Météo-France Seasonal Forecast Bulletin

OCTOBER - NOVEMBER - DECEMBER 2022

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General synthesis : OND 2022

In the Pacific Ocean, the "La Niña" phenomenon is expected to continue in the coming months. Moreover the negative phase of the IOD is developing rapidly. These two phenomena will largely impact the climatic conditions of equatorial and tropical regions. There seems to be teleconnections to the mid-latitudes, unless they are not clearly detected by SF200. They may provide some predictability over North America, but also over North Atlantic and Europe. However, there are discrepancies between models on the positioning of some anomalies (Z500 for example) and on their impacts in T and RR.

A) Oceanic forecast :

- ENSO : weak La Niña.

- IOD : strongly negative

- Tropical Atlantic : neutral

B) Drivers :

- "La Niña" and negative IOD

C) Atmospheric circulation :

A positive anomaly of Z500 extends accross North Atlantic up to Europe, with some differences between models. In MSLP, it corresponds to a positive anomaly centred on the Atlantic, covering partially Europe. Blocking regimes or Atlantic Ridge regimes should be more frequent than normal.

D) Most likely conditions :

The warm tercile is the most likely over Europe.

The dry tercile is most likely over the Iberian Peninsula and Middle East. A wet scenario is most likely at high latitudes. No scenario elsewhere.

Next bulletin : scheduled on October 21th

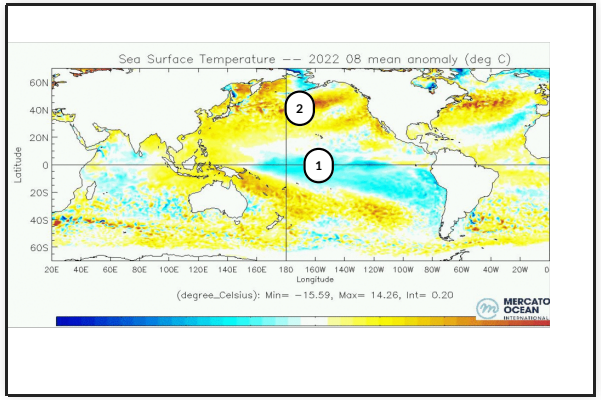
Oceanic analysis of August 2022 : SST anomalies

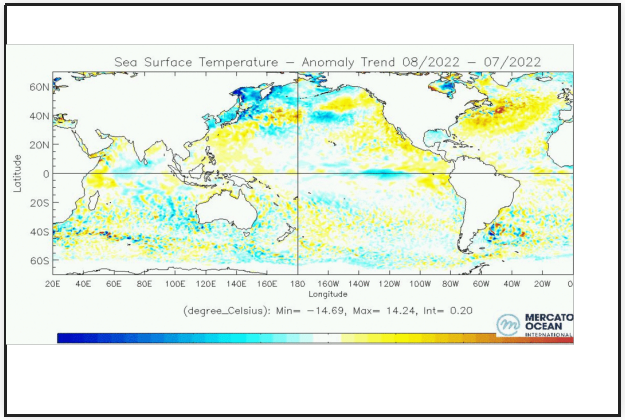
Current ENSO situation : moderate La Niña

In the Pacific Ocean : in the tropics, large pattern of negative anomalies corresponding to La Niña, associated to positive anomalies around the Maritime Continent. Mid-latitudes of the northern hemisphere are entirely covered by positive anomalies, of high intensity in the center (east of the dateline).

In the Indian Ocean : the East/West gradient has become stronger, corresponding to reinforcement of the negative IOD

In the Atlantic Ocean :The warm anomaly present from the European coast to USA coast has increasted. No evolution over the tropics with weak anomalies.



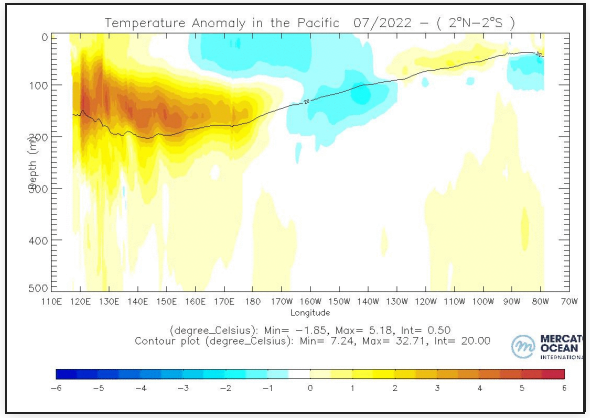


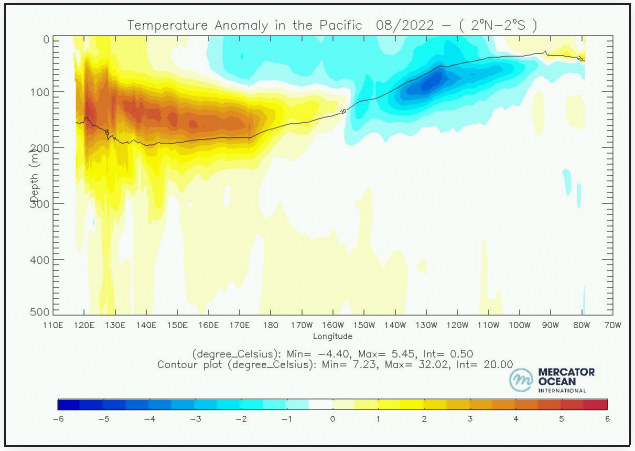
SST Anomalies and trend with the previous month (c) Mercator-Ocean

1 - La Niña pattern
2 - Warm anomalies everywhere in mid-latitudes, with areas of very positive anomalies.

Oceanic analysis of August 2022 : Pacific vertical section

A cold kelvin wave propagates towards the east of the basin. In August, there is still a strong warm anomaly in the west side in subsurface.

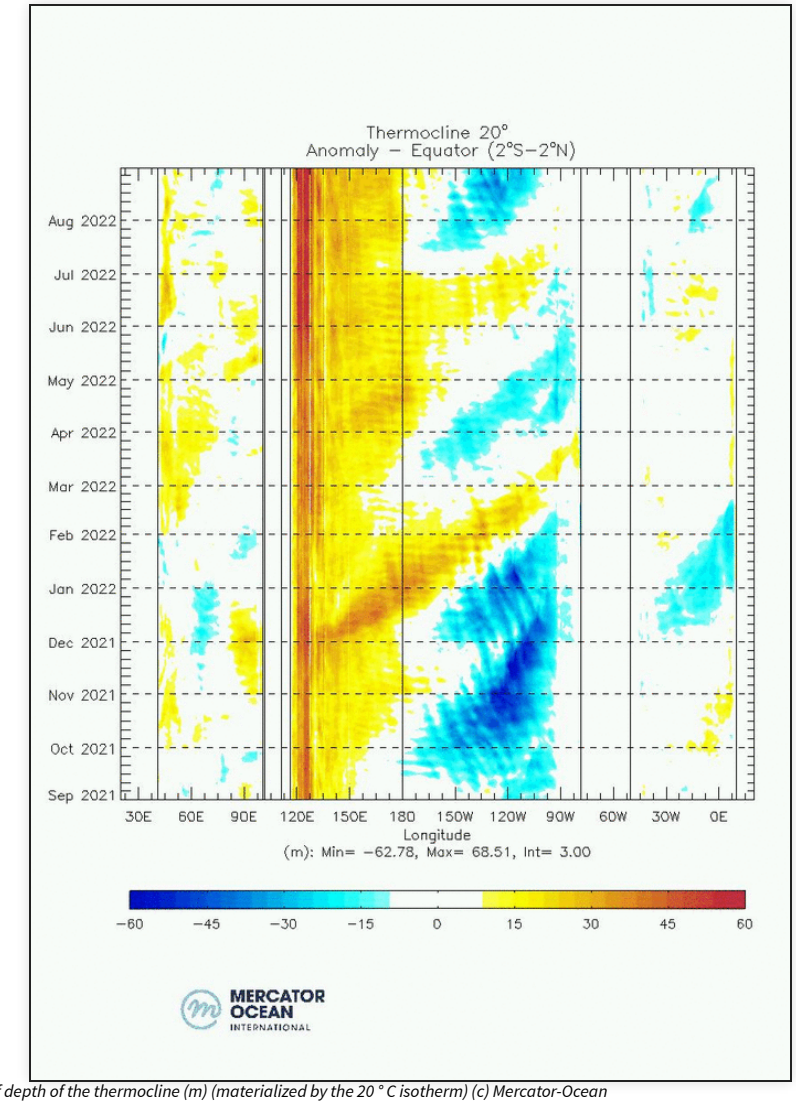




Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

Oceanic analysis of August 2022 : Hovmüller diagram of the 20°C isotherm

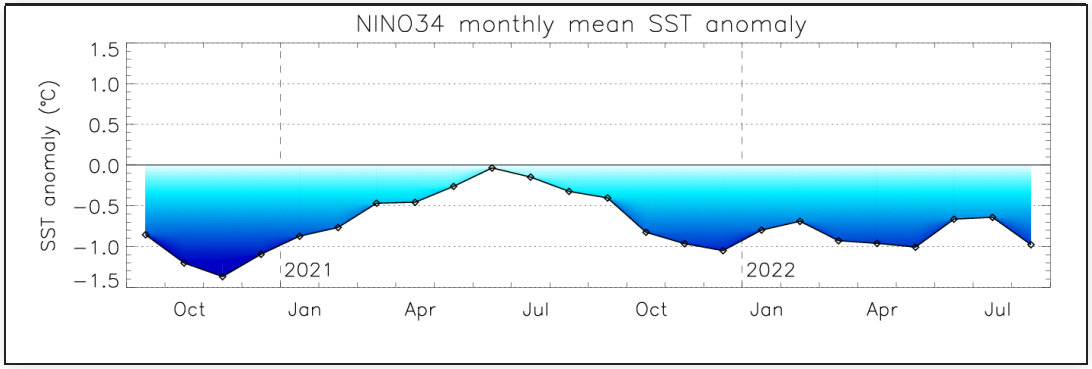
Same comment as before.



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

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

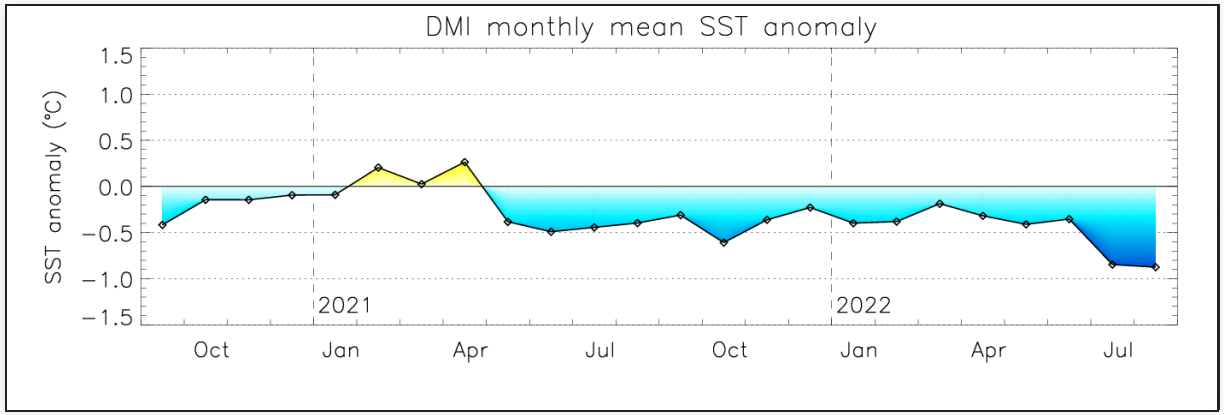
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -0.8°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

Oceanic analysis of August 2022 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -1.0°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

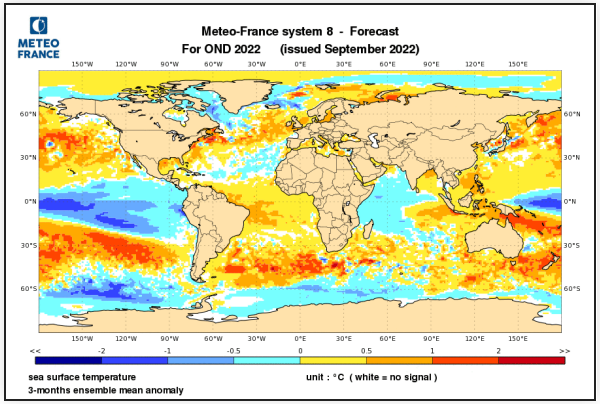
Oceanic forecast : SST anomaly

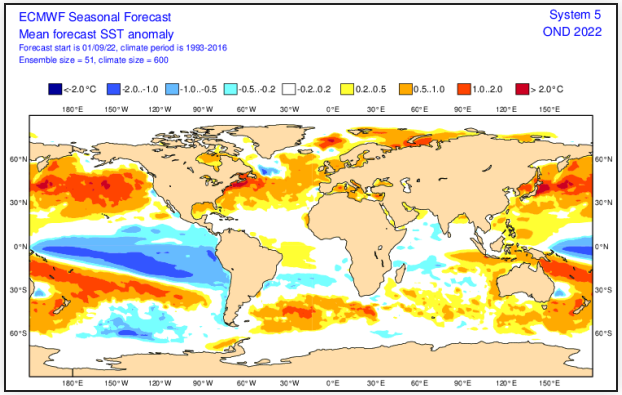
Good agreement between MF-S8 and ECMWF-SEAS5 in the main anomaly patterns.

In the Pacific Ocean : Persistence of the two main patterns, La Niña and the generelazised positive anomaly in the Northern Pacific.

In the Indian Ocean : The East/West gradient is clearly accentuated (negative IOD).

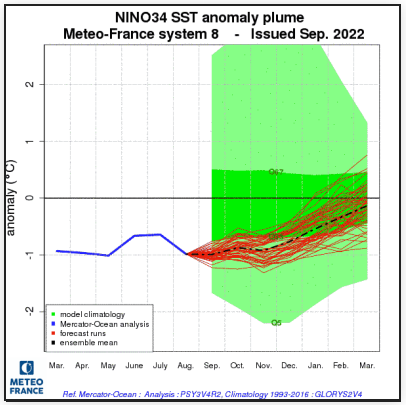
In the Atlantic Ocean : MF-S8 remains warm around the equator while ECMWF-SEAS5 is neutral; most models show a significiant warm anomaly on the west of the basin, off the Bresilian coast. In the North Atlantic, the warm anomaly is weakening. The western half of the Mediterranean sea remains warmer than normal.

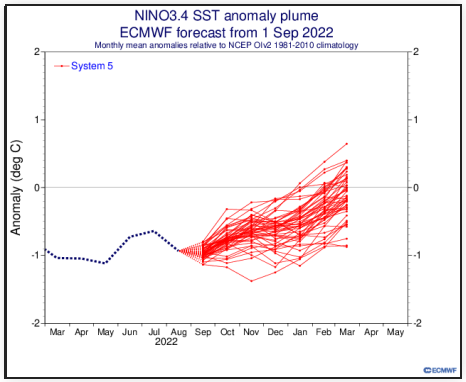




Oceanic forecast : NINO3.4 Plume diagrams

Little evolution in the coming months with MF-S8, a slight positive trend with ECMWF-SEAS5 (with more spread)

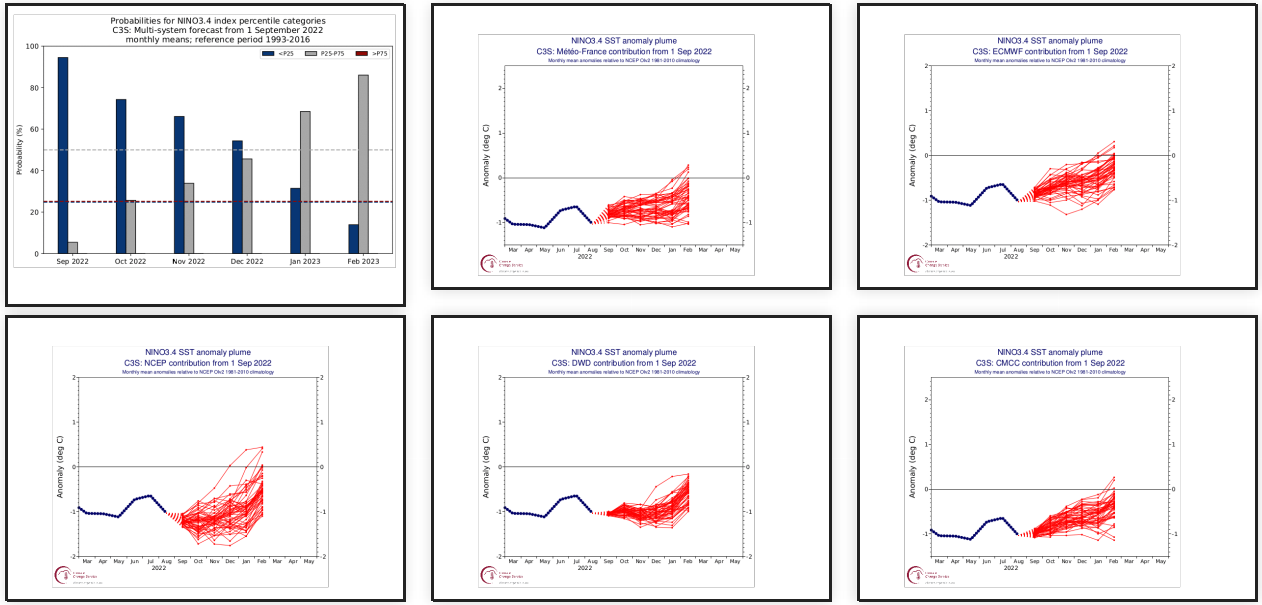




Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

For the coming months, all the models forecast the persistence of La Niña at its current intensity or slightly weaker than now.

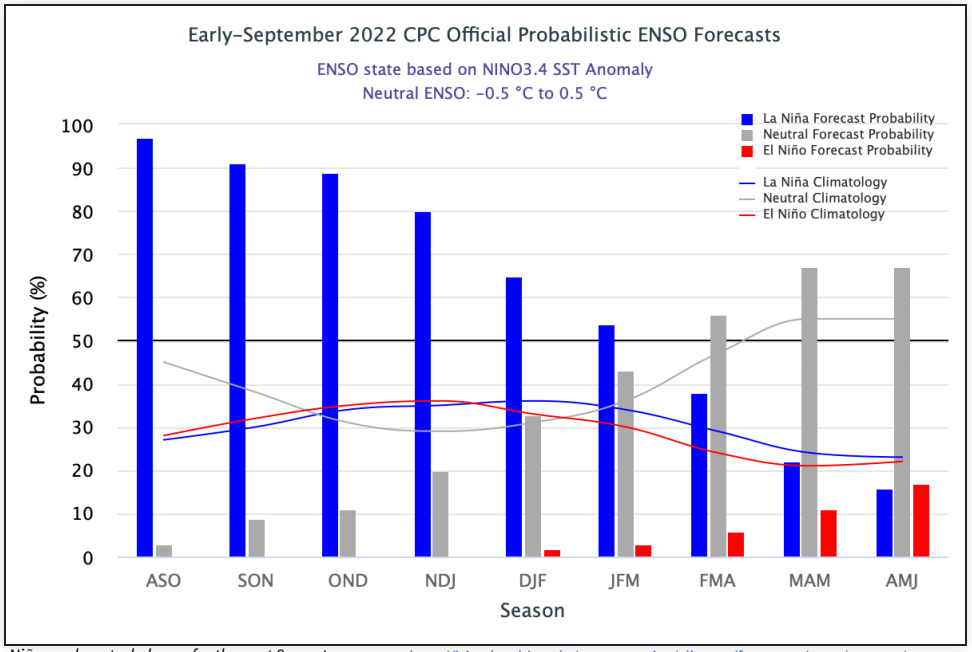
The most likely phase for the next three months : Weak La Niña



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

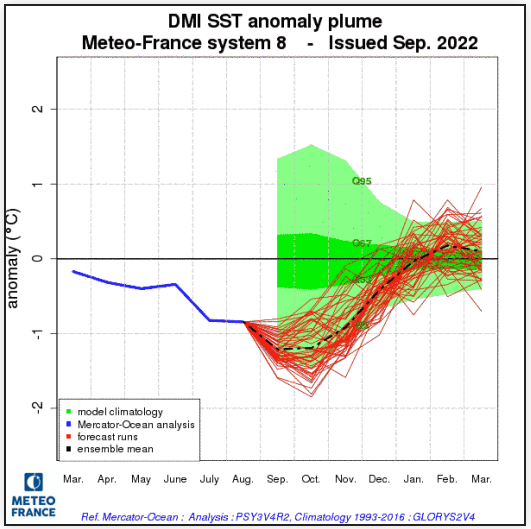
IRI forecast : about 90% chance of "La Nina" and 10% of neutral condition for OND.

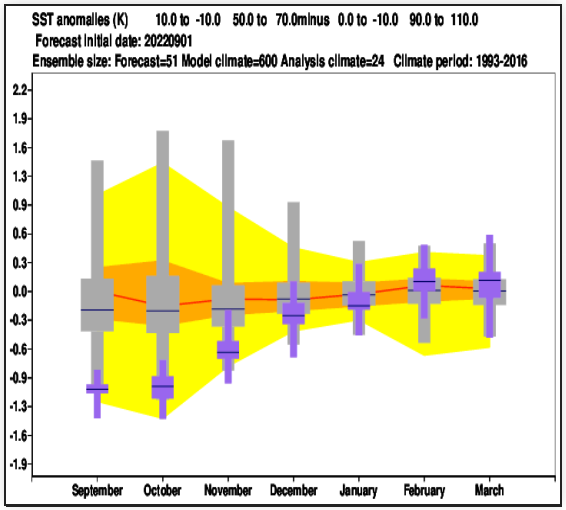


Probability of Niño, Niña, and neutral phases for the next 8 quarters. source http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Oceanic forecast : Indian ocean - DMI evolution

Strong negative values of DMI expected for the next few months, for both models.



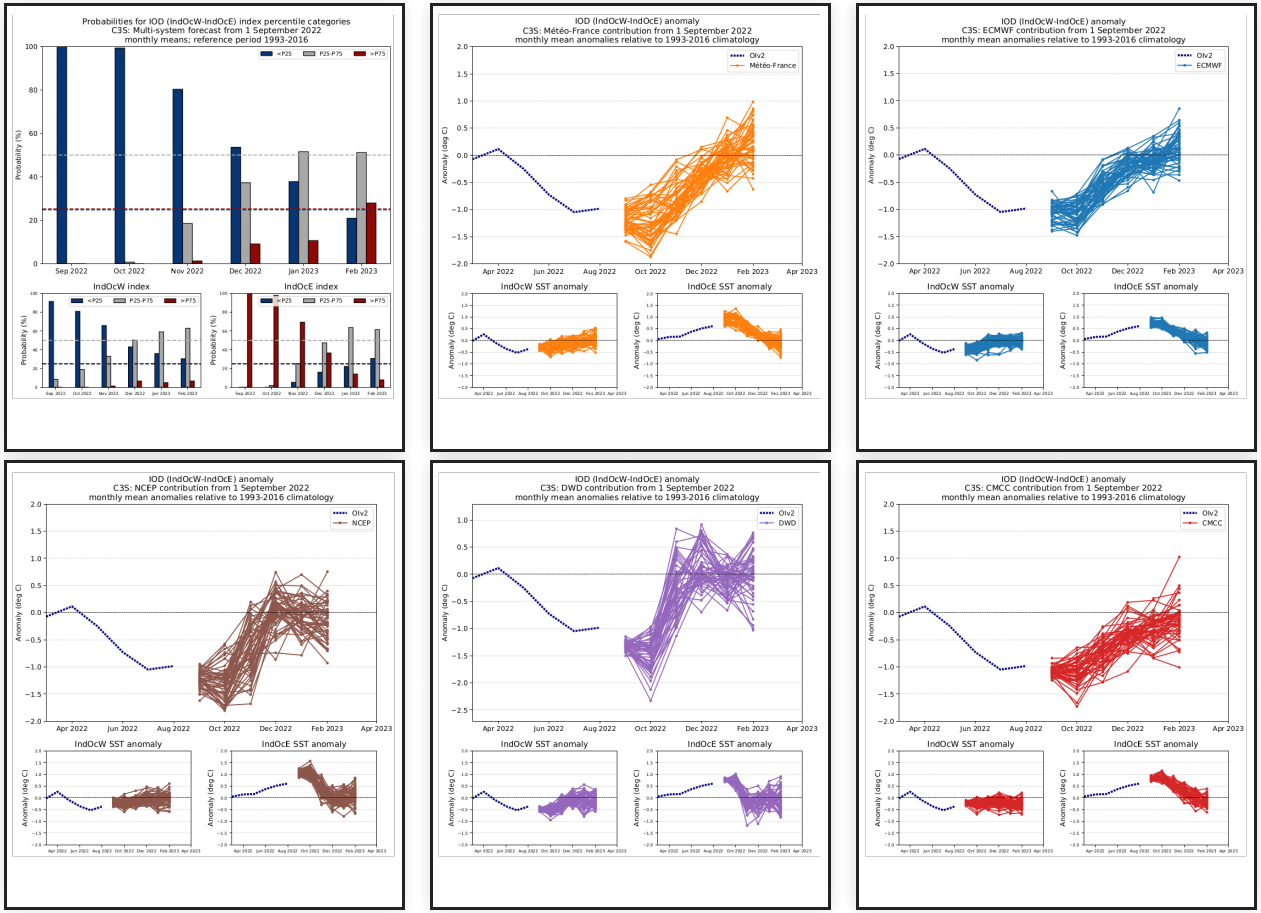


DMI index : analysis, forecasts and model climatology with MF-S8 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

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

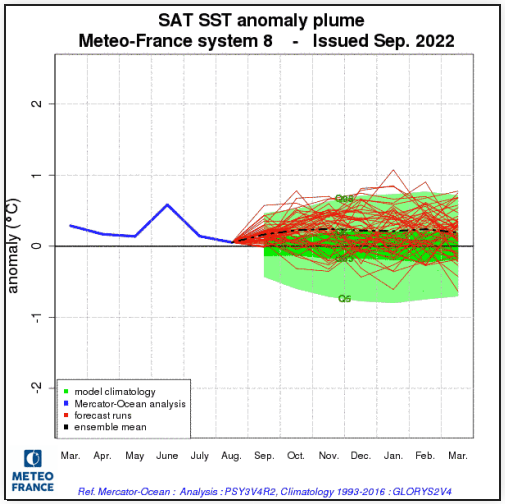
Expected Phase for the next three months : negative.

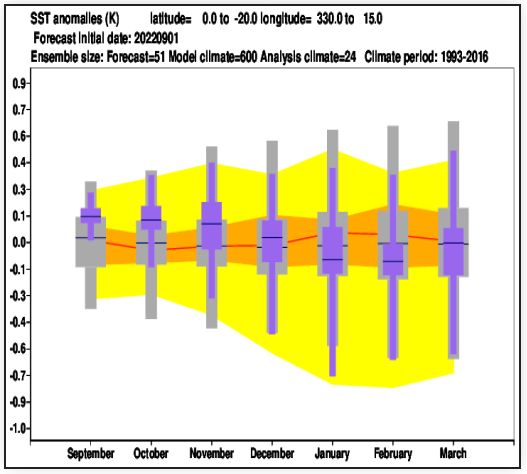


C3S multi-system probabilty forecast (top left figure) and C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010.

Oceanic forecast : Atlantic ocean - SAT evolution

Forecasts close to climatology





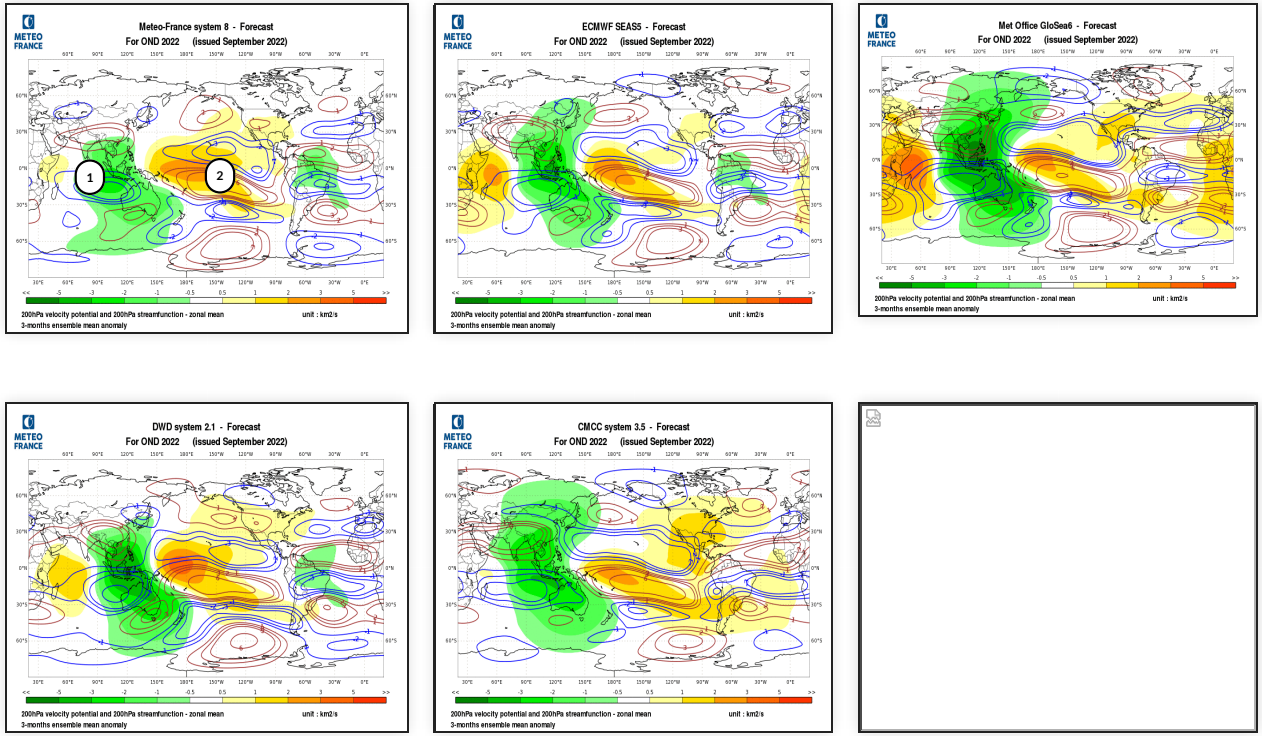
Anomaly on the SAT box : analysis, forecasts and model climatology with MF-S8 on the left and SEAS5 on the right

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

Very good agreement between models for the main patterns (linked to La Niña and negative IOD).

Velocity Potential : Strong dipole over Indian and Pacific Oceans: a downward motion anomaly centered over the western Central Pacific (linked to La Niña); a strong upward motion anomaly centered over the eastern Indian Ocean (linked to La Niña combined with a negative IOD), and downward motion anomaly over East Africa (not for all the models). On the Atlantic most models suggest upward motion on the western part of the basin, extendind to the north of South America (expected effect of the Nina)

Streamfunction : Strong quadripole in the Indian and Pacific oceans, in link with La Niña and the IOD. Over the western Pacific, teleconnections to North America are even visible with some models. The dipole over the Indian Ocean extends up to the Arabian Peninsula and East Africa. Over the Atlantic, despite differences in VP200, there is quite a good agreement for a dipole over both sides of the equator, and on cyclonic anomaly circulation extending on the Iberian peninsula.

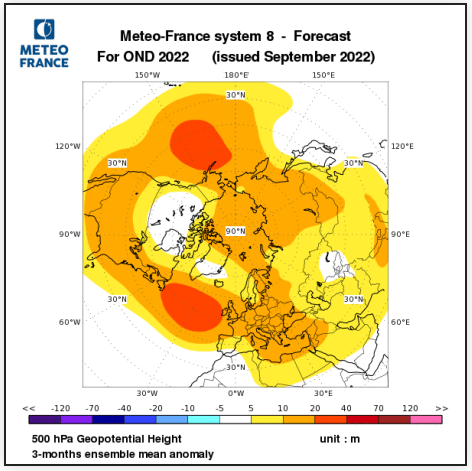


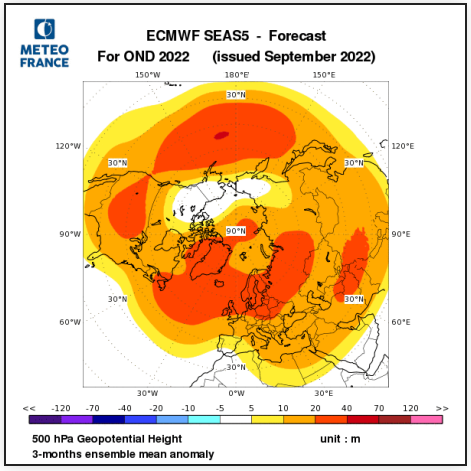
MF8,SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

1 - VP : upward motion anomaly related to La Nina and the SST anomaly gradient in the Indian Ocean
2 - VP : downward motion anomaly related to La Nina

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Quite good agreement in terms of large scale circulation patterns. Over North America, the PNA- pattern is visible in the 2 models, even if the main poles are not exactly at the same place. Large positive anomaly over the Atlantic and Europe, more accentued with SEAS5. On Asia also SEAS5 has more marked positive anomalies. Neverthless a relative minimum appears around Kazakhstan.

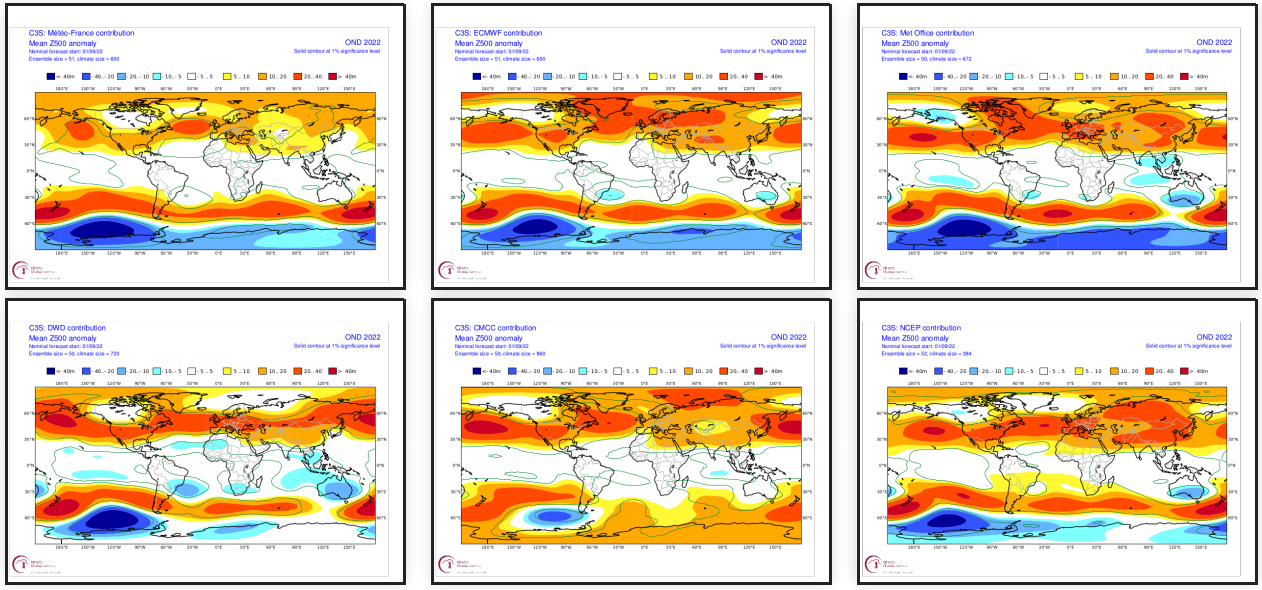




polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

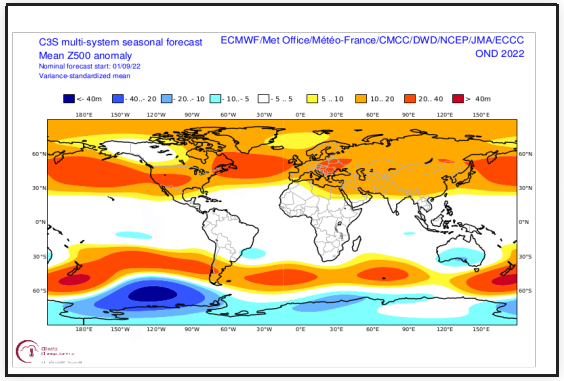
All models predict a PNA- pattern over western North America.
Similarly, around the North Atlantic, there are positive anomalies up to Europe at mi-latitude. Further north, from Greenland to Scandinavia the models disagree, some propose a strong positive anomaly.



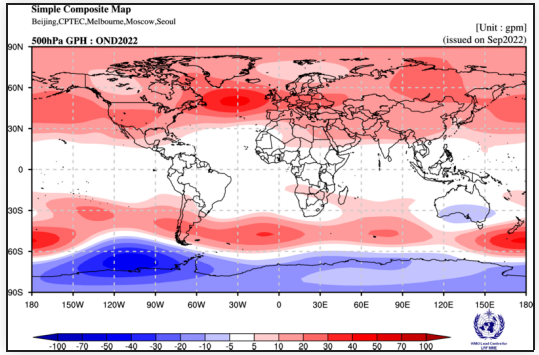
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

Both multi-models agree on the main anomalies in Z500, both in the southern and northern hemispheres.



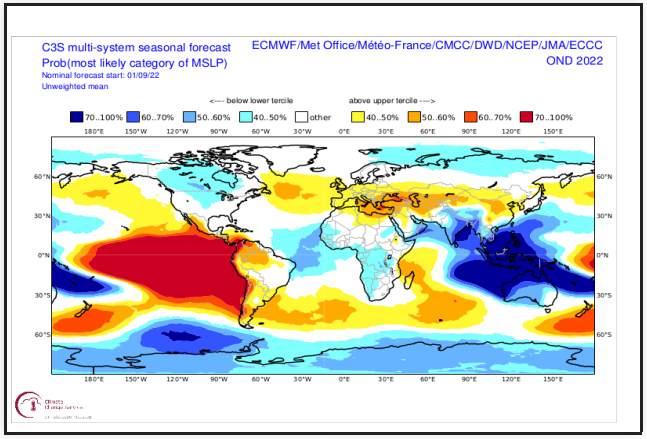
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



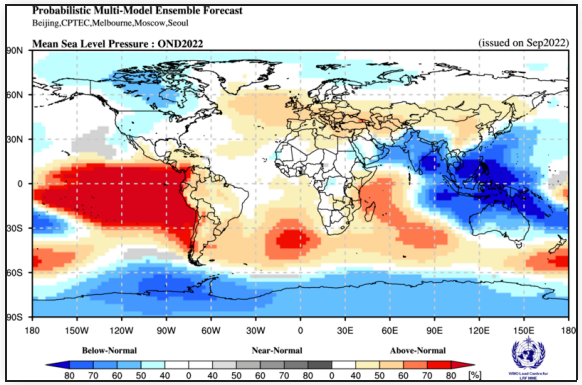
Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilites multi-systems

Good agreement between multi-model combinations.



C3S multi-models MSLP terciles probability.



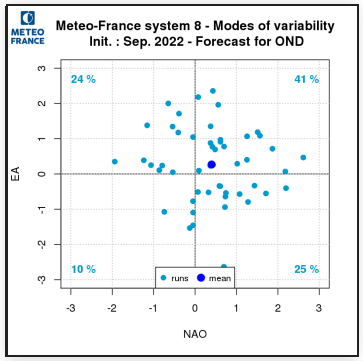
Others models of WMO multi-models MSLP terciles probability.

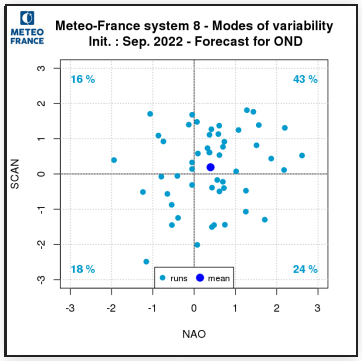
Modes of variability : forecast

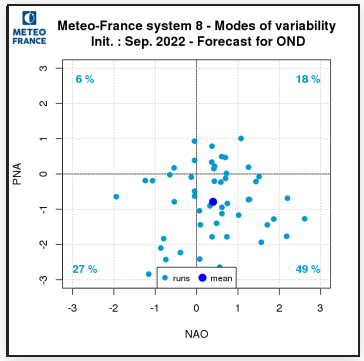
Good agreement between the two models :

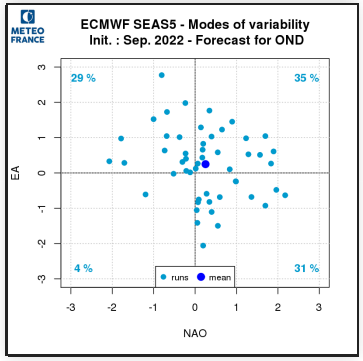
Still good confidence in PNA- and NAO+.

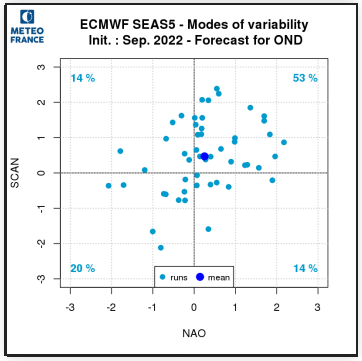
Lower signal for other modes. Neverthless a majority of runs give a positive phase of SCAN and EA.

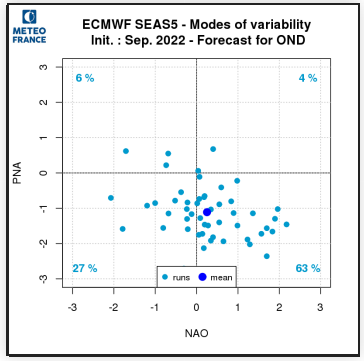








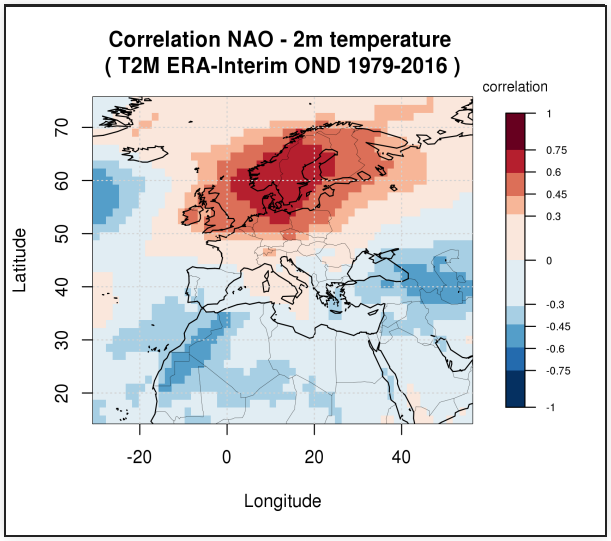


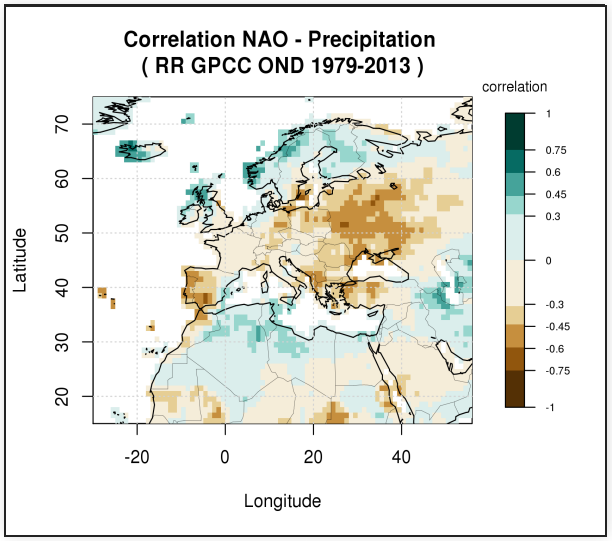


See the modes of variability patterns

Modes of variability : NAO impacts

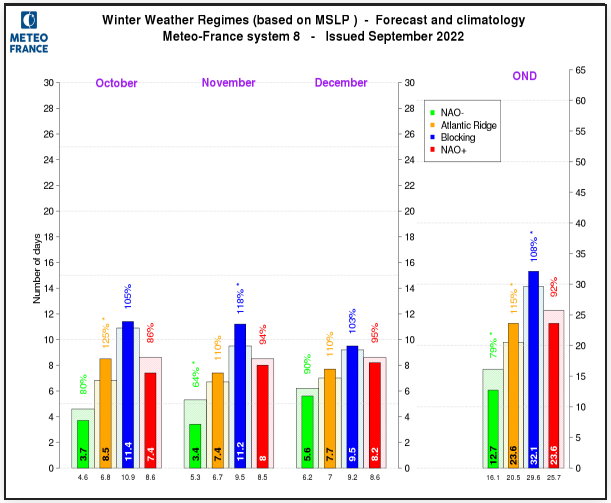
Positive phase of the NAO next quarter

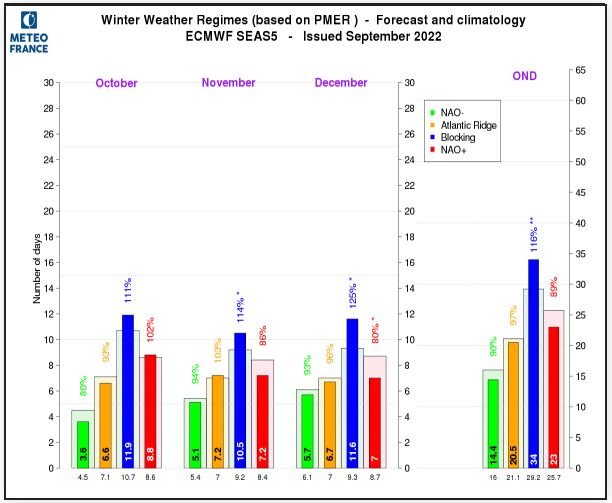




Weather regimes : winter MSLP

Blocking regime is significantly favoured with both models. Atlantic Ridge also with MF8.

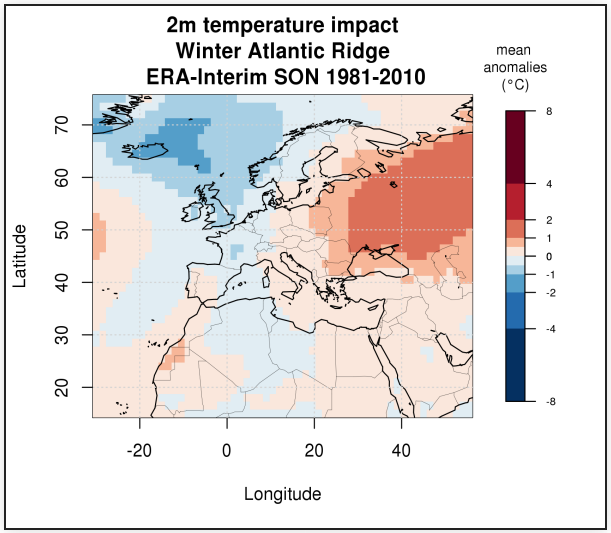


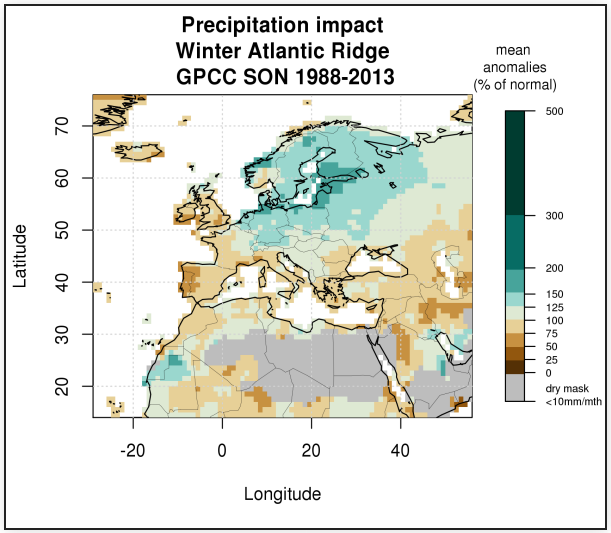


Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S8 (left) and SEAS5 (right).

Weather regimes : Impacts

The Atlantic Ridge weather regime should be favored, according to MF-S8, over the quarter.

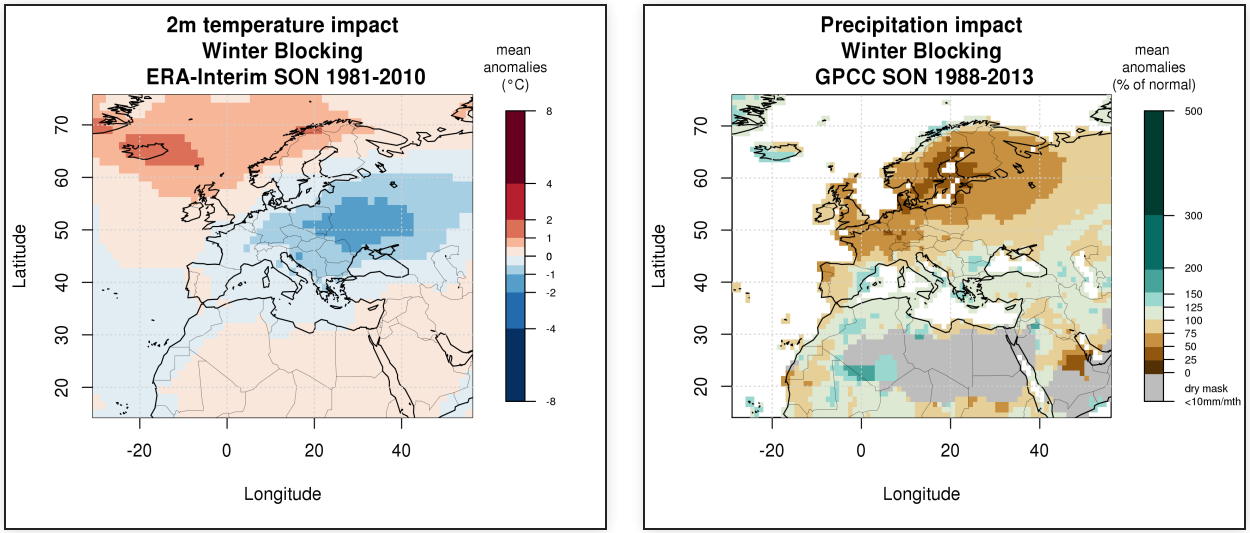




Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Weather regimes : Impacts

Winter Blocking weather regime should be favored according models, over the quarter.

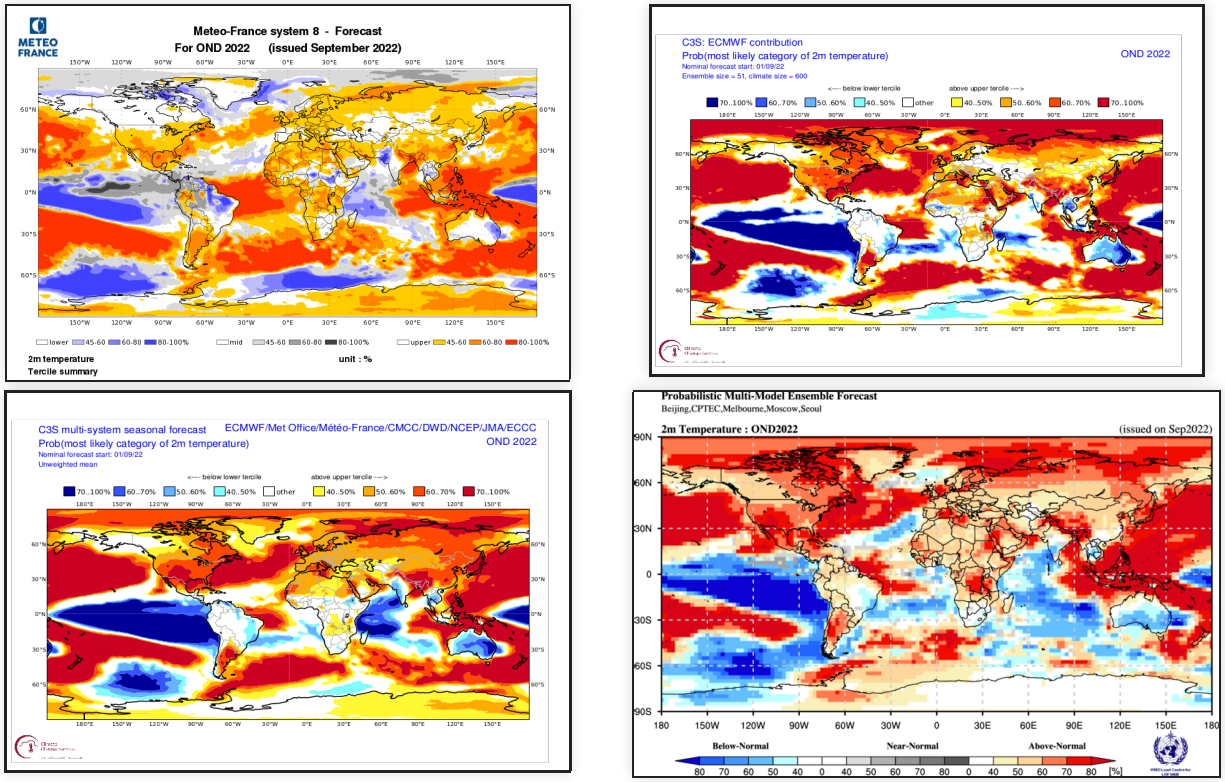


Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

Good agreement between models, both in the intertropics and in the mid-latitudes.

In MF-S8, the probabilities for the warm scenario are higher than the other models in the tropical Atlantic and over Africa



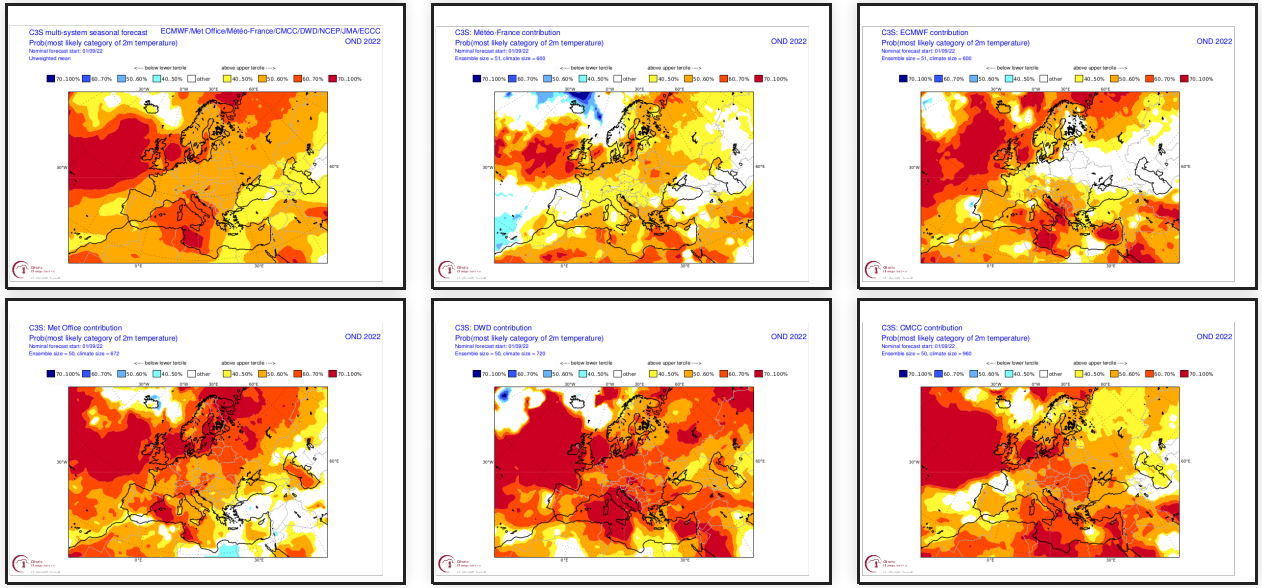
2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

On the European continent, the warm signal is less marked with models that favors blocking (like ECMWF) than with models that favors the Atlantic Ridge or NAO+ (like DWD).

In the multi-models, the hot scenario is the most likely over almost all of Europe.

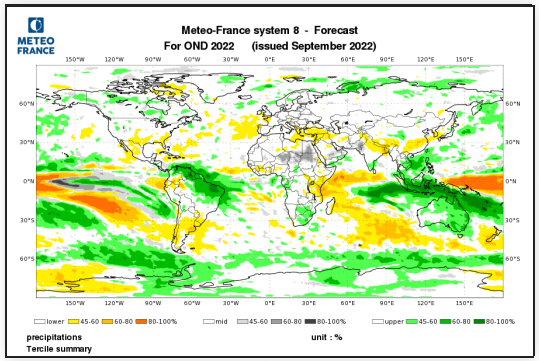
This is partly due to climate change because the privilegied circulation (Atlantic-Ridge and Blocking) is not really favorable to a warmer than normal scenario over Western Europe.

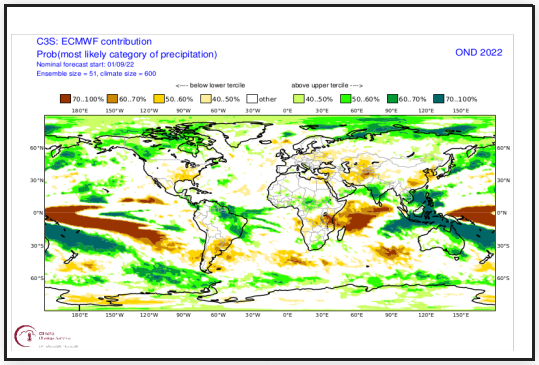


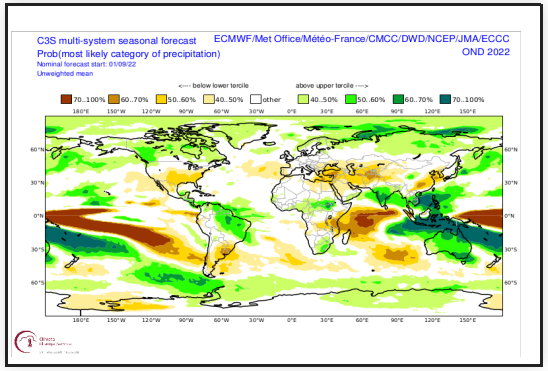
C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO , DWD, CMCC models.

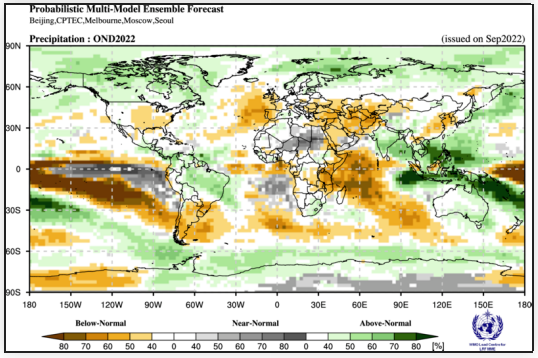
Forecast of climatic parameters : Precipitation

Strong and concordant signal in the tropics.
In mid-latitudes, weak signal but in good agreement over North America. The stronger signal concerns Middle East : relatively high probabilities for dry conditions, consistent with the teleconnexion from IOD.





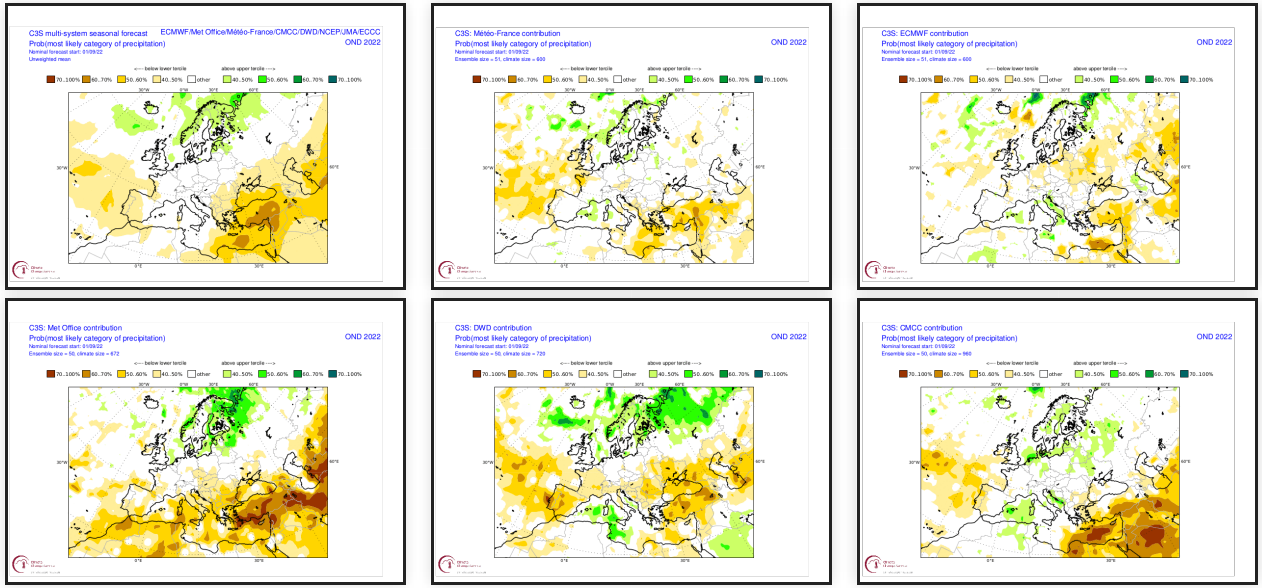




precipitation probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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

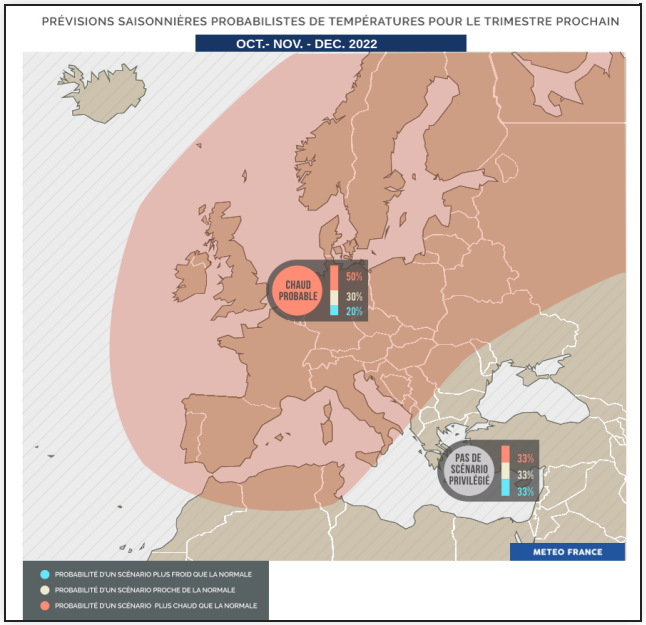
Only the dry signal over the Near East has a good consensus between the models.
Elsewhere, the models sometimes show significant differences.



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

Synthesis map for Europe : Temperature

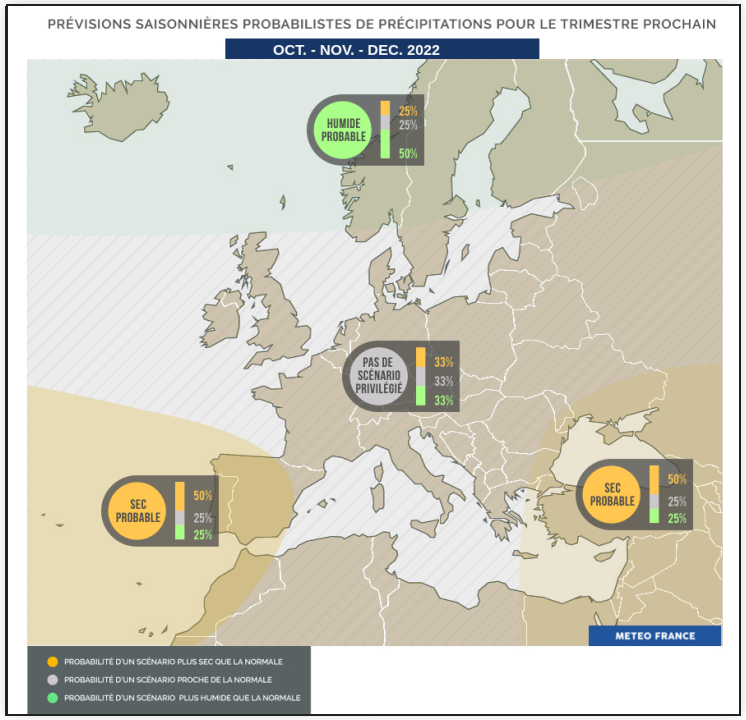
Almost all models priviledge the warm tercile over Europe. This is partly due to climate change because the privilegied circulation (Atlantic-Ridge and Blocking) is not really favorable to a warmer than normal scenario over Western Europe. In the south eastern part of the domain (including eastern Mediterranean sea), there seems to be more uncertainties.



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

Synthesis map for Europe : Precipitation

No clear agreement between models for precipitations, which explains the lack of signal in a large part of the domain. We choose to keep a dry signal over the Iberian peninsula (positive anomalies in MSLP) and over Middle East (positive Z500 and MSLP anomalies, in link with IOD teleconnexion) and a wet signal at high latitudes (north shift of the disturbed flow).



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