Météo-France Seasonal Forecast Bulletin

SEPTEMBER - OCTOBER - NOVEMBER 2020

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General synthesis : SON 2020

A) Oceanic forecast :

- **ENSO : La Niña phase foreseen**. Models confirm a trend towards La Niña in the next months. Its intensity should be "weak", but the spread is still large for next winter (see C3S NINO3.4 plumes)

- **IOD** : a strong decrease is expected in next 3 months, toward a negative IOD situation.

B) Atmospheric circulation :

- classical response to "La Niña" in the tropics (upward motion anomaly over the Eastern Indian Ocean, downward motion anomaly over Central Pacific). No clear teleconnexions to mid-latitudes.

- over the North Atlantic and Europe : good consistency between models for a positive phase of NAO (zonal regimes predominant).

=> Most likely conditions :

- Wet conditions over Maritime Continent and Australia. Dry over West Africa (end of monsoon)

- **over Europe** : warm over south-west and north-east Europe. Drier than normal in the southern part of Europe. Wet probabilities over Scandinavia

Next bulletin : scheduled on September 22th

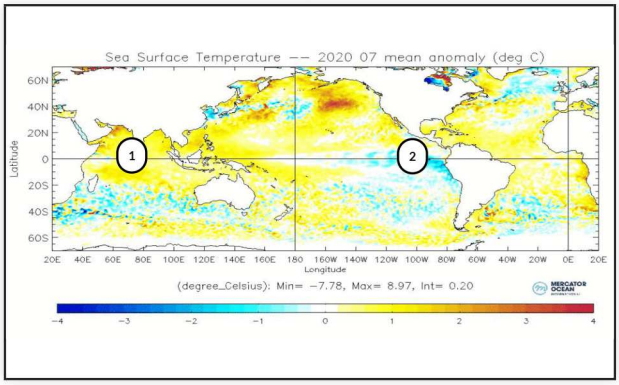
Oceanic analysis of July 2020 : SST anomalies

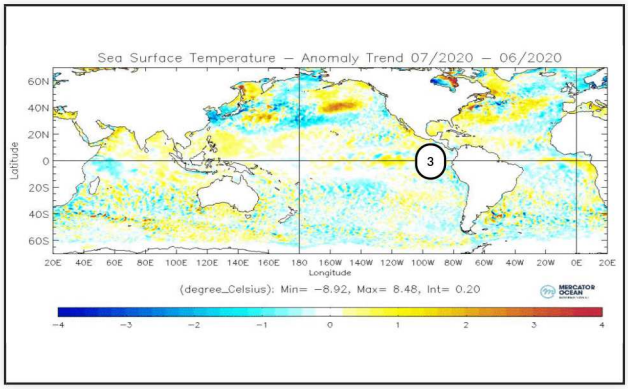
Current ENSO situation : neutral conditions.

The Atlantic remains globally warmer than normal in the tropics and up to mid-latitudes (the thin cold anoamly along the equator has disappeared in July).

In the Pacific, little change in the tropics and along the equator. In the Northern hemisphere, the Ocean remains significantly warmer than normal. Along the equator, there is still a noticeable contrast between the West (warm anomalies) and the East (cold anomalies).

The Indian Ocean is still warmer than normal north of 20°S. The east-west gradient has weakened.



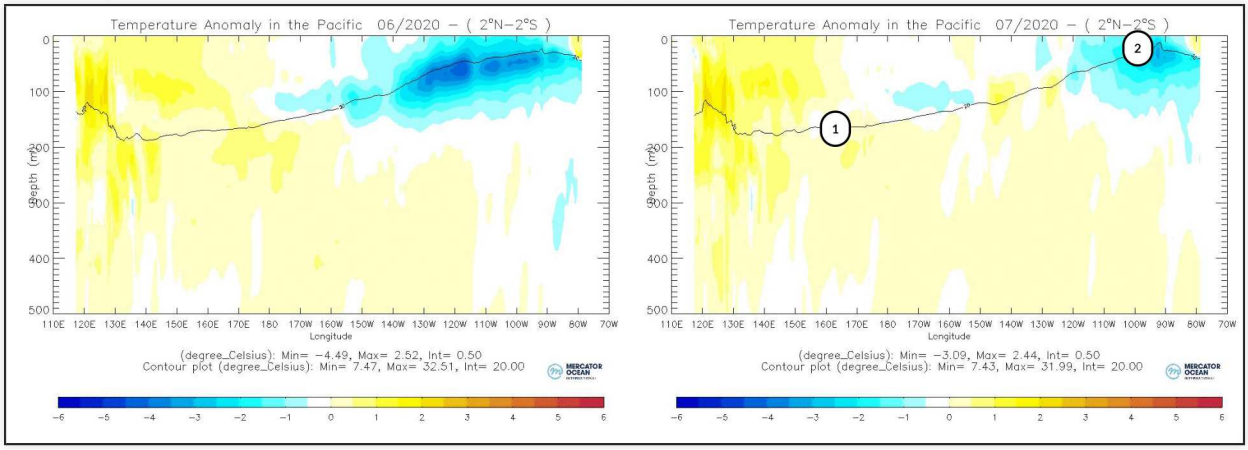


SST Anomalies and trend with the previous month (c) Mercator-Ocean

1 - warm Indian Ocean
2 - Cold anomalies settled
3 - No evolution in July

Oceanic analysis of July 2020 : Pacific vertical section

The cold kelvin wave is still visible in the very eastern part of the basin. No new cold anomaly in the western part likely to indicate a later development.

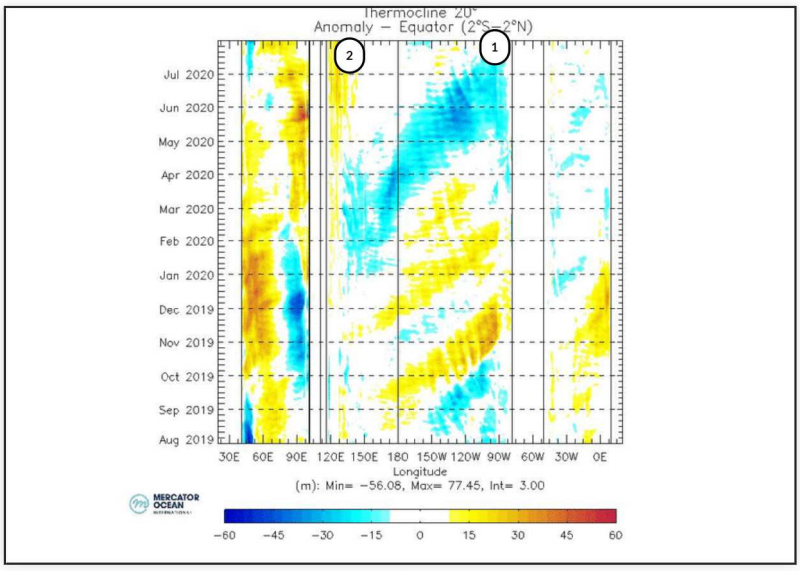


Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

1 - No marked anomaly in the western part
2 - Trace of the cold Kelvin wave in subsurface and at surface

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

In the Pacific, the propagation of the cold anomaly from the West to the East is now completed. The thermocline is close to normal along the equator.



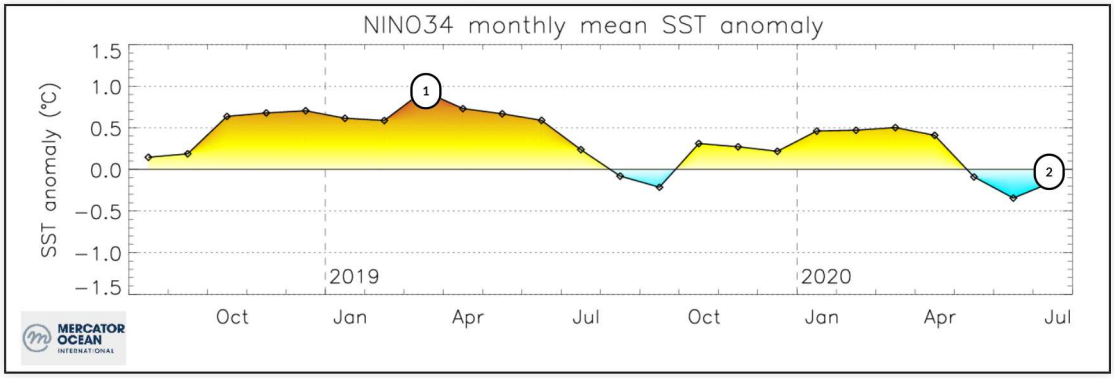
Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 ° C isotherm) (c) Mercator-Ocean

1 - End of the propagation of the cold wave
2 - A slightly positive anomaly is still present in the very Western part of the basin, no evolution in July

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

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -0.2 °C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

Weak anomaly in Nino3.4 box, below "La Niña" threshold (in absolute value).



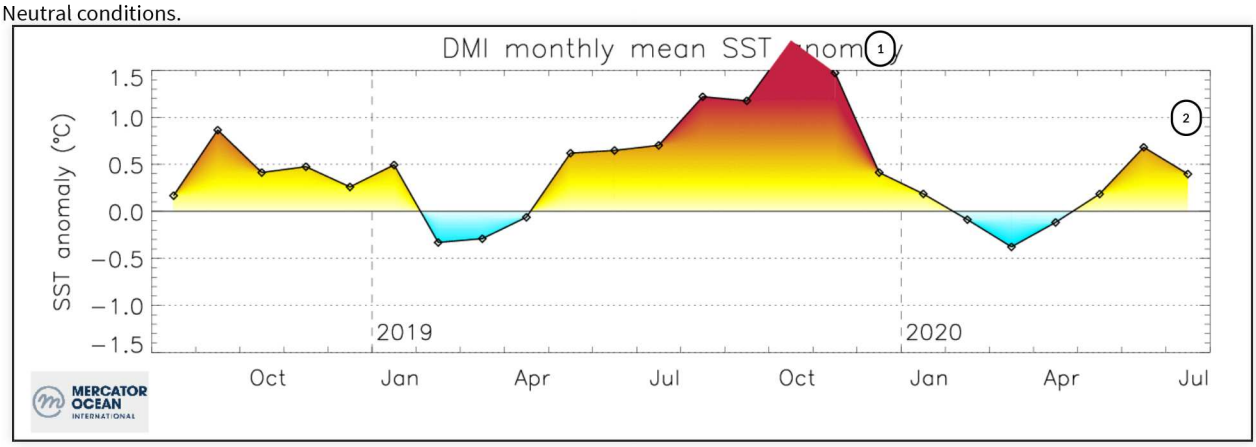
Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

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

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

DMI Index issued from Mercator Ocean PSYV4R2 analysis : +0.4°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/iod1.png)

Neutral conditions.



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

1 - IOD on record in october
2 - Return to positive phase

Oceanic forecast : SST anomaly

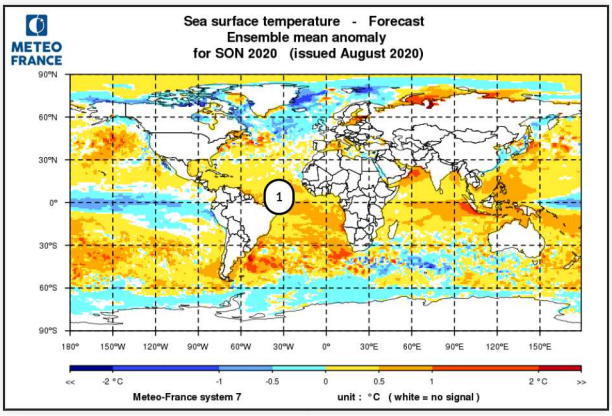
Good agreement between MF-S7 and ECMWF-SEAS5. Same anomaly patterns, little differences in intensity.

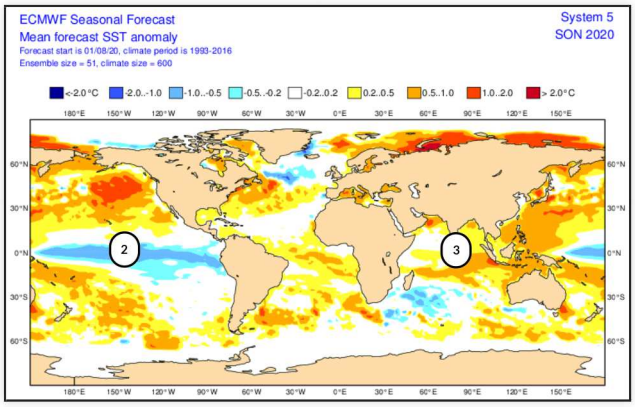
The main evolutions (compared to July) are the extension of the negative anomaly in along the equatorial Pacific, and the development of a gradient in the equatorial Indian Ocean.

In the Pacific Ocean : Along the equator cooling extends west beyond the date change line. Elsewhere, the Pacific Ocean is expected to be warmer than normal especially the northeast quarter.

In the Indian Ocean : along the equator, develoment of a West-East gradient (IOD), similar in both models (mainly due to a warming in the Eastern part)

In the Atlantic Ocean : still warmer than normal in the southern hemisphere up to mid-latitudes. In Northern Atlantic, persistence of a North-South gradient (a little stronger in MF-S7).

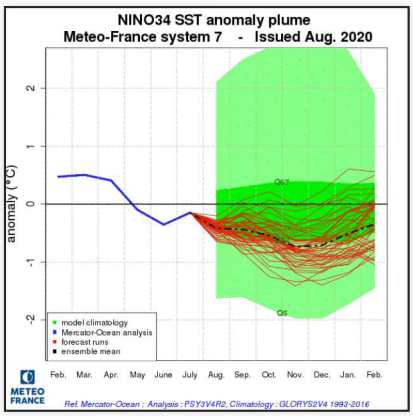


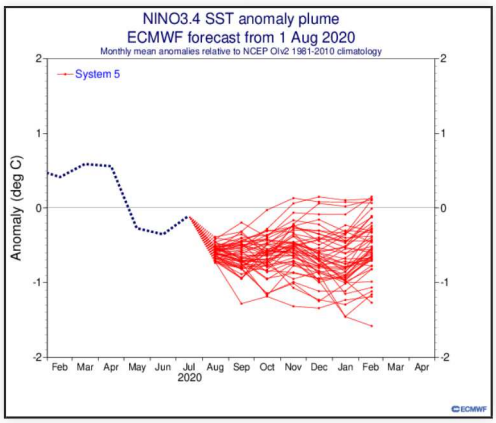


1 - warmer than normal
2 - cold anomaly along the equator
3 - ECMWF-SEAS5 colder than MF-S7 but West-East gradient is similar

Oceanic forecast : NINO3.4 Plume diagrams

The two models agree : the most probable scenario is a slight decrease of the NINO3.4 index, to reach rapidly La Niña threshold and stabilize in the next months.

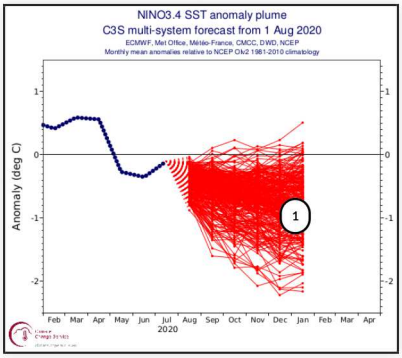


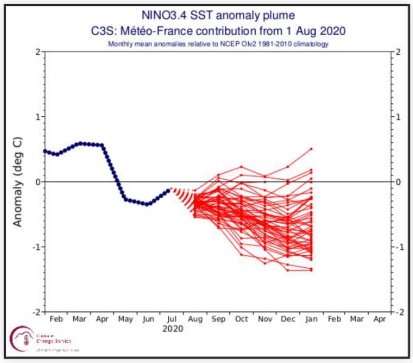


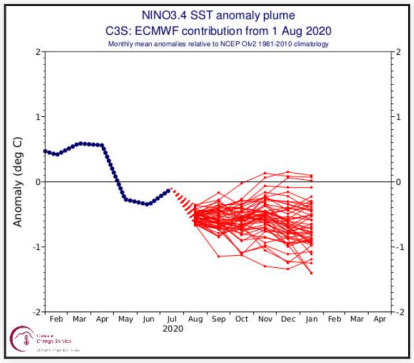
Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

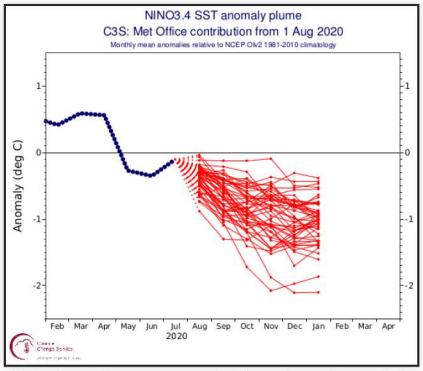
Quite a good agreement, almost all the simulations foreseen negative anomalies, and a majority between -0.5 and -1°C.

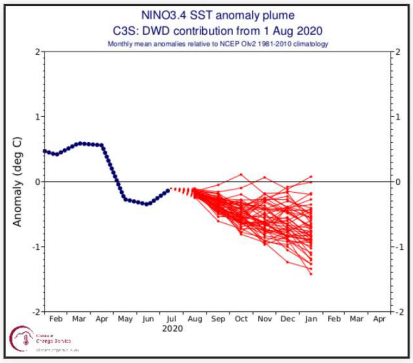
Expected Phase for the next three months : La Niña

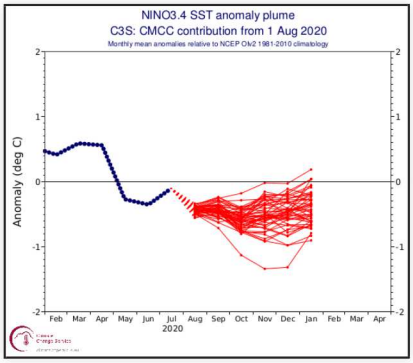










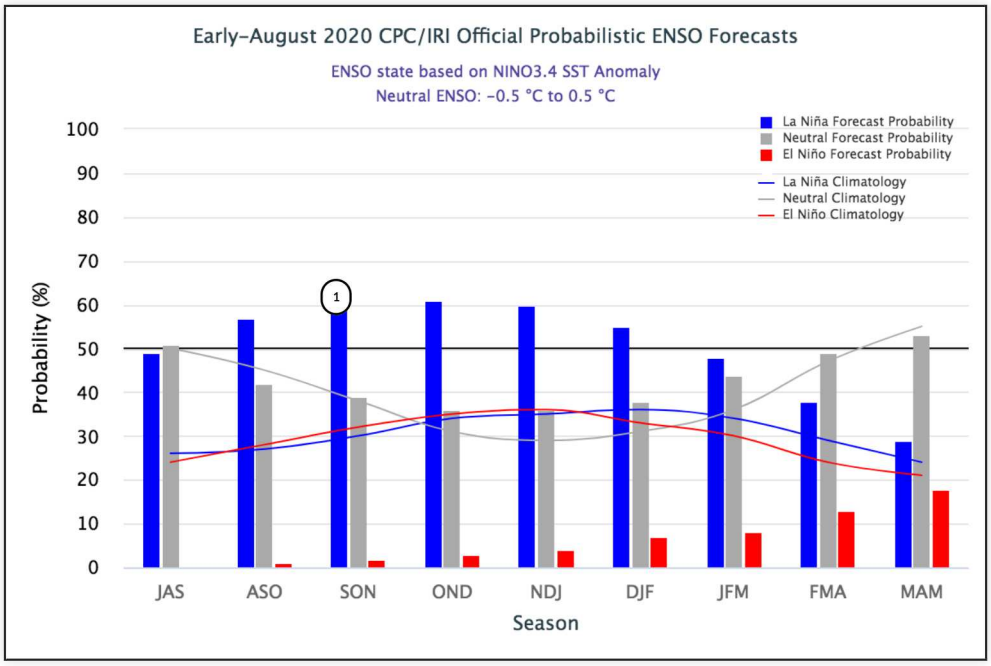


C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

1 - Large spread but quite a good consensus for negative anomalies and a majority for a "La Niña" event in the next months

Oceanic forecast : Synthesis from IRI

According to IRI forecast, La Niña is the most probable phase for SON 2020 (probability : ~60%).

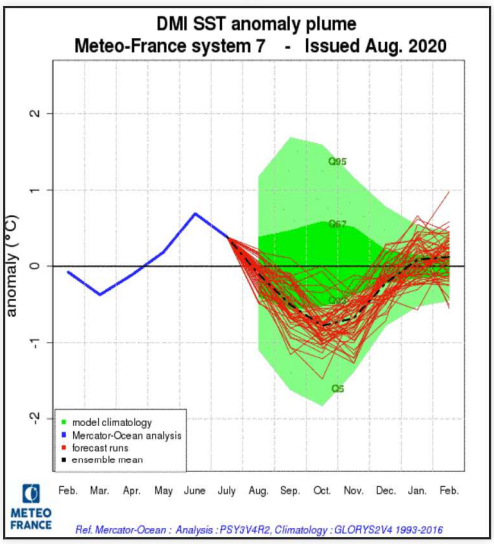


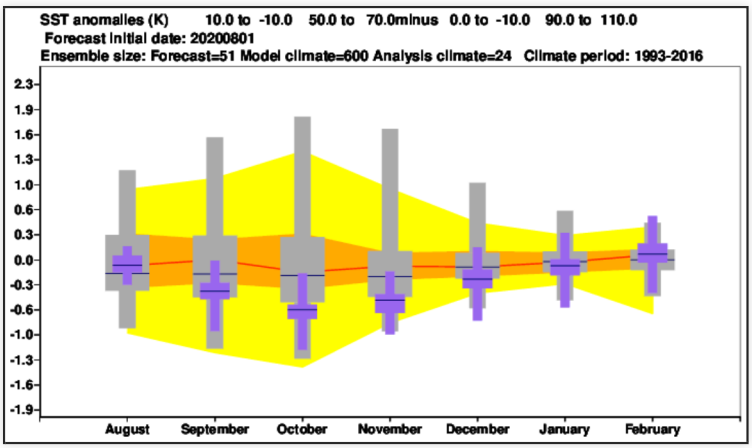
Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

1 - La Nina forecast slightly more likely than normal

Oceanic forecast : Indian ocean - DMI evolution

Good agreement between models in the Indian Ocean. The DMI is expected to fall sharply in next 3 months, toward a negative IOD situation. This is the most probable phase in case of La Niña event.





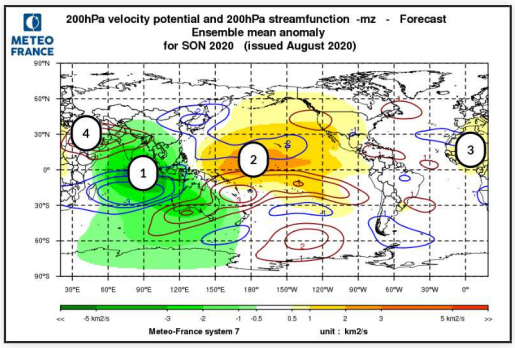
DMI index : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

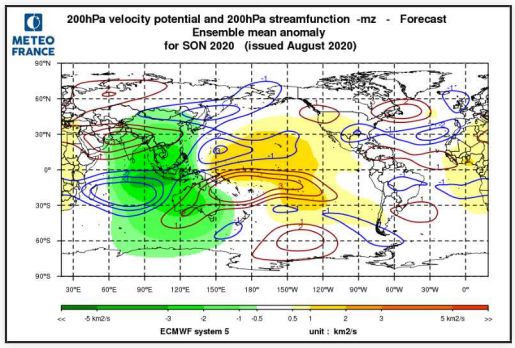
Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

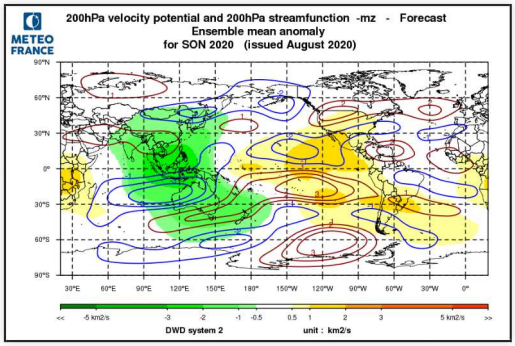
Velocity Potential : The four models are in good agreement concerning the main anomaly patterns : a large upward motion anomaly area centred over the Eastern Indian Ocean, and a large downward motion anomaly centred over the Central Pacific. This is fully consistent with the expected impacts of negative IOD and La Niña.

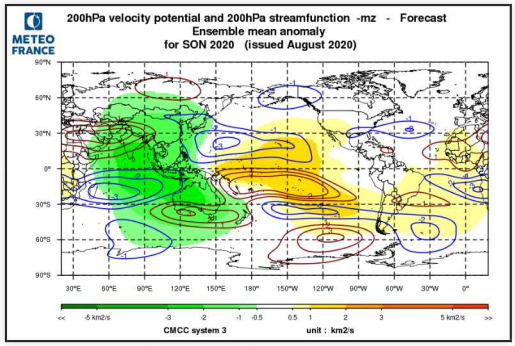
No noticeable anomalies over the Atlantic. Weak positive anomaly over West Africa (but present in 3 models).

Streamfunction : The models are in good agreement concerning the quadripole of anomalies over the Indian Ocean and Western Pacific. This is the expected response to VP200 anomalies. Weak anomalies (but consistent between models) in North Atlantic tropics close to the African coasts.









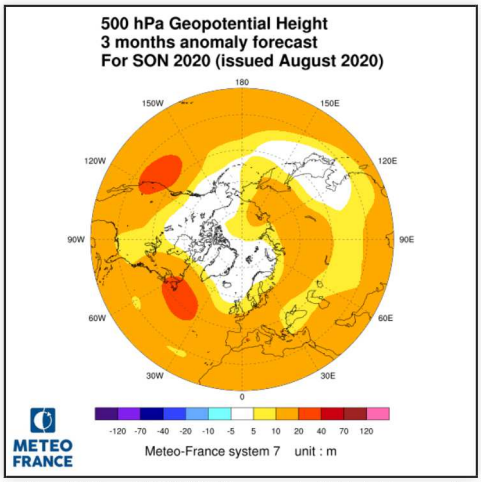
MF7,SEAS5, DWD and CMCC 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

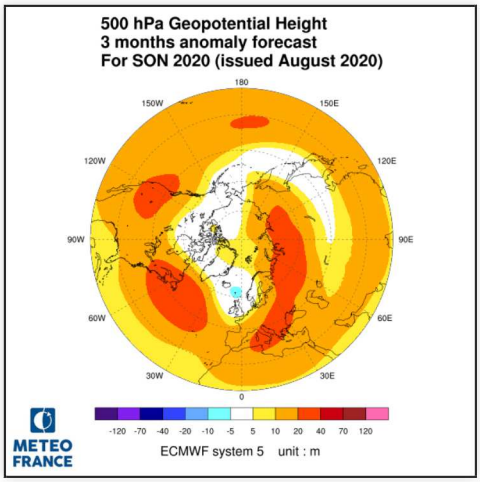
1 - VP : large area of upward motion anomaly
2 - VP : large downward motion anomaly
3 - VP : weak anomaly (downward motion anomaly) but present in 3 of the 4 models
4 - SF : anticyclonic circulation anomaly

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Good consistency between the 2 models over the hemisphere and especially over North Atlantic and Europe.

Anyway, south of 50°N, the signal is polluted by the positive climate trend. See MSLP for further analysis.



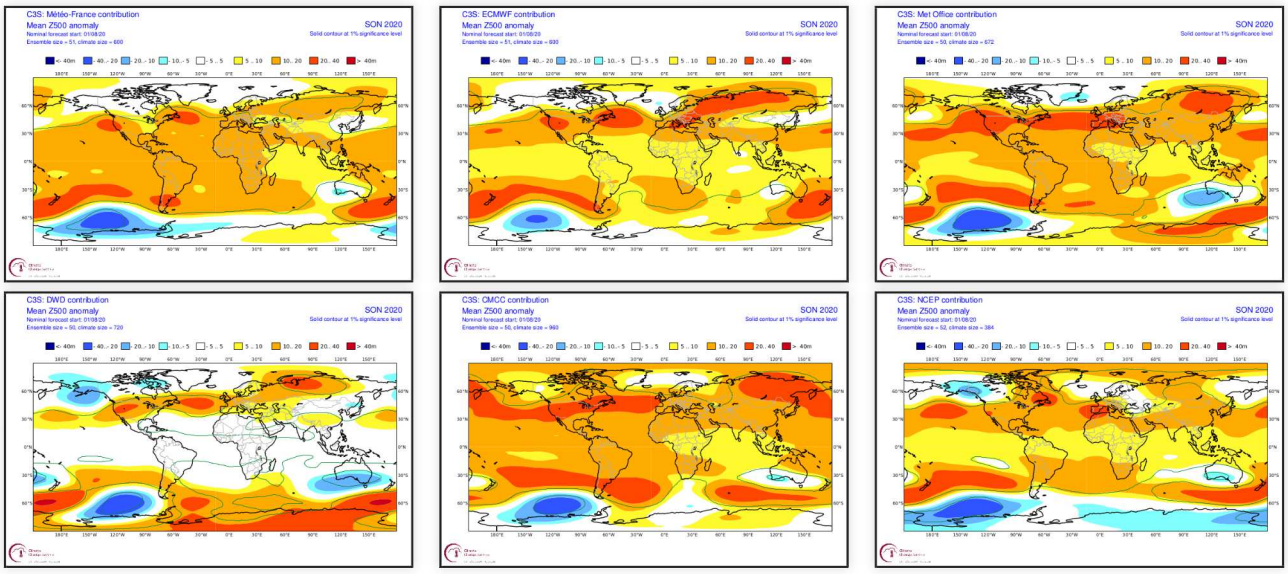


polar projection of MF7 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

Over North Atlantic and Europe, patterns are fairly consistent, with high values from Quebec to northern Russia via the western Mediterranean basin. Low values are expected over the far north of the Atlantic with a more or less pronounced extension towards Scandinavia. An important difference : the zonality close to Europe. The patern is very zonal in two models (UKMO and CMCC), whereas the other three have a meridian component.

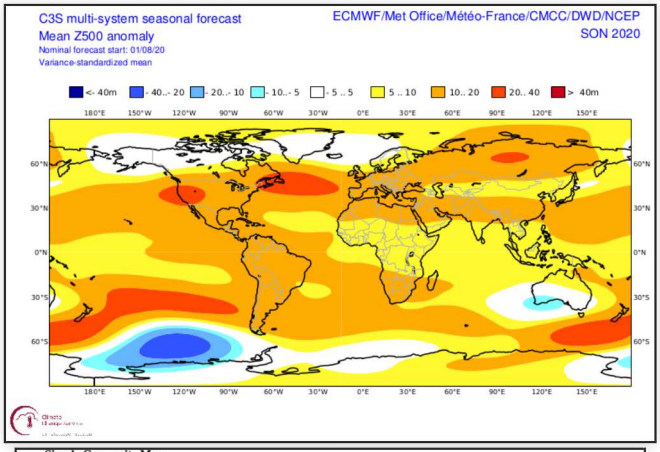
The relative weakness on the Indian Ocean and Central Asia is foreseen by all models.

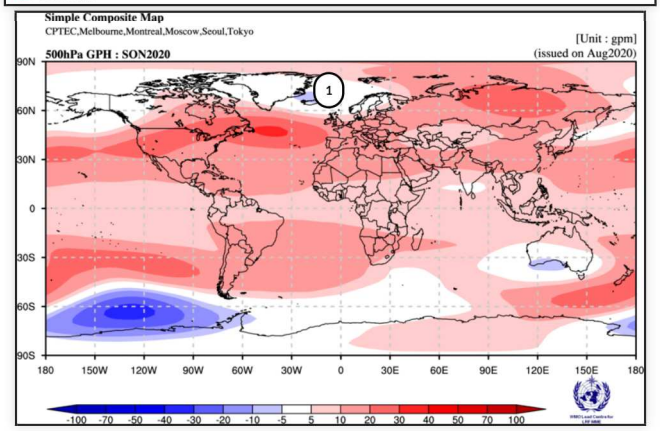


MF-S7, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

Consistent general scheme particulary on North Atlantic circulation.



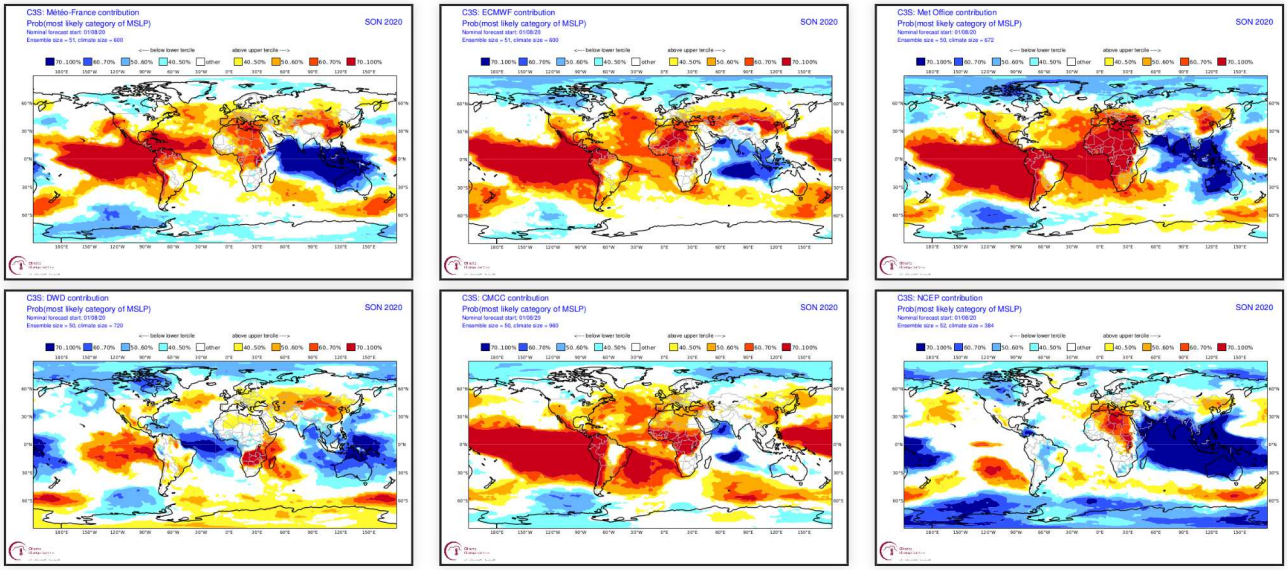


1 - Forecast close to the C3S multimodel

Atmospheric circulation forecasts : MSLP probabilities

Strong dipole between the Indian Ocean and the Pacific is the tropics, in links with the VP200 anomalies.

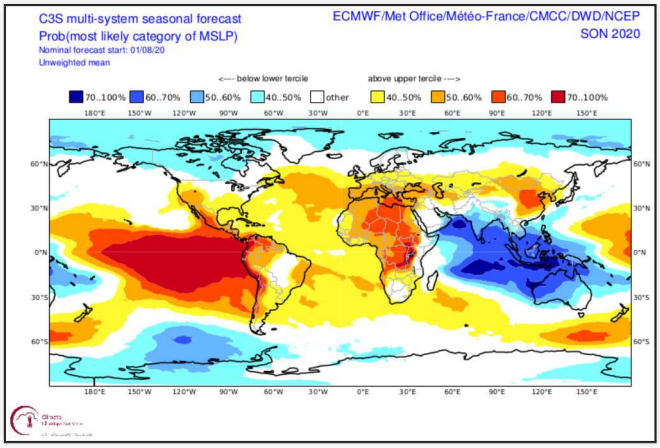
Most models forecast a positive anomaly accross North Atlantic extending to the soutwest of Europe. And a negative anomaly over Scandinavia.



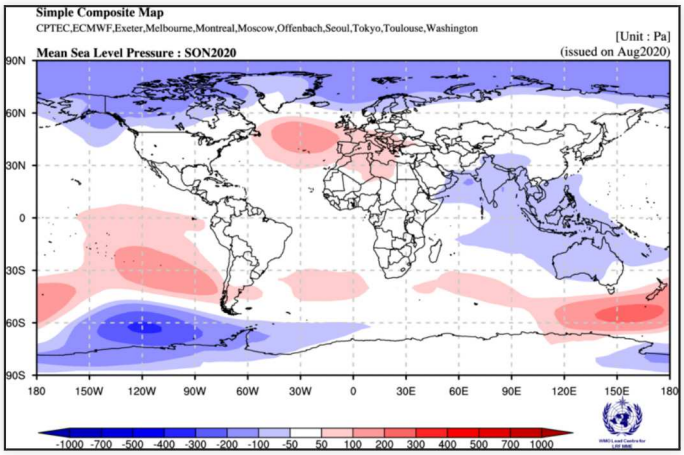
MF-S7, SEAS5, UKMO, DWD, CMCC and NCEP models probability maps.

Atmospheric circulation forecasts : MSLP probabilites multi-systems

Fairly good agreement between the two multi-models. On the North Atlantic, the pattern is very close to the Summer Zonal weather regime.



C3S multi-models.

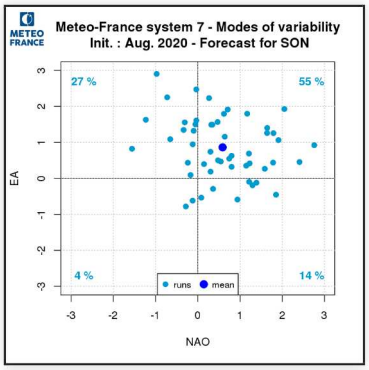


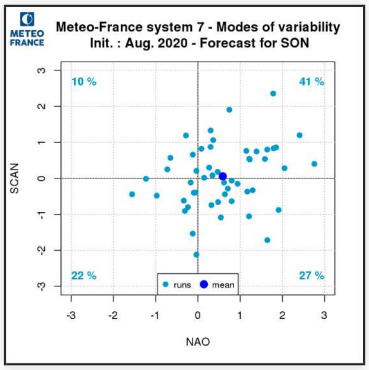
Others models of WMO multi-models.

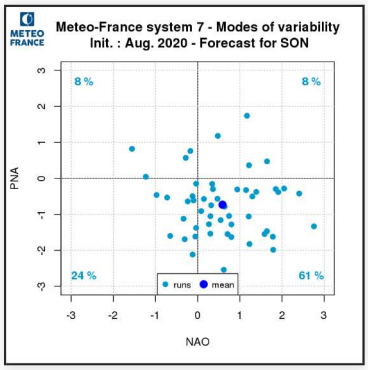
Modes of variability : forecast

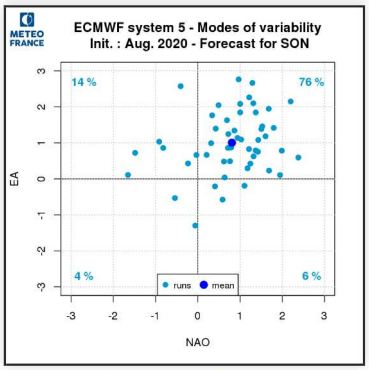
Both models suggest a high probability of positive NAO mode and positive EA mode, and negative PNA

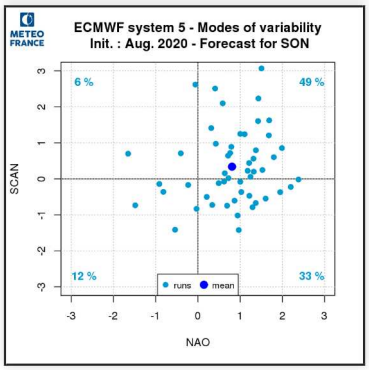
Note that these signals are partly linked to the climate change trend.

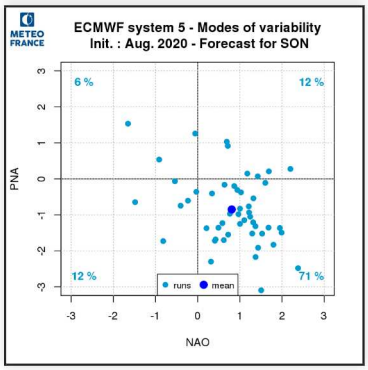








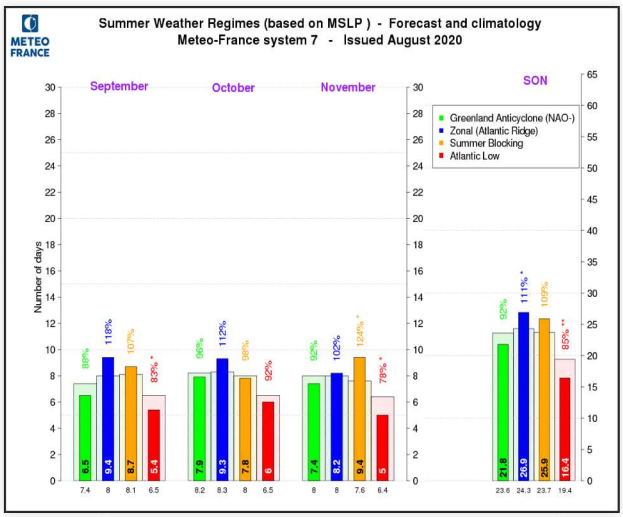


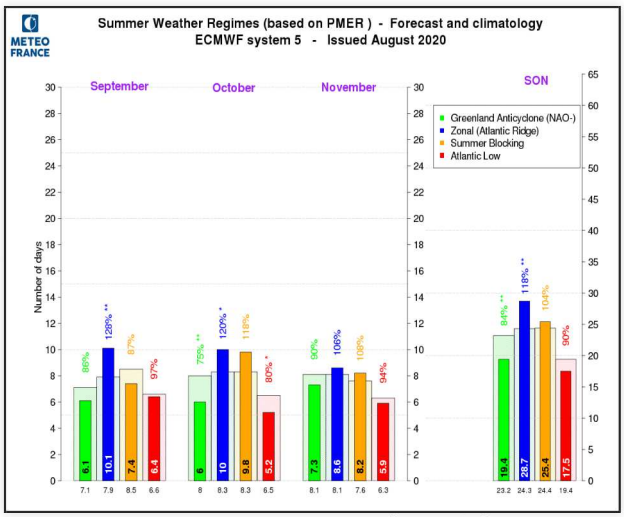


see the modes of variability patterns

Weather regimes : summer MSLP

Both models foreseen higher frequencies for the Zonal regime, this is the most significant signal (consistent with the 3-month mean of MSLP). This is what we have observed in July.

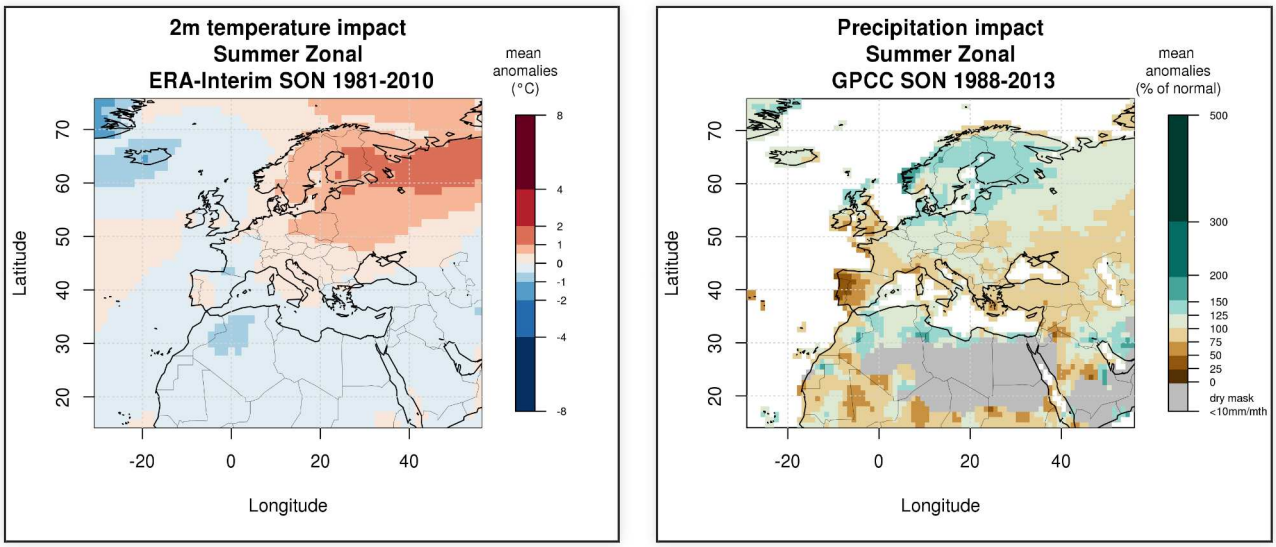




Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S7 (left) and SEAS5 (right).

Weather regimes : Impacts

Summer Zonal weather regime is favored



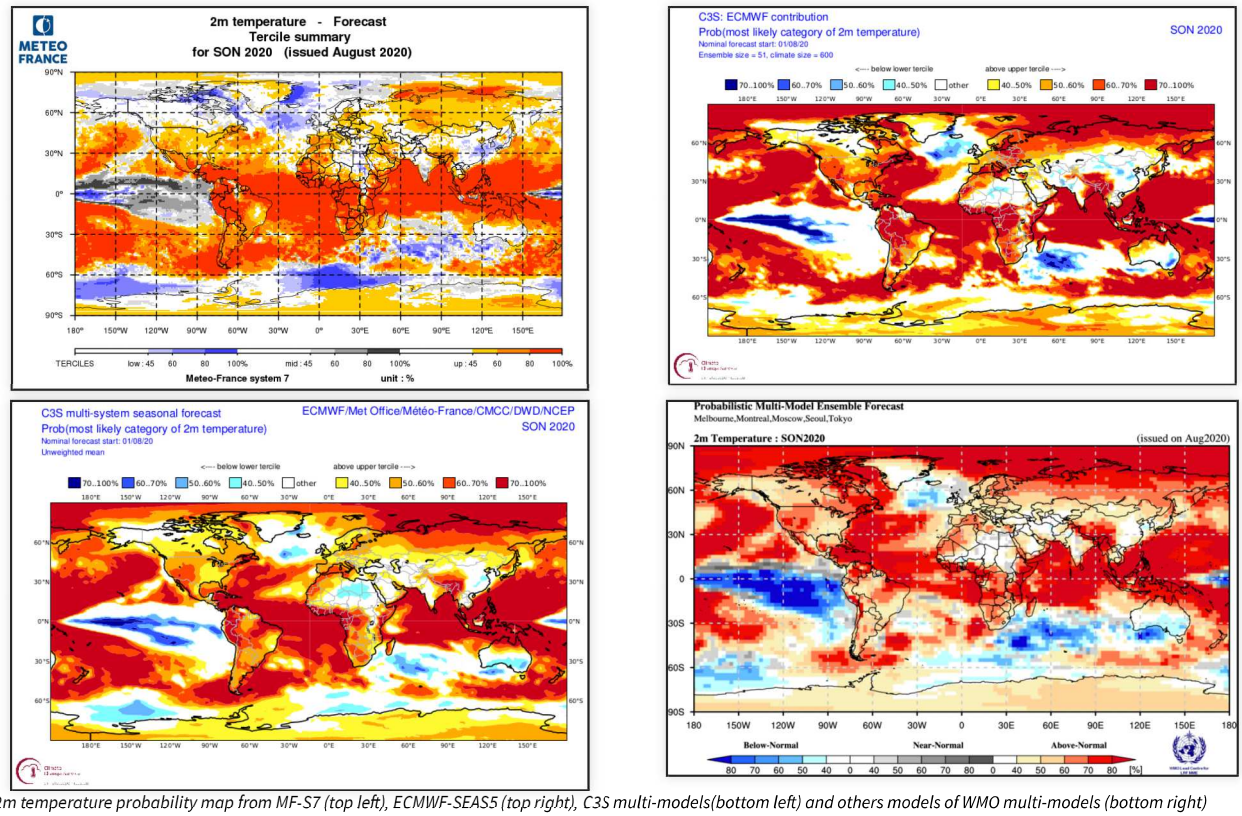
Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

NB : in many continental regions, positive anomalies are linked to climate change.

Quite good consistency between models.

The neutral or negative anomalies over South Australia and over Asia are linked to the circulation induced by IOD- and La Niña.

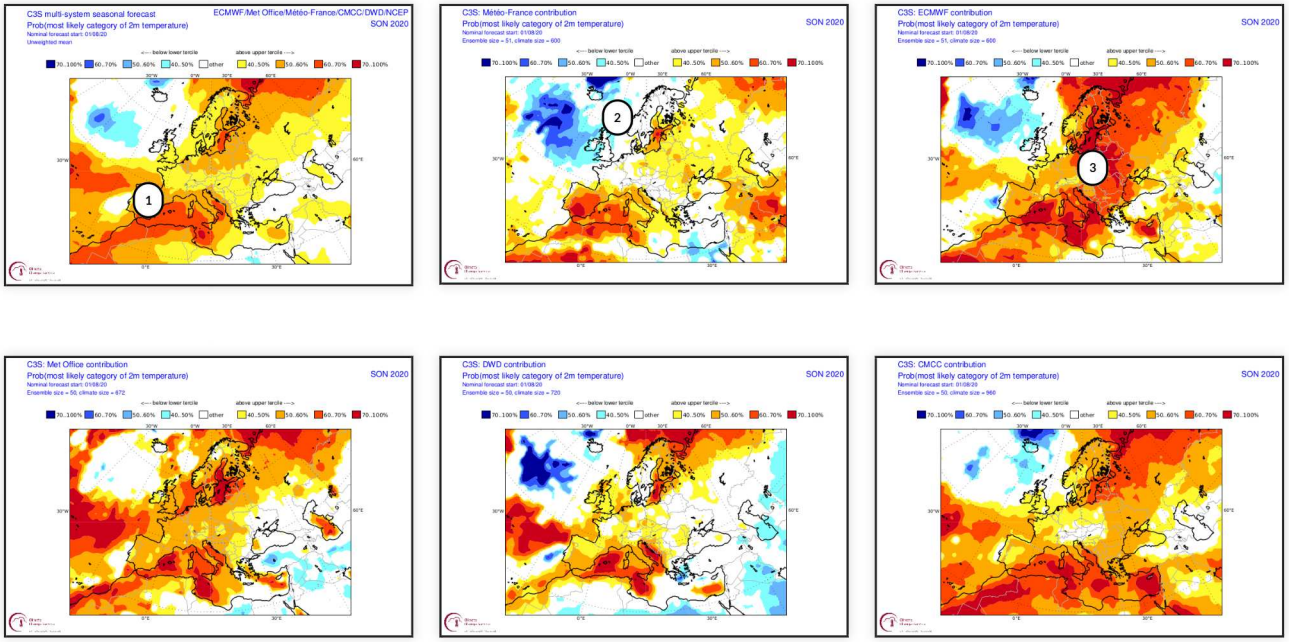


2m temperature probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

Over Western Europe and Western Mediterranean Sea, the expected zonal circulation should limit the warm signal (except over the Iberian Peninsula).

Over Central Europe and Scandinavia, models are quite different.

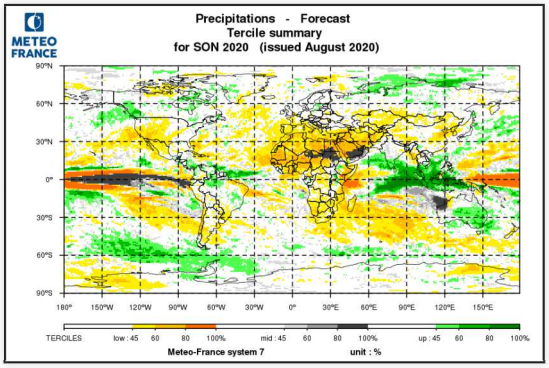


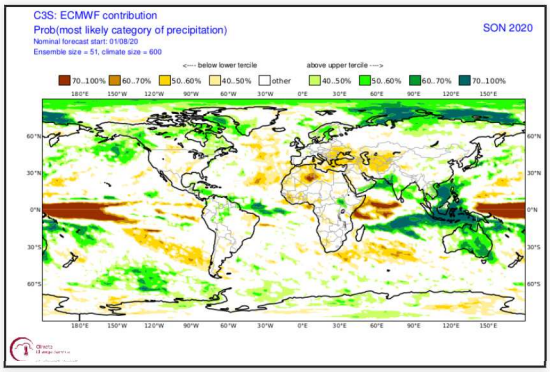
C3S multi-models probability map (top left) and MF-S7, ECMWF-SEAS5, UKMO (bottom left), DWD, CMCC models.

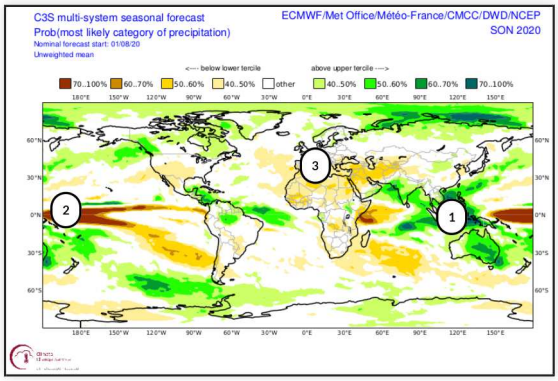
1 - Good consistency for a warm signal over South Western Europe and Western Mediterranean Sea
2 - Strong North-South contrast over Europe with MF-S7
3 - ECMWF-SEAS5 has the highest probability of warm conditions over Central and Northern Europe

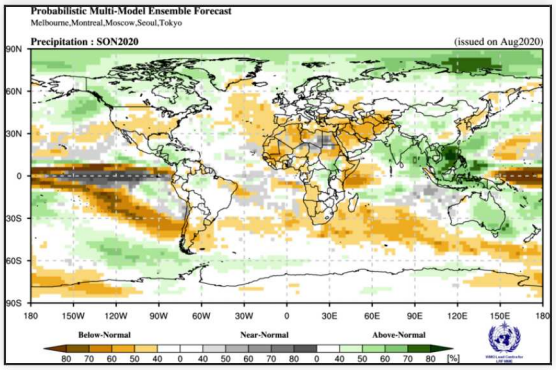
Forecast of climatic parameters : Precipitation

Good consistency of models in the tropical belt where the forecast is a continuation of previous months.







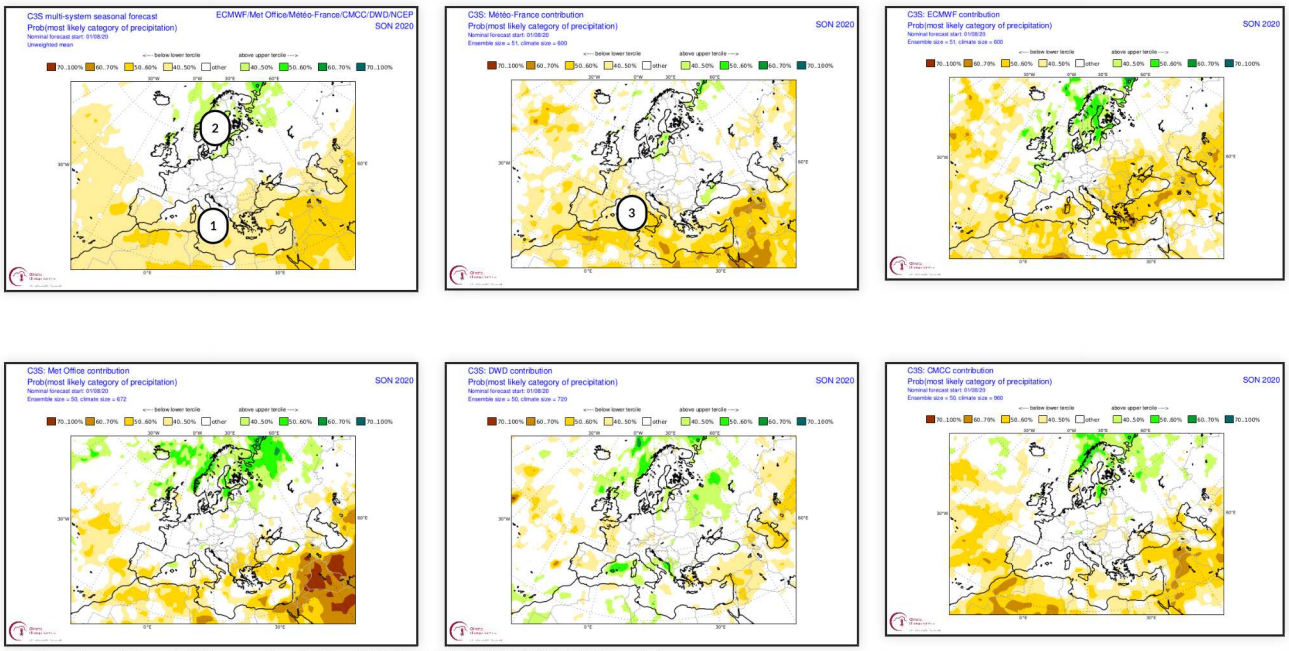


precipitation probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

1 - Strong wet signal (negative IOD)
2 - Dry signal linked to the Nina
3 - dry signal in a majority of models

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

The models agree on a drier than normal scenario for the Mediterranean area. Good consensus on the wet probability over Scandinavia. This is a typical response to the Zonal regime.

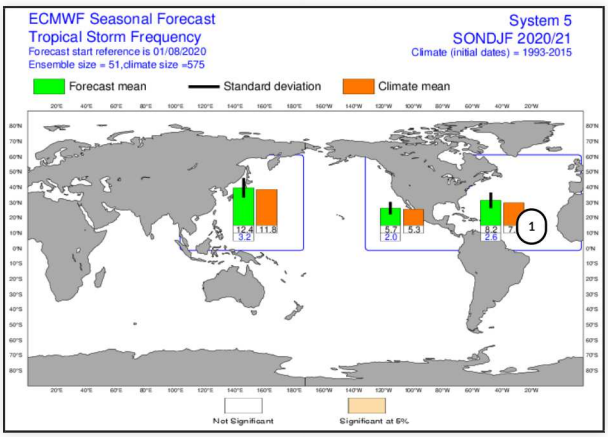


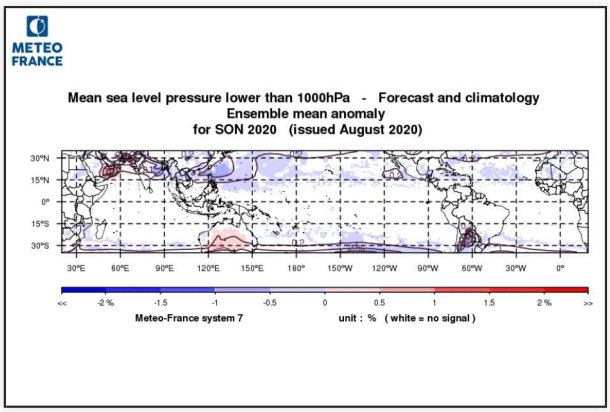
C3S multi-models probability map (top left) and MF-S7, SEAS5, UKMO, DWD, CMCC models.

1 - large-scale dry signal
2 - weak wet signal
3 - MF-S7 has the driest scenario on Mediterranean basin

Forecast of climatic parameters : Tropical Storm Frequency

In the Atlantic cyclone season activity may be close to normal according ECMWF or less intense than normal according MF-S7. ECMWF forecasts a normal activity in the Pacific, as MF-S7 forecast a reduced activity.

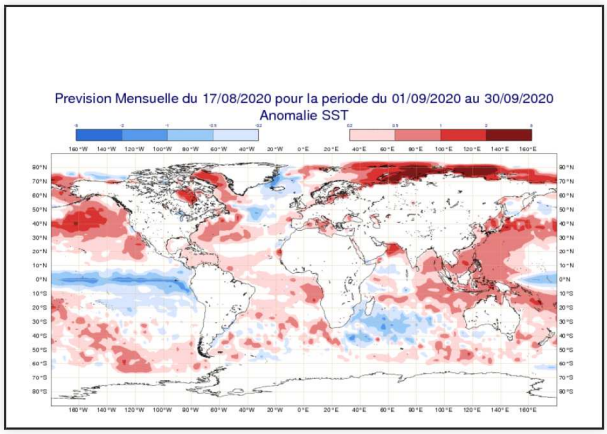


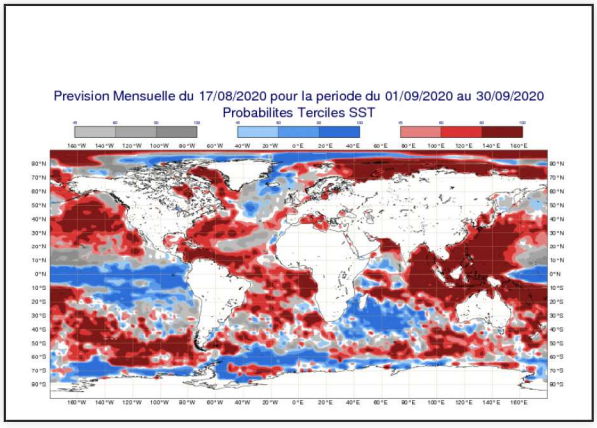


1 - close to normal

Monthly forecast of 20200817 : SST

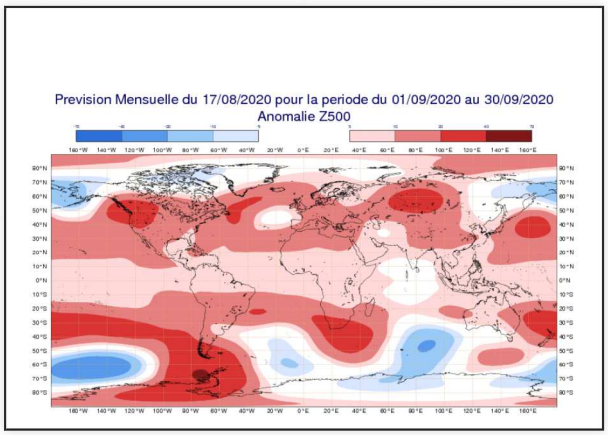
In the tropics, the monthly forecast is very consistent with the seasonal forecast.

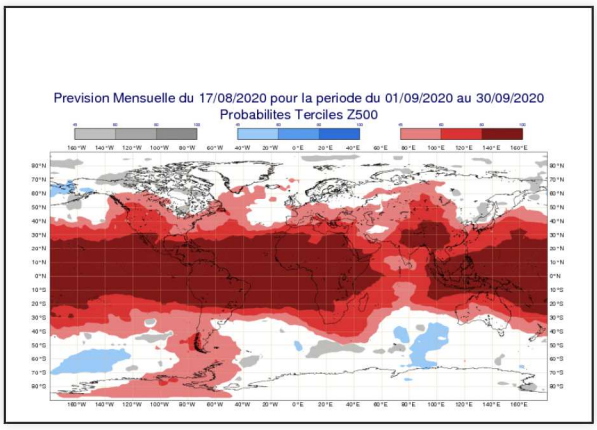




Monthly forecast of 20200817 : Z500

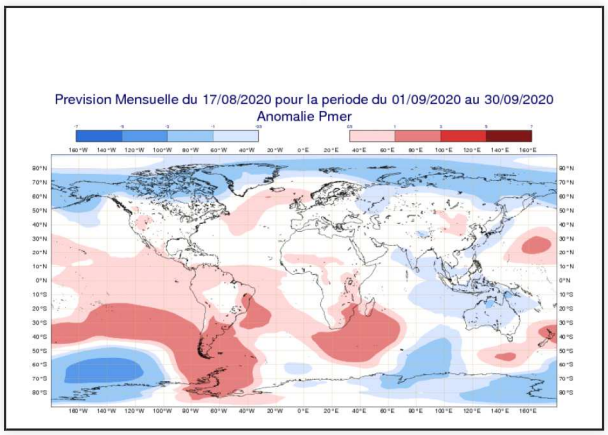
Complex pattern over North Atlantic and Europe, with gloablly positive anomalies but a relative low over near Atlantic.

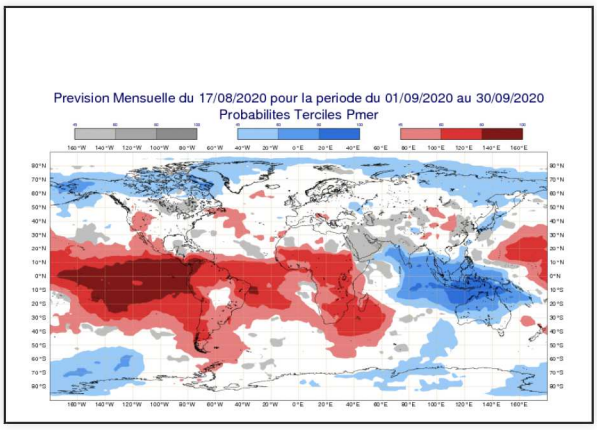




Monthly forecast of 20200817 : MSLP

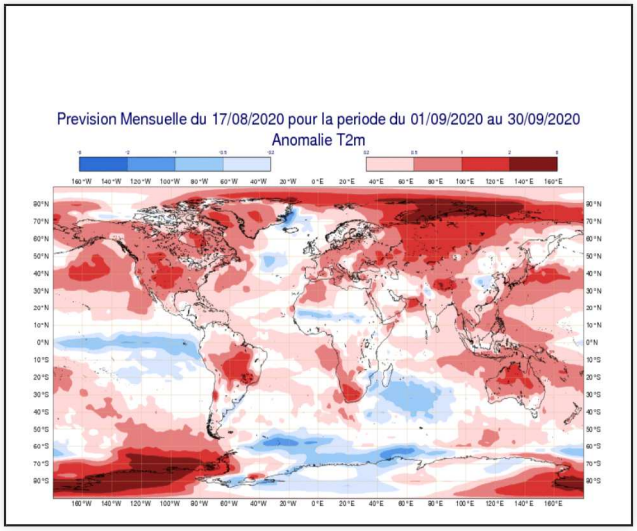
Weak anomalies

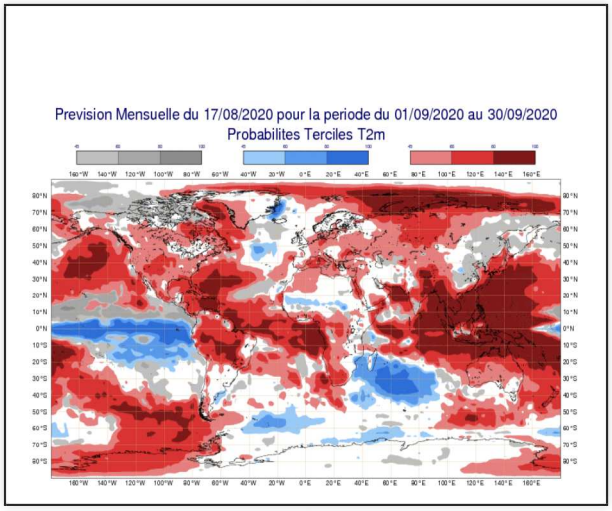




Monthly forecast of 20200817 : temperature

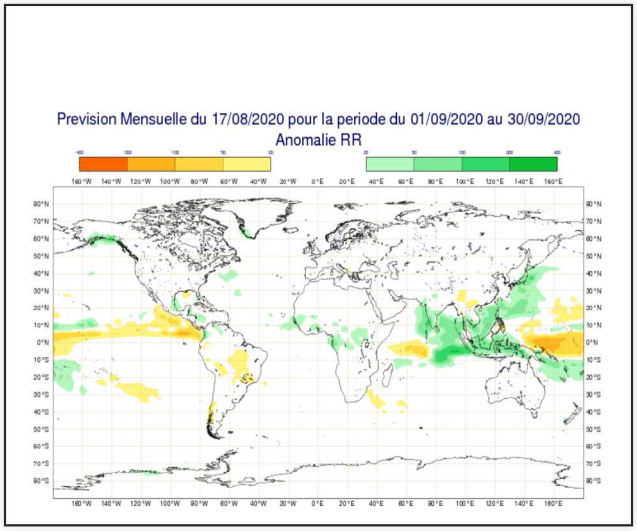
Positive signal over Europe, no signal over Scandinavia.

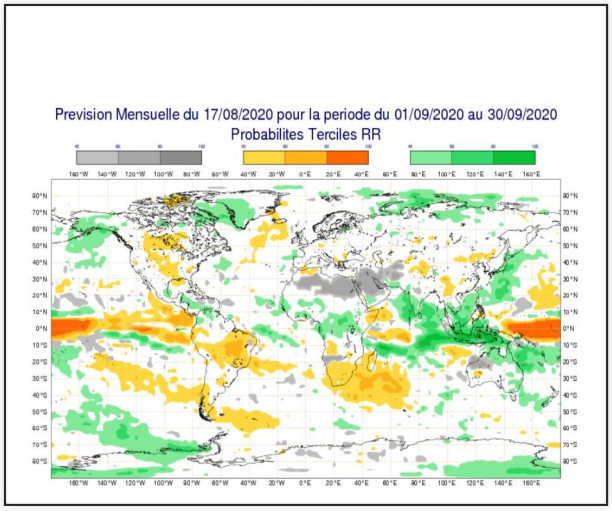




Monthly forecast of 20200817 : precipitation

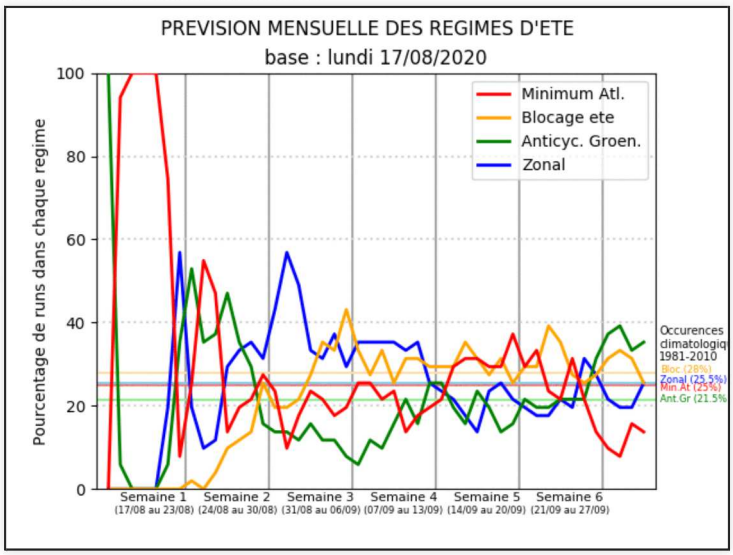
No signal.





Monthly forecast of 20200817 : summer SLP weather regimes

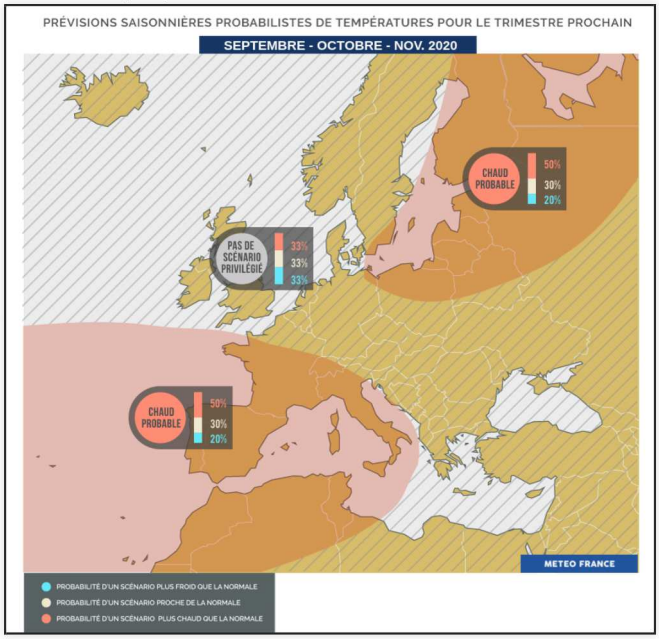
The zonal weather regime is *favored* like the seasonal forecasts



Synthesis map for Europe : Temperature

The synthesis takes into account usual impacts of the foreseen dominant regime (zonal) : warm signal in the North-East of the domain, no signal elsewhere. We have chosen to add a warm signal over Southern Western Europe and Western Mediterranean, due to predominance of anticyclonic situations over these regions.

These conclusions are consistent with the majority of models.



Synthesis map for Europe : Precipitation

The zonal regime, favoured in the forecasts, is associated with drier than normal weather over Southern Europe and wetter than normal around Scandinavia.

Globally this is consistent with the mojority of models.