

Météo-France Seasonal Forecast Bulletin

NOVEMBER - DECEMBER 2022 - JANUARY 2023



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General synthesis : ND 2022 - J 2023

The "La Niña" situation will continue in the next quarter in the Pacific Ocean. In the Indian Ocean, the negative phase of the IOD will diminish significantly.

Moreover, the teleconnections to the mid-latitudes over the three oceans are clearly visible.

All these elements should bring predictability in the tropical regions but also towards North America. When arriving over Europe, the effects of the teleconnections are more limited and discrepancies appear between the models on the atmospheric circulation, and thus on the weather parameters (RR and T)

A) Oceanic forecast :

- ENSO : weak La Niña.
- IOD : negative phase weakening
- Tropical Atlantic : close to neutral

B) Drivers :

- "La Niña" and negative IOD

C) Atmospheric circulation :

A positive anomaly of Z500 extends across North Atlantic up to Europe, with some differences between models on the position of the relative extrema. In MSLP, it corresponds to a positive anomaly from the North Atlantic to Western Europe. A negative anomaly is centered on the Moroccan coasts.

Blocking regimes should be more frequent than normal.

D) Most likely conditions :

the warm tercile is limited to the British Isles, while the normal tercile is favored over continental Western Europe. No scenario elsewhere..

The dry tercile is expected from Turkey to Central Europe. The wet tercile is most likely from Canary Islands to Balearic Islands and on the far North of Europe. No scenario elsewhere..

Next bulletin : scheduled on November 22nd

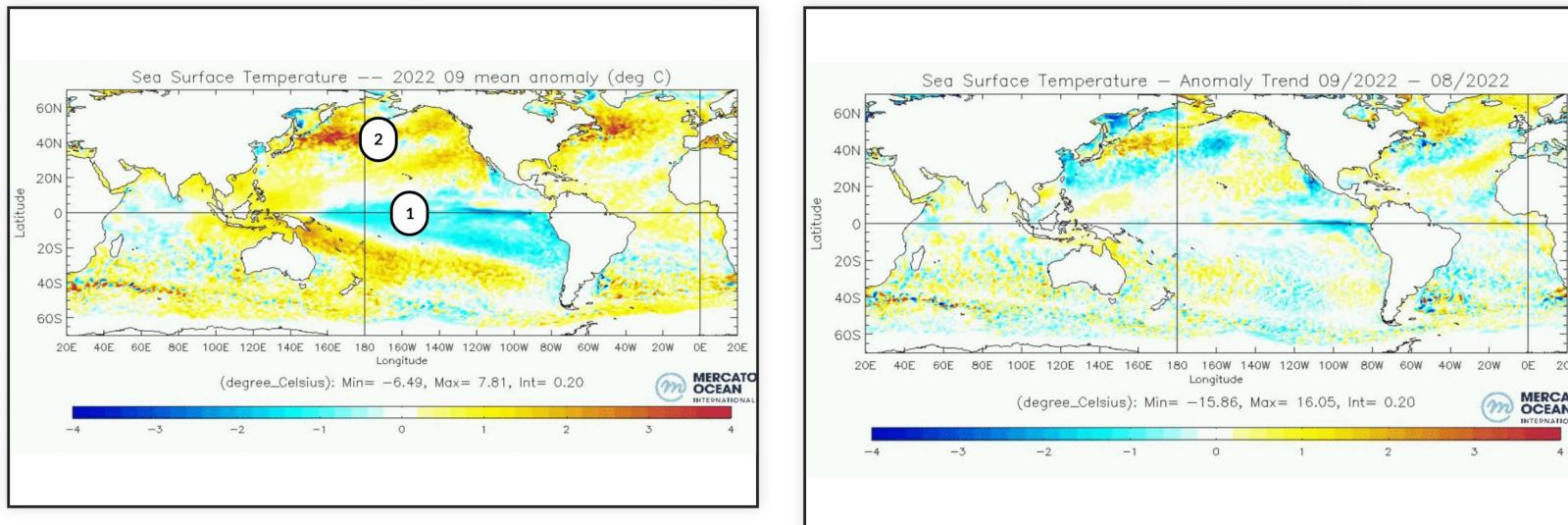
Oceanic analysis of September 2022 : SST anomalies

Current ENSO situation : moderate La Niña

In the Pacific Ocean : In the tropics, the Niña pattern remains in place: a warm anomaly near the Maritime Continent and a cold anomaly over a large part of the Eastern Ocean. This pattern does not change much from one month to the next. On the other hand, at mid-latitudes in the Northern Hemisphere, the positive anomaly is fading.

In the Indian Ocean : There is also little change in the East/West gradient of the SST characteristic of the negative phase of the IOD.

In the Atlantic Ocean : Not much signal or evolution in the tropics. In the North Atlantic, the warm anomaly is shifting northward.



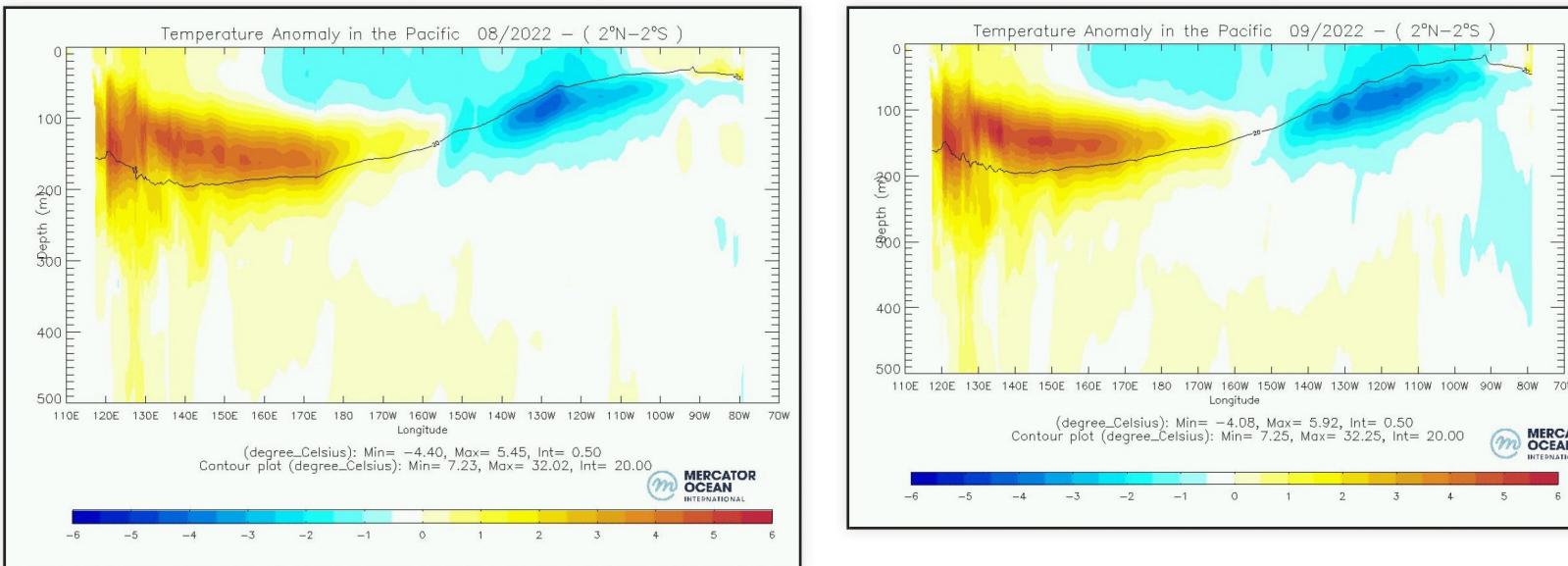
SST Anomalies and trend with the previous month (c) Mercator-Ocean

1 - La Niña pattern

2 - Warm anomalies everywhere in mid-latitudes

Oceanic analysis of September 2022 : Pacific vertical section

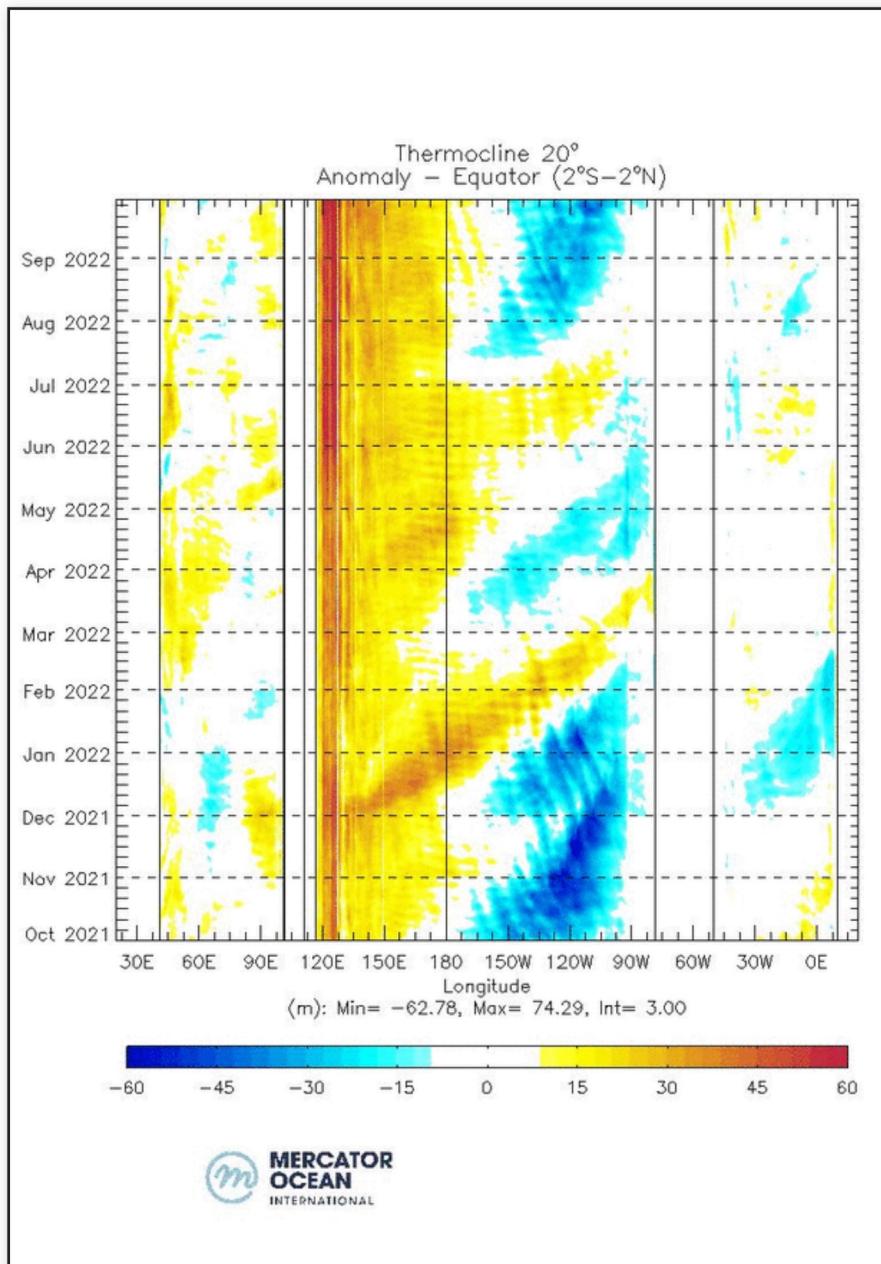
The cold Kelvin wave continues to propagate slowly eastward. The warm anomaly in the west remains strong.



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

Oceanic analysis of September 2022 : Hovmöller diagram of the 20°C isotherm

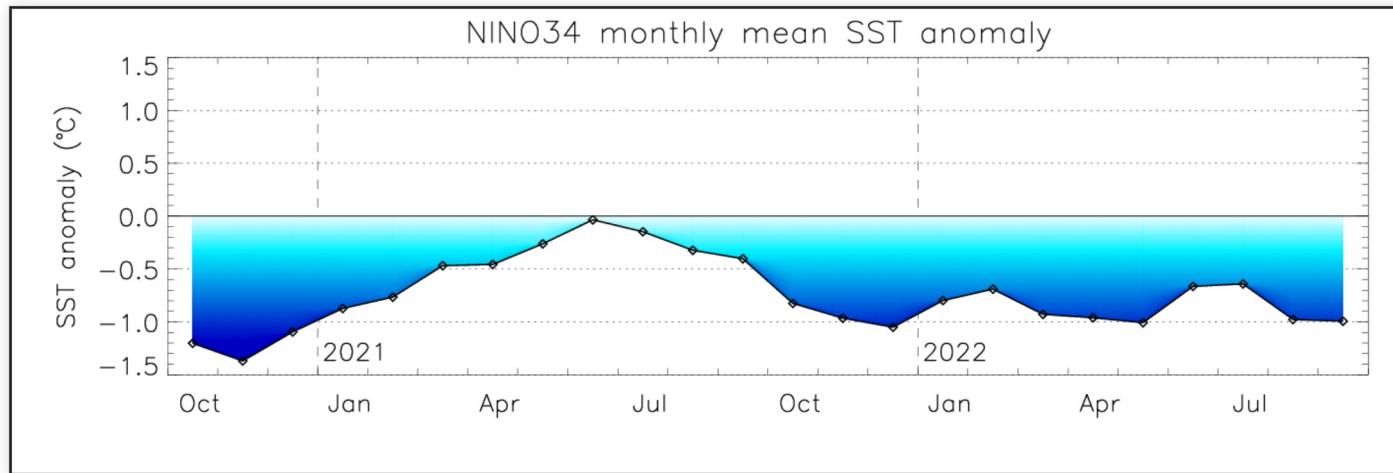
Same comment as before.



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

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

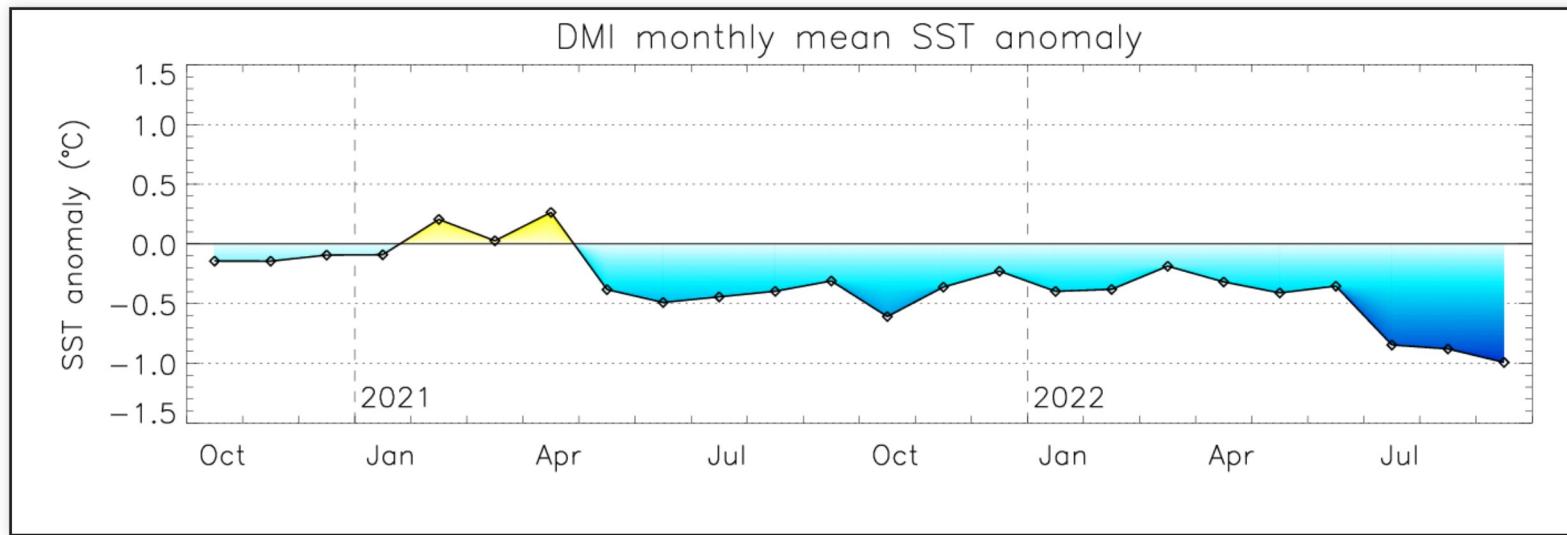
Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -0.9°C
(see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)



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

Oceanic analysis of September 2022 : Indian Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.9°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

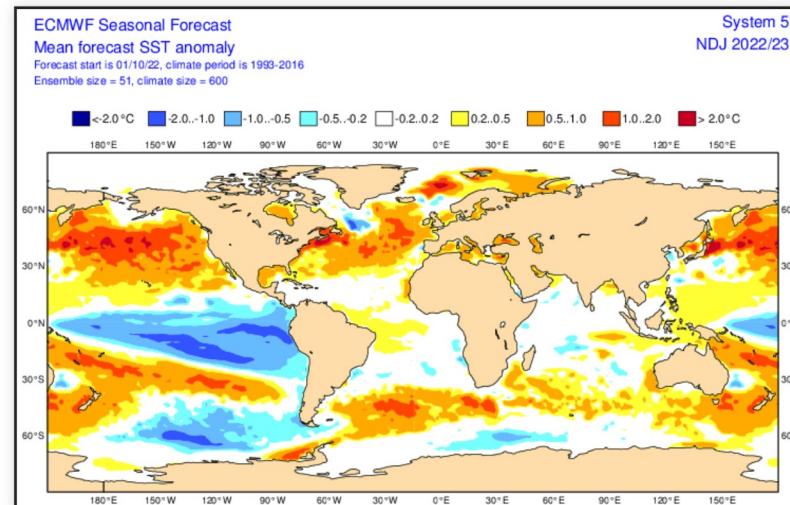
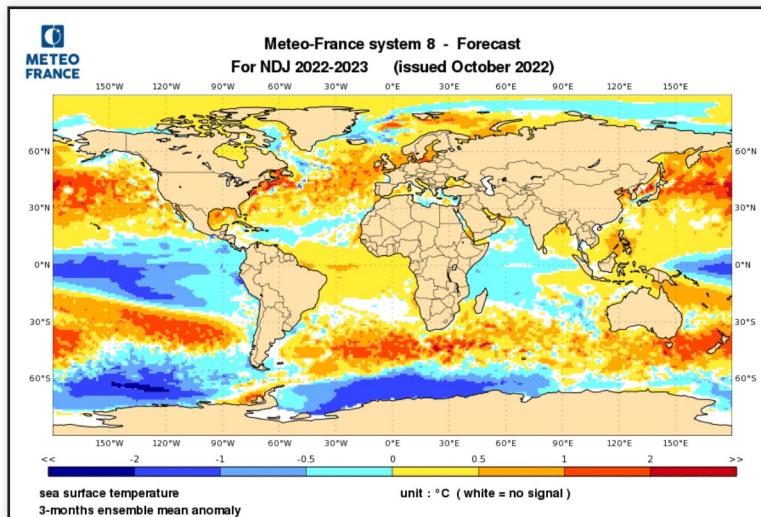
Good agreement between MF-S8 and ECMWF-SEAS5 in the main anomaly patterns.

In the Pacific Ocean : The characteristic pattern of La Niña (and PDO- phase) continues for the quarter.

In the Indian Ocean : The East/West gradient weakens with a cooling near the Maritime Continent.

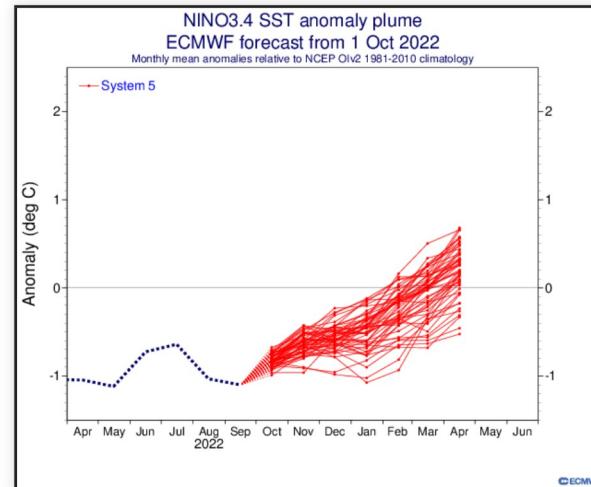
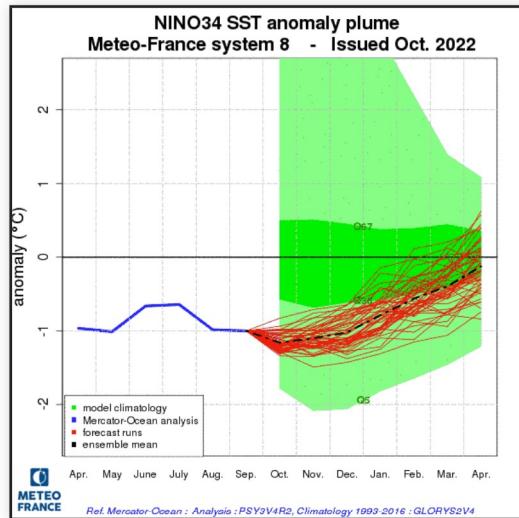
In the Atlantic Ocean : MF-S8 is still slightly warmer than ECMWF in the tropics, but the signal also weakens.

Little change in the North Atlantic and the Mediterranean.



Oceanic forecast : NINO3.4 Plume diagrams

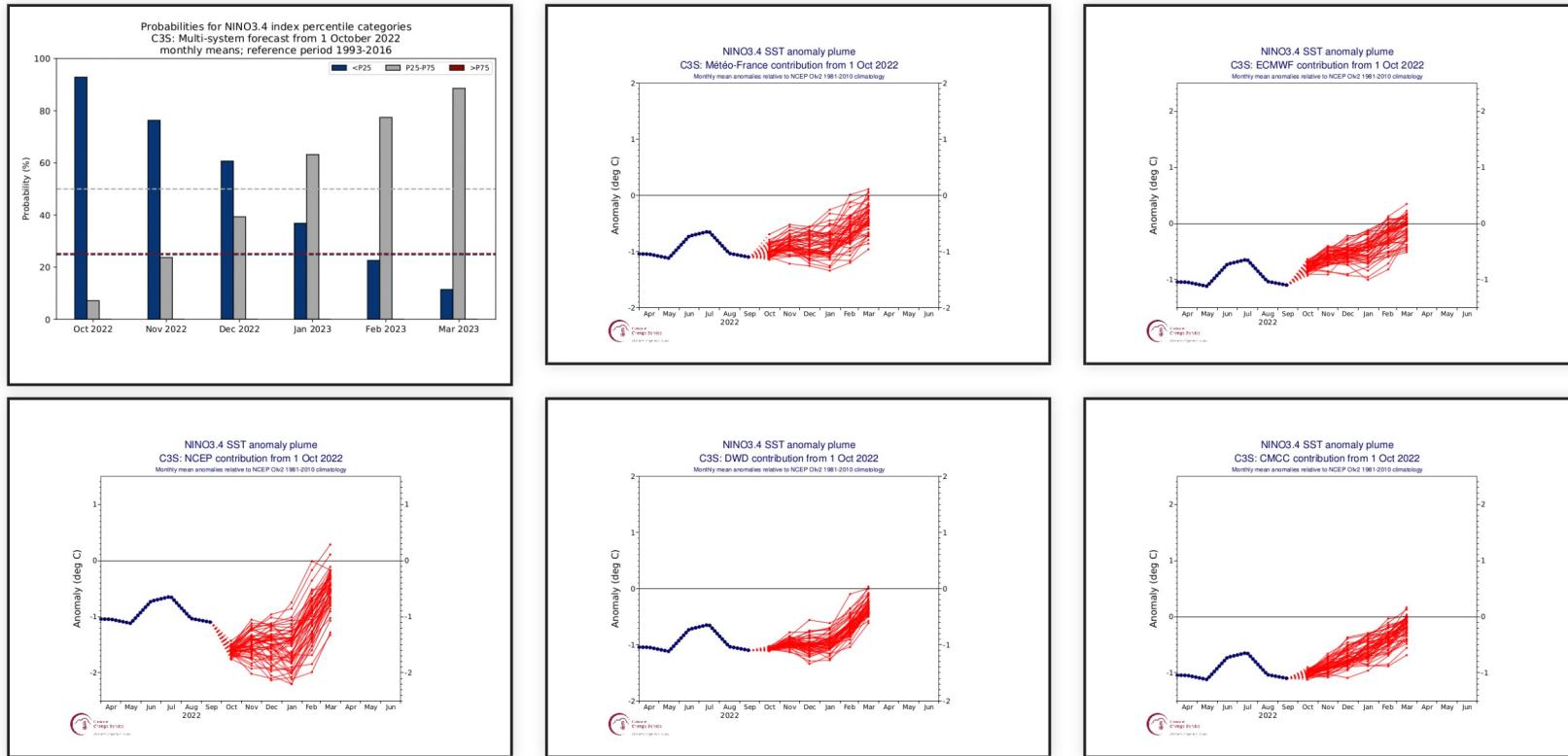
Positive trend for both models with reduced spread, but faster with ECMWF-SEA5.



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

All the models converge towards an attenuation of the "La Niña" phenomenon in the coming months.

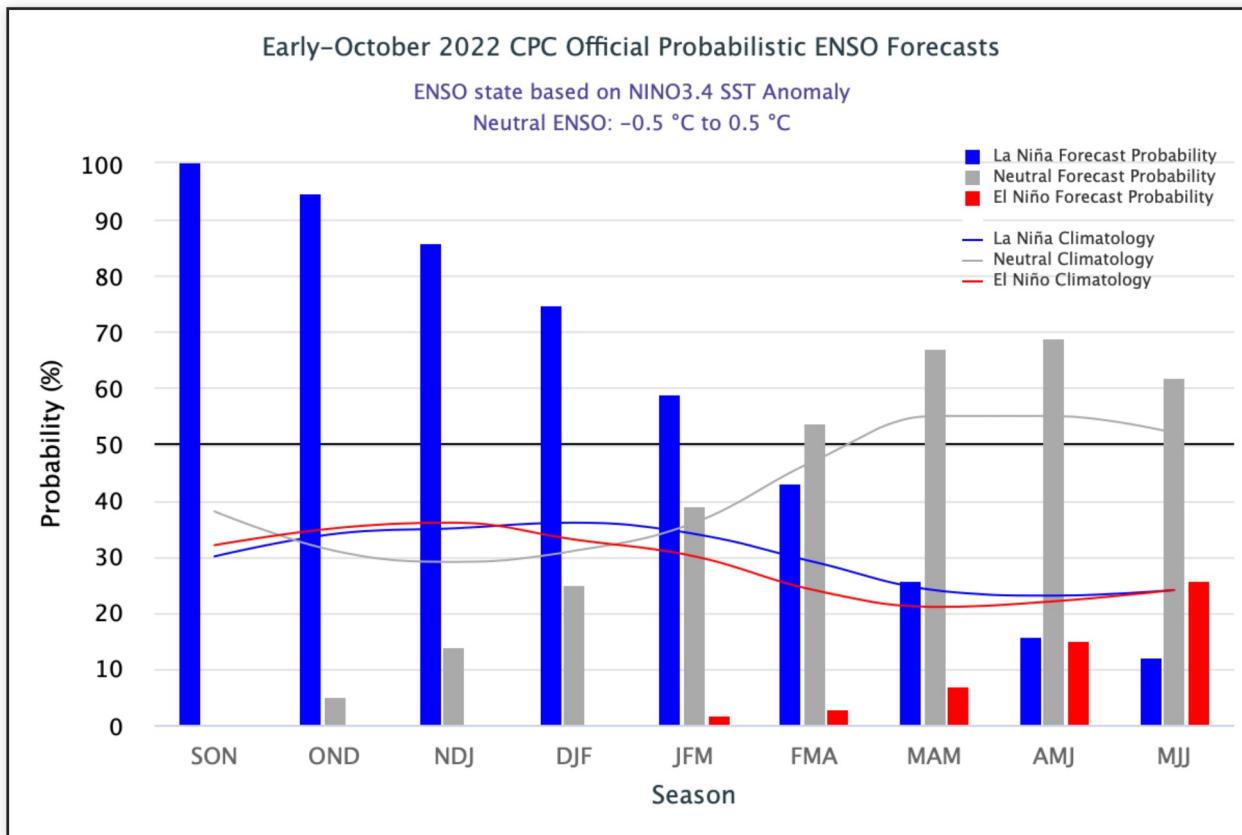
The most likely phase for the next three months : Weak La Niña



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

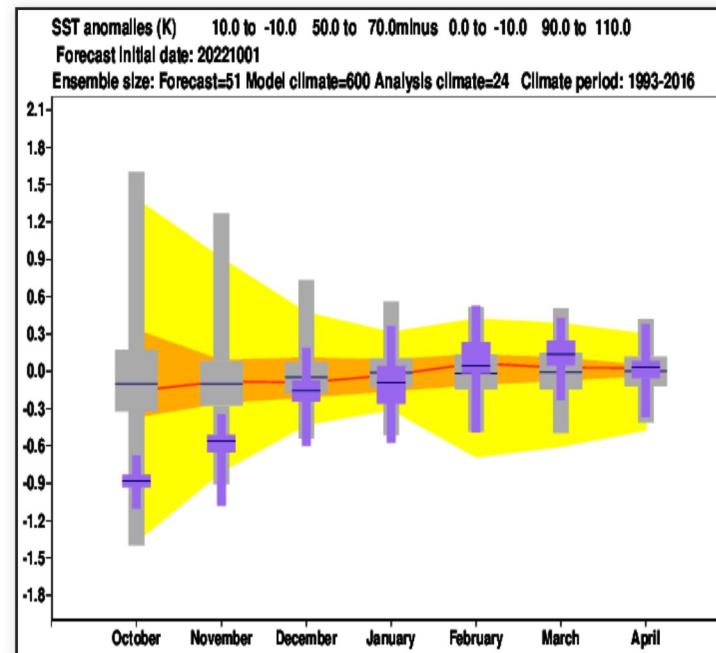
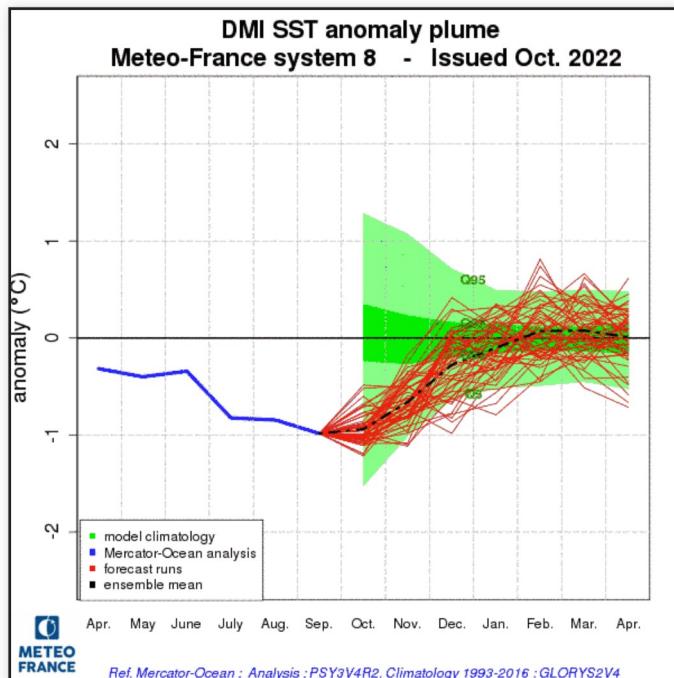
IRI forecast : about 85 % chance of "La Niña" and 15 % of neutral condition for NDJ.



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

The DMI index increases rapidly during the quarter, for both models, with a return to neutrality at the end of the period.

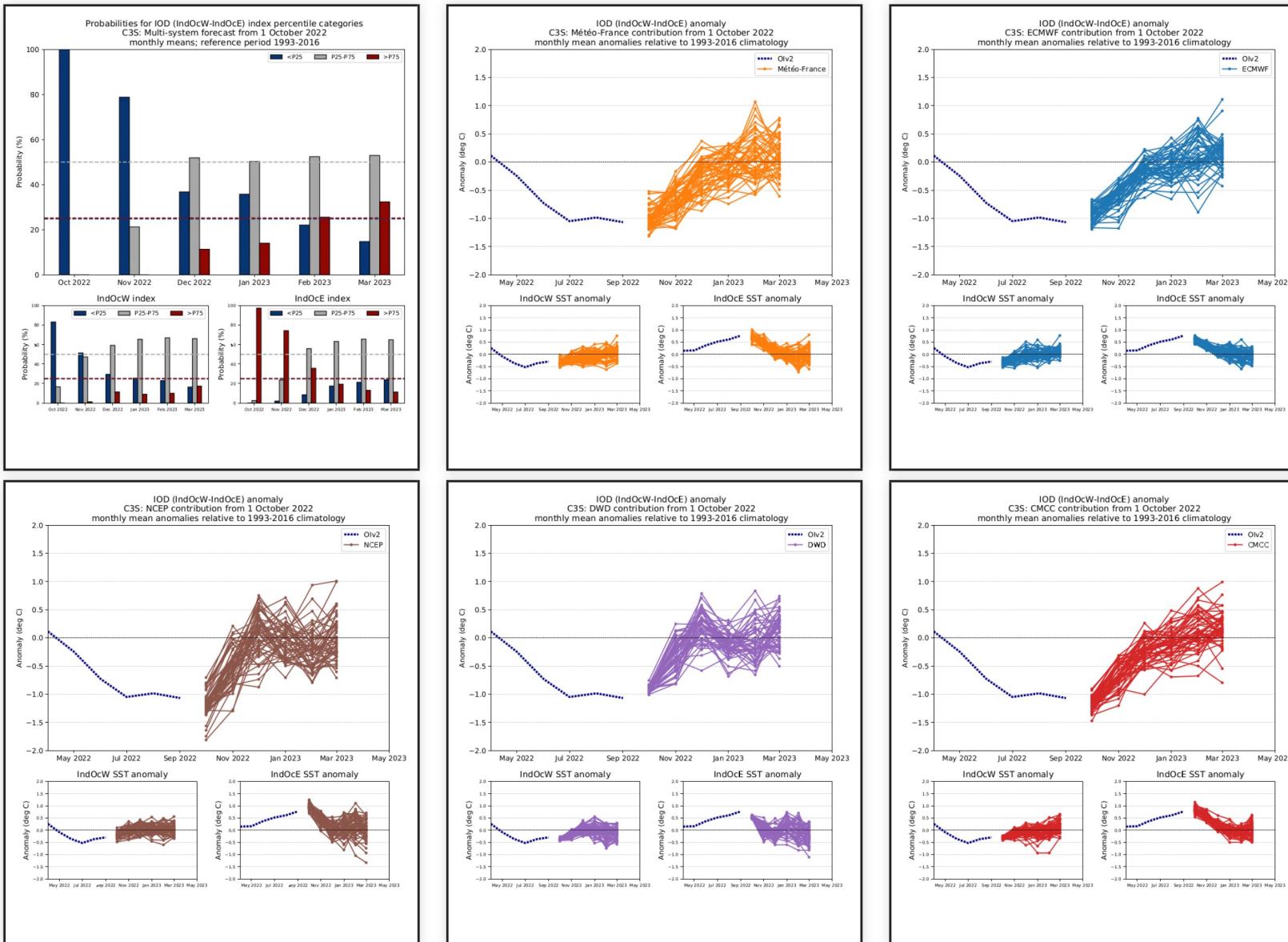


DMI index : analysis, forecasts and model climatology with MF-S8 on the left and ECM-SEAS5 on the right

Oceanic forecast : C3S IOD re-scaled plume diagrams

Fast cooling for the "East" box for all models.

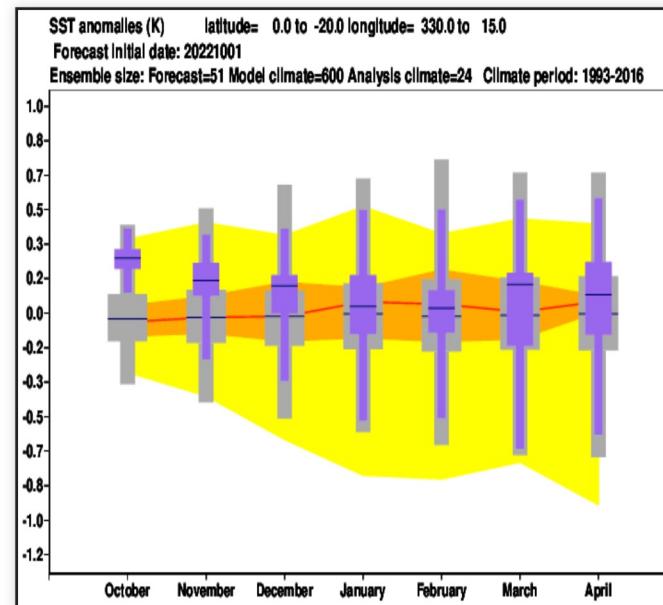
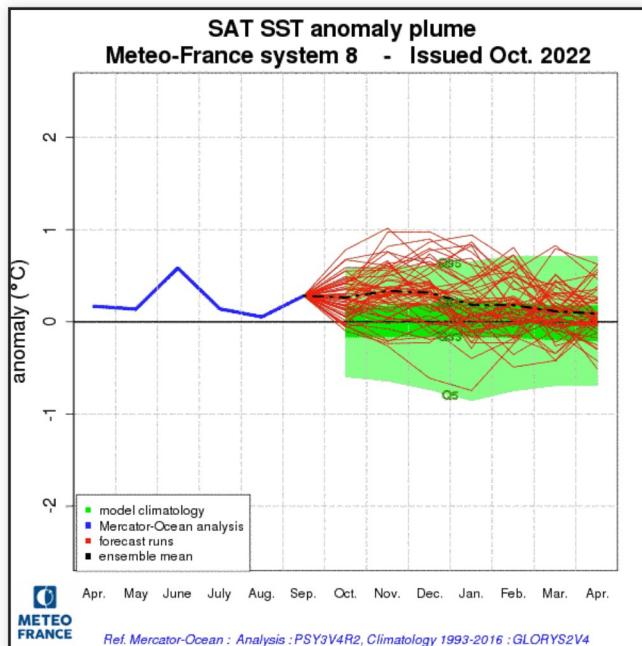
Expected Phase for the next three months : weakly negative.



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

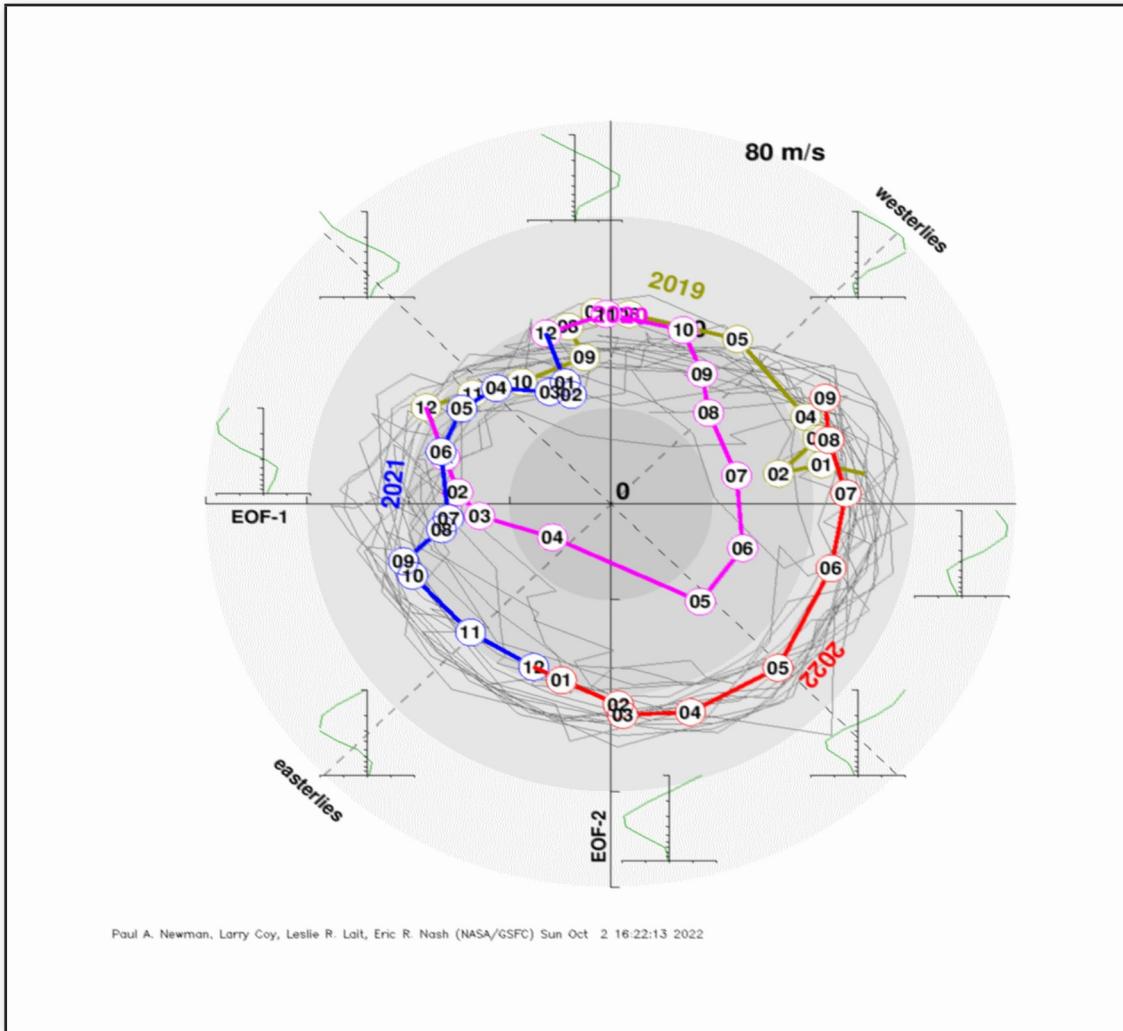
Gradual return to neutral conditions at the end of the period.



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

Drivers : QBO analysis

Since last winter, the QBO has changed phase. It is now in the western phase. This phase favors the strengthening of the polar vortex and thus reduces the probability of an SSW.



MF-S7 analysis of the zonal component of the wind at 030hPa in May, July, September and November

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).

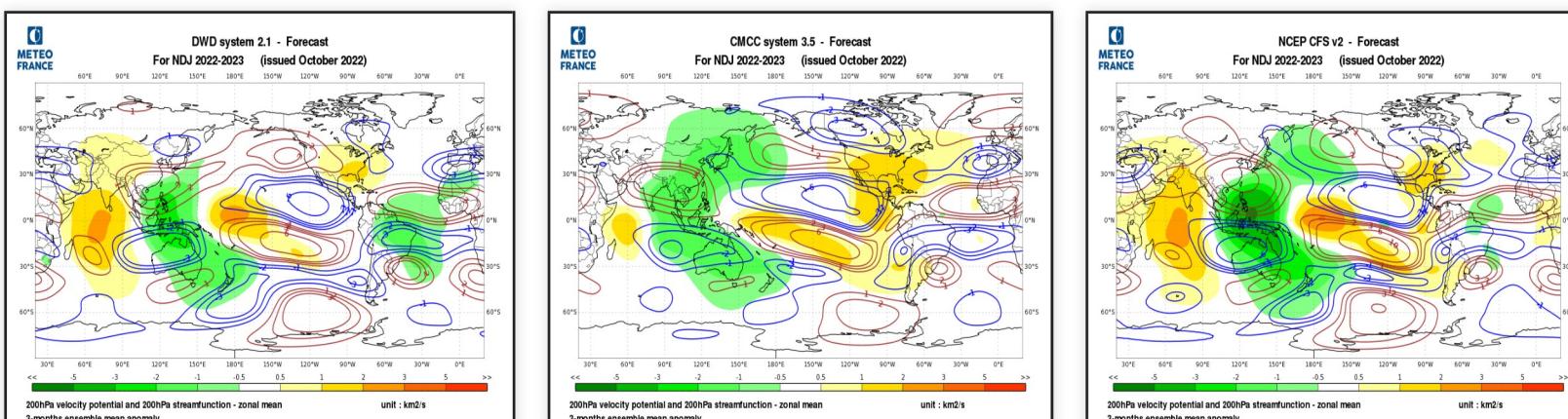
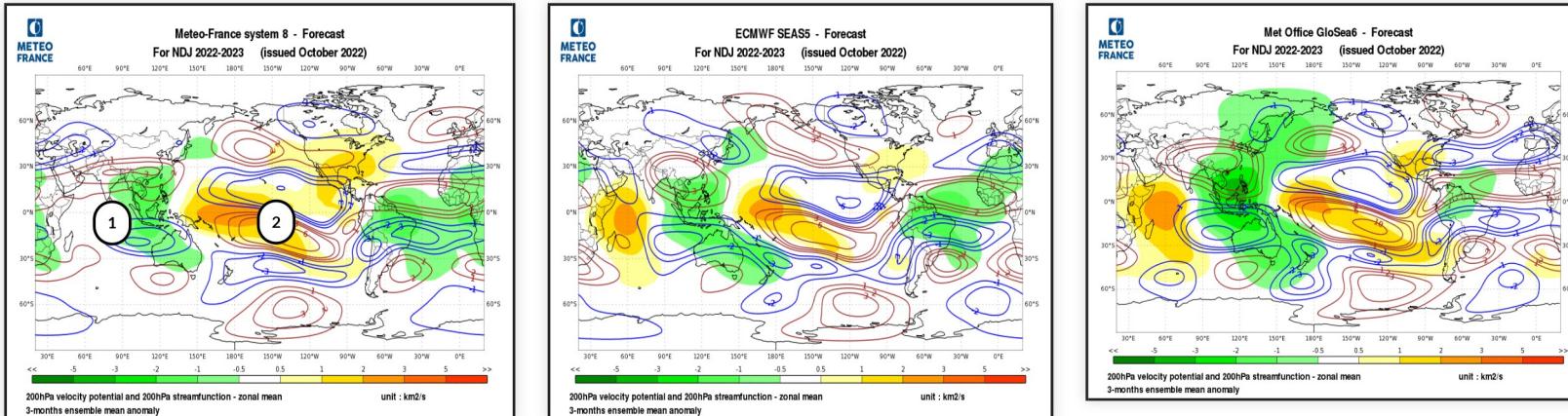
Velocity Potential : The dipole linked to La Niña is still in place: a downward motion anomaly from the Pacific to the American coasts, and an upward motion anomaly over the Maritime Continent.

This upward motion anomaly, also linked to the negative phase of the IOD, is associated with a downward motion anomaly over the western Indian Ocean (except MF-S8).

Finally, a last upward motion anomaly, related to La Niña, is positioned from the North of Brazil to the Equatorial Atlantic.

Streamfunction : Three powerful dipoles are present above the three Oceans. From these three dipoles, teleconnections are clearly visible, especially towards the mid-latitudes of the northern hemisphere.

However, there are discrepancies in the positioning of the anticyclonic anomaly near Europe.



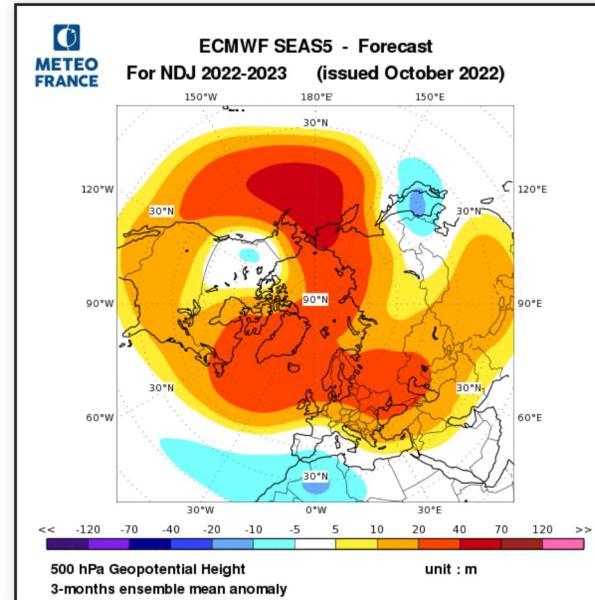
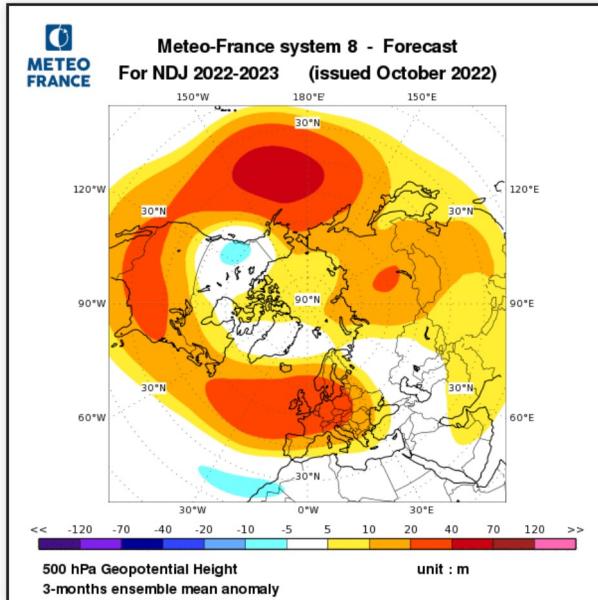
MF8,SEAS5, UKMO, DWD, CMCC and NCEP 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies (isolines, red: anticyclonic in the northern hemisphere, blue: cyclonic in the northern hemisphere).

1 - VP : upward motion anomaly related to La Niña 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

Good agreement on the PNA- pattern over the US Northwest and on the positive anomaly stretching from the US to the North Atlantic. On the other hand, ECMWF-SEAS5 predicts a strong positive anomaly from Quebec to Greenland, Scandinavia and eastern Europe, while MF-S8 limits this anomaly from the near Atlantic to the British Isles and proposes a relative minimum over Greenland and western Russia.

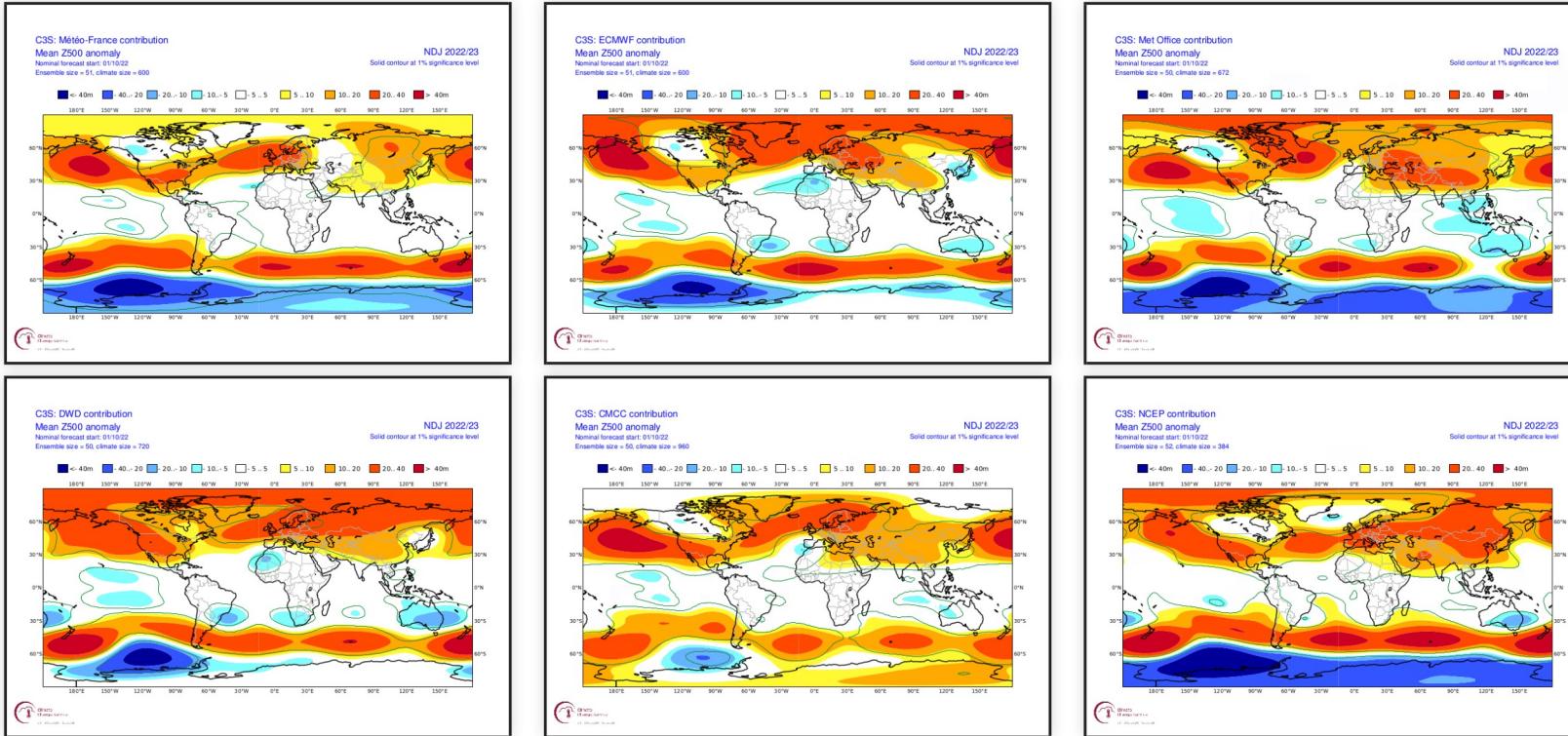


polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

Almost all models provide for a PNA- pattern (in connection with teleconnections). Associated with this pattern is a belt of positive Z500 anomaly stretching from the West American coast to Newfoundland and Europe. A small negative anomaly is positioned over the Canary Islands.

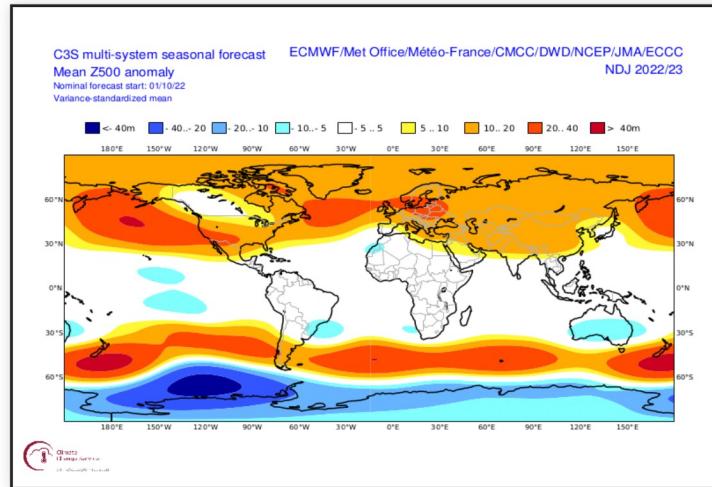
However, the location of the extrema of positive Z500 anomaly around Europe differ from one model to another.



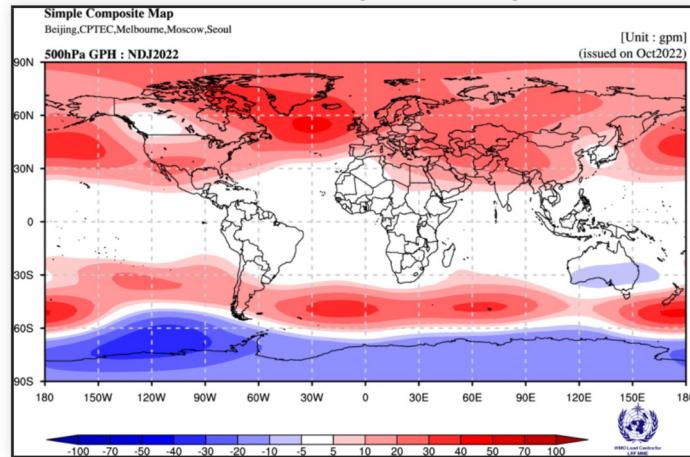
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

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



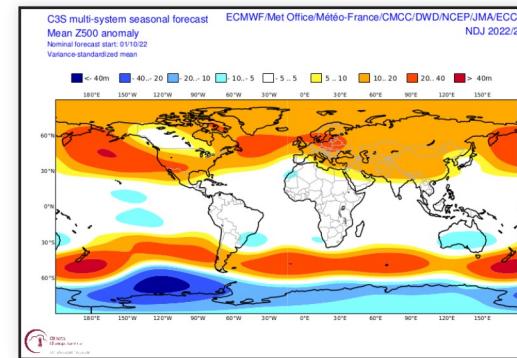
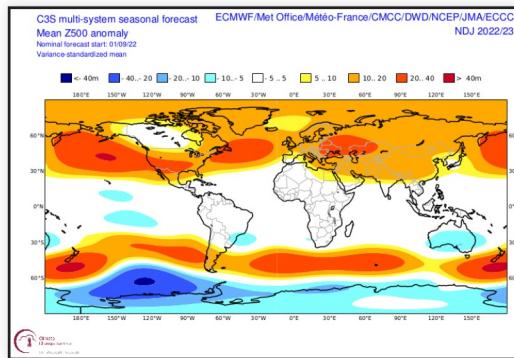
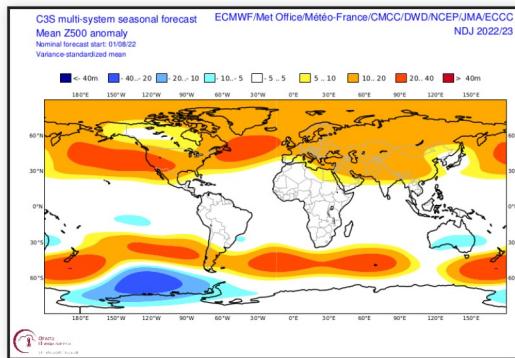
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



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

Atmospheric circulation forecasts : Forecast stability

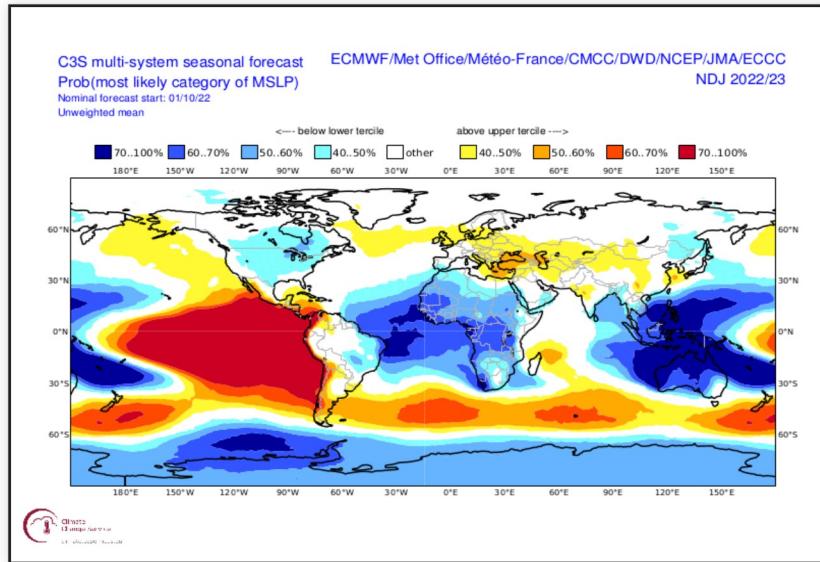
Good stability with the C3S multi-models, even over Europe.



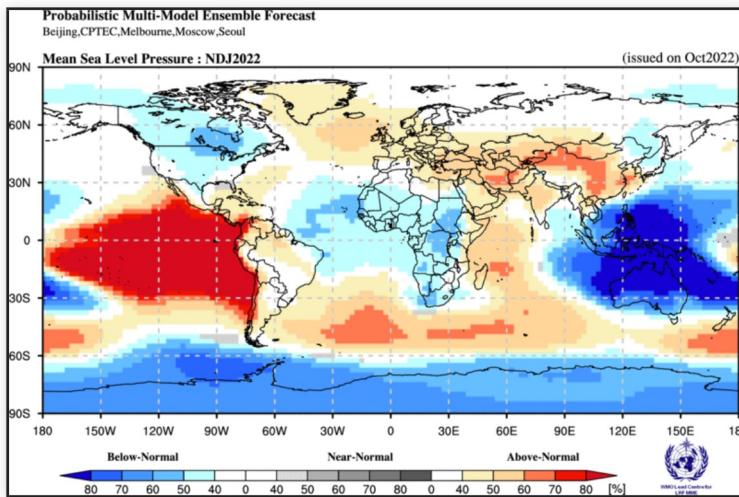
Successive forecasts of the C3S multi-model for the coming quarter

Atmospheric circulation forecasts : MSLP probabilités multi-systems

Good agreement between multi-models.



C3S multi-models MSLP terciles probability.

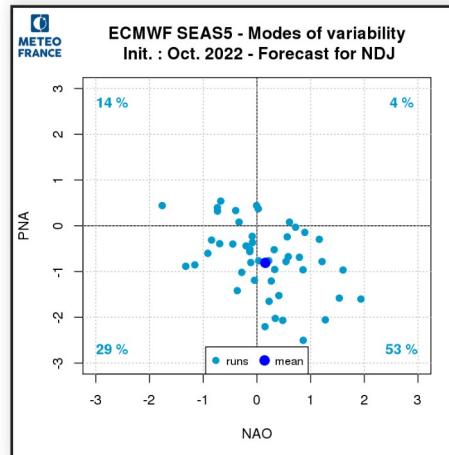
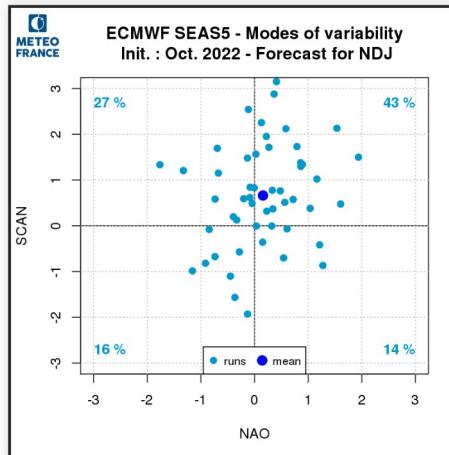
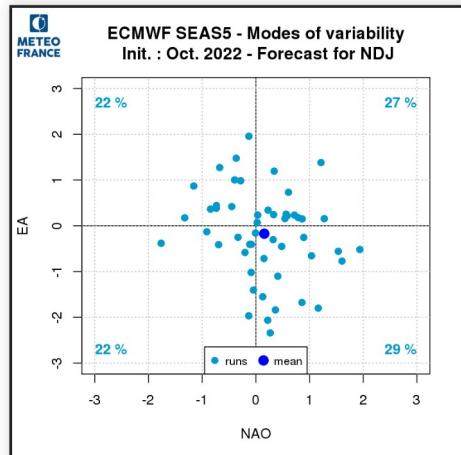
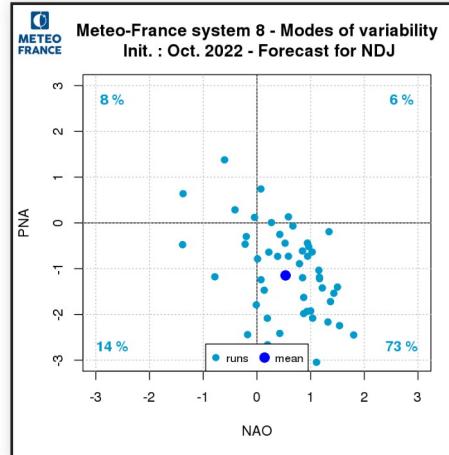
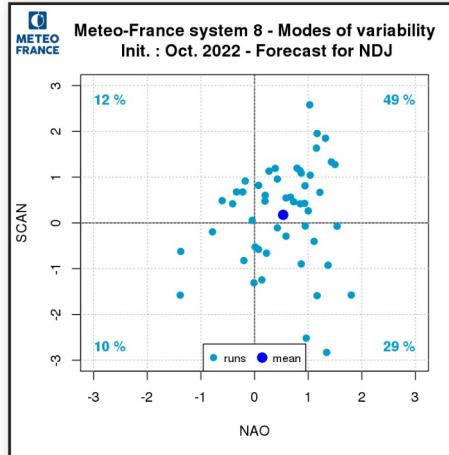
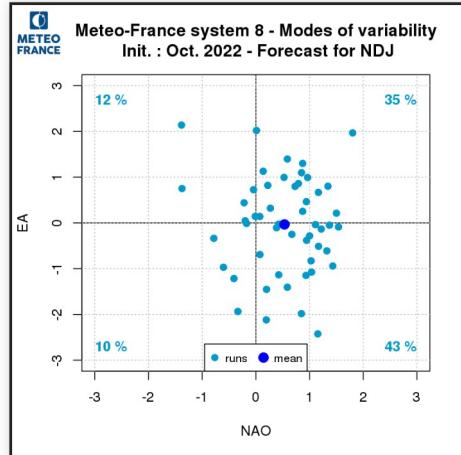


Others models of WMO multi-models MSLP terciles probability.

Modes of variability : forecast

Both models agree on a PNA-.

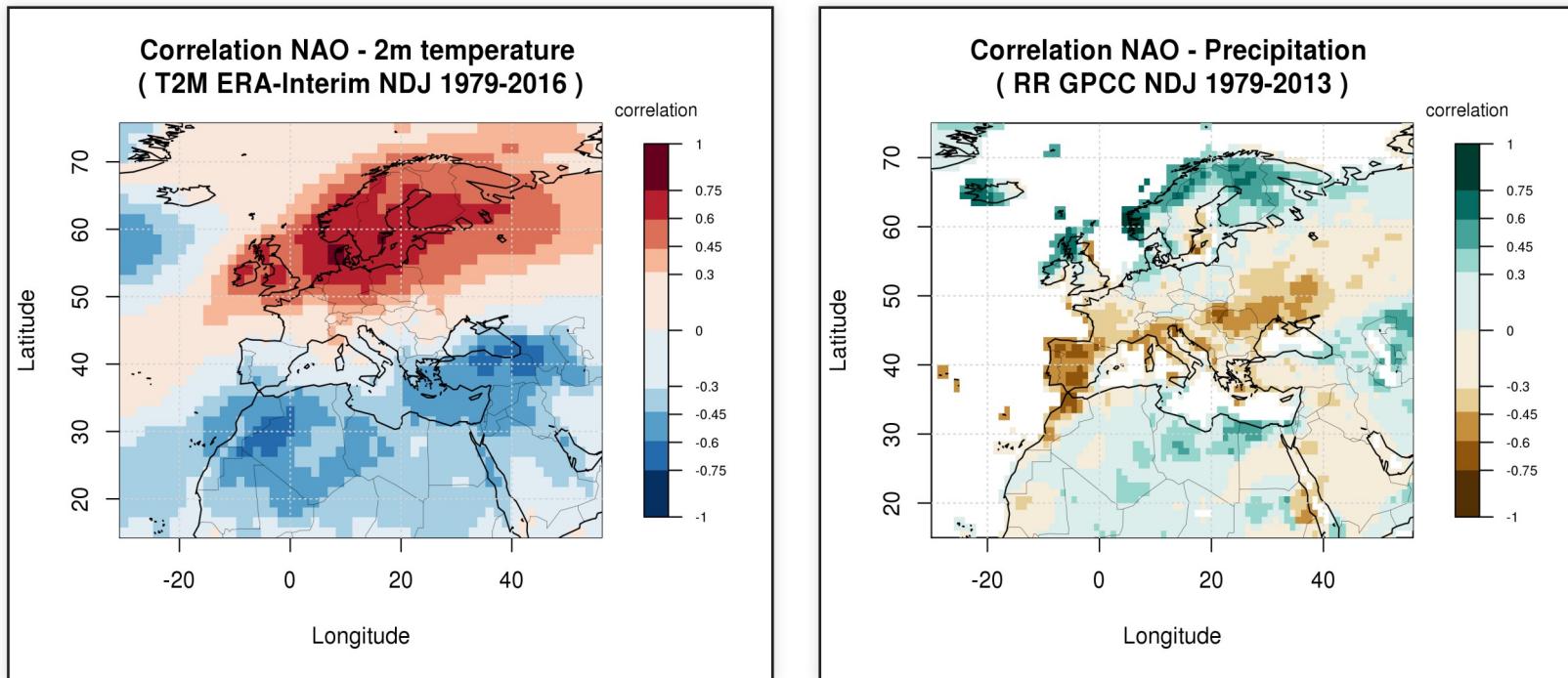
Both models also provide a SCAN+ mode (weaker with MF-S8). The NAO+ mode is envisaged by MF-S8, while there is no signal for the EA mode.



See the modes of variability patterns

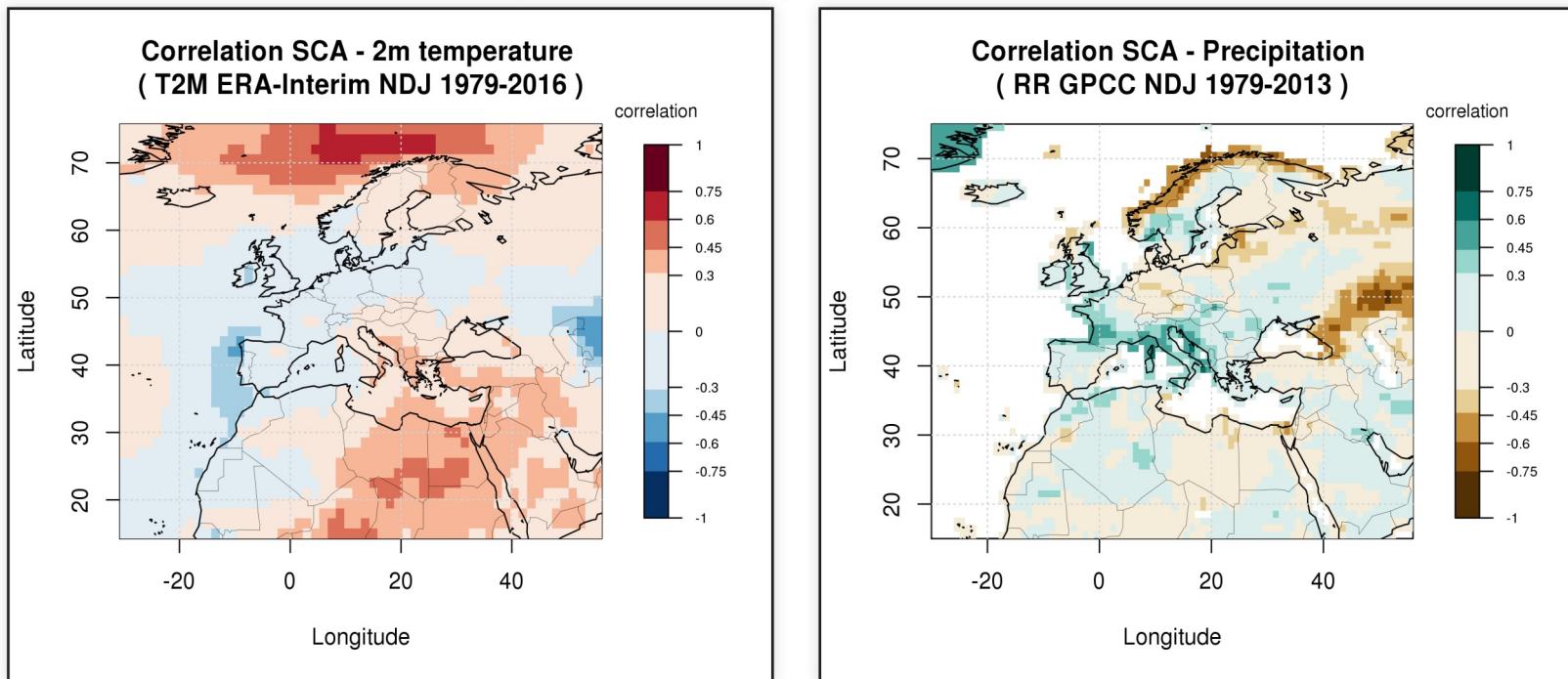
Modes of variability : NAO impacts

Positive phase of the NAO next quarter



Modes of variability : SCA impacts

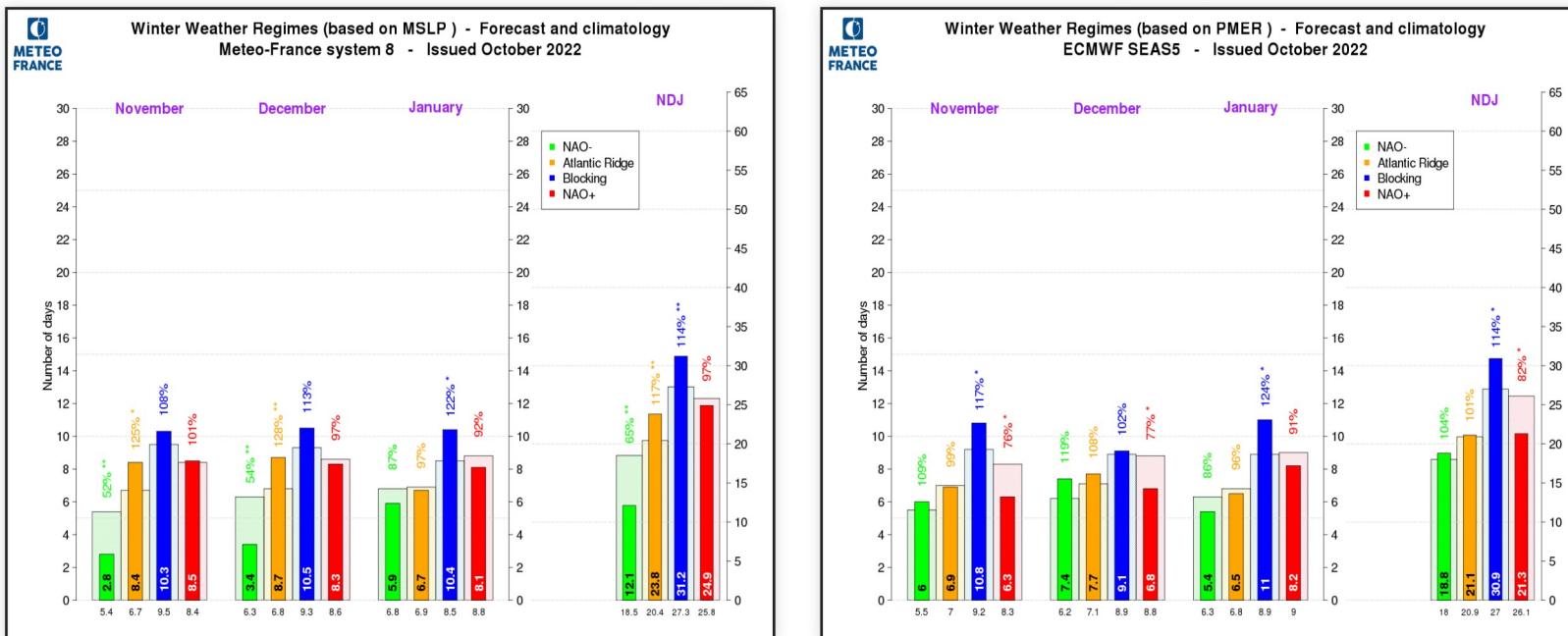
The impacts of NAO and SCAN mode are opposite over many European countries for temperature.



Weather regimes : winter MSLP

The "Blocking" regime is significantly above their climatology over the quarter for both models., at the expense of the NAO- regime which is significantly below.

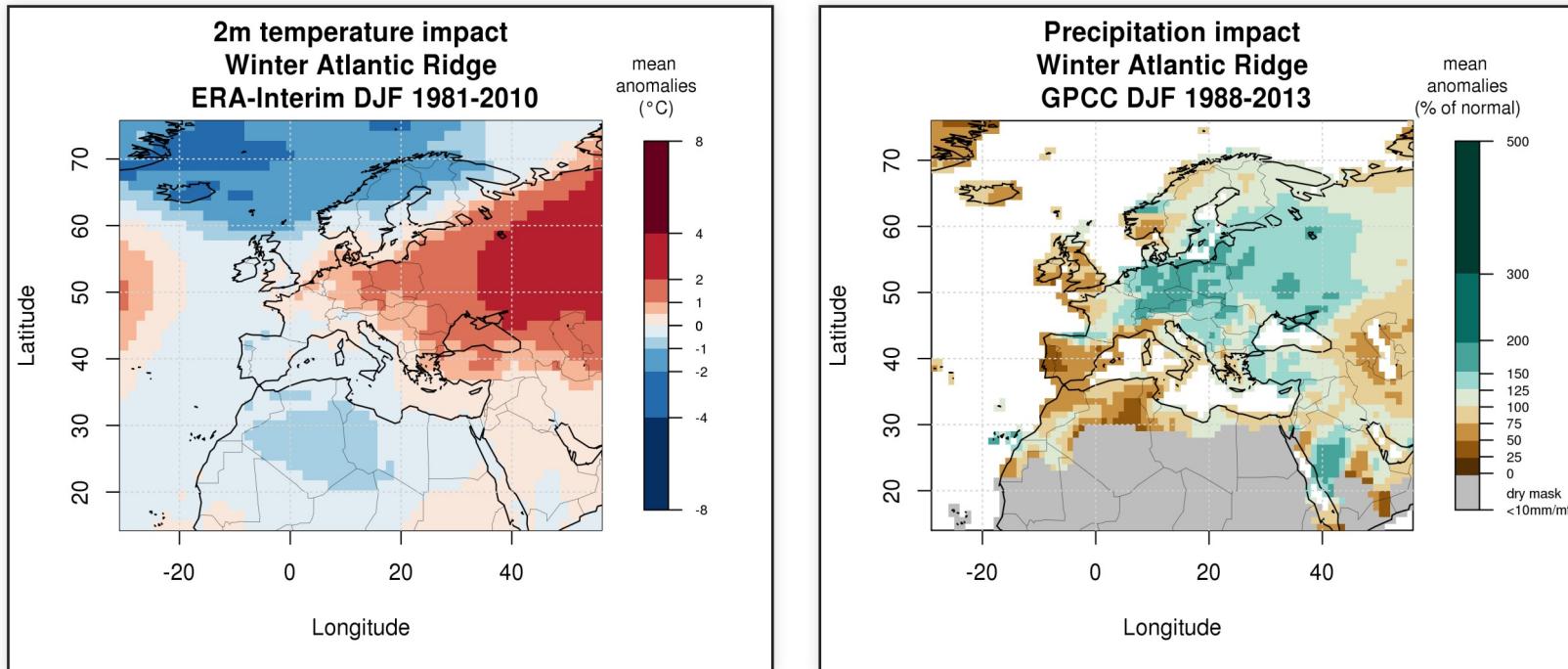
MF-S8 also foresees the overrepresented "Atlantic Ridge" regime, at the expense of the NAO- regime.



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

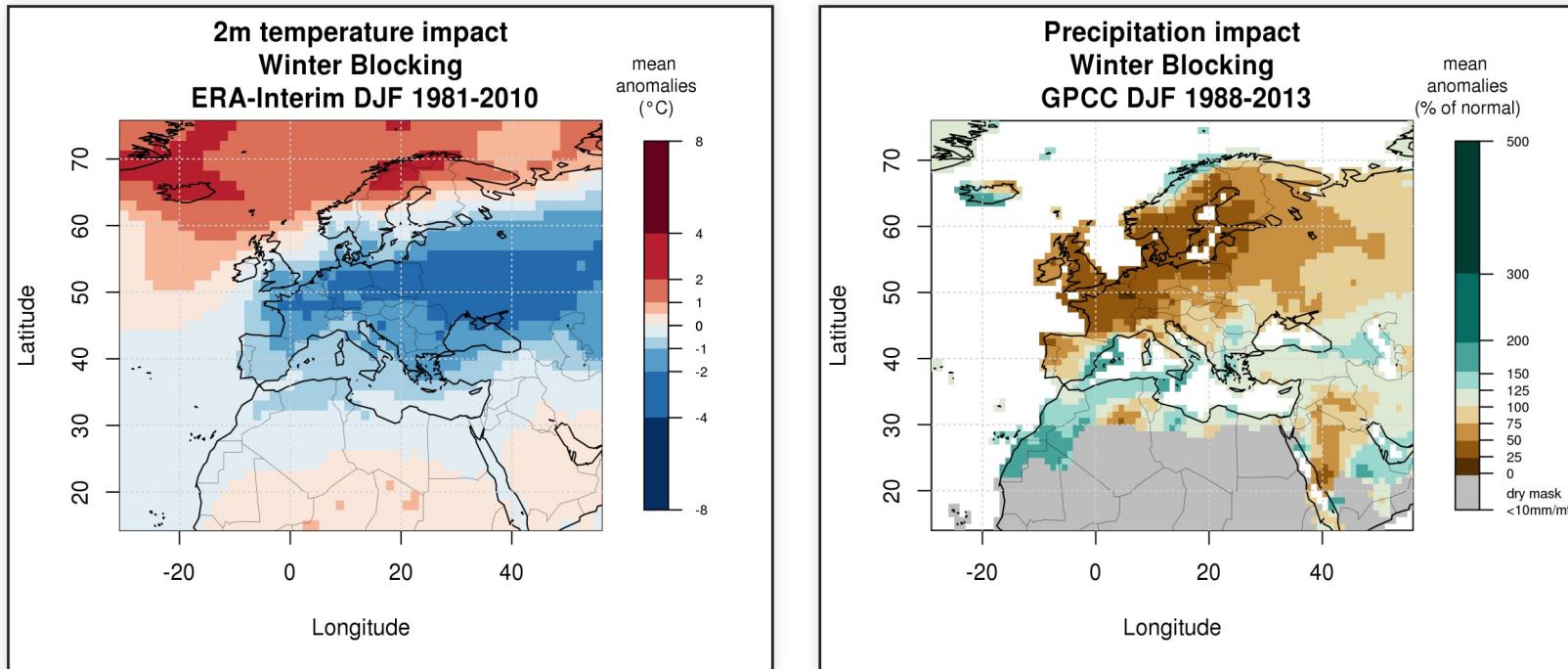
The Atlantic Ridge weather regime should be favored, according to MF-S8, over the quarter.



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 by both models, over the quarter.

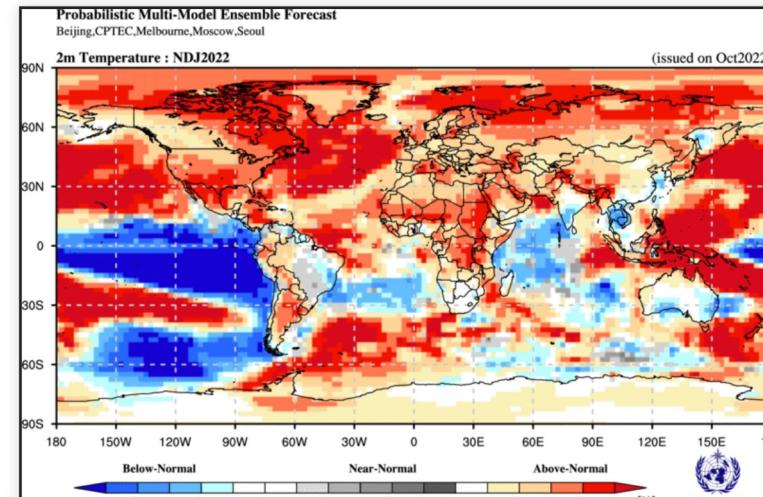
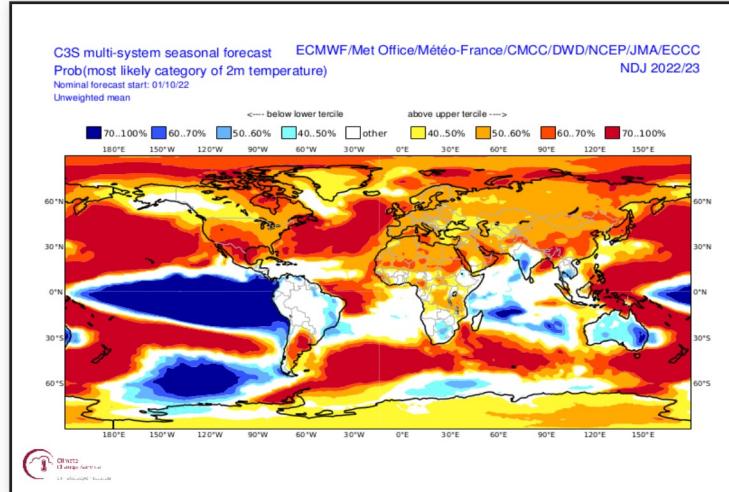
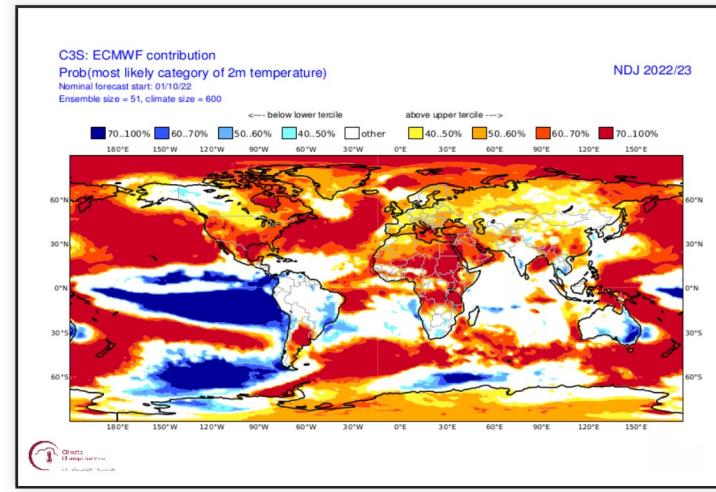
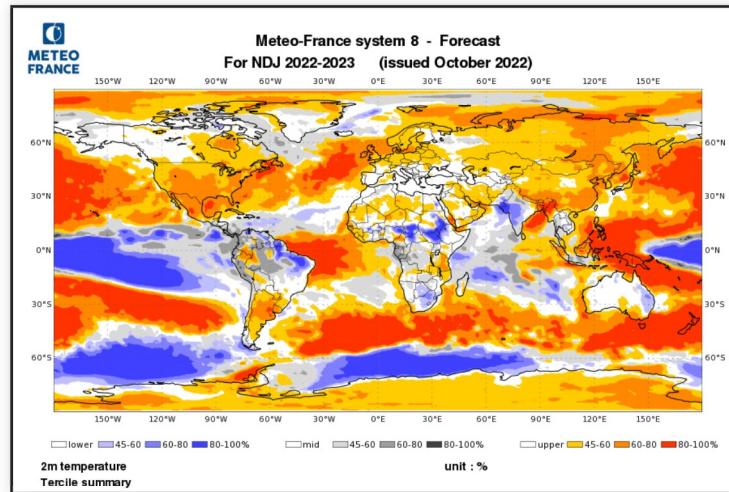


Impact of Summer Blocking weather regimes on temperature and precipitation. (ref ERA-interim 1981-2010)

Forecast of climatic parameters : Temperature probabilities

The models are in good agreement over most regions of the world.

The only notable exception is in tropical Africa. MF-S8 proposes a cold anomaly, contrary to the other models, in connection with the forecast of upward motion anomalies over the African continent.

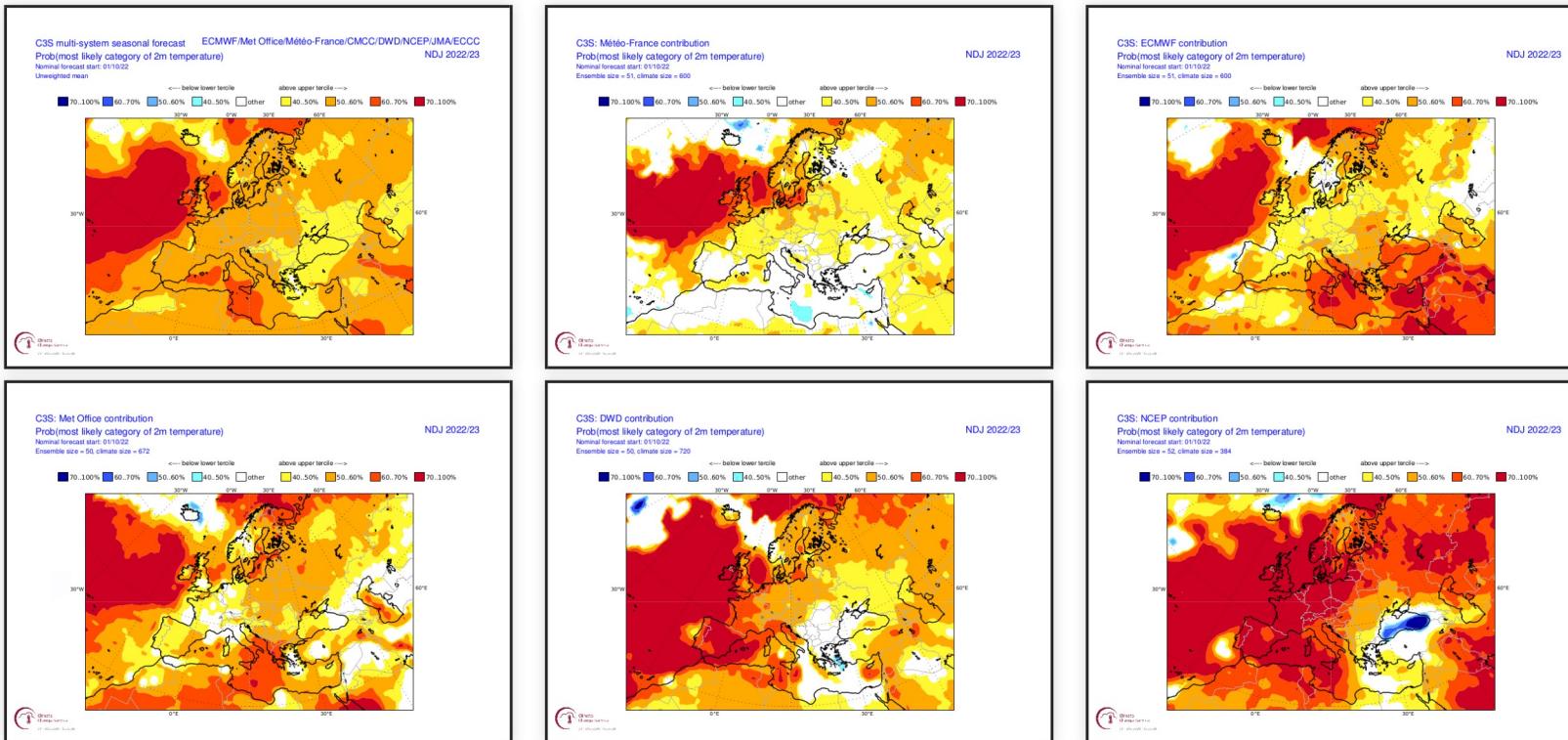


2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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

The models that favour blocking do not obtain a cold signal over continental Western Europe but a less warm signal (MF-S8, ECMWF or Met-Office). This is partly due to the climate trend.

The warm signal of the multi-models is accentuated by the contribution of the NCEP model which favors the NAO+ mode.

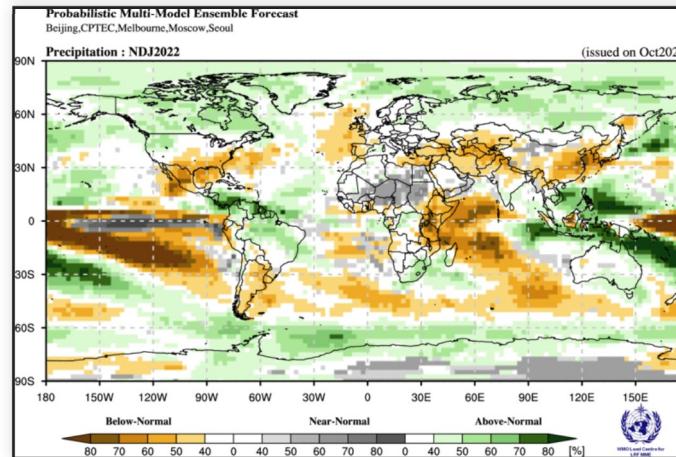
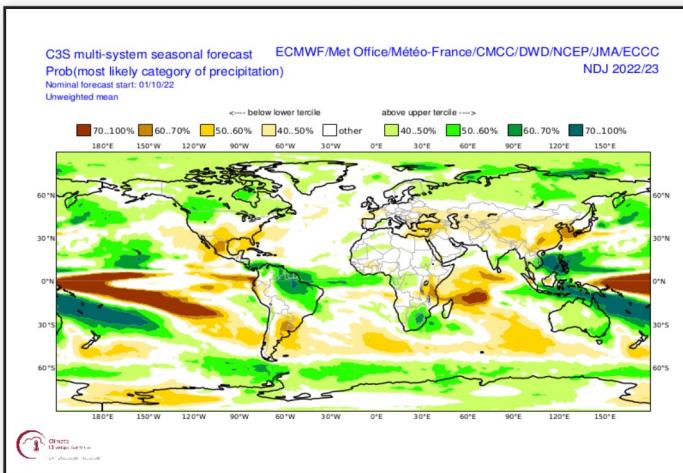
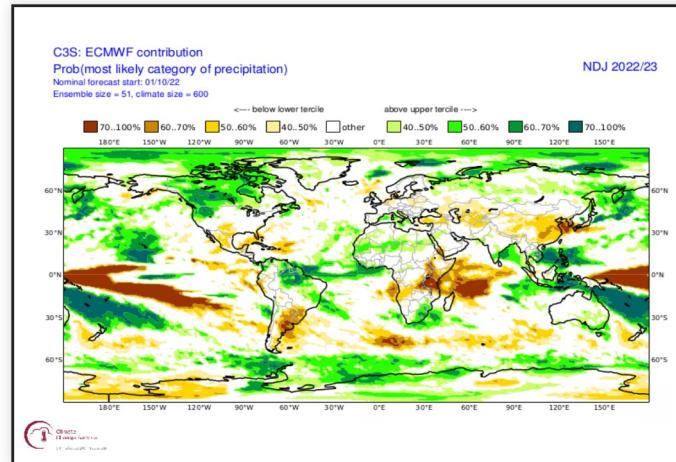
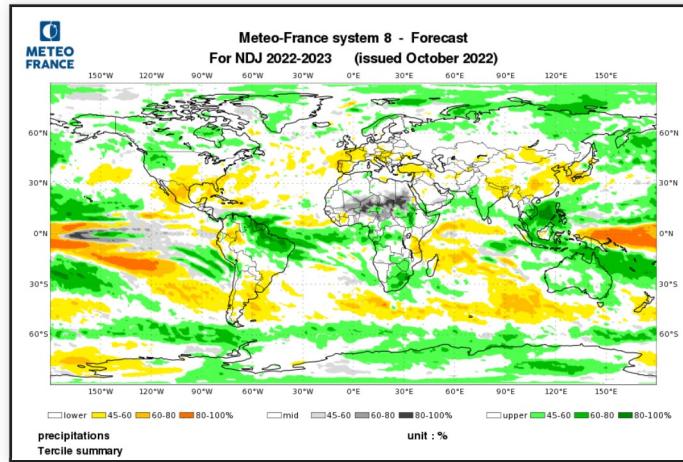


C3S multi-models probability map (top left) and MF-S8, ECMWF-SEAS5, UKMO , DWD, CMCC models.

Forecast of climatic parameters : Precipitation

The models are, as for temperatures, in good agreement over most continents, with strong signals over the Maritime, American and Asian continents, in connection with La Niña.

Some differences are however to be noted, especially in Europe.

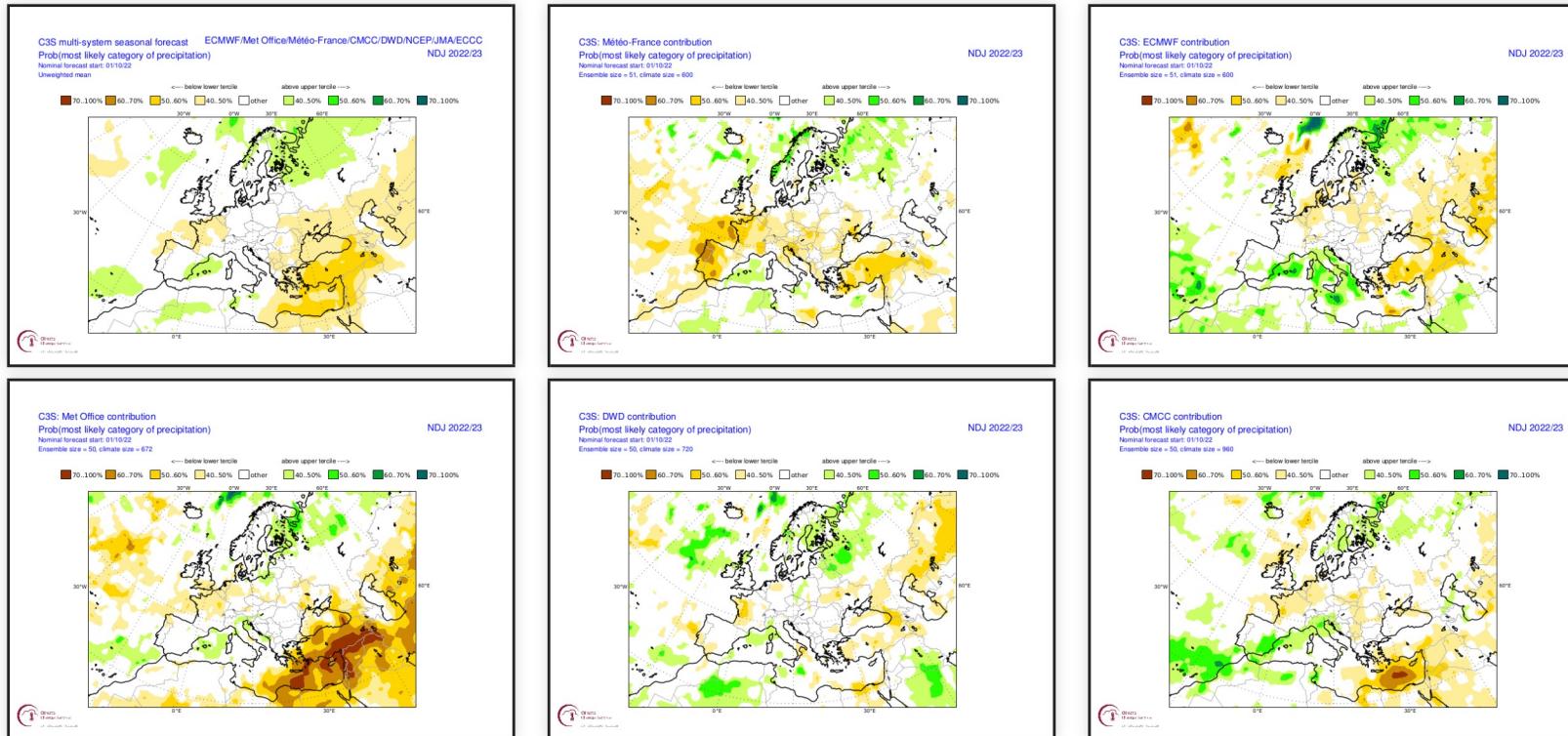


precipitation probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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

Most models agree on a drier than normal signal east of the Mediterranean Basin, towards Turkey.

Over the rest of Europe, the signals are weaker. However, we find elements of the blocking pattern: wetter signal on the west part of the Mediterranean basin and on the extreme north of Europe and slight drier signal on Eastern Europe.

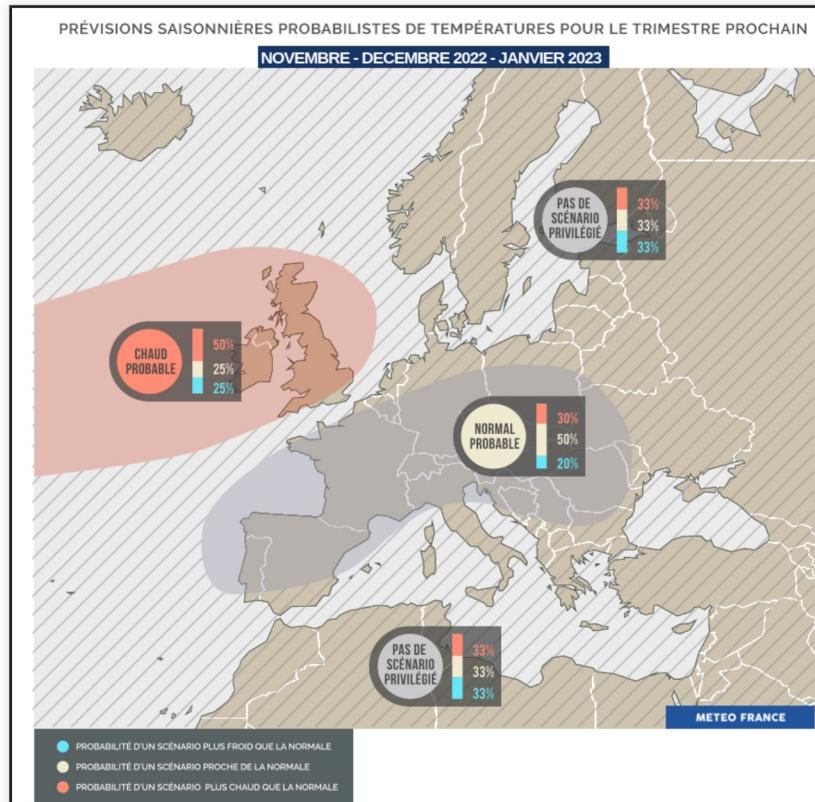


C3S multi-models probability map (top left) and MF-S8, SEAS5, UKMO, DWD, CMCC models.

Synthesis map for Europe : Temperature

The main models favor "Blocking" and "Atlantic Ridge" weather patterns. Taking into account the climate trend, this results in an area with a near normal scenario over most of continental Western Europe. The warmer-than-normal scenario is favored only to the north of this area.

No scenario emerges over the rest of the continent.

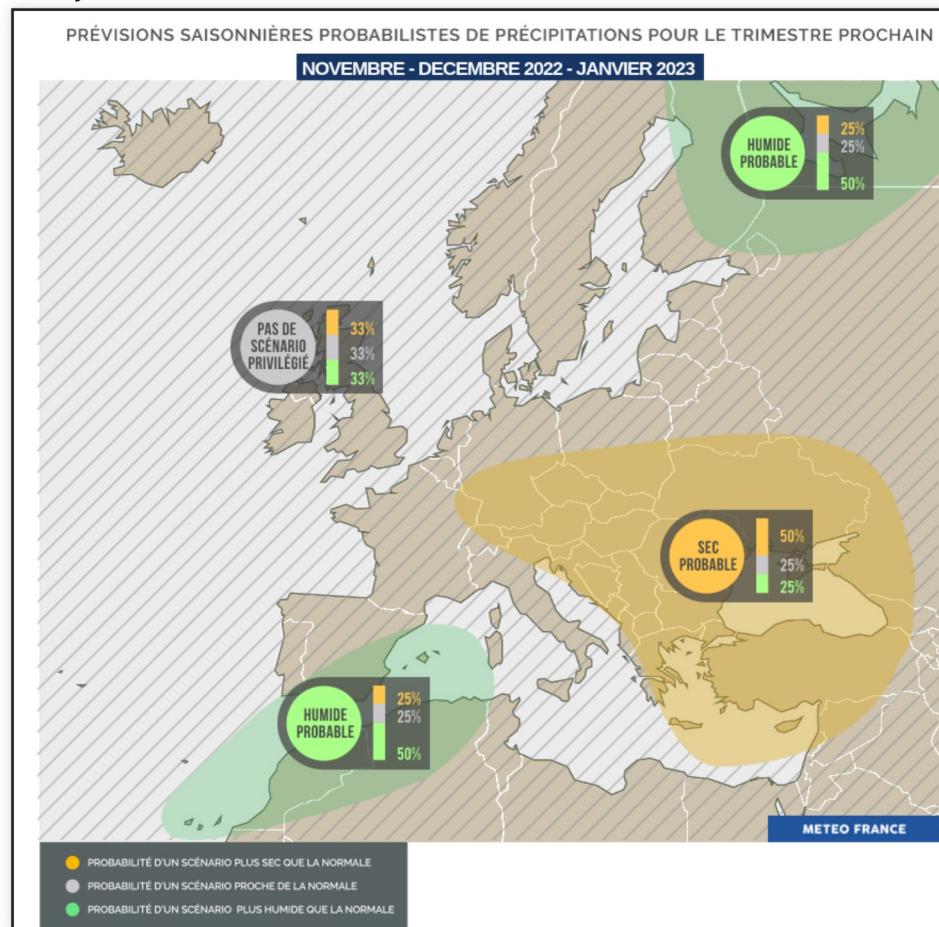


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

In agreement with the preferred blocking regime and the dry signals proposed by the models, an area with a drier than normal scenario is placed from Turkey to Central Europe, and a wetter than normal area over the extreme north of Europe.

Over the western Mediterranean basin, an area with a wetter-than-normal scenario is proposed in connection with the altitude minimum centered on the Canary Islands.



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