

Météo-France Seasonal Forecast Bulletin

SEPTEMBER - OCTOBER - NOVEMBER 2021

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General synthesis : SON 2021

A new "La Nina" event is likely to develop in the next months, and in parallel a negative phase of the IOD. On the equatorial Atlantic, the strong positive SST anomaly would stay in place. The impacts of these forcings in terms of large scale circulation (see VP/SF 200 hPa or MSLP) are visible in all the models in the tropics. But their impacts in mid-latitude are limited. On the North Atlantic and Europe, there isn't any clear consensus between models in a privileged circulation.

A) Oceanic forecast :

- ENSO : probably a new La Niña event
- IOD : negative phase
- Equatorial Atlantic : strong positive anomaly

B) Drivers :

No drivers identified (except oceanic forcings listed above)

C) Atmospheric circulation :

- over the North Atlantic and Europe : no privileged circulation.

D) Most likely conditions :

- **West African Monsoon** : wet signal on the coastal countries
- **over Europe and the Mediterranean Basin** : warm tercile privileged over the Mediterranean Basin, North of Africa and Middle East .
Dry tercile privileged in the South-Eastern part of the domain

Next bulletin : scheduled on September 20nd

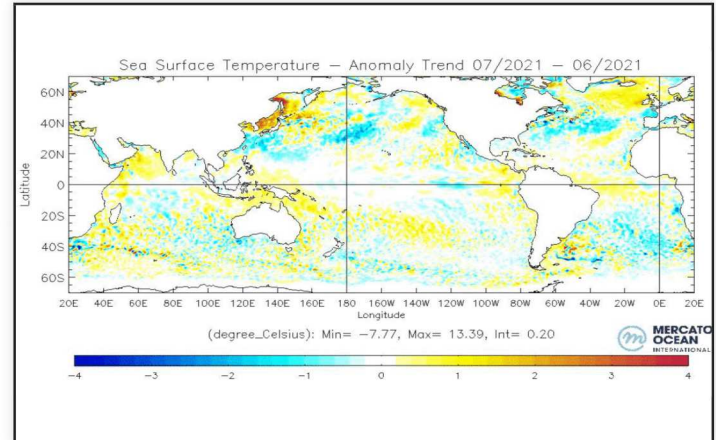
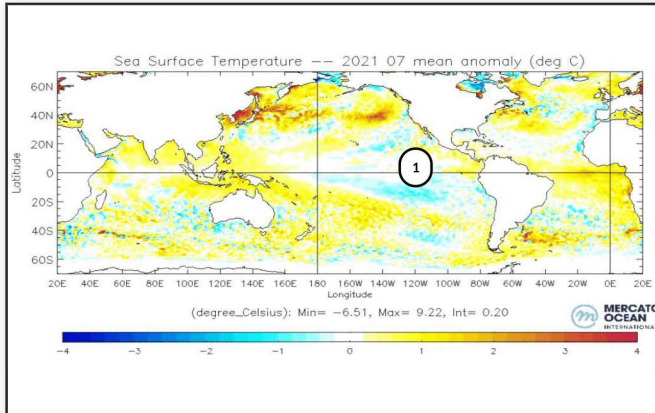
Oceanic analysis of July 2021 : SST anomalies

Current ENSO situation : neutral conditions

In the Pacific Ocean : a slight cold anomaly persists in Central Pacific. In the North hemisphere, the warm anomaly is weakening.

In the Indian Ocean : warm anomalies on the eastern side of the basin and around the Maritime Continent, and near normal to the west.

In the Atlantic Ocean : strong positive anomalies along the equator. In the Northern hemisphere, the large positive anomaly pattern between 20°N and 45°N has weakened.

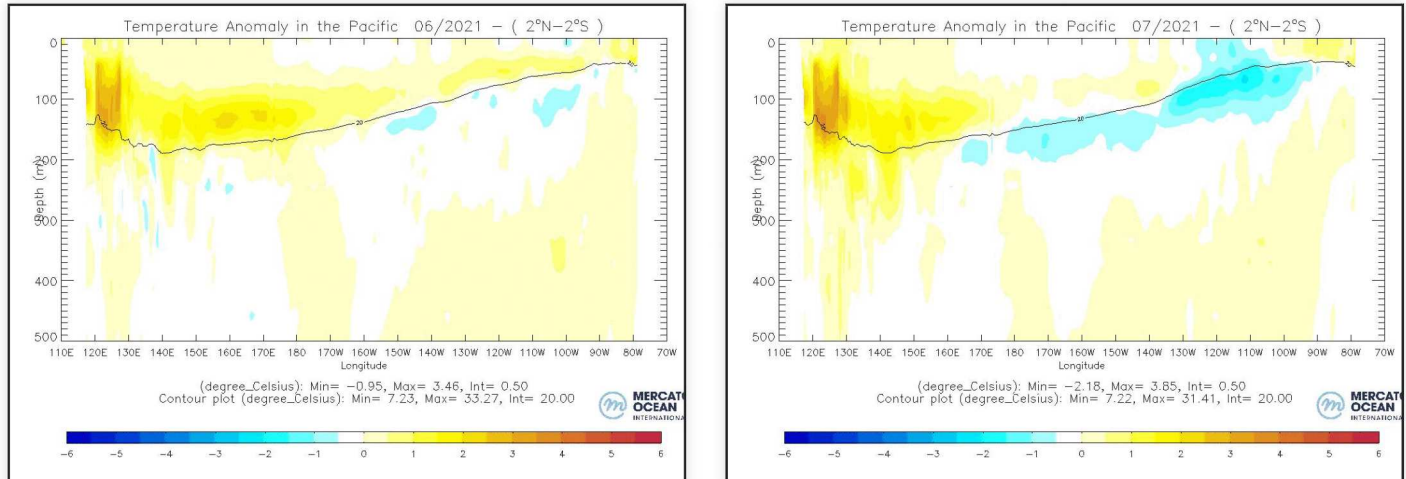


SST Anomalies and trend with the previous month (c) Mercator-Ocean

1 - Close to neutral conditions

Oceanic analysis of July 2021 : Pacific vertical section

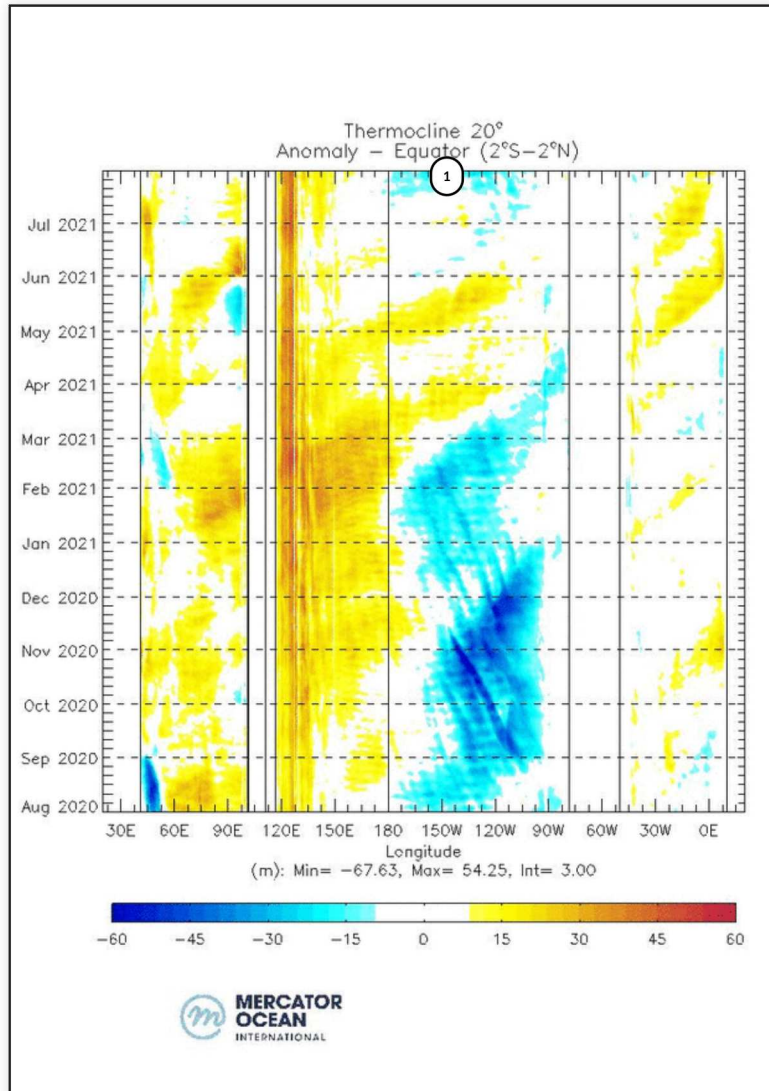
In subsurface, a cold anomaly has appeared in the Eastern part of the basin.



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

Oceanic analysis of July 2021 : Hovmöller diagram of the 20°C isotherm

In the Pacific Ocean, the thermocline has risen in the central-east Pacific.



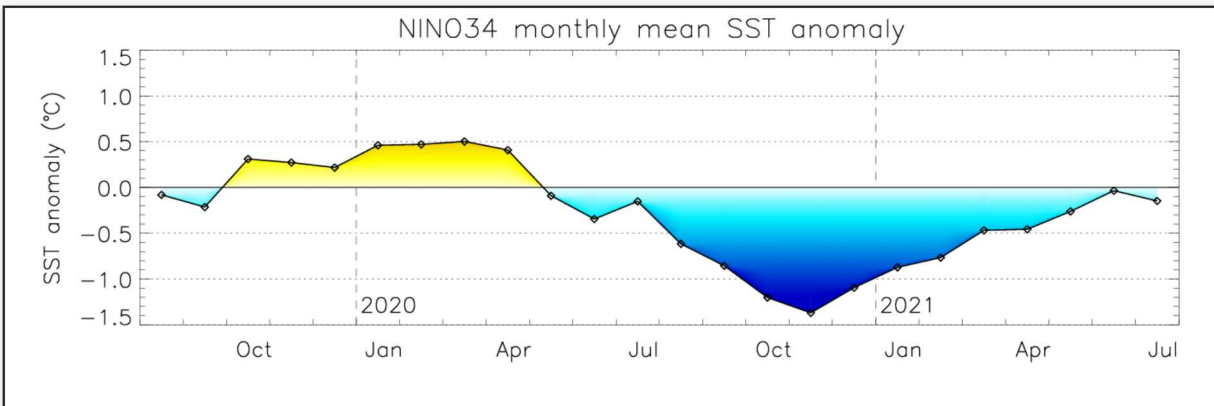
Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 °C isotherm) (c) Mercator-Ocean

1 - Reemergence of the thermocline in central Pacific

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

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : close to 0°C

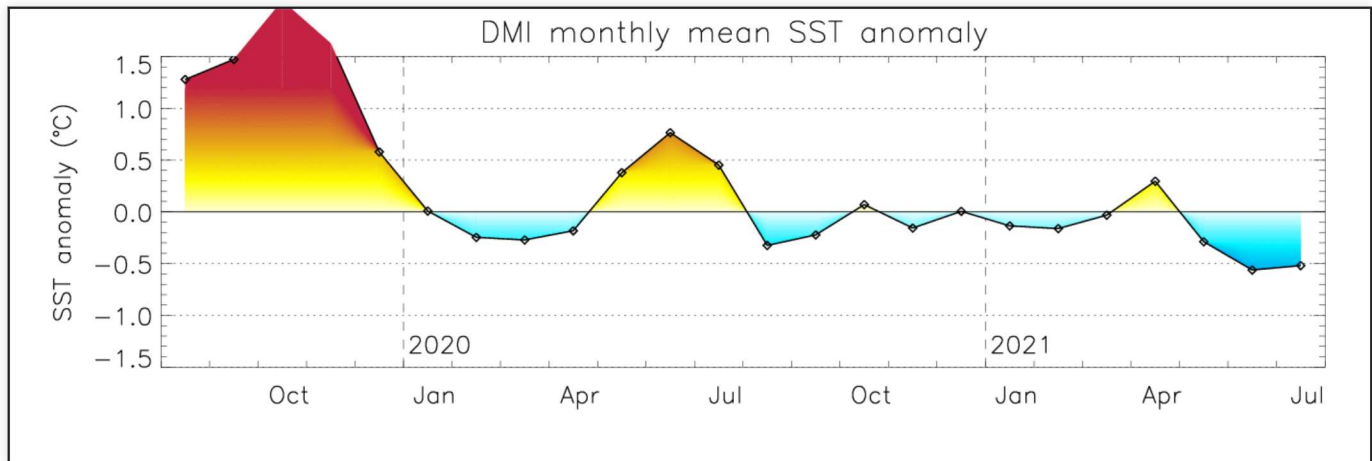
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

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

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.5 °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

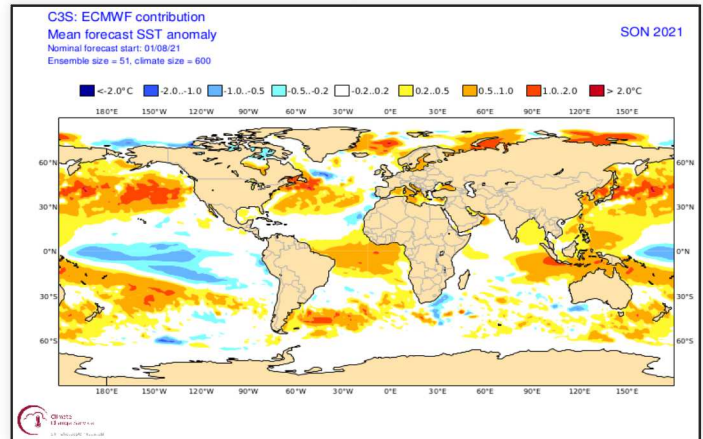
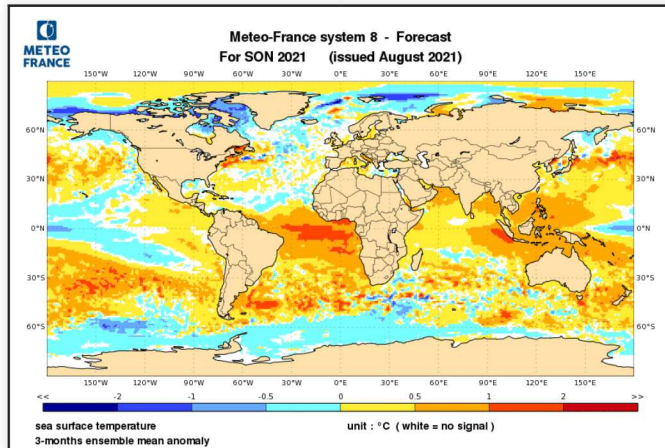
Oceanic forecast : SST anomaly

Good agreement between MF-S8 and ECMWF-SEAS5 in all oceans.

In the Pacific Ocean : the cold anomaly pattern associated to La Niña is resuming in the forecasts, more clearly in ECMWF-SEAS5. Good agreement on the warm anomaly patterns in mid-latitudes (Northern and Southern hemisphere).

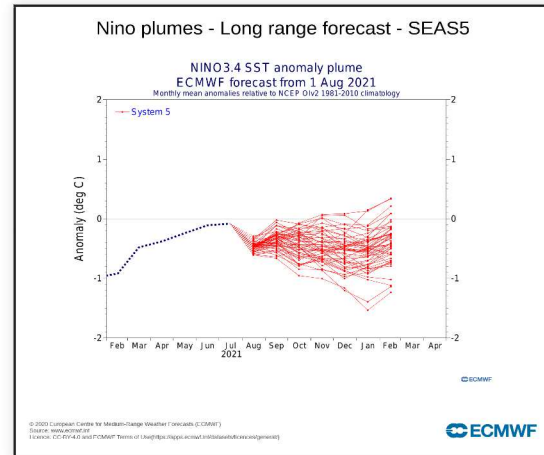
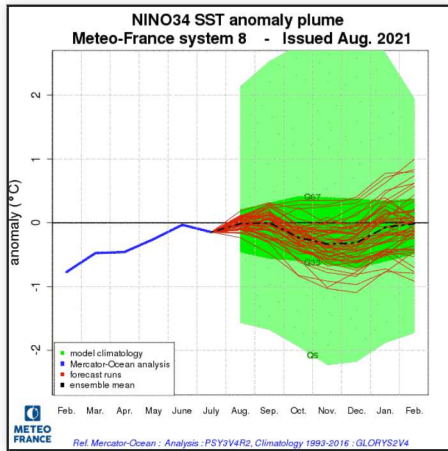
In the Indian Ocean : Predominance of positive anomalies in the Eastern part of the basin. MF-S8 is warmer in the Northern regions.

In the Atlantic Ocean : Persistence of a large and strong warm anomaly along the equator. North of 60°N, MF-S8 is significantly colder than ECMWF-SEAS5.



Oceanic forecast : NINO3.4 Plume diagrams

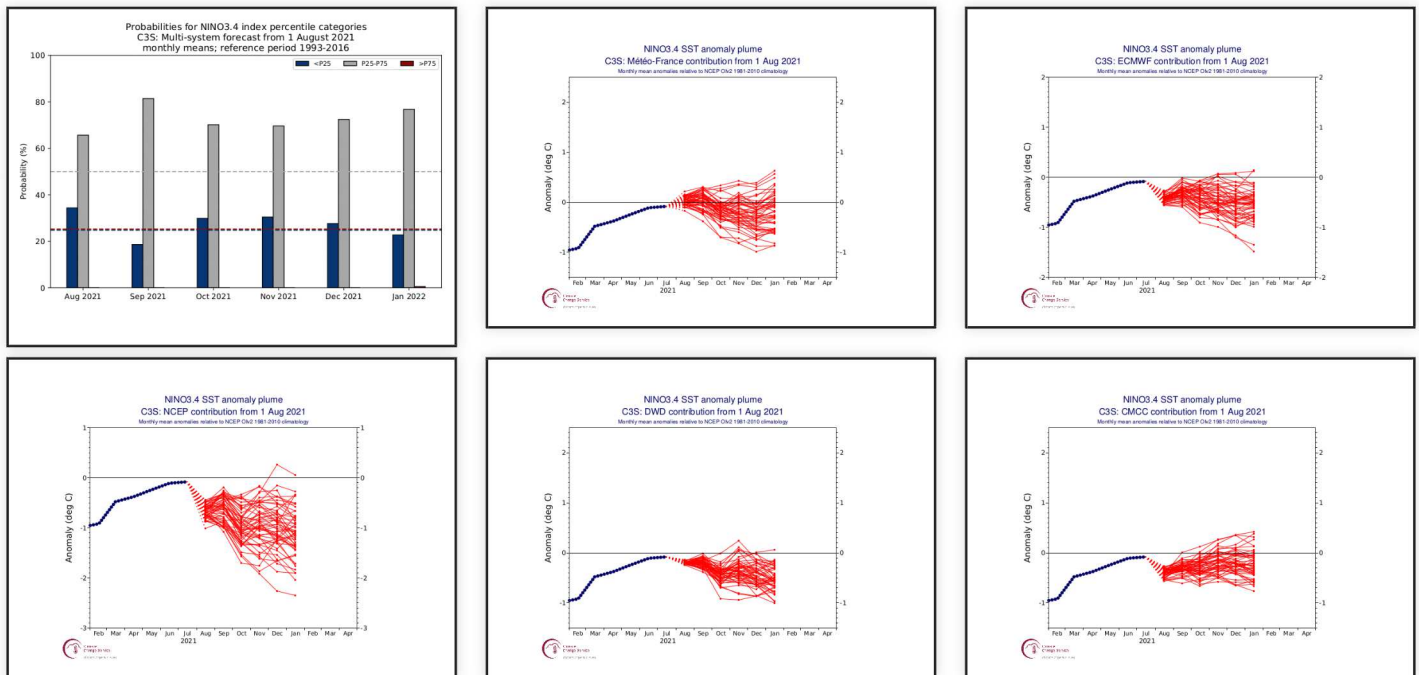
ECMWF-SEAS5 and MF-S8 : both models similarly forecast a cooling trend in the next months. Low spread, the most likely category is neutral, but significant probability for La Nina conditions.



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

All the models agree on near normal or negative conditions. Only one model (NCEP) to evolve toward a moderate to strong La Nina event.

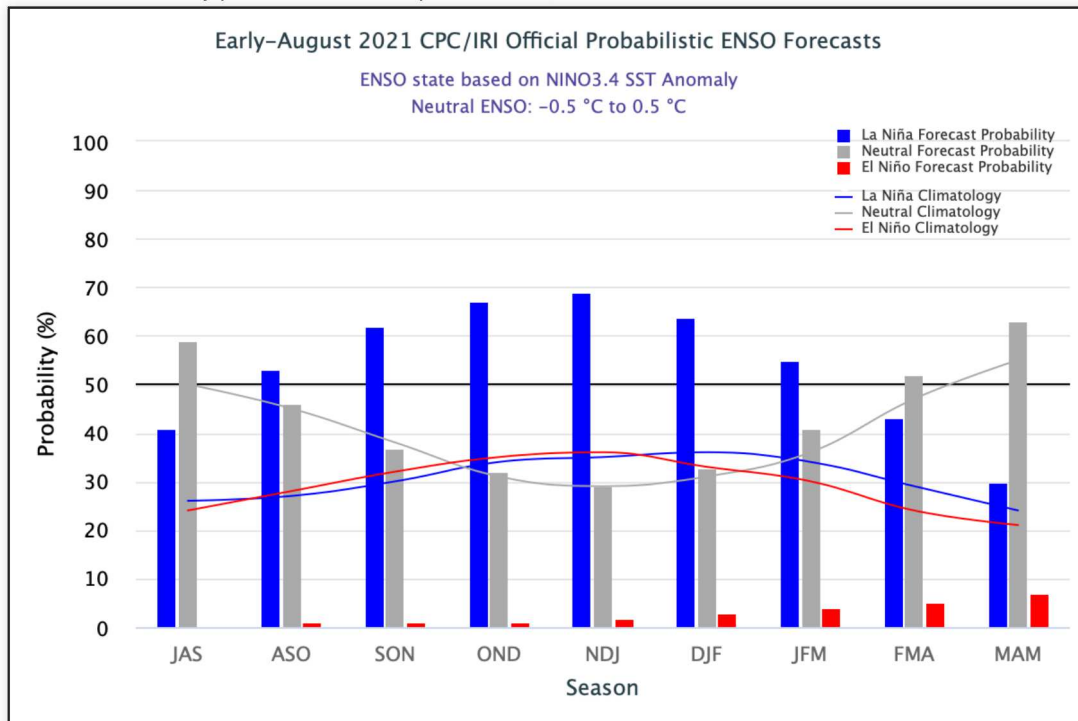
Because of the SST pattern in the Pacific, and despite the Nino3.4 probability forecast emphasises a neutral phase (see barplots on top left), **the most likely phase for the next three months : weak La Niña.**



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

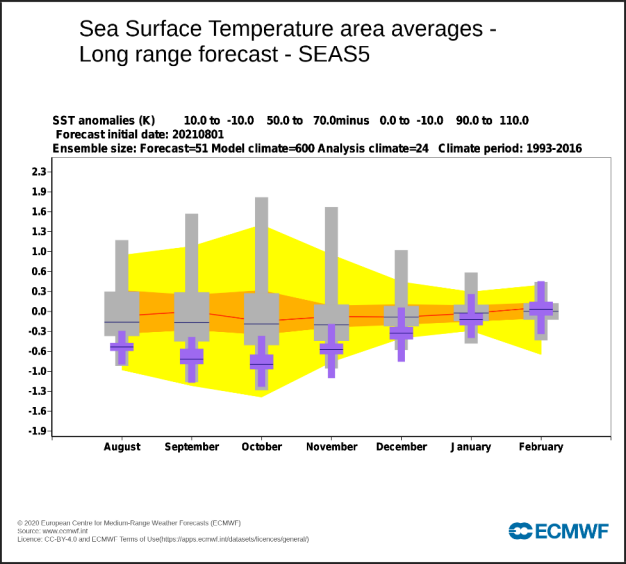
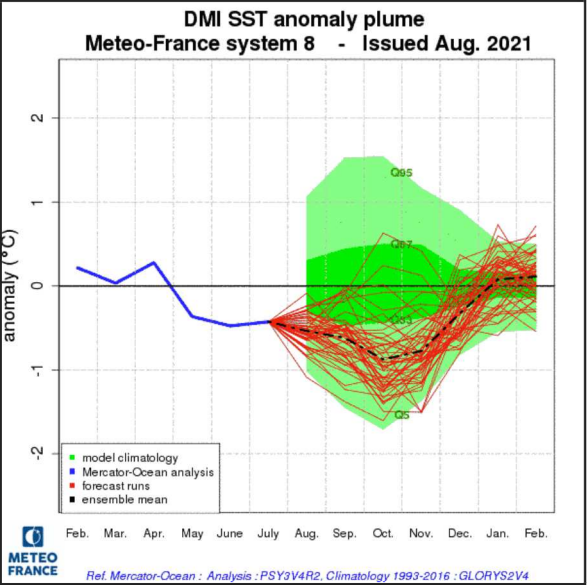
For IRI, "La Nina" is the most likely phase for the next quarter



Probability of Niño, Niña, and neutral phases for the next 8 quarters. source <http://iri.columbia.edu/our-expertise/climate/forecasts/ens0/current/>

Oceanic forecast : Indian ocean - DMI evolution

Good agreement for strong negative values (compared to climatology) in the next months.

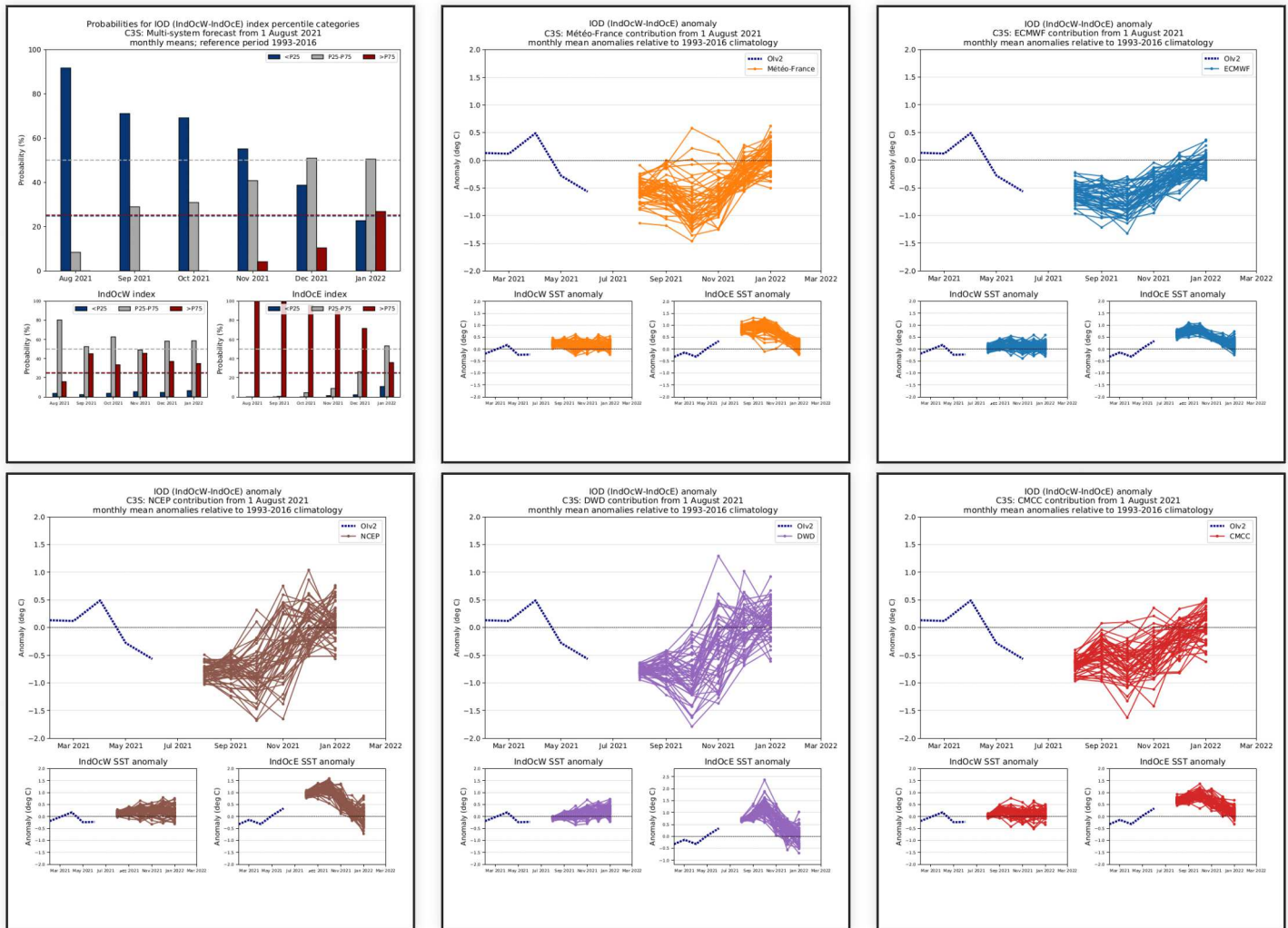


DMI index : analysis, forecasts and model climatology with MF-S7 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

Good agreement between C3S models for a negative phase of the Indian Ocean Dipole.

Expected Phase for the next three months : negative.

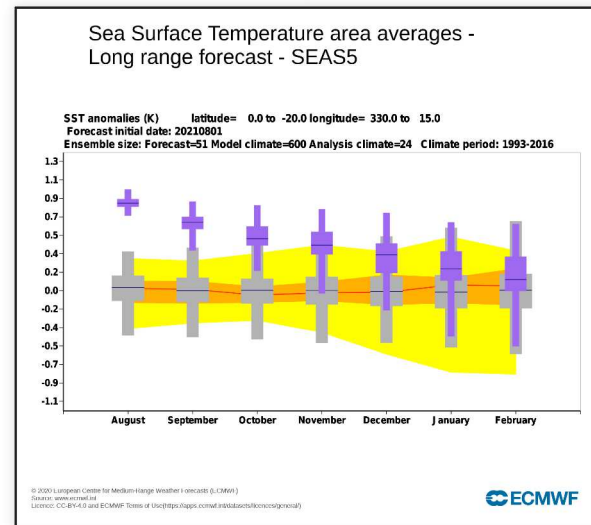
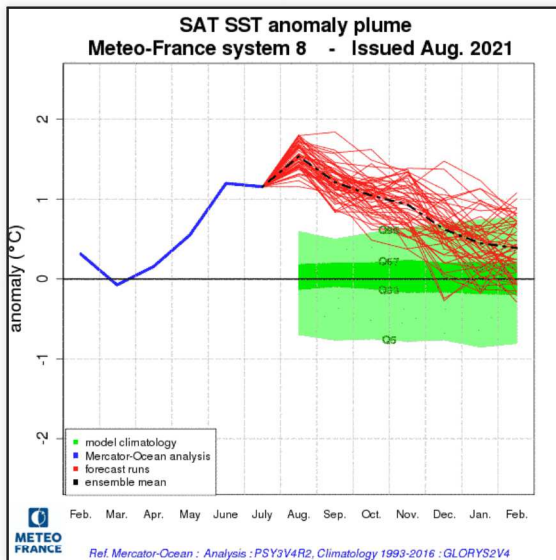


C3S multi-system probability forecast (top left figure) and C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

Oceanic forecast : Atlantic ocean - SAT evolution

The strong warm anomaly persists beyond the next quarter.

The TASI ([see here MF-S8](#)) would then be significantly negative, a factor that is favourable to rainfall in coastal countries (north of Gulf of Guinea) and unfavourable to the activity of the west African monsoon in the Sahel.



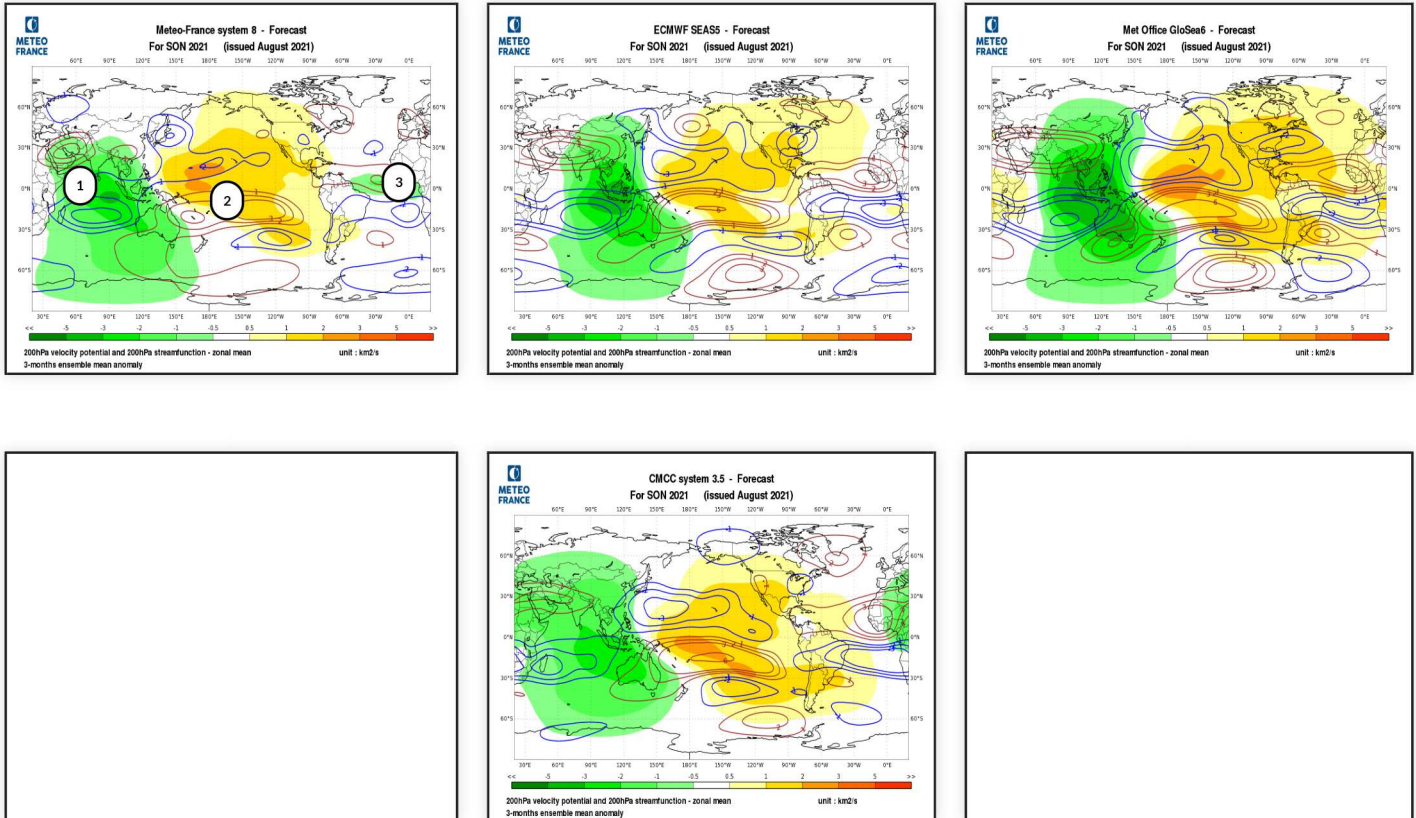
Anomaly on the SAT box : analysis, forecasts and model climatology with MF7 on the left and SEAS5 on the right

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

Good agreement between models in the tropics, low signals in mid latitudes of the northern hemisphere.

Velocity Potential : clear dipole pattern in the models corresponding to a "La Nina" response. That means a downward motion anomaly over the Central/East Pacific and an upward motion anomaly over the Maritime Continent extending to the Indian Basin. Over Africa and equatorial Atlantic, weak and contradictory signals between models : one could expect a negative anomaly (upward anomaly motion) due to the strong positive SST anomaly, but only MF-S8 clearly forecasts this scenario.

Streamfunction : clear dipoles on both sides of the equator over each basin. However the signal seems to be mostly trapped in the tropics. There is maybe a trace of teleconnexion toward mid-latitudes along the Eastern coast of America up to North-West Atlantic. Another point of agreement : the positive anomaly covering Middle East and extending over the Eastern Mediterranean Sea.



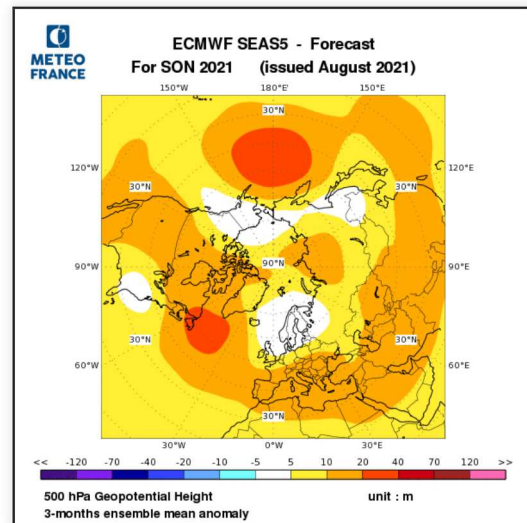
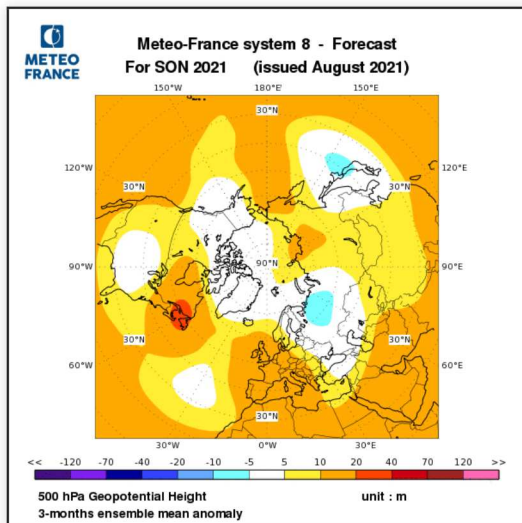
MF8, SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange : subsidence) and stream function anomalies (isolines, red : anticyclonic in the northern hemisphere, blue : cyclonic in the northern hemisphere).

- 1 - VP : large area of upward motion anomaly
- 2 - VP : downward motion anomaly related to La Nina
- 3 - VP : upward motion anomaly in MF-S8

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

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

The anomaly patterns are globally in phase, except over West Atlantic and Europe.

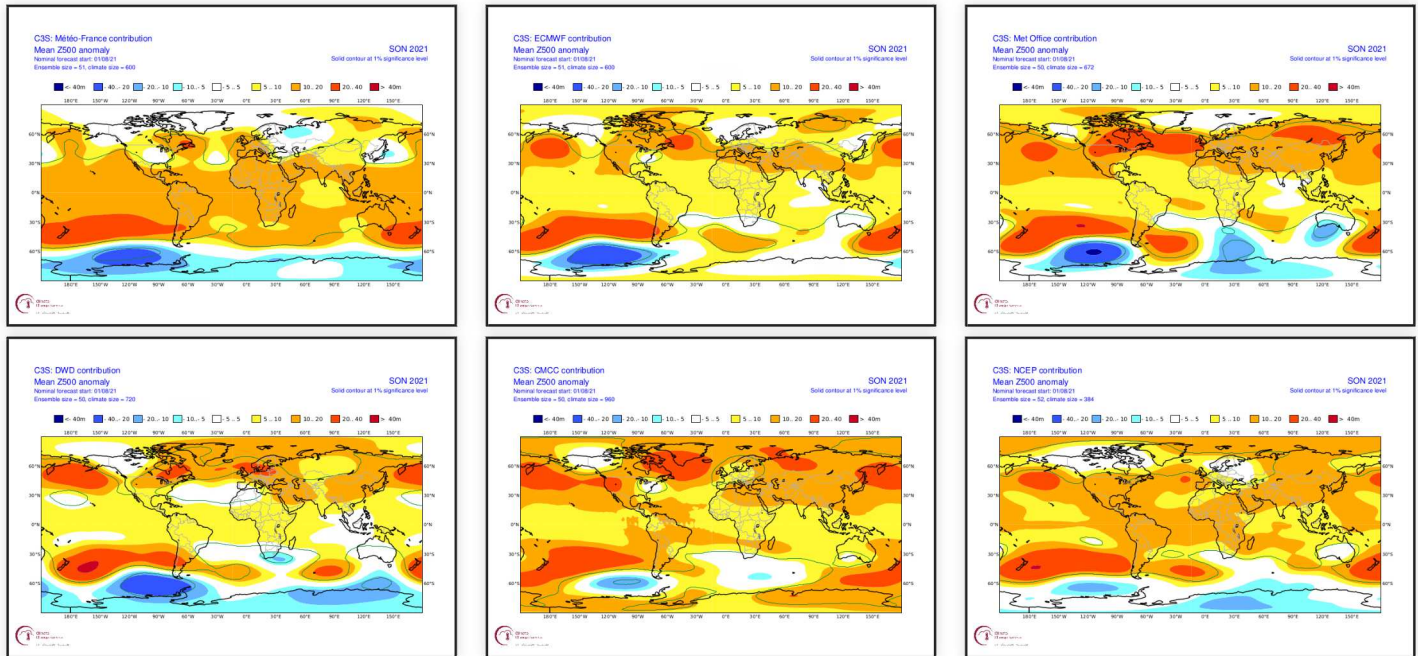


polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

On North America most models highlight a dipole of anomalies : negative over Alaska and positive around Quebec.

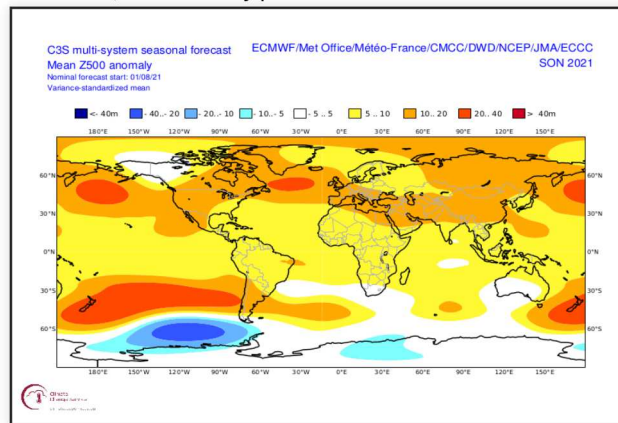
Over North Atlantic and Eurasia the forecasts are different from one model to another.



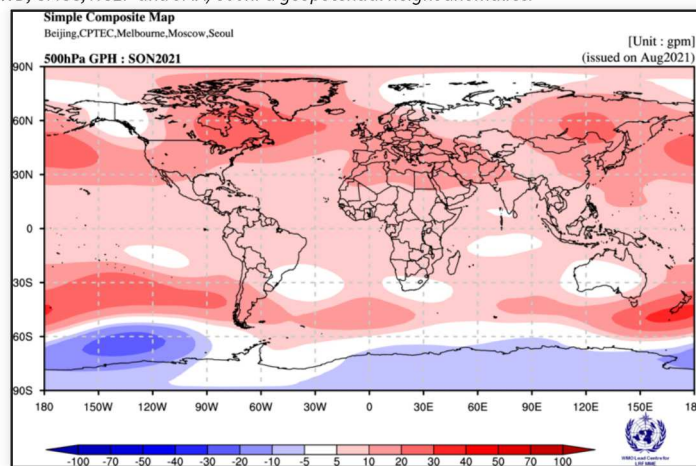
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

Over North America, a PNA- pattern is visible in both multi-model charts. It is extended by a positive anomaly over North-West Atlantic. From Eastern North Atlantic to Eurasia, the anomaly patterns are less marked and shifted from one model to another.



C3S multi-models (MF-S7, SEAS5, UKMO, DWD, CMCC, NCEP and JMA) 500hPa geopotential height anomalies.

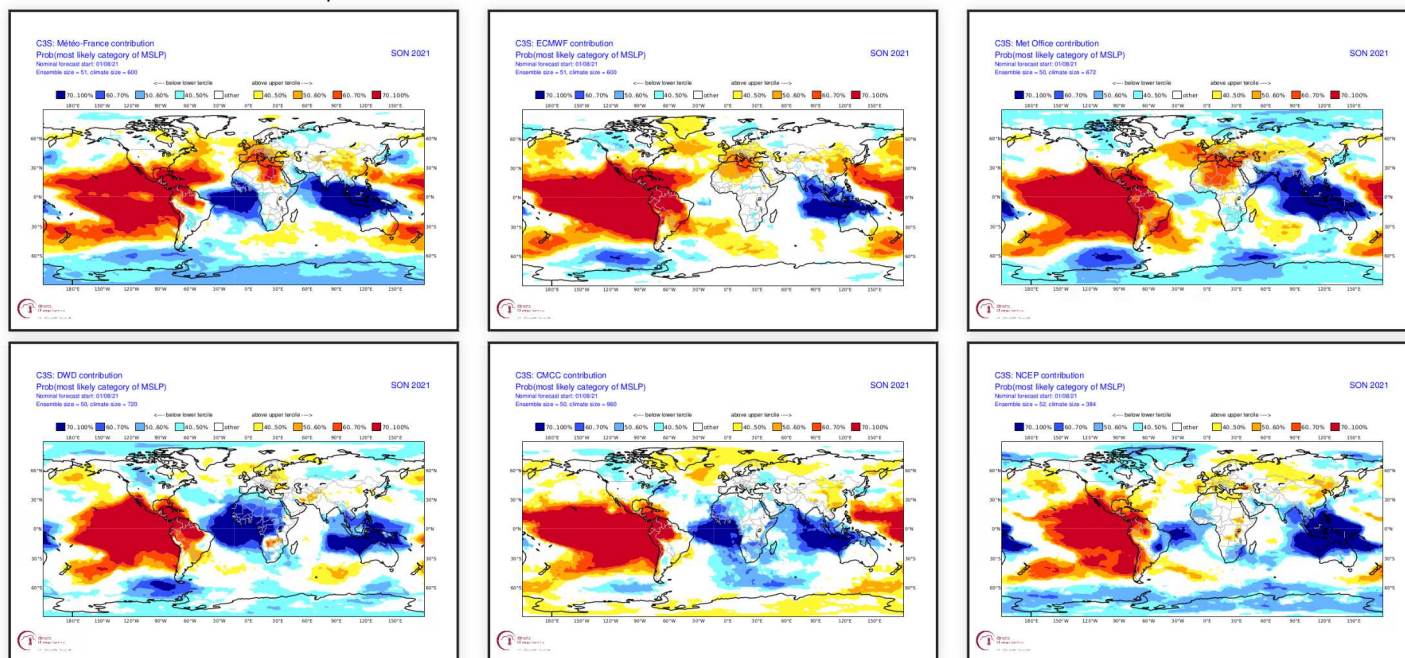


Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilities

In the tropics, in link with SST and VP200 anomalies, strong probability signals : the highest tercile is almost certain accross the Pacific up to Central America and North of South America. In the Eastern part of the Indian Ocean, over West Africa and across the equatorial Atlantic, the lowest tercile is highly probable but the patters differ from one model to another.

In the North Atlantic and over Europe, there is no clear consensus. The most frequent signal is positive MSLP anomalies from the Canadian Eastern coasts Europe and over the Mediterranean Basin.

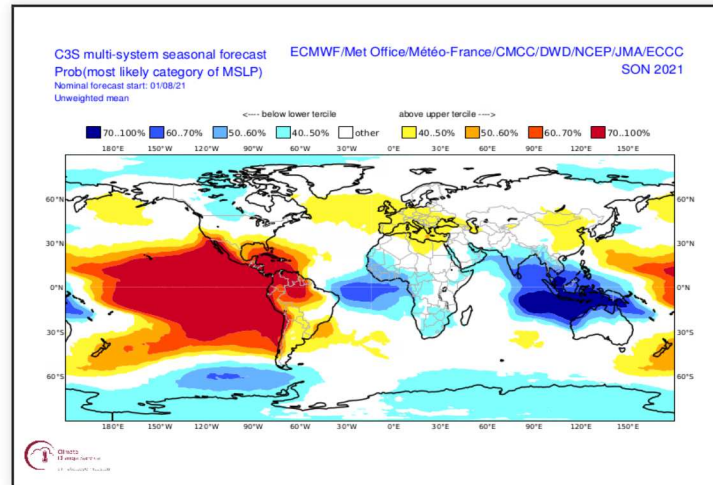


MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP models probability maps.

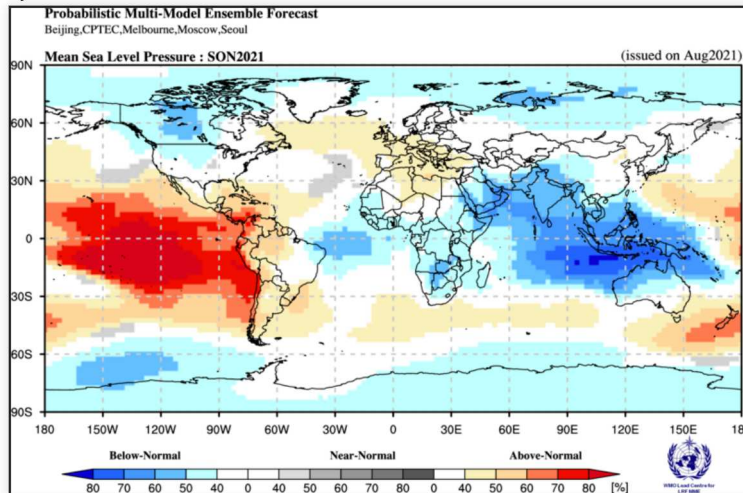
Atmospheric circulation forecasts : MSLP probabilities multi-systems

Very good agreement between the two multi-models in the tropical zone.

In the Northern hemisphere over mid-latitude, weak signal. A positive anomaly is visible from North Atlantic to Europe and Mediterranean Sea.



C3S multi-models MSLP terciles probability.

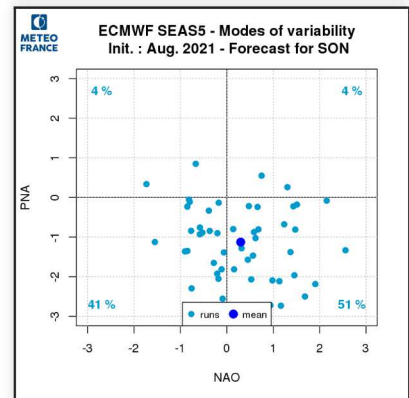
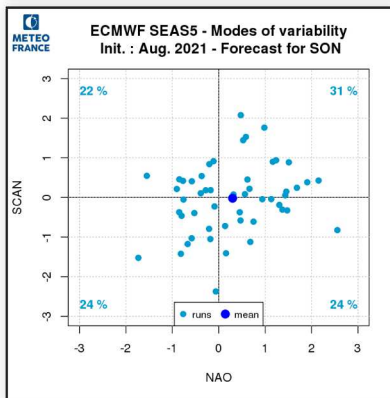
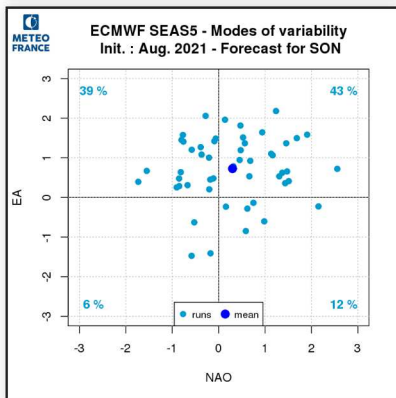
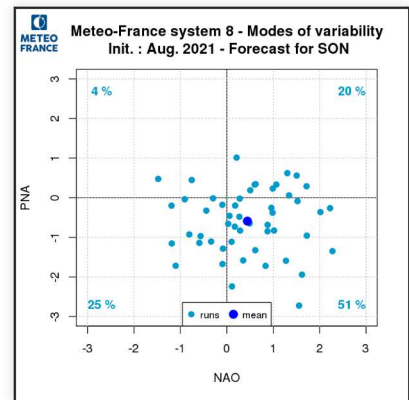
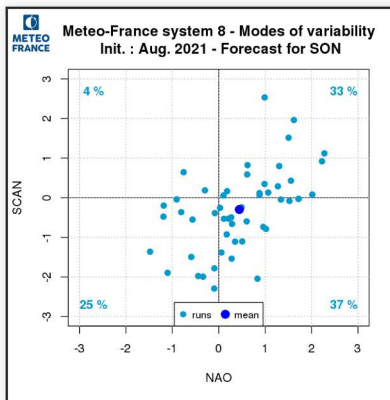
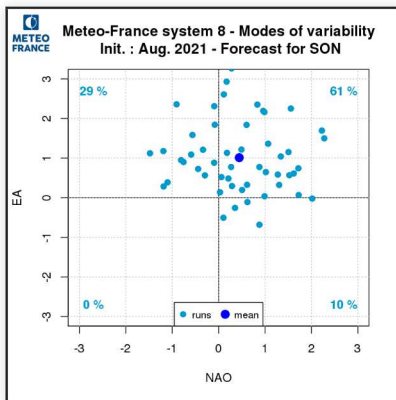


Others models of WMO multi-models MSLP terciles probability.

Modes of variability : forecast

Good confidence in a negative PNA and positive EA.

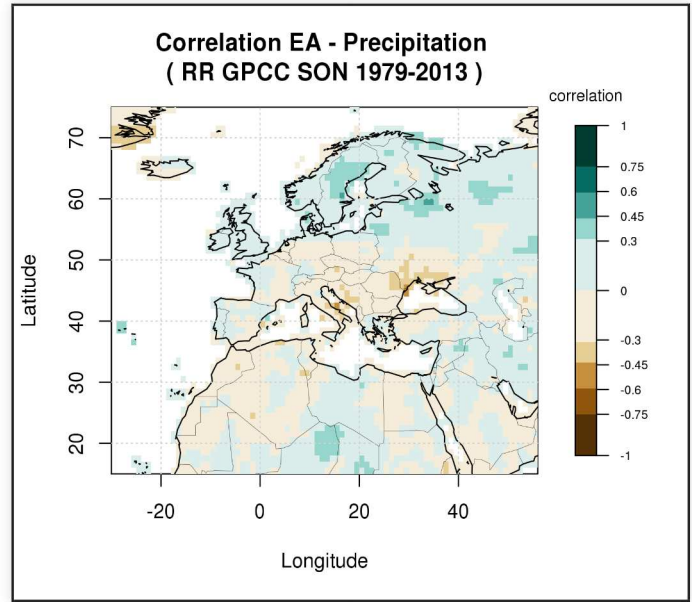
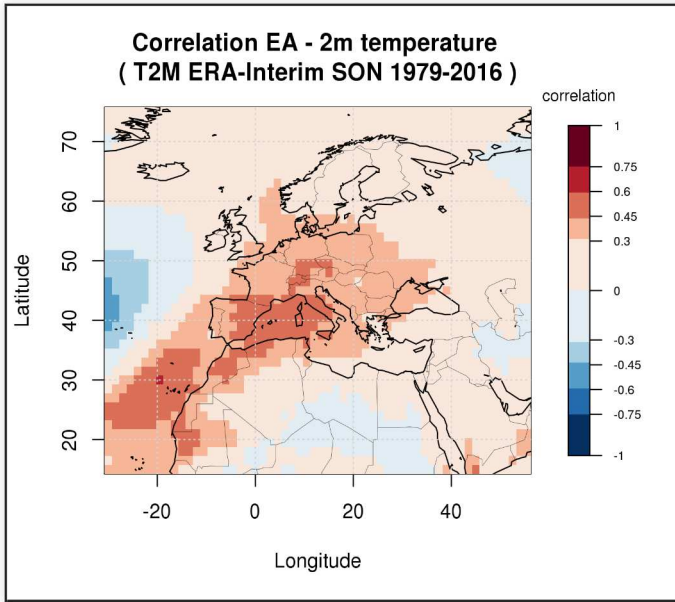
No clear signal for NAO and Blocking.



[See the modes of variability patterns](#)

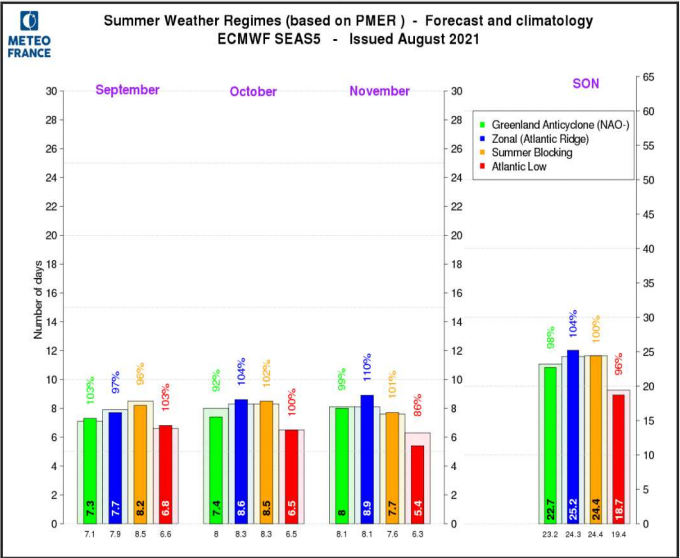
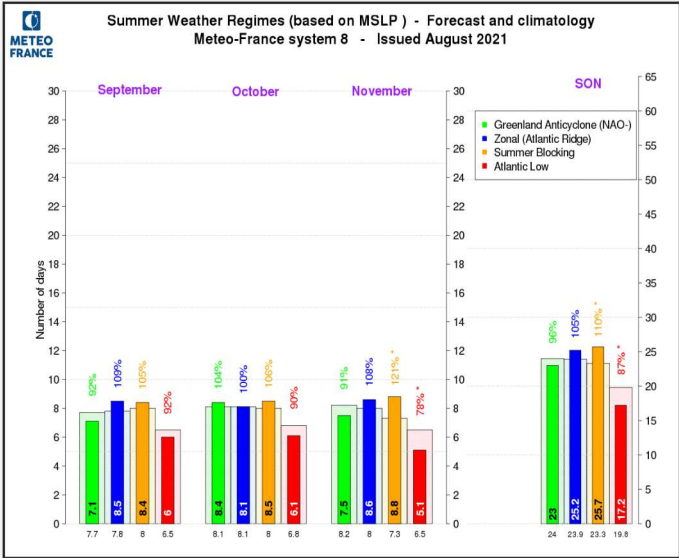
Modes of variability : EA impacts

EA mode has a strong influence in particular on the temperature on the south-west of Europe.



Weather regimes : summer MSLP

No agreement between models. No significant anomaly in ECMWF-SEAS5.

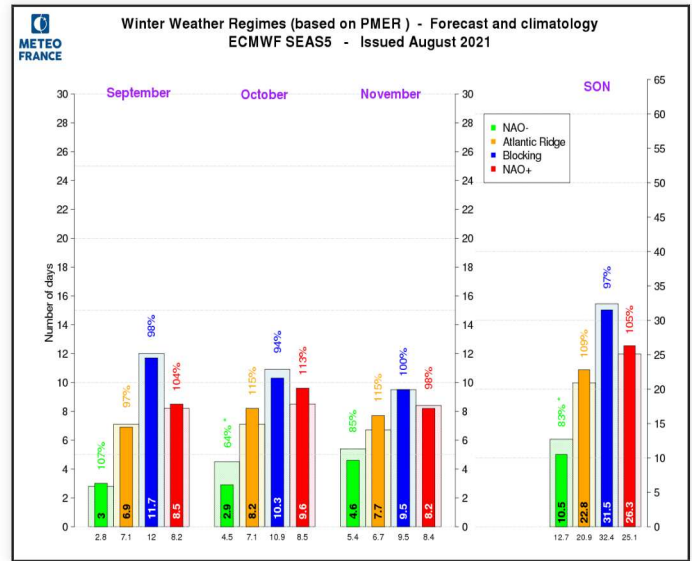
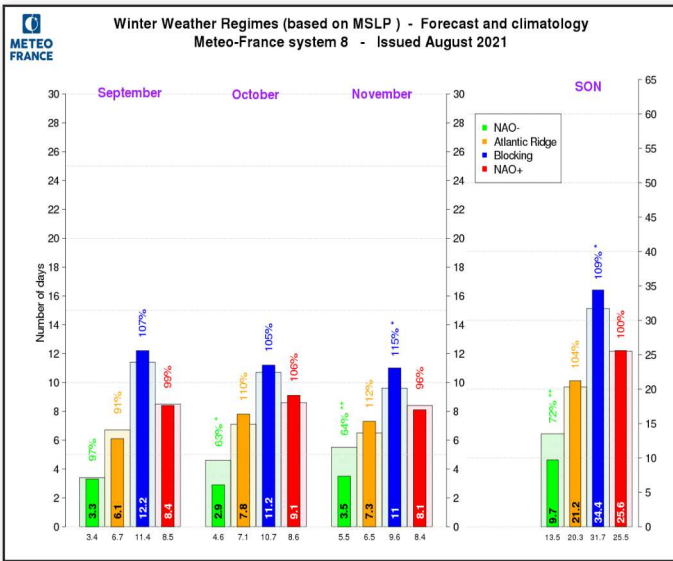


Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S8 (left) and SEAS5 (right).

Weather regimes : winter MSLP

No clear consensus between the two models.

The only common significant signal concerns NAO- : less frequent than *normal* in the 2 models.



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).

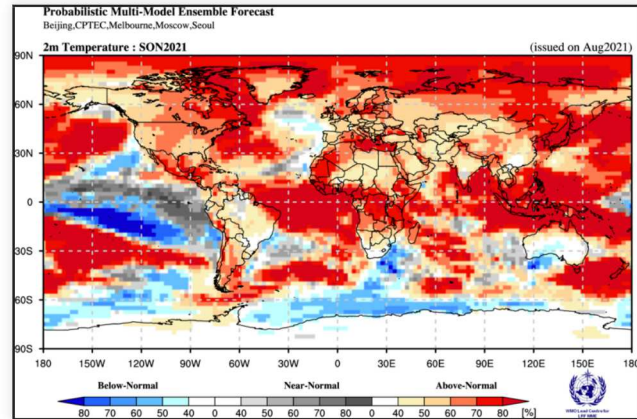
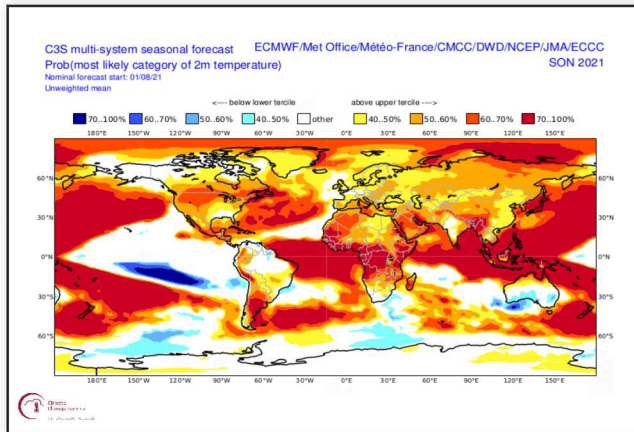
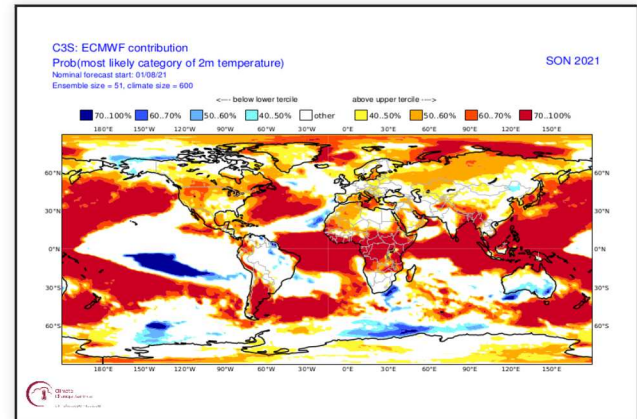
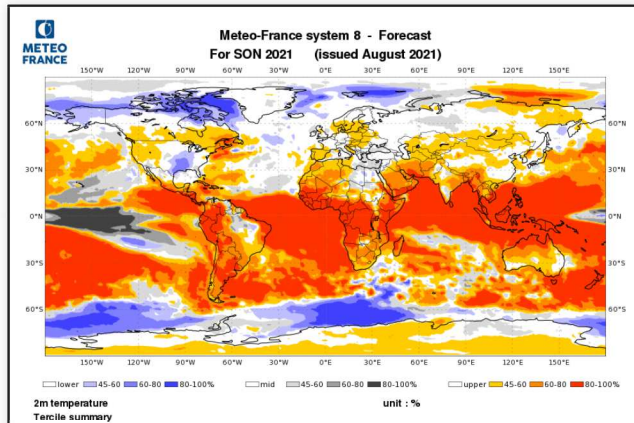
Forecast of climatic parameters : Temperature probabilities

Over North America, quite good agreement for positive anomalies almost everywhere, except Alaska and North of Gulf of Mexico. Over South America, positive trend except over the North-Eastern part.

Over Africa, positive signal except over the South of the continent and over the North-Eastern part.

Over Oceania, North-South contrast with positive anomalies expecting in the North, negative in the South (South of Australia).

Over Eurasia, weak and contradictory signals.

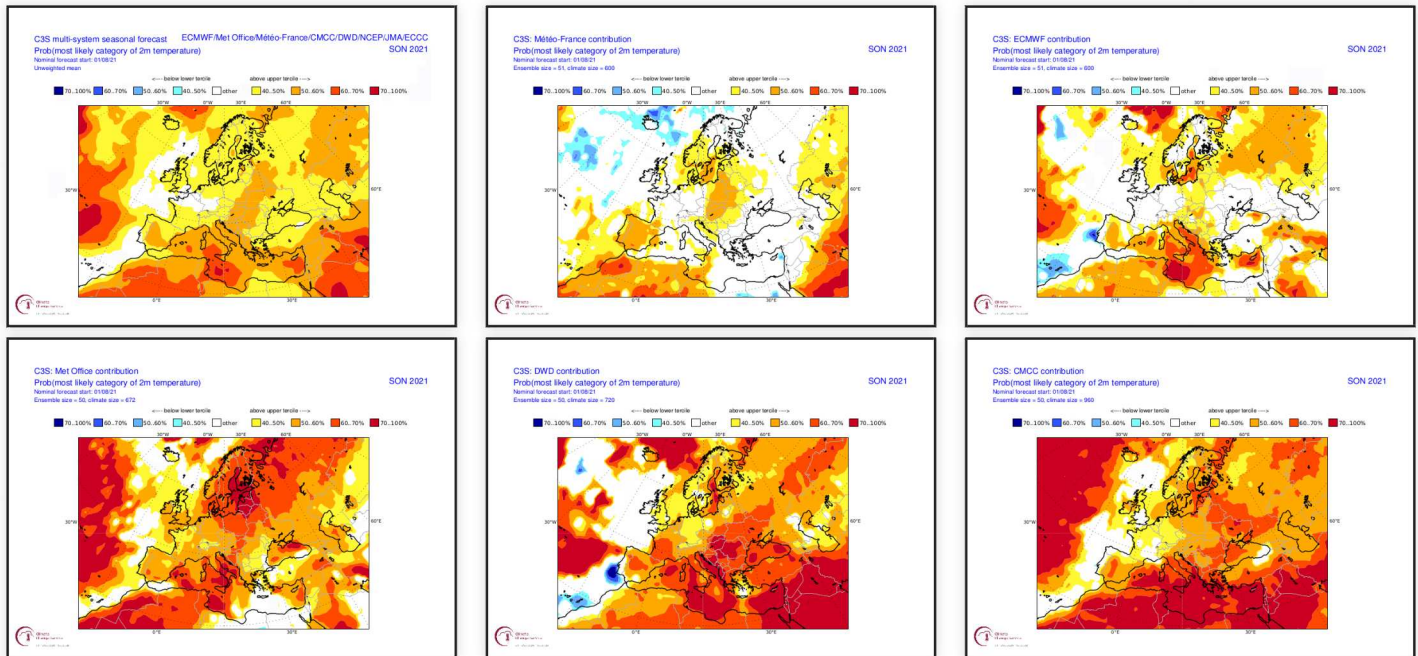


2m temperature probability map from MF-S8 (top left), ECMWF-SEASS (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

All the models forecast the highest probability for the "warmer than normal" tercile around the Mediterranean Basin and over Middle East.

Elsewhere, no consensus between models. The positive signal is more frequent, but with little confidence regarding the uncertainty about general circulation.



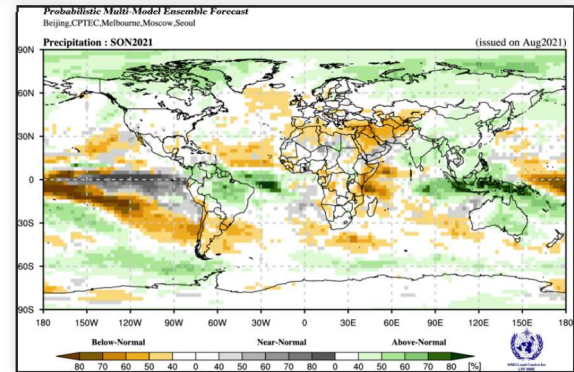
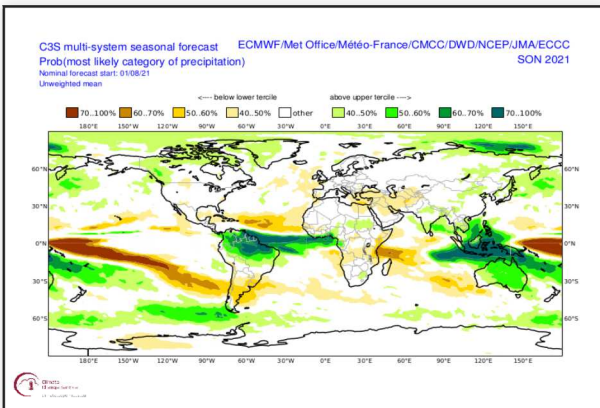
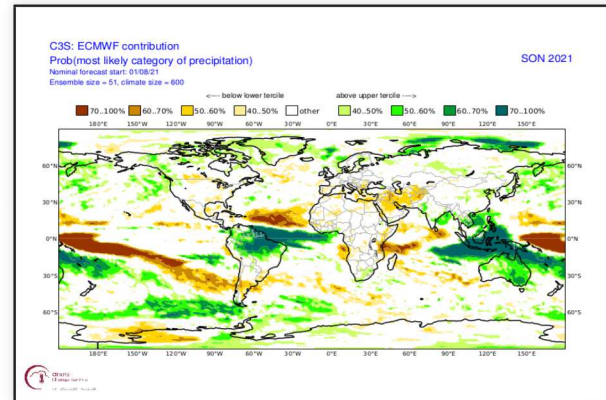
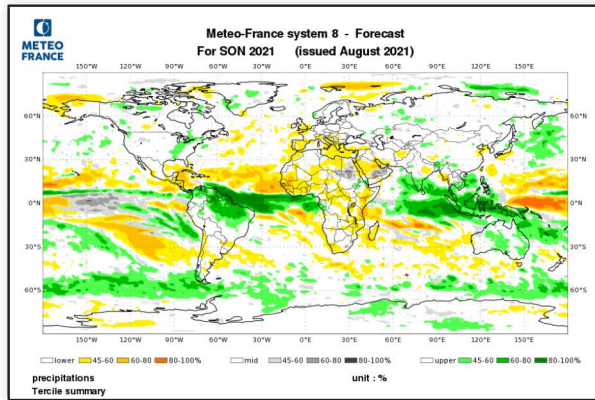
C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Precipitation

Models are consistent in the tropics and up to mid-latitudes over South America and Australia.

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 robust.

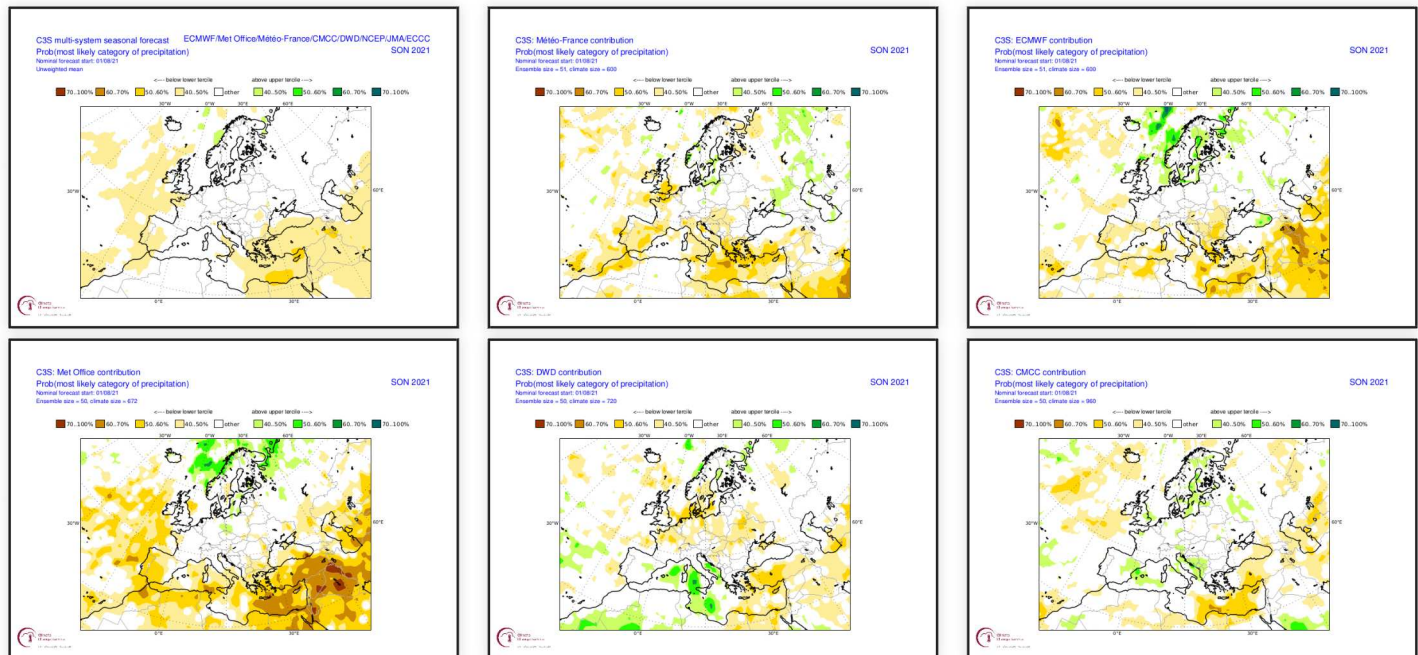
Elsewhere, probabilities rarely exceed 40% : no dominant scenario



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)

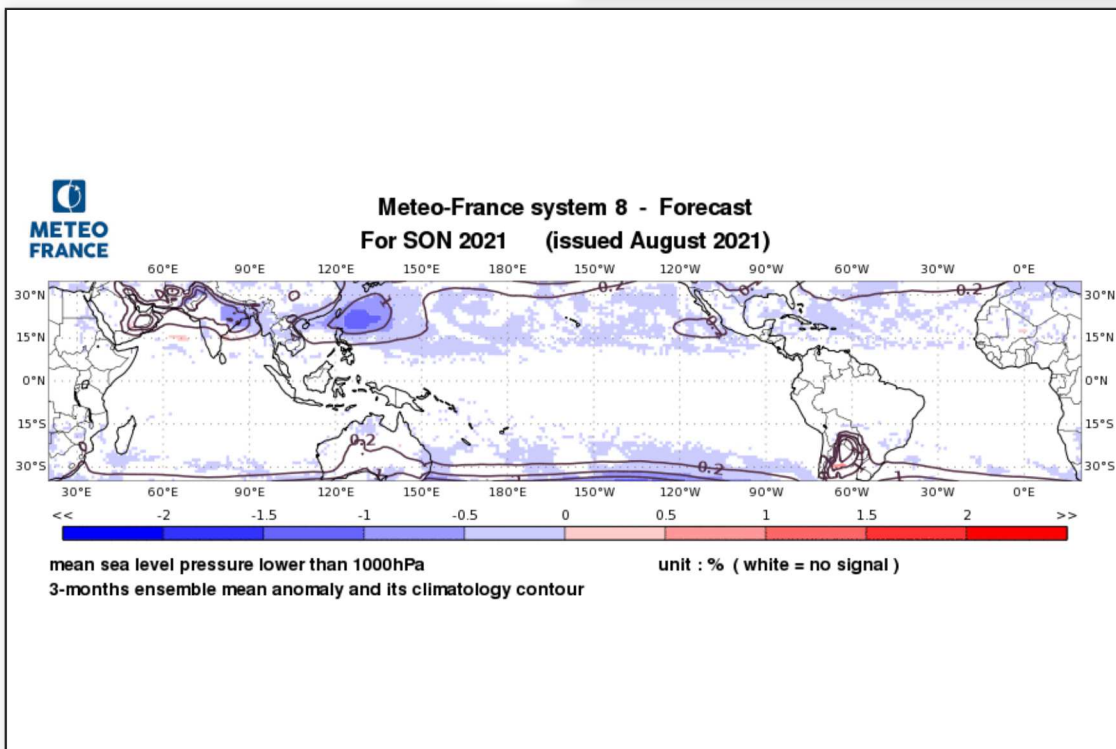
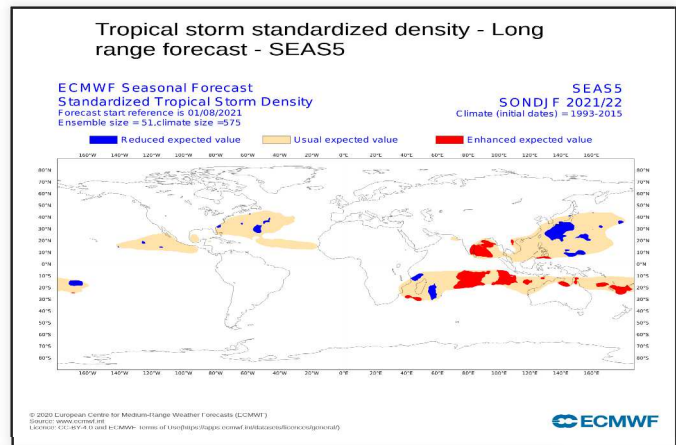
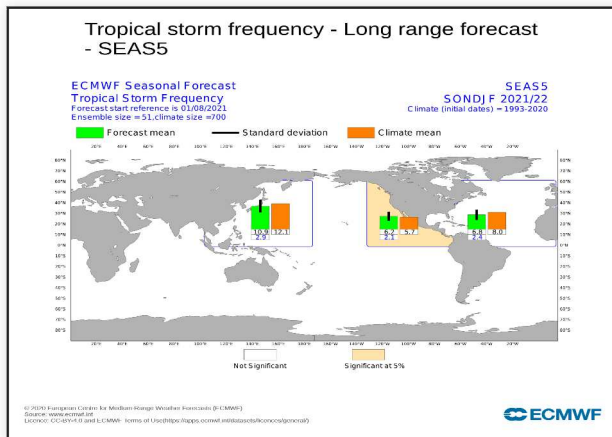
Forecast of climatic parameters : Precipitation probabilities over Europe in C3S models

A scenario slightly drier than normal dominates on the countries around the east of the Mediterranean basin. As for Z500 and T2m, the climate trend probably explains a part of the dry signal. Elsewhere, no signal.



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

Forecast of climatic parameters : Tropical Storm Frequency

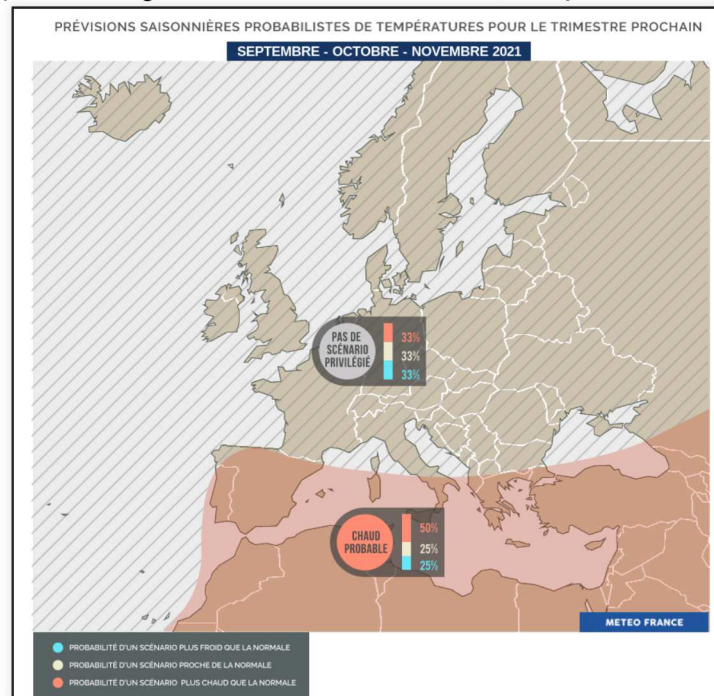


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Synthesis map for Europe : Temperature

No consensus between models on a privileged circulation over Europe.

Anyway we have decided to keep the warm signal over the Mediterranean Basin, mainly because it is present in most of the models.



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

Synthesis map for Europe : Precipitation

No clear signal in the forecast, except from the eastern Mediterranean to the Middle East where the dry signal is most likely.



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