Météo-France Seasonal Forecast Bulletin

OCTOBER - NOVEMBER -DECEMBER 2021

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General synthesis : OND 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 on the northern hemisphere are limited in contrast to the southern hemisphere where teleconnections are clear.

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 : the Atlantic ridge regime is favoured by models.

D) Most likely conditions :

- **over Europe and the Mediterranean Basin** : warm tercile privileged over the Mediterranean Basin, North of Africa and Middle East . Dry tercile is privileged in the South-Eastern and South-Western part of the domain.

Next bulletin : scheduled on October 21nd

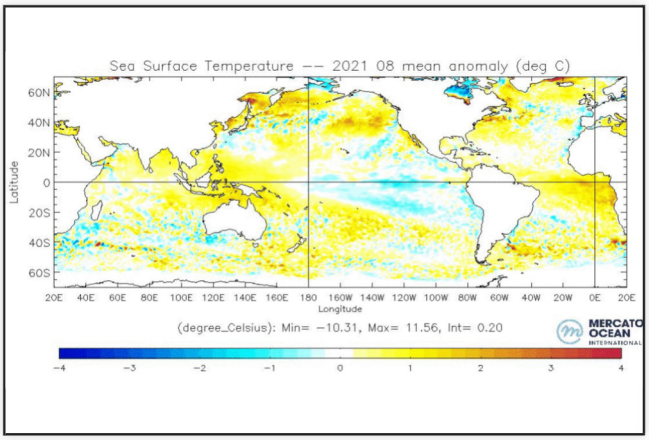
Oceanic analysis of August 2021 : SST anomalies

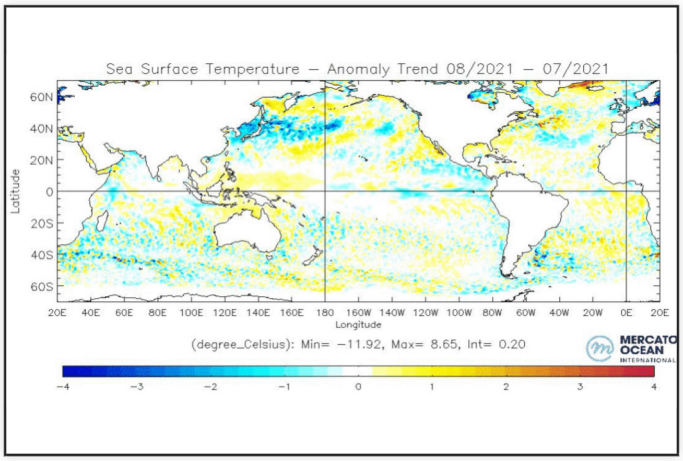
Current ENSO situation : neutral conditions

In the Pacific Ocean : a slight cold anomaly persits 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 s has continued to weaken.

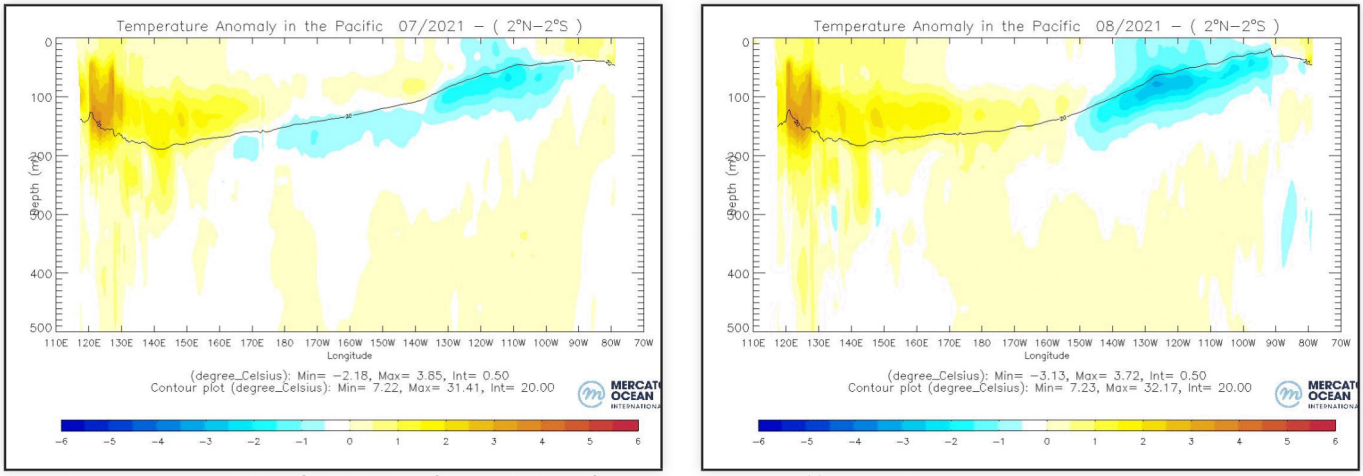




SST Anomalies and trend with the previous month (c) Mercator-Ocean

Oceanic analysis of August 2021 : Pacific vertical section

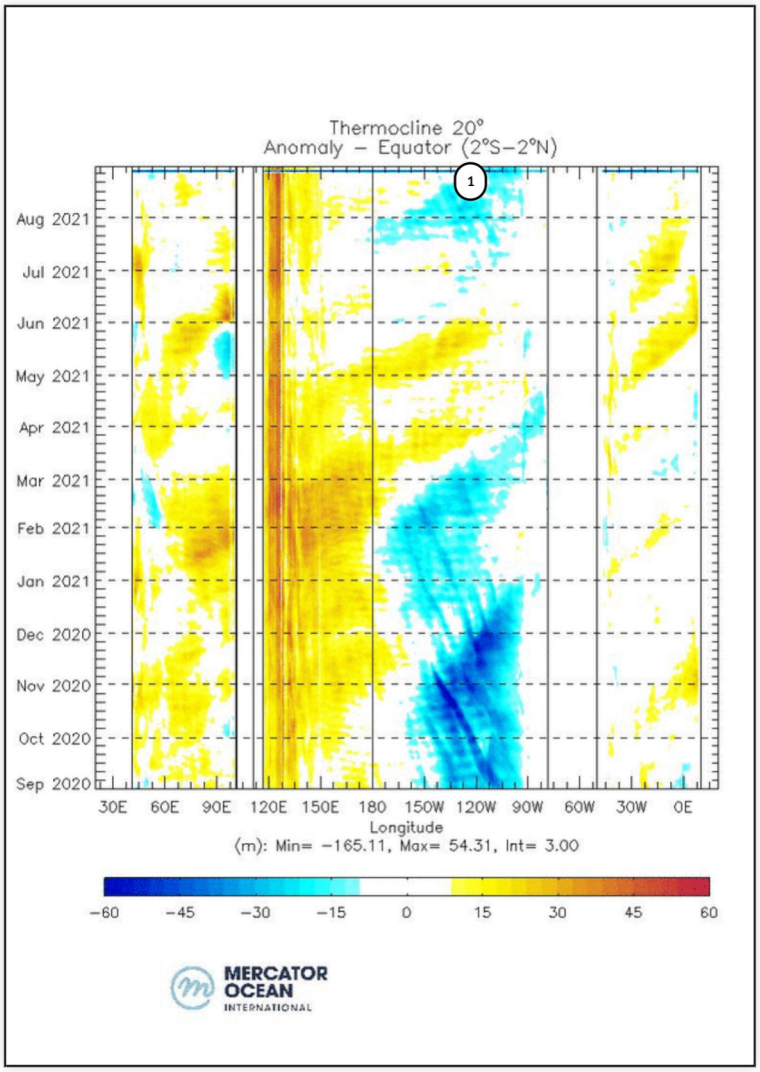
In subsurface cold anomaly has strengthened in the Eastern part of the basin.



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

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

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

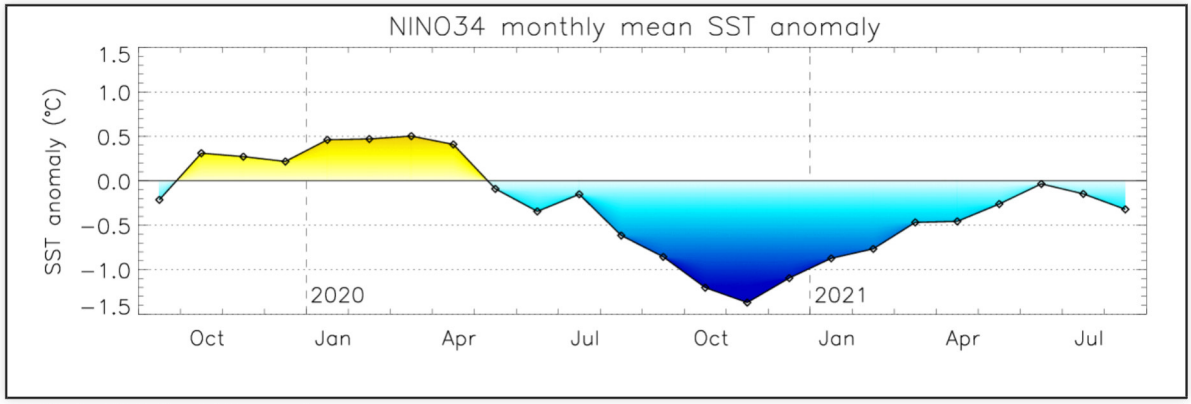


Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 ° C isotherm) (c) Mercator-Ocean

1 - Reemergence of the thermocline on the eastern Pacific

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

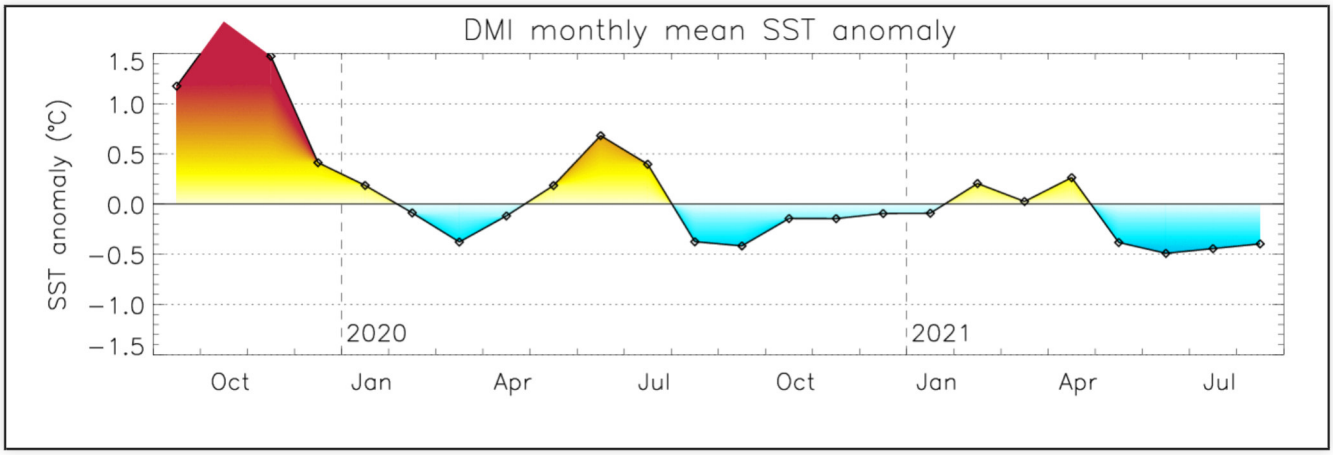
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : - 0.3°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

Oceanic analysis of August 2021 : 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)



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

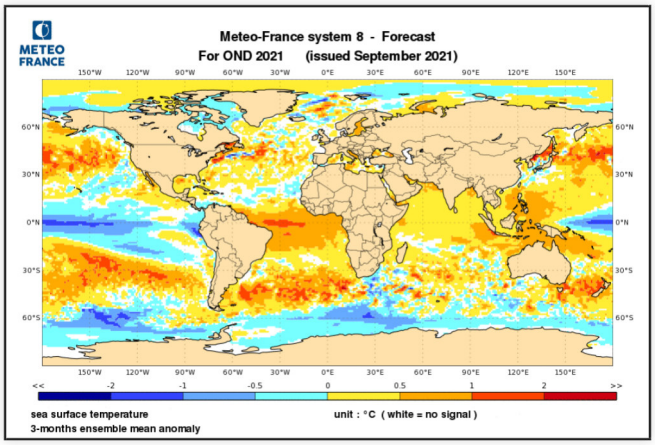
Oceanic forecast : SST anomaly

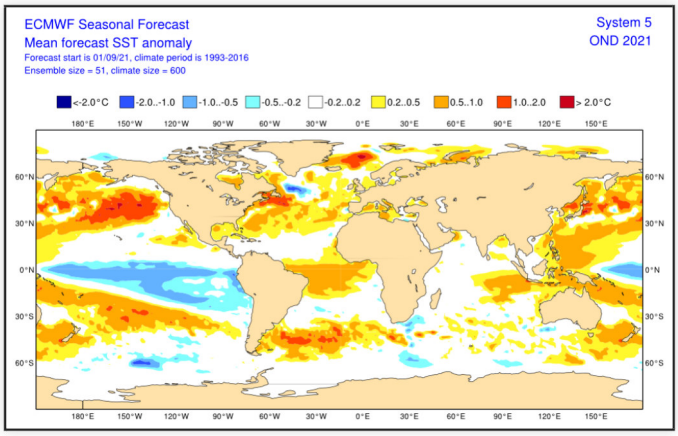
Good agreement between MF-S8 and ECMWF-SEAS5 in all oceans.

In the Pacific Ocean : the cold anomaly pattern associated to La Niña is resuming in the forecasts. 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.

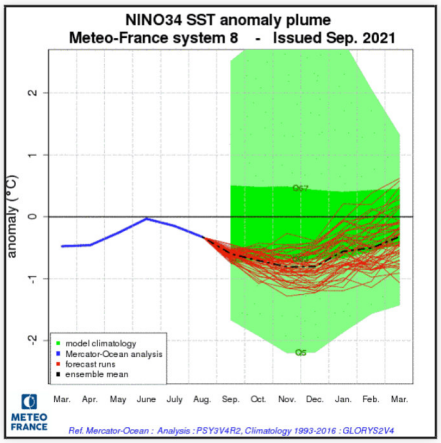
In the Atlantic Ocean : Persitance of a large and strong warm anomaly along the equator. North of 60°N, MF-S8 is significantly colder than ECMWF-SEAS5.

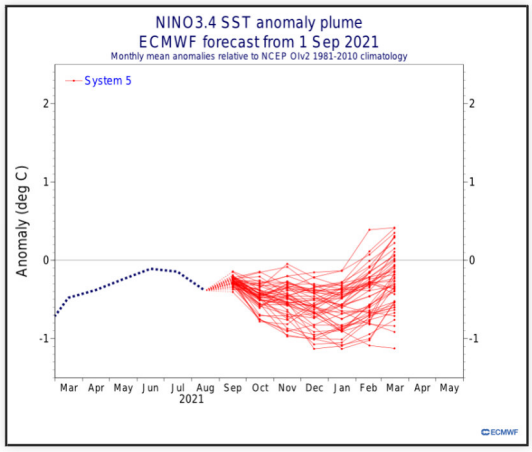




Oceanic forecast : NINO3.4 Plume diagrams

ECMWF-SEAS5 and MF-S8 : both models similarly forecast a cooling trend in the next months. Low spread, the most likely category is neutral for SEAS5 and La Nina conditions for MF8.

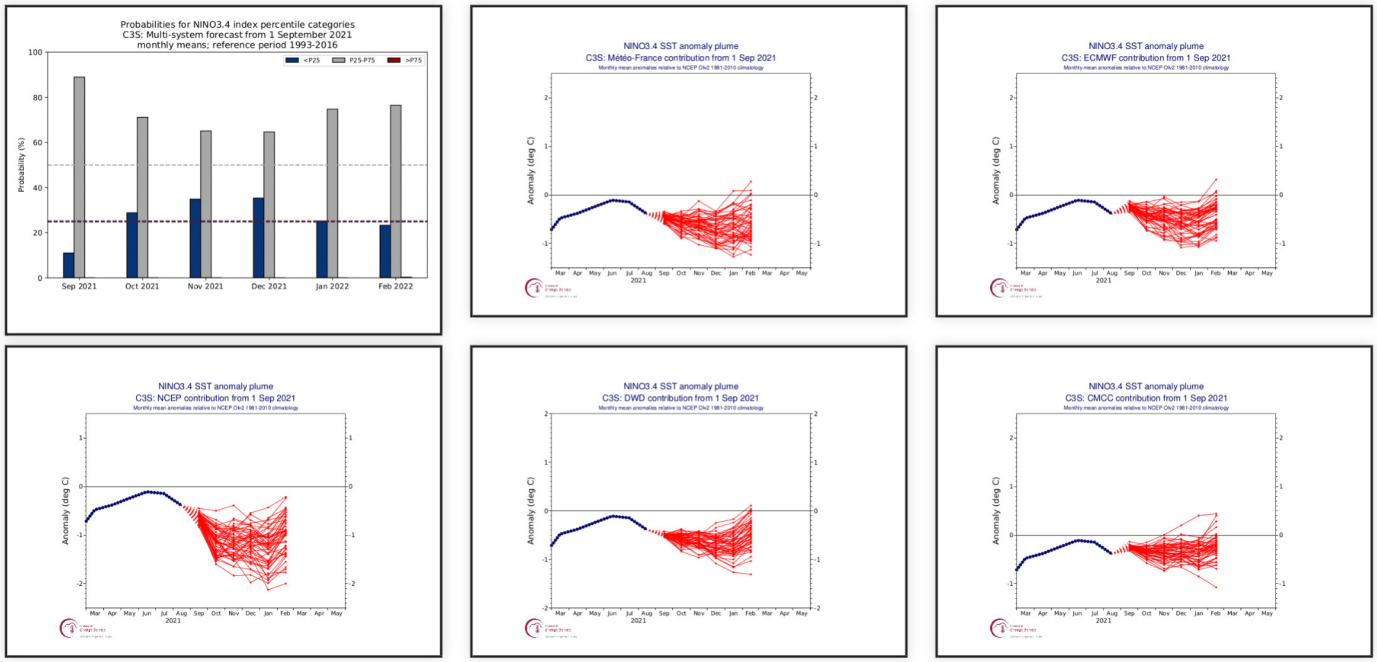




Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

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

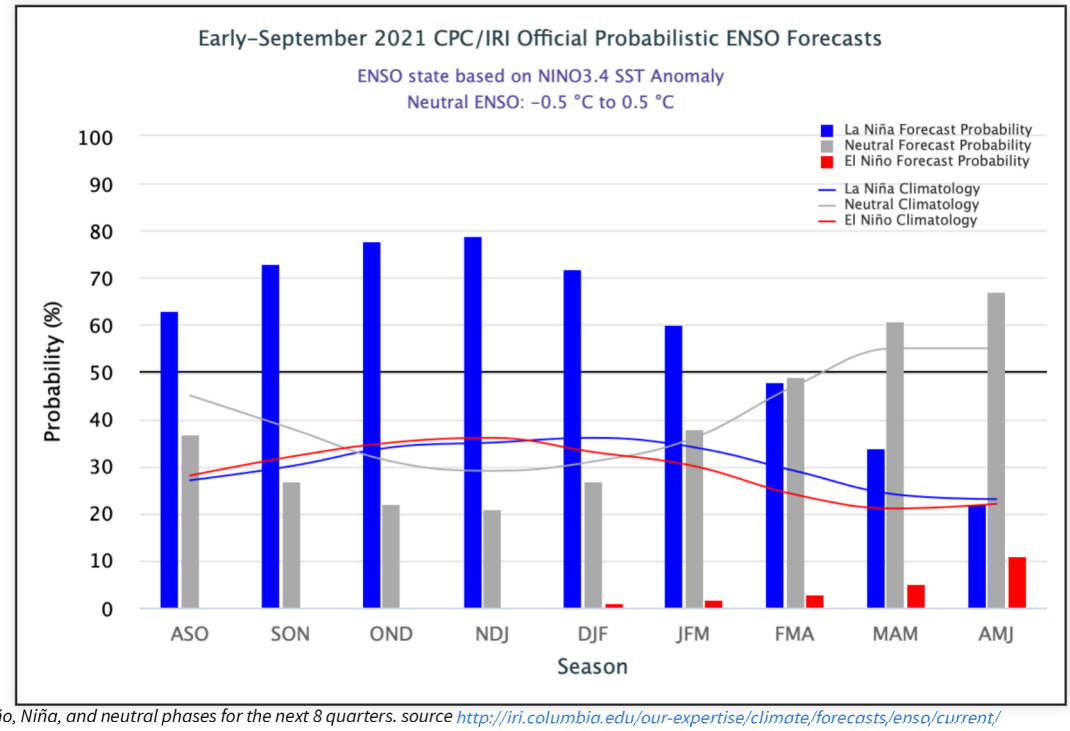
Because of the SST pattern in the Pacific, and despite the Nino3.4 probability forecast emphasises a neutral phase (see barplots on top left), **the most likely phase for the next three months : weak La Niña.**



C3S multi-system probabilty 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

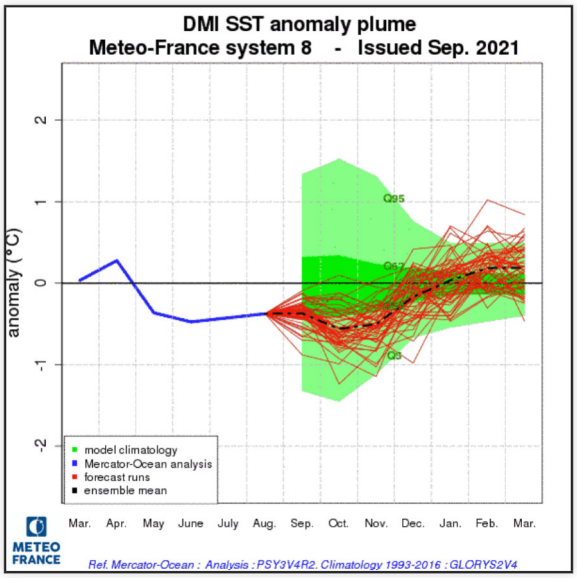
For IRI, "La Nina" is the most likely phase for the next quarter

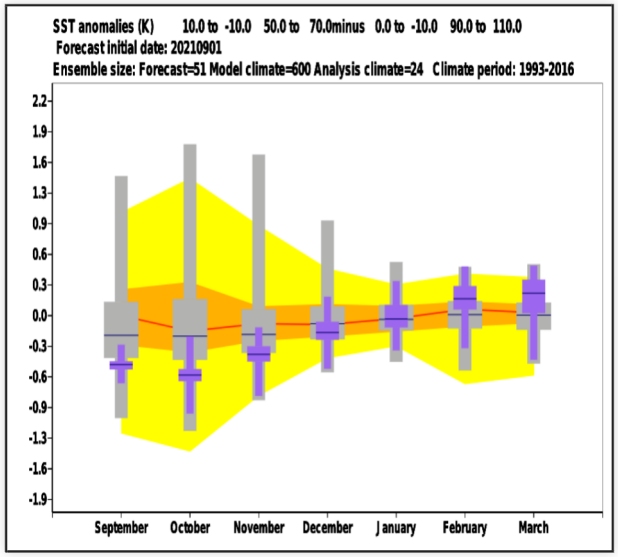


Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Oceanic forecast : Indian ocean - DMI evolution

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



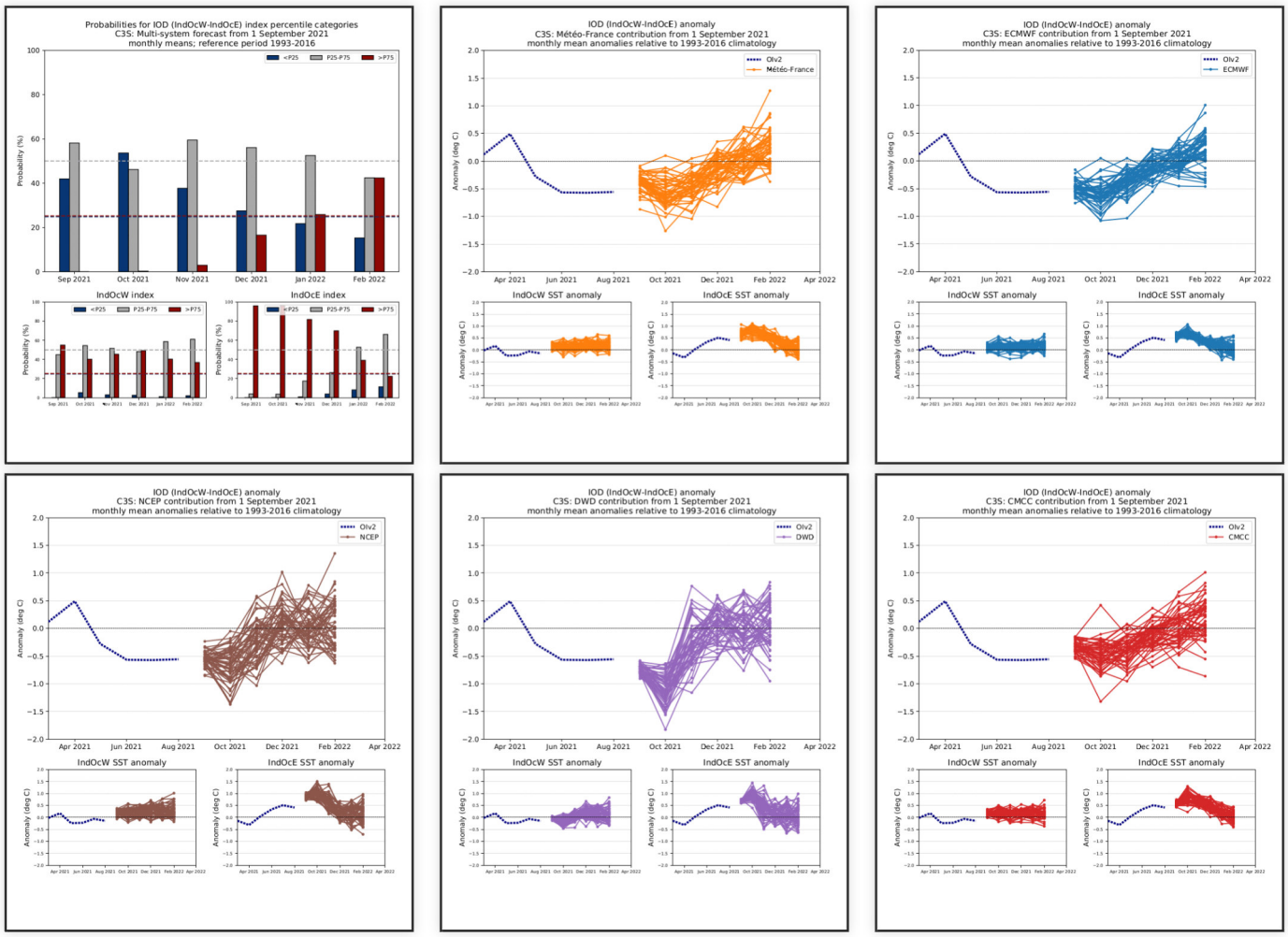


DMI index : analysis, forecasts and model climatology with MF-S7 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

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

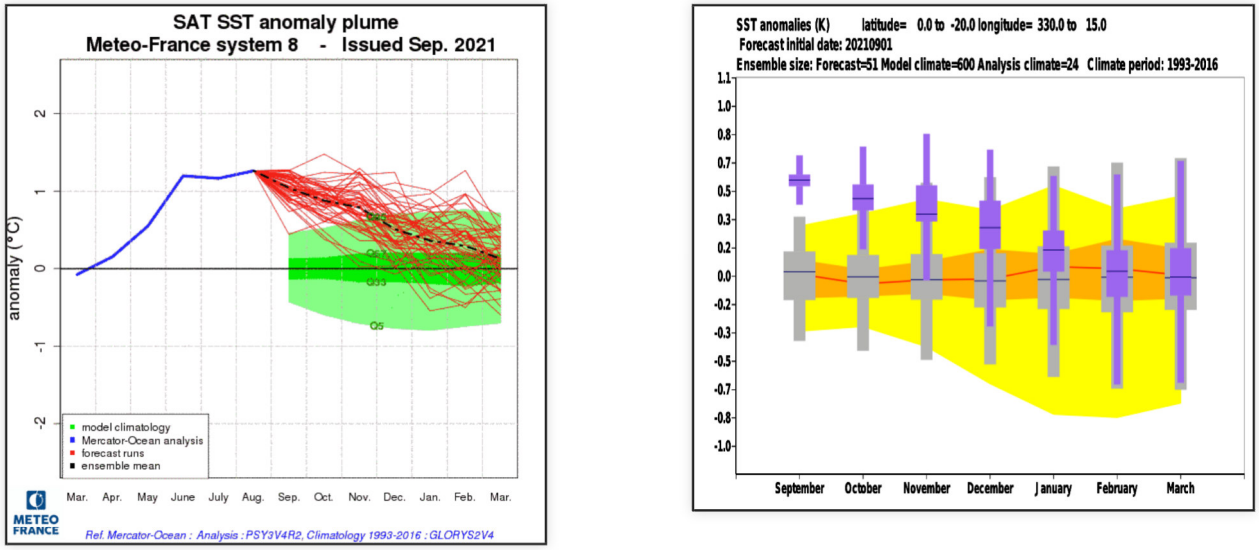
Expected Phase for the next three months : negative.



C3S multi-system probabilty 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

Historically high values are down but remain well above climatology next quarter.



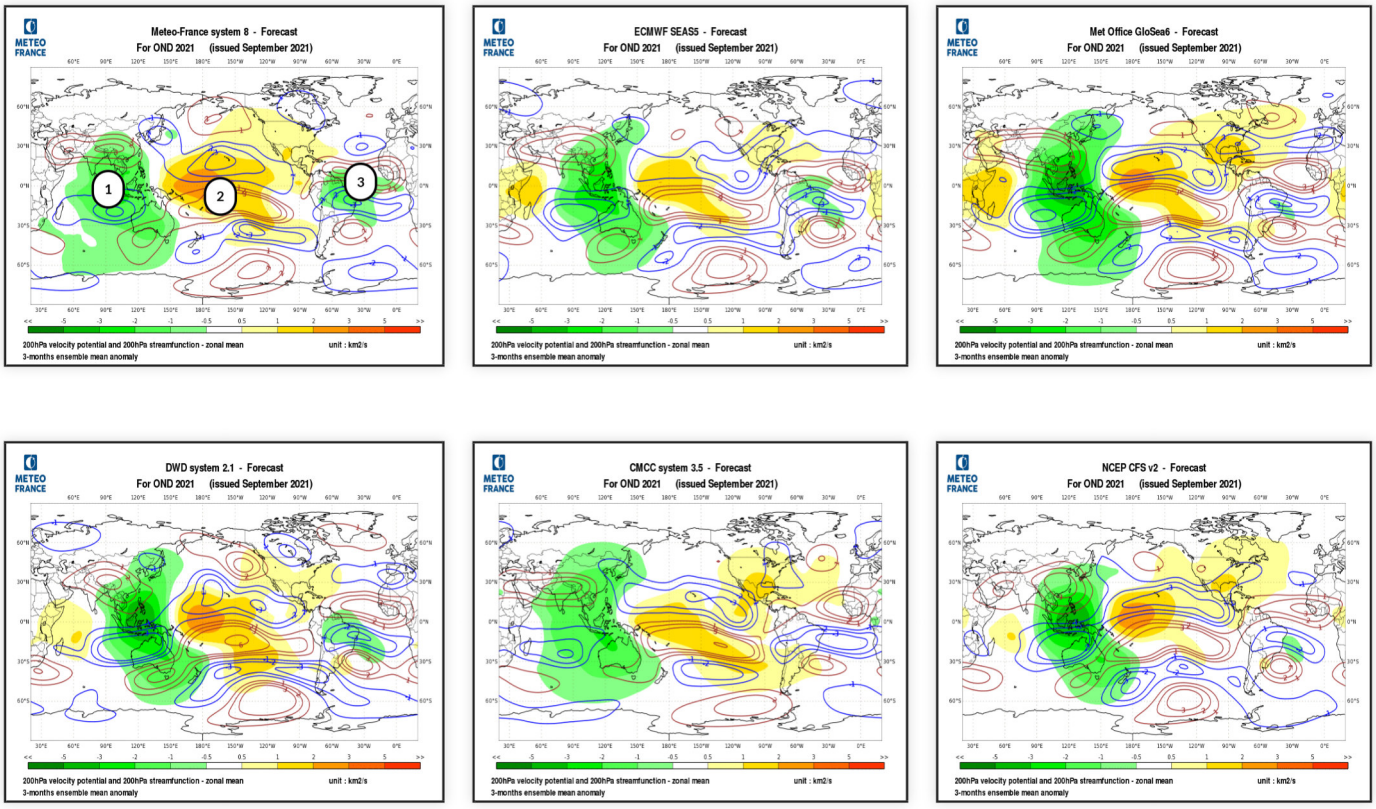
Anomaly on the SAT box : analysis, forecasts and model climatology with MF7 on the left and SEAS5 on the right

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 east of the Indian basin. Over Africa and equatorial Atlantic, weak signals : one could expect a negative anomaly (upward anomaly motion) over Atlantic, due to the strong positive SST anomaly, and downward motion on the west of Indian bain and eastern Africa because of the negative phase of IOD.

Streamfunction : clear dipoles on both sides of the equator over each basin. However the signal seams to be mostly trapped in the tropics in the northern hemisphere. There is maybe a trace of teleconnexion toward mid-latitudes on the North Atlantic (cyclonic circulation off Morocco/anticyclonic circulation south of Greenland). and on the North Pacific (anticylonic circulation on the northeast of the basin) .



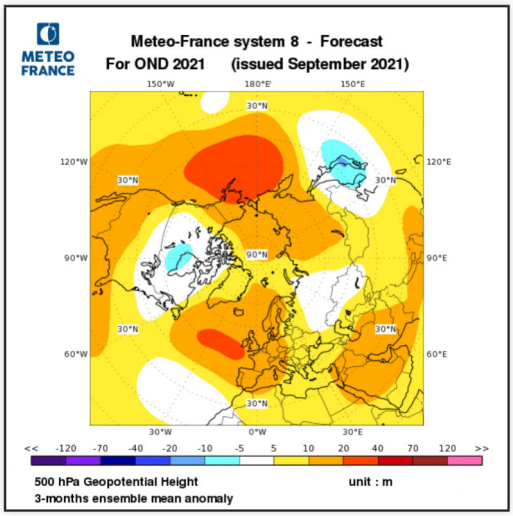
MF8,SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

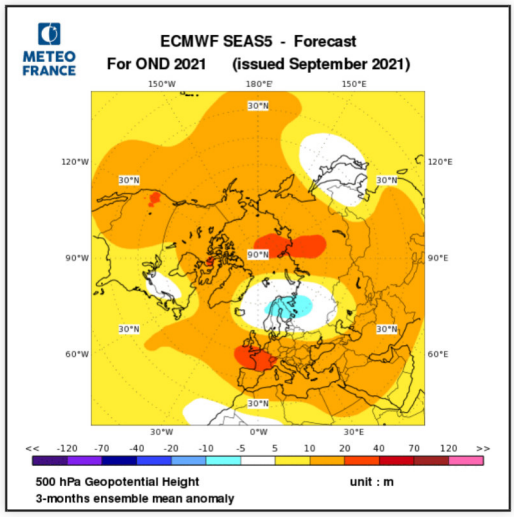
1 - VP : large area of upward motion anomaly
2 - VP : downward motion anomaly related to La Nina and negative IOD
3 - VP : upward motion anomaly in MF-S8 linked to warm SST anomalies

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

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

The anomaly patterns are globally in phase over Pacific and Atlantic at tropical and temperate latitudes. On the other hand, around Scandinavia and Canada the anomaly structures are different.

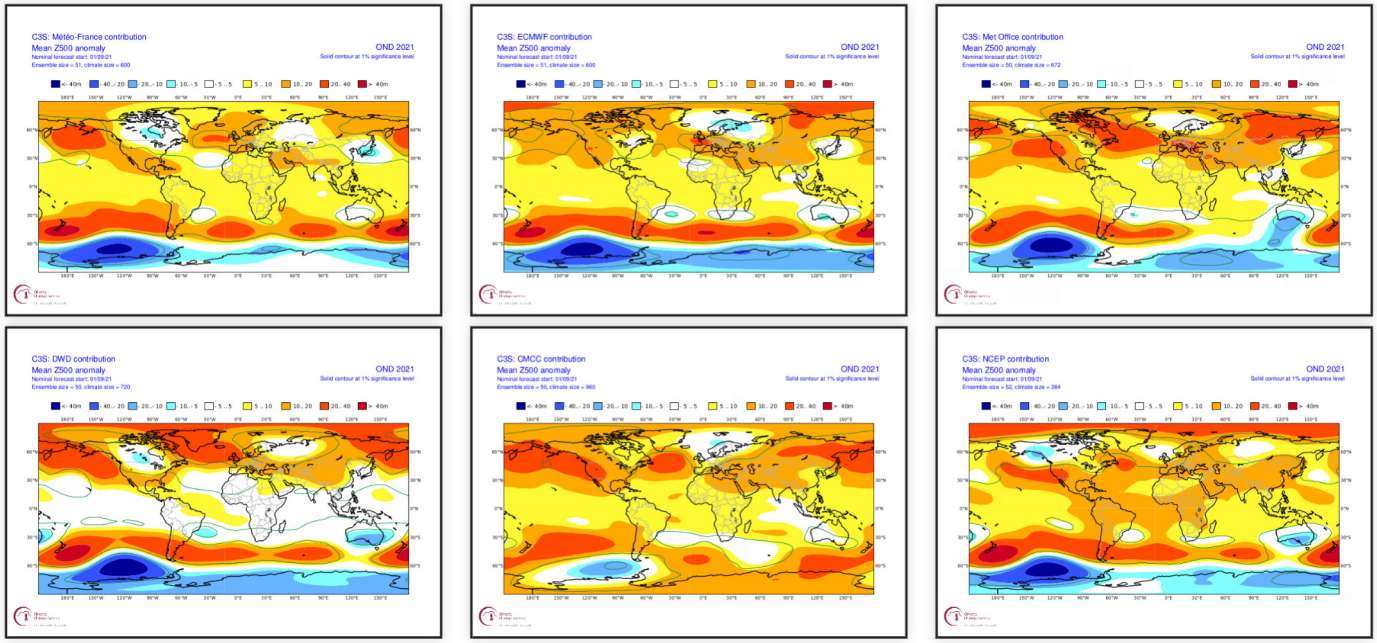




polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

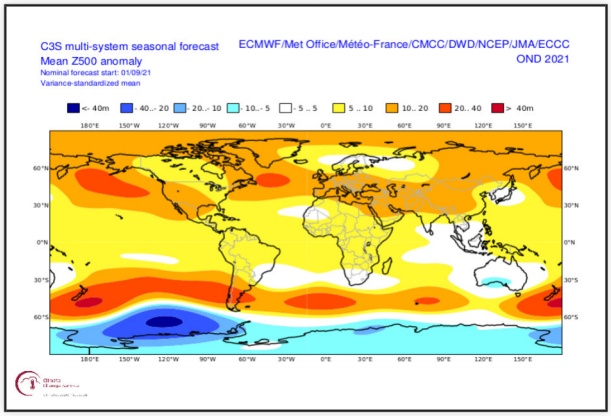
Two large-scale structures are present in most models: the positive anomaly in the north-east Pacific and the positive anomaly in southern Greenland in south-west Europe.
A negative anomaly is present towards Canada with varying positioning and intensity between models. Another weakness is present between Iceland and northern Russia with marked uncertainty on the positioning.



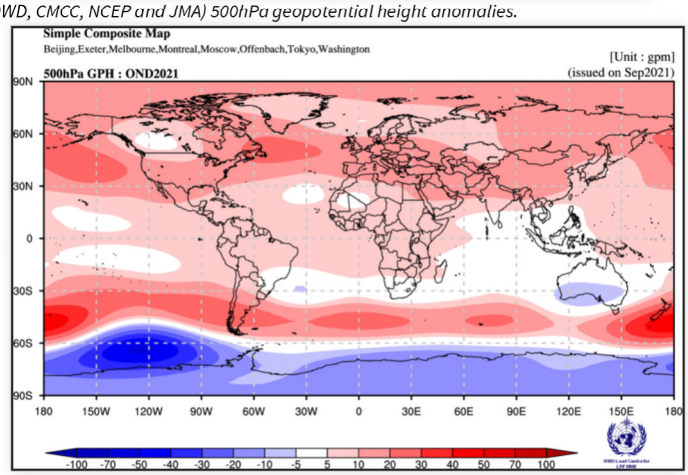
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

Over North America, a PNA- pattern is visible in both multi-model charts. On the Atlantic a positive anomaly is present from off Quebec to south Europe while a weakness is expected further south (same structure as stream function at 200Hpa)



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

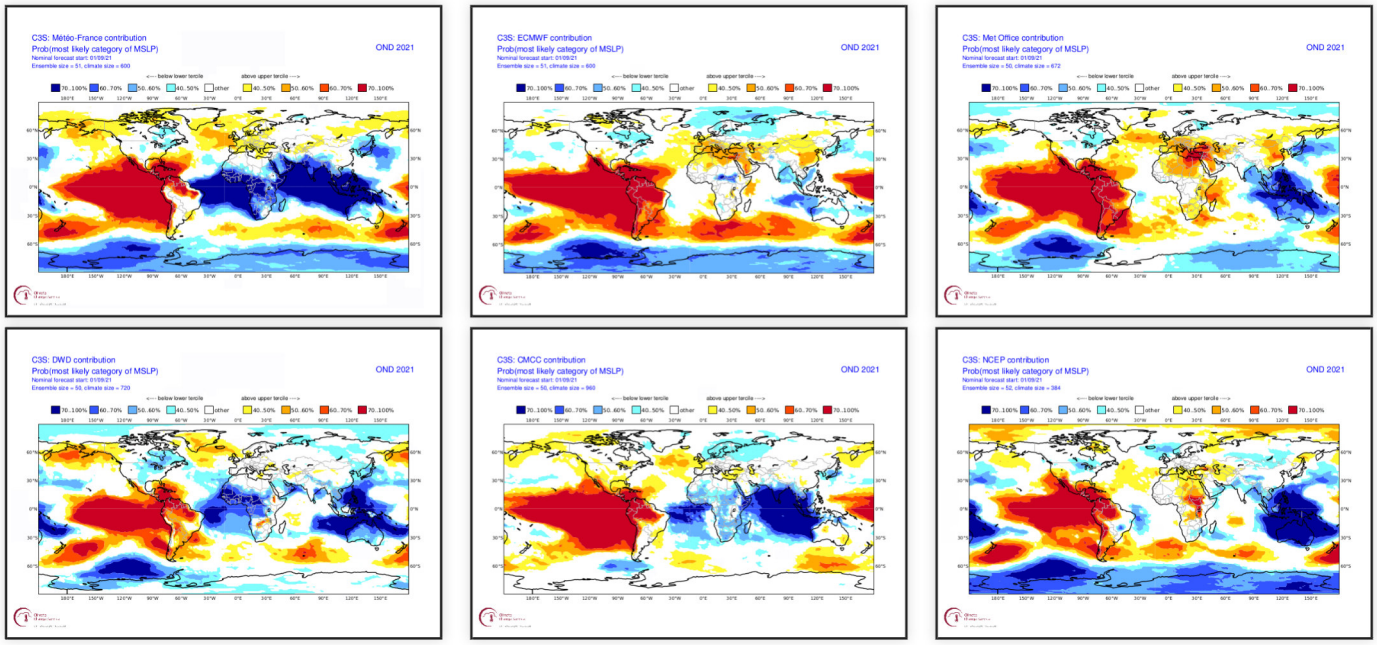


Others models of WMO multi-models 500hPa geopotential height anomalies.

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 equatorialAtlantic, the lowest tercile is highly probable but the pattens 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.

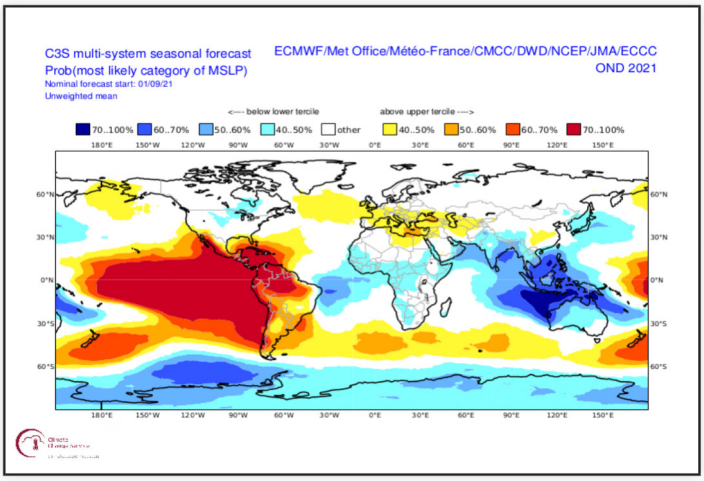


MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP models probability maps.

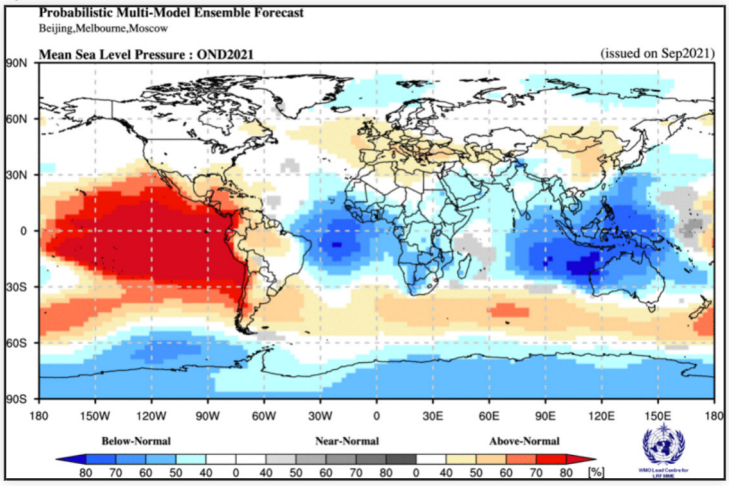
Atmospheric circulation forecasts : MSLP probabilites multi-systems

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.

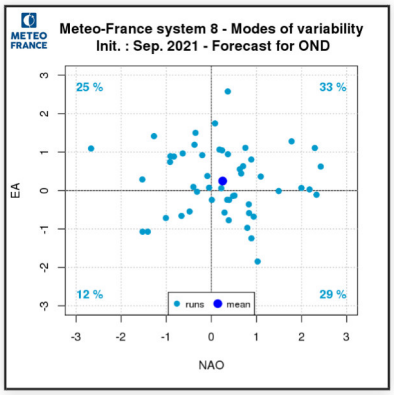


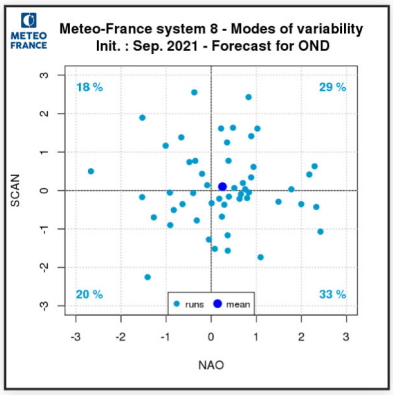
Others models of WMO multi-models MSLP terciles probability.

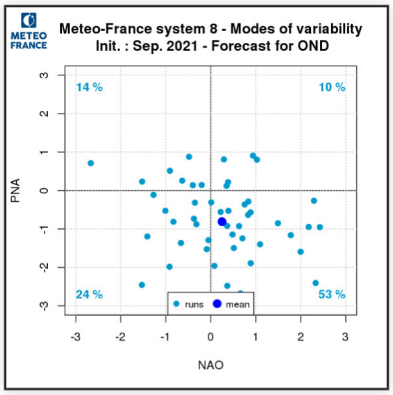
Modes of variability : forecast

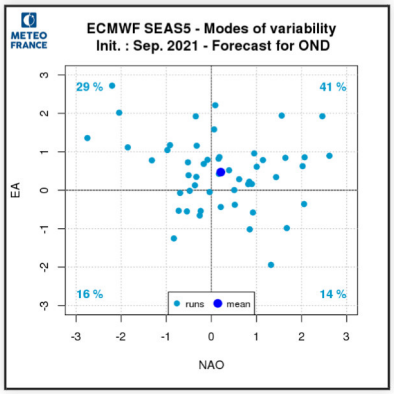
Good confidence in a negative PNA. Positive EA et NAO are more likely.

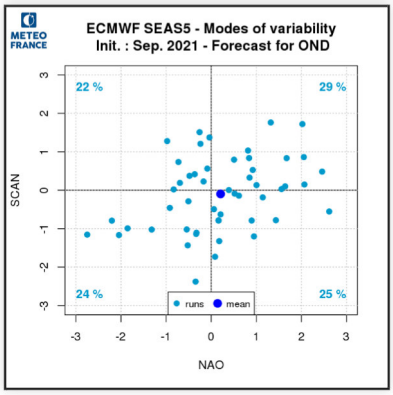
No clear signal for Blocking.

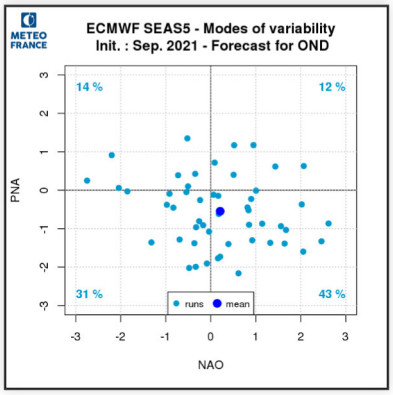










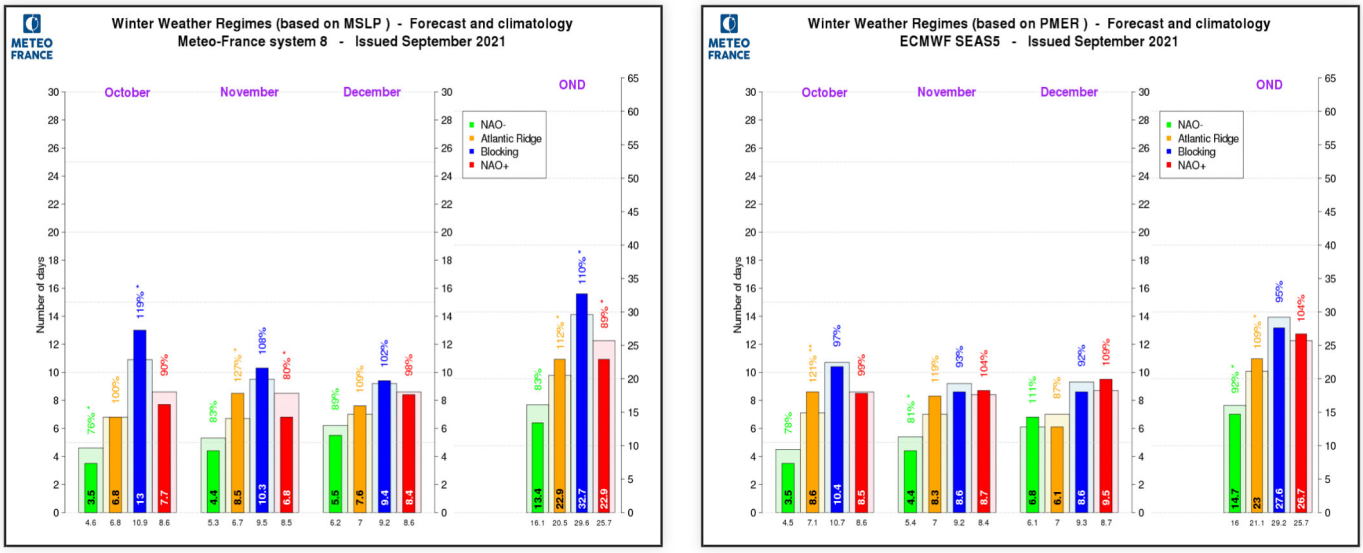


See the modes of variability patterns

Weather regimes : winter MSLP

No clear consensus between the two models.

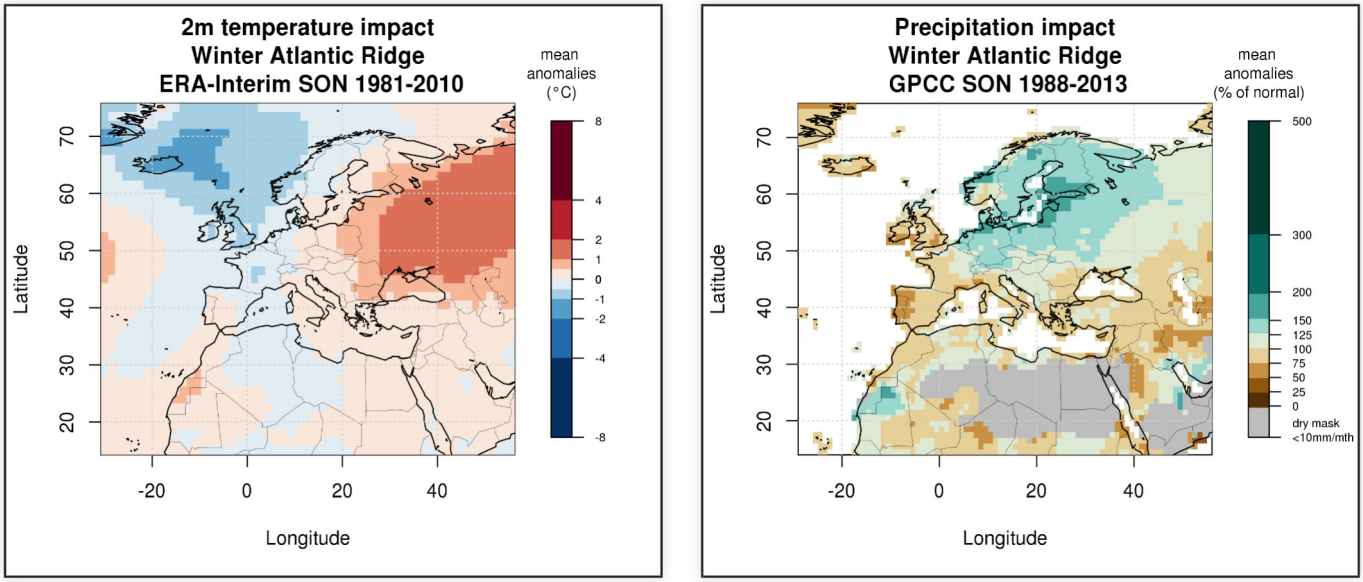
The only common significant signal concerns Atlantic Ridge more frequent than normal in the 2 models.



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).

Weather regimes : Impacts

Winter Blocking weather regime should be favored over the quarter



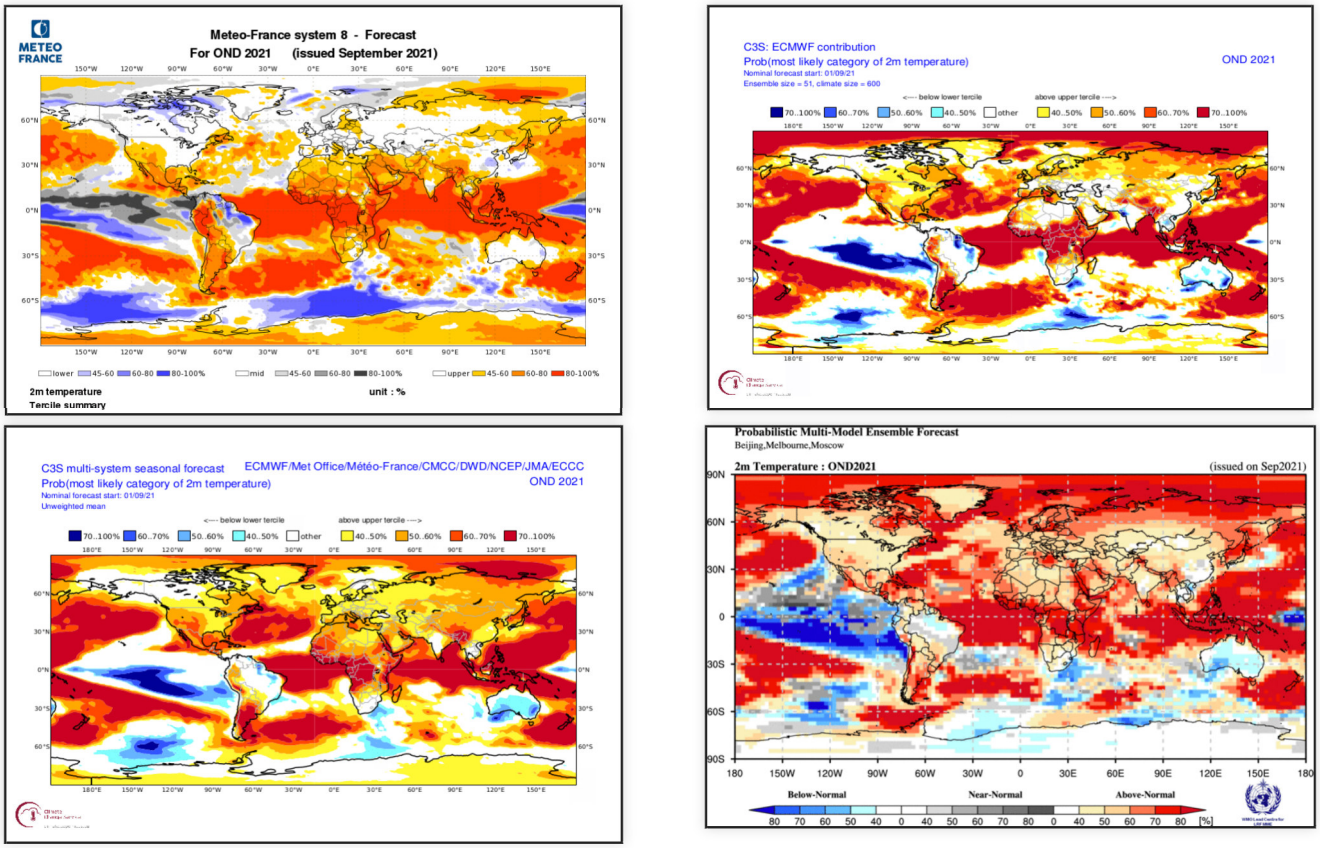
Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

In the tropics a warm signal emerges except ont the Pacific and South America.

Over North America a warm signal is present from Mexoco to the west of the United States.

On Eurasia a weak and diffus warm signal reflecting global warmiing and dispersion of the models.

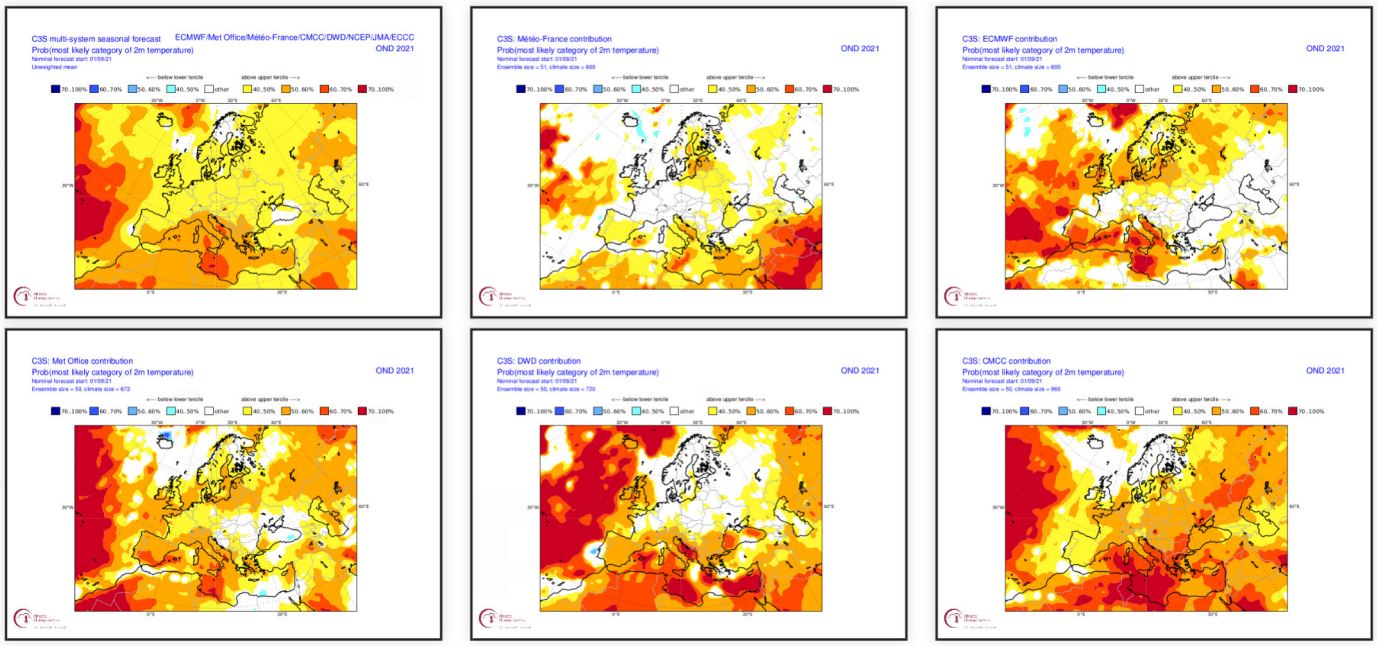


2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

We don't find the effect of the Atlantic Ridge regime (cool over western Europe and hot over eastern Europe. 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.

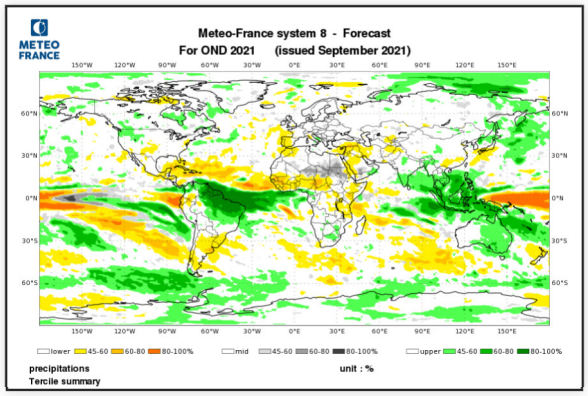


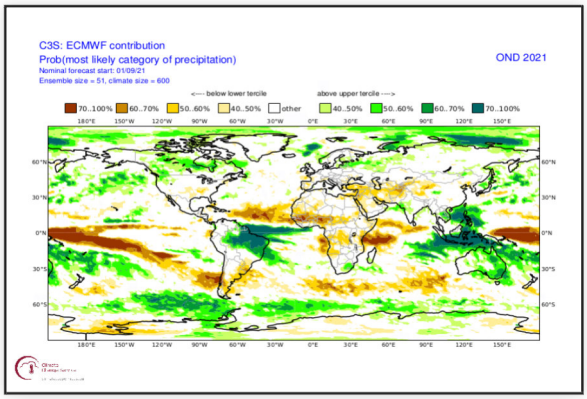
C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO , DWD, CMCC models.

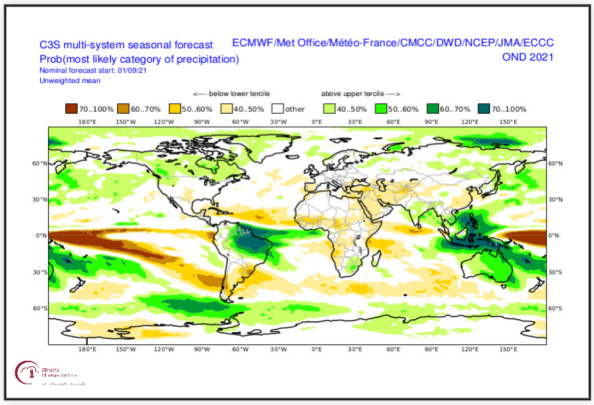
Forecast of climatic parameters : Precipitation

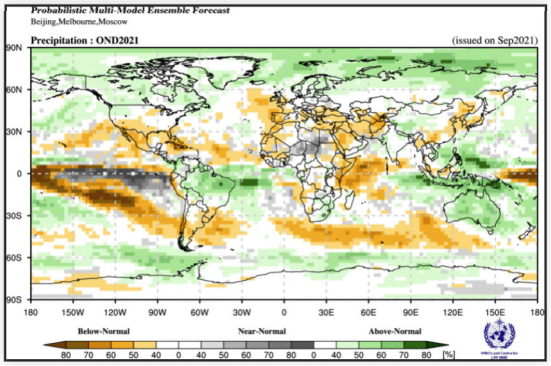
Models are consistent in the tropics and up to mid-latitudes over South America and Australia.

On the northern hemisphere the signal is weak. Multimodels highlight a dry signal over the Middle East and wet signal over Canada and northern Siberia.







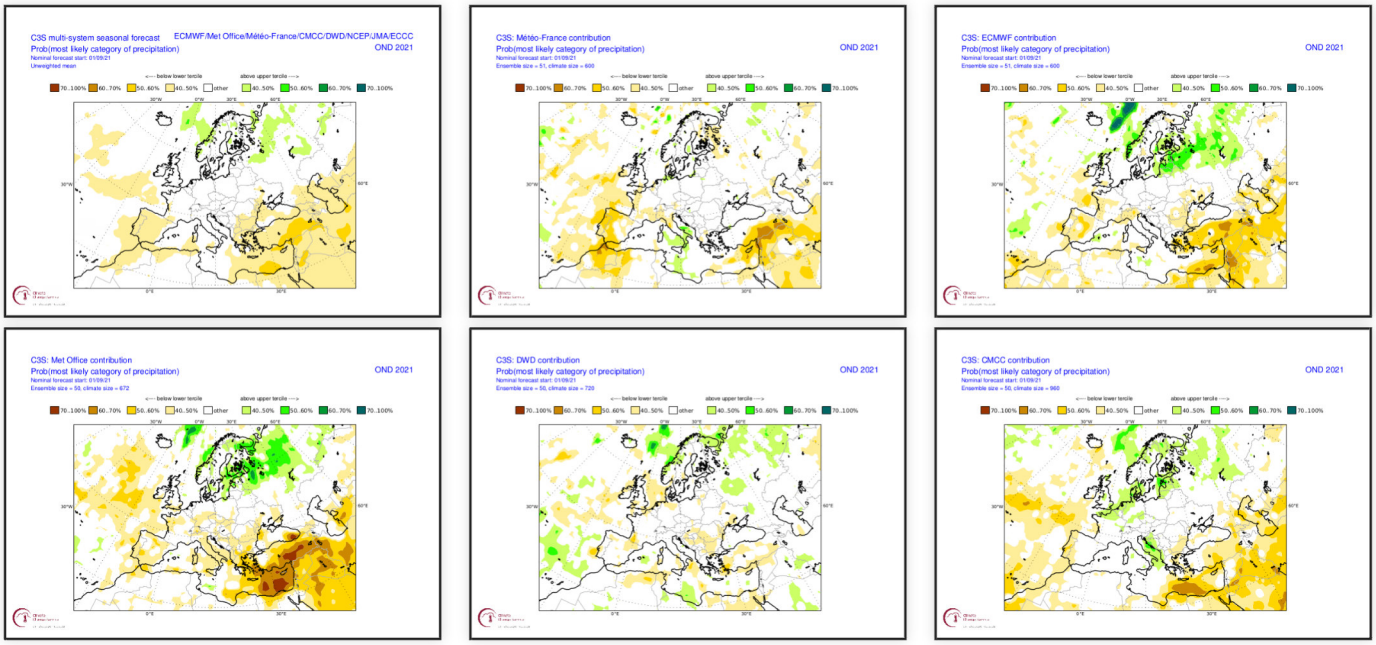


precipitation probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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 and from the Atlantic facade to the Iberian peninsular.

Around Scadinavia the wet scenario is more likely.

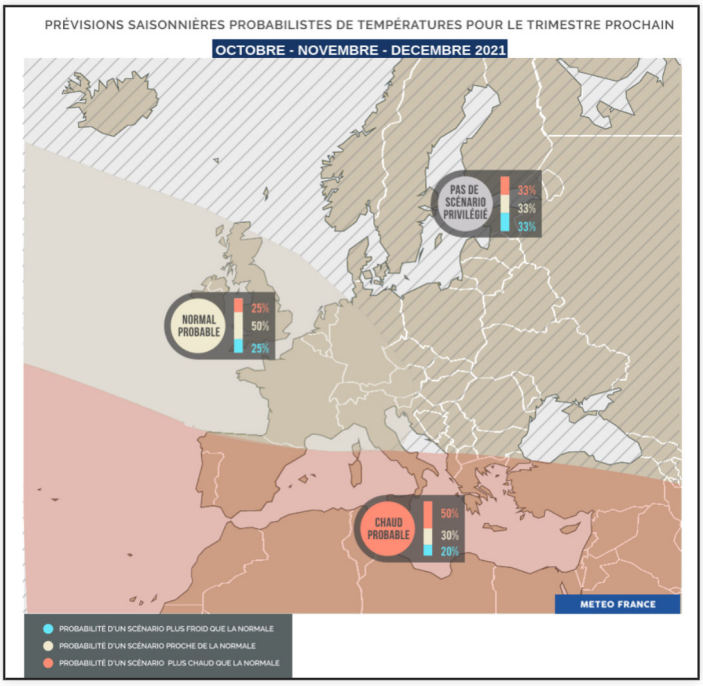


C3S multi-models probability map (top left) and MF-S8, SEAS5, UKMO, DWD, CMCC models.

Synthesis map for Europe : Temperature

Despite a privileged Atlantic Ridge regime, the température reponse varies according to the models.

Anyway we have decided to keep the warm signal over the Mediterranean Basin, mainly because it is present in most of the models. We also retain the option that in the margin of the atlantic Ridge the temperatures should not deviate too far from normal over western Europe.



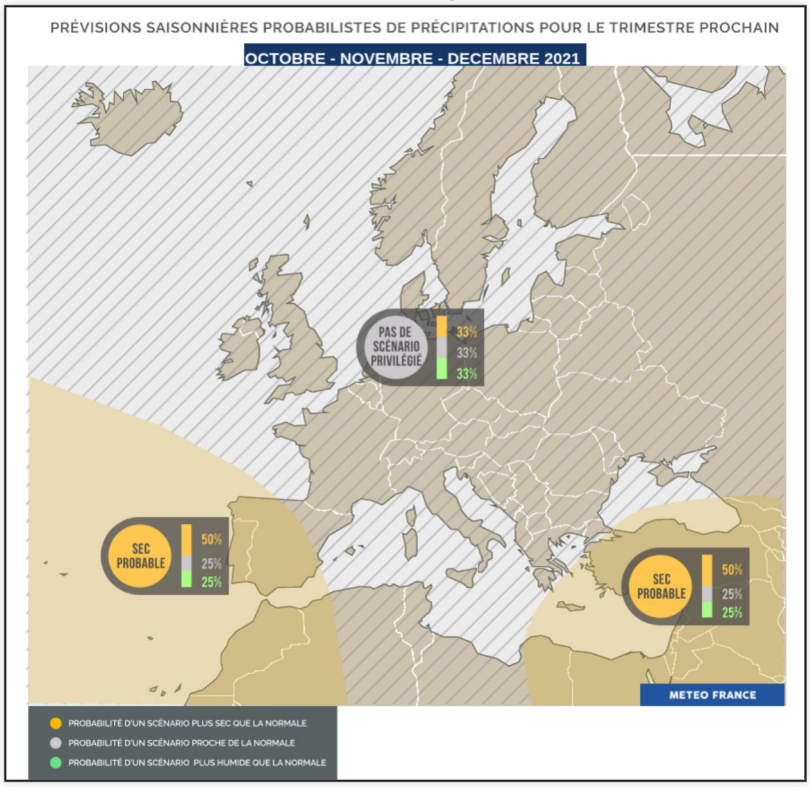
Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

The signal of the multi-models is similar to that of the Atlantic ridge regime.

Dry signal is most likely from the near Atlantic to Iberian Peninsula as well as on the east of the Mediterranean.

The suggested wet signal around Scandinavia is not taken into account given the uncertainty on atmospheric circulation in this region.



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