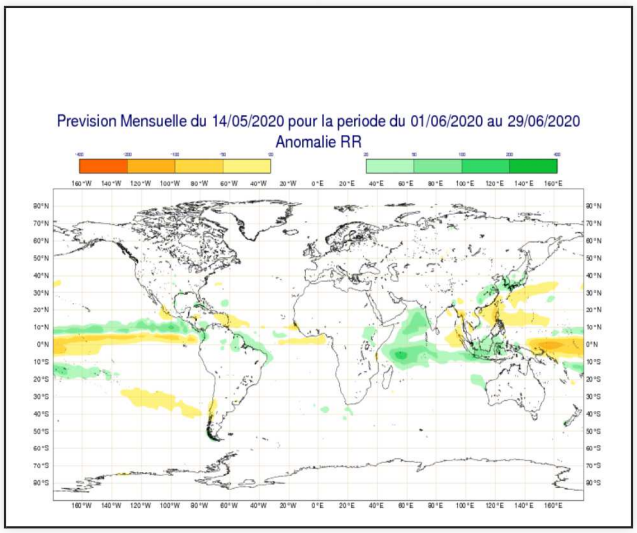


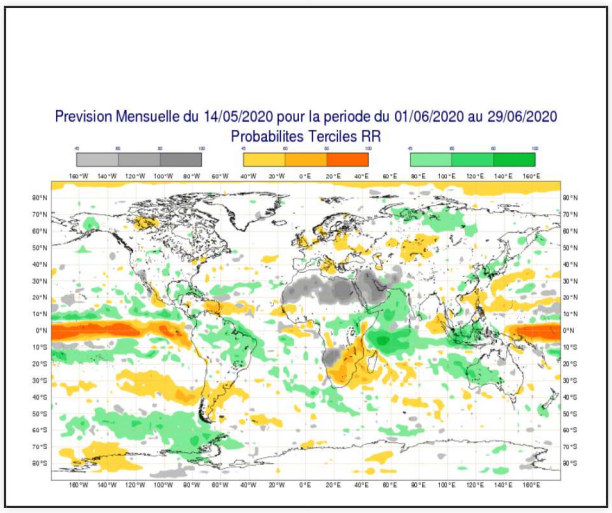


1 - warm anomaly for the month on all Europe, except Northern and eastern part.

Monthly forecast of 20200514 : precipitation

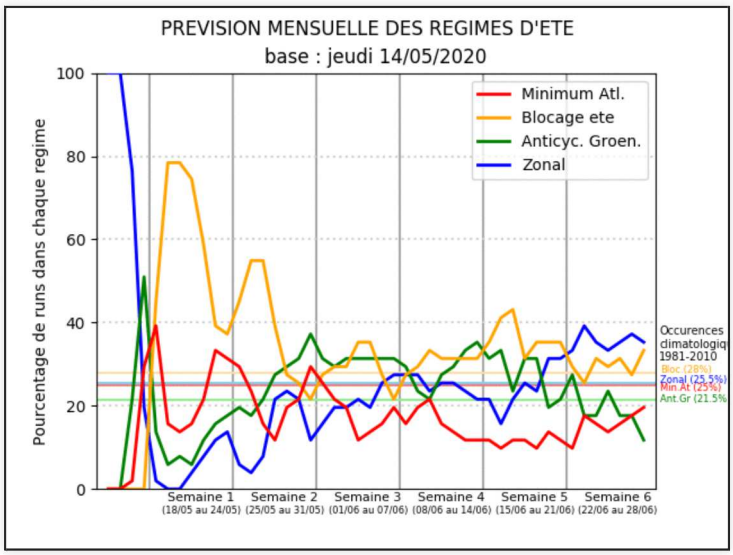
Weak dry signal over Europe.





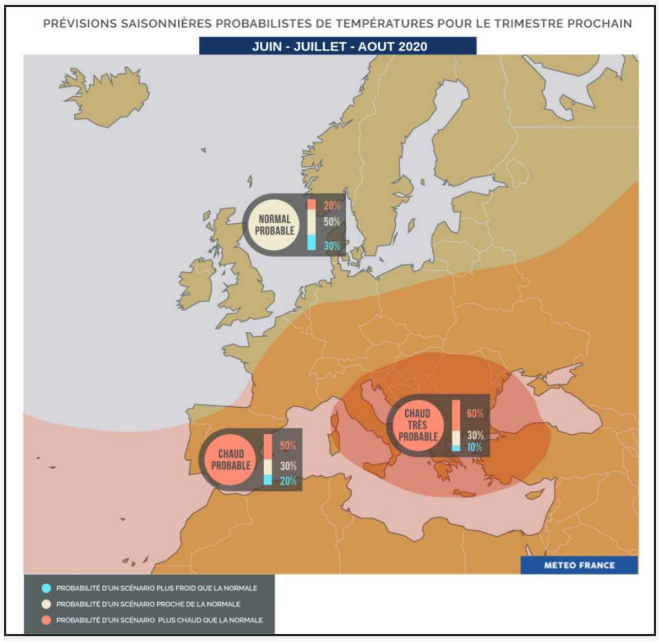
Monthly forecast of 20200514 : summer SLP weather regimes

Summer blocking is slightly *dominant*.



Synthesis map for Europe : Temperature

Following a scenario diminated by an anticyclonic anomaly over Europe (so the Azores high probably stronger than normal) + climate trend, a "warm" scenario is priviledged over the southern part of the domain. Inside this area, several models suggest a stronger signal centred on the Balkans. At the contrary, the western flow would probably be stronger than normal in Northern Europe (see MF-S7 U10M), so it may weakening the *effect of climate trend* : the "normal" scenario seems to be the most likely.



Synthesis map for Europe : Precipitation

In links with the MSLP scenario explained on the previous slide, north-south dipole of anomaly in terms of precipitations.