

Météo-France Seasonal Forecast Bulletin

JANUARY - FEBRUARY - MARCH 2023

Table of Content

1. General synthesis	
1. JFM 2023	3
2. Oceanic analysis of November 2022	
1. SST anomalies	4
2. Pacific vertical section	5
3. Hovmöller diagram of the 20°C isotherm	6
4. Pacific Ocean - Nino3.4 index history	7

General synthesis : JFM 2023

The Pacific Ocean is still in a "La Niña" phase even if it weakens during the quarter, while the IOD returns to neutral in the Indian Ocean. Teleconnections are still present over the Pacific and Atlantic basins, providing predictability, including to Europe.

A) Oceanic forecast :

- ENSO : La Niña to ease in early 2023.
- IOD : neutral conditions.
- Tropical Atlantic : close to neutral

B) Drivers :

- "La Niña".

C) Atmospheric circulation :

In connection with "la Niña", a positive anomaly in Z500 stretches from the United States to Europe and Russia, with a maximum anomaly over Eastern Europe.

This pattern should favor positive phase of NAO and positive phase of Blocking.

D) Most likely conditions :

For temperatures a warmer than normal conditions are expected over the far north of Europe. No preferred scenario elsewhere.

For precipitation, drier than normal conditions are most likely over southeastern Europe. Over the extreme north of Europe a wetter than normal scenario is expected. No preferred scenario elsewhere.

Next bulletin : scheduled on January 20th

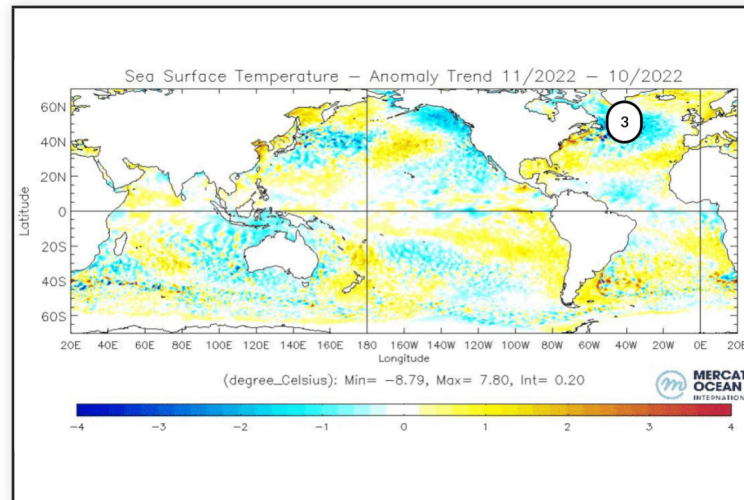
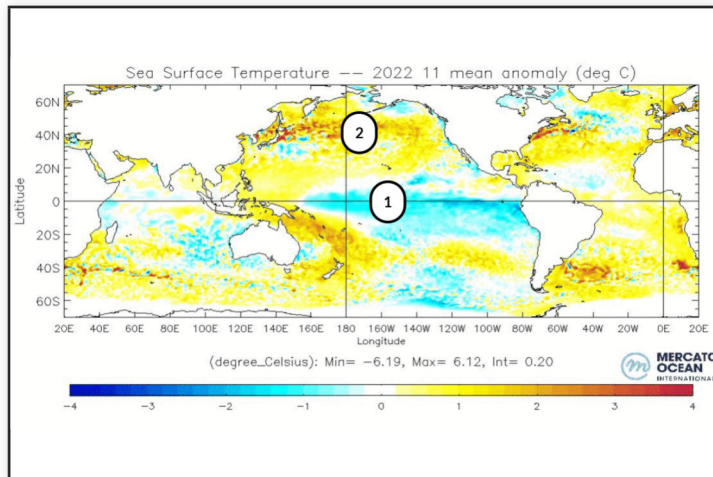
Oceanic analysis of November 2022 : SST anomalies

Current ENSO situation : moderate La Niña

In the Pacific Ocean : In the tropics, the typical cold anomaly of "La Niña" is still present. The extremum of this cold anomaly has reached the South American coasts. The trace of the PDO- remains visible with the warm anomaly still quite marked in the mid-latitudes of the Northern Hemisphere.

In the Indian Ocean : Neutral condition without east/west contrast.

In the Atlantic Ocean : Not much signal on the equator and in the southern hemisphere. The warm anomaly off Newfoundland has weakened significantly.

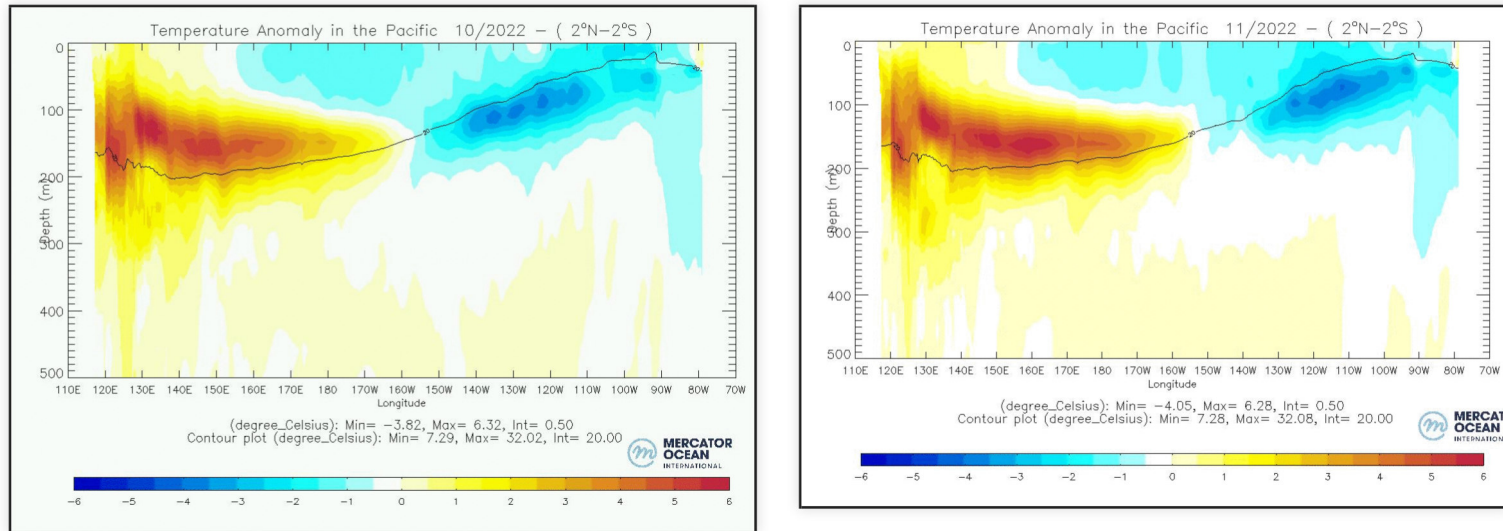


SST Anomalies and trend with the previous month (c) Mercator-Ocean

- 1 - La Niña pattern
- 2 - Warm anomalies everywhere in mid-latitudes
- 3 - Significant cooling

Oceanic analysis of November 2022 : Pacific vertical section

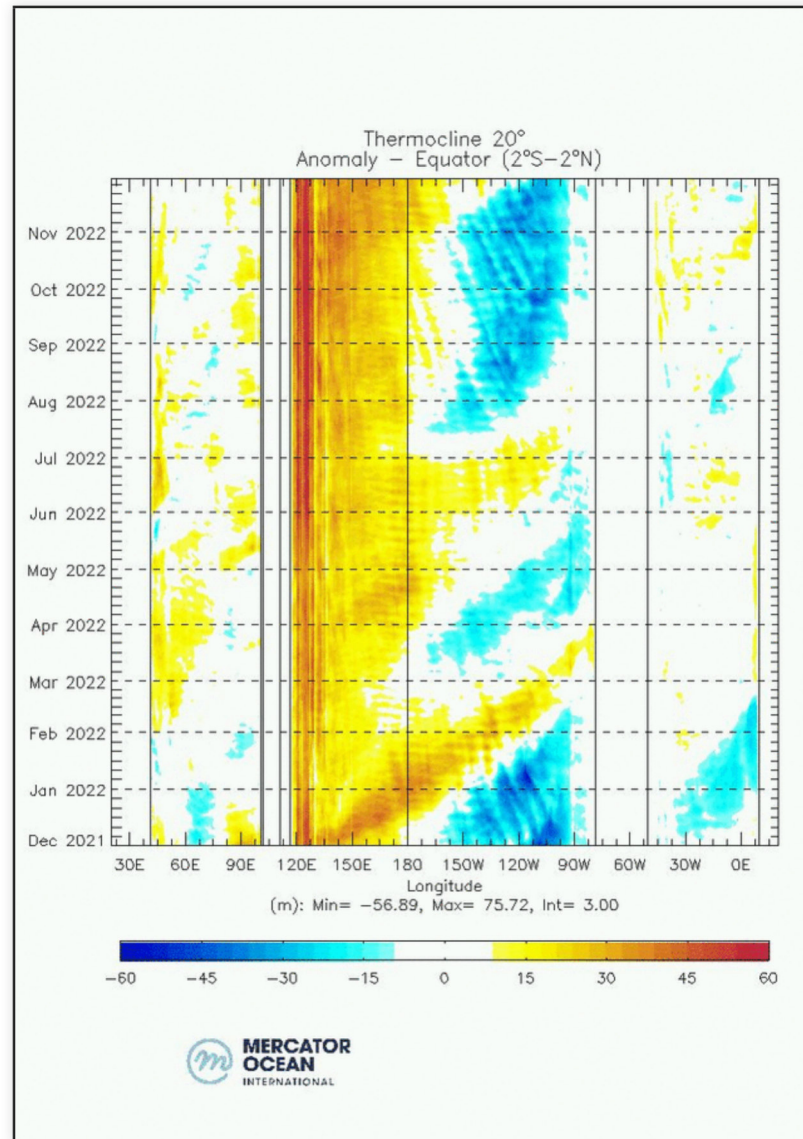
Little change in the thermocline, and eastward propagation of the coldest surface anomaly.



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

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

Same comment as before.

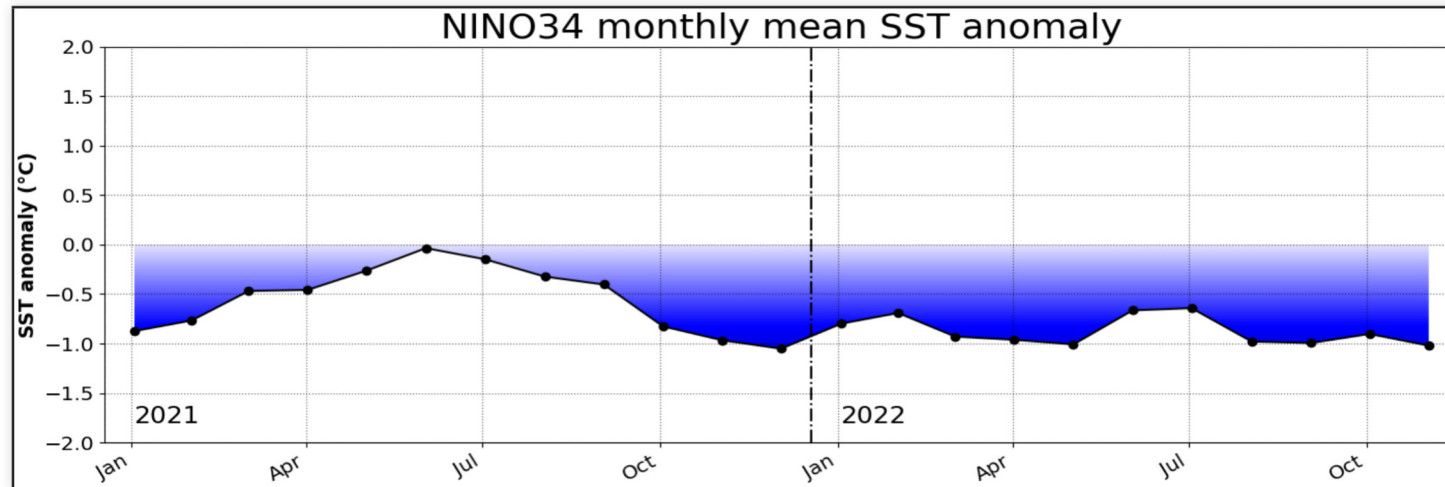


Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 °C isotherm) (c) Mercator-Ocean

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

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : -1.0°C

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

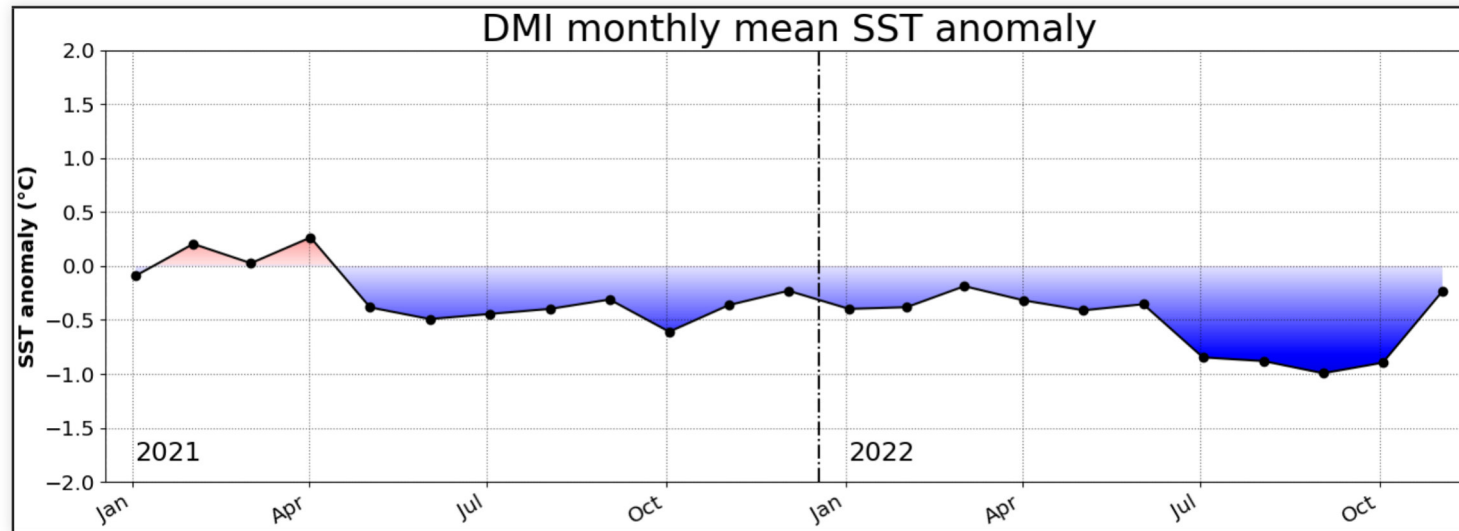


Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

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

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.2°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

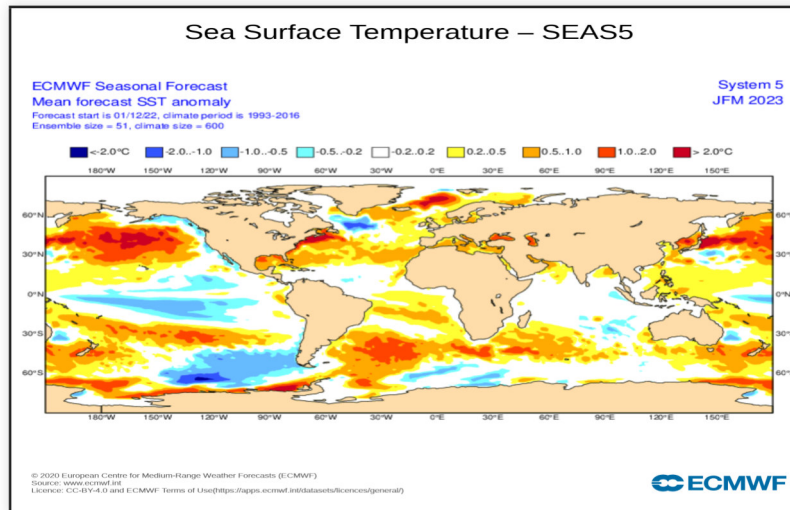
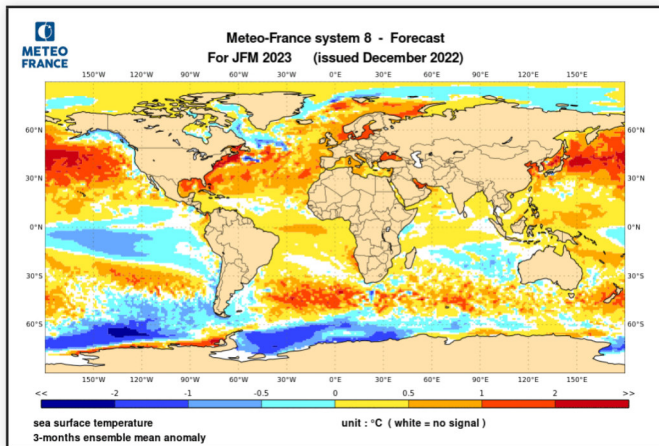
Oceanic forecast : SST anomaly

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

In the Pacific Ocean : The anomalies related to "La Niña" and PDO- remain present for this quarter.

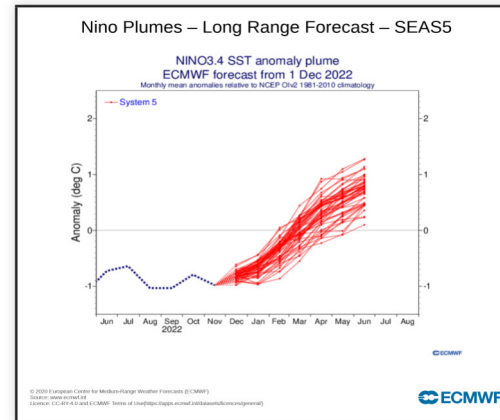
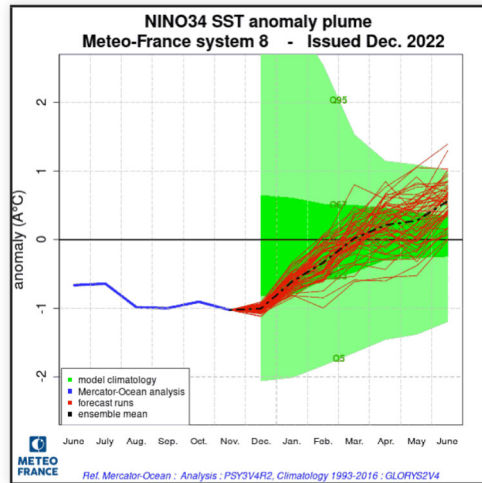
In the Indian Ocean : neutral condition.

In the Atlantic Ocean : Little or no signal in the tropics. Warm anomalie from American coast to Europe. Cold anomalie south of Greenland



Oceanic forecast : NINO3.4 Plume diagrams

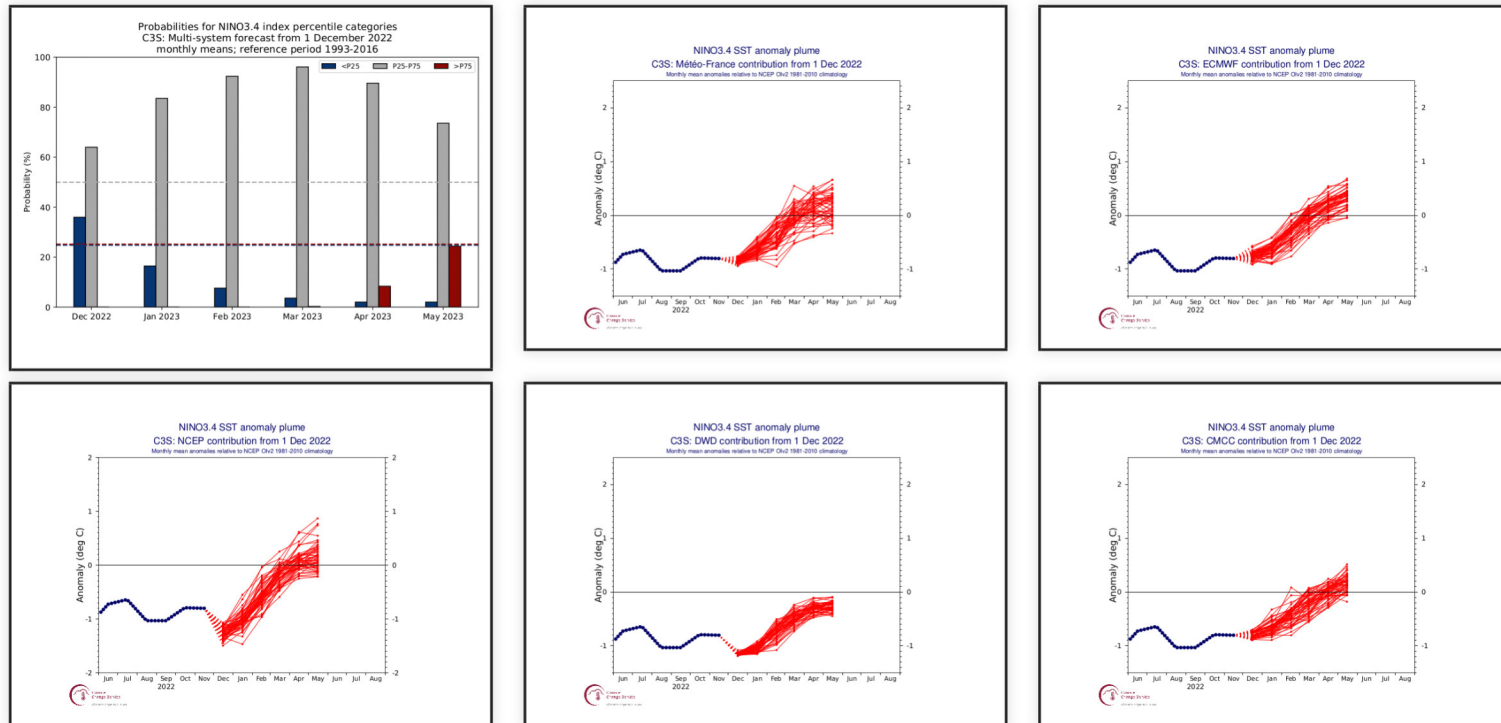
Both models agree on a gradual rise in the index and a return to neutrality during next quater.



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

Imminent end of "La Niña" . DWD is cooler than the others.

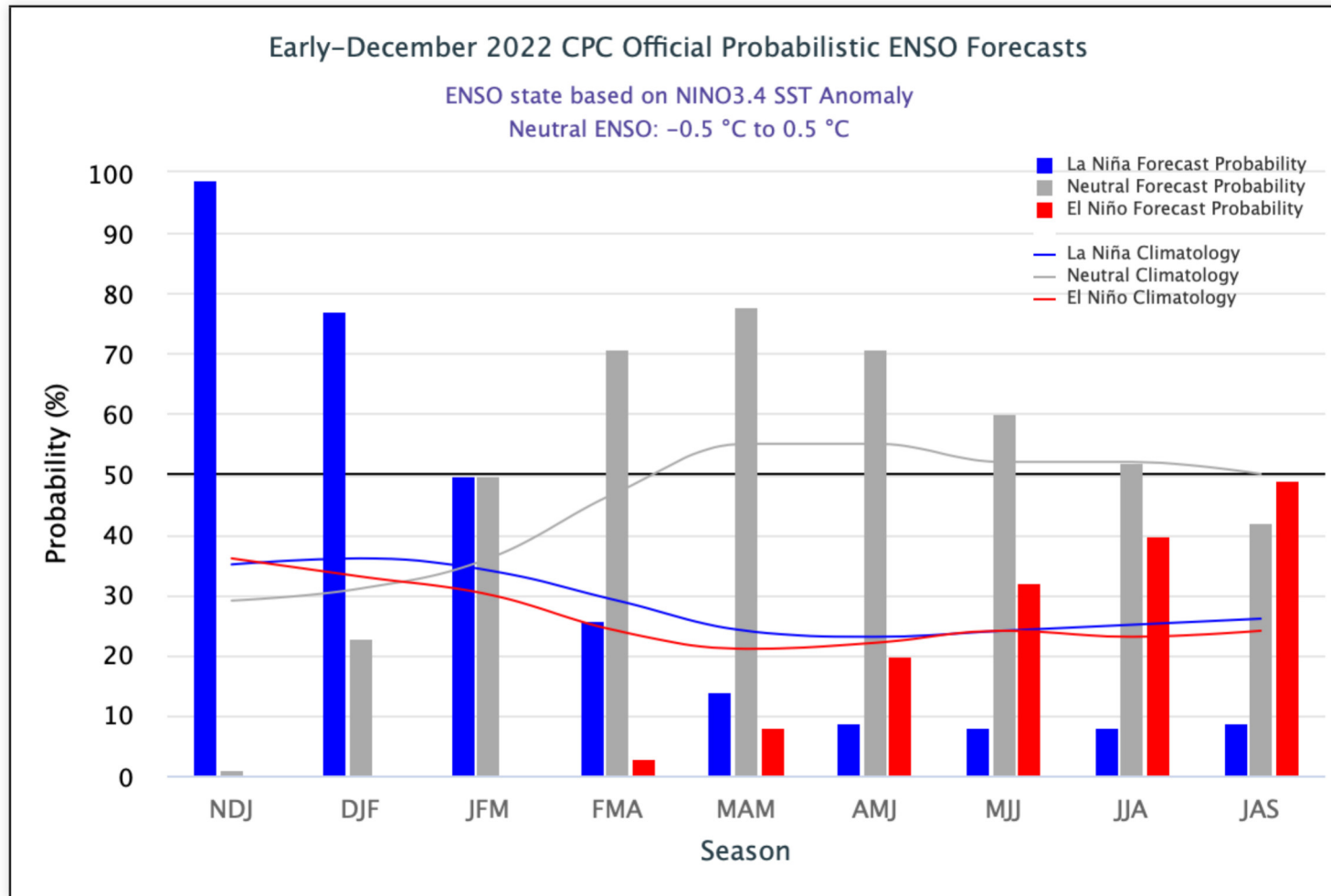
The most likely phase for the next three months : Neutral



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

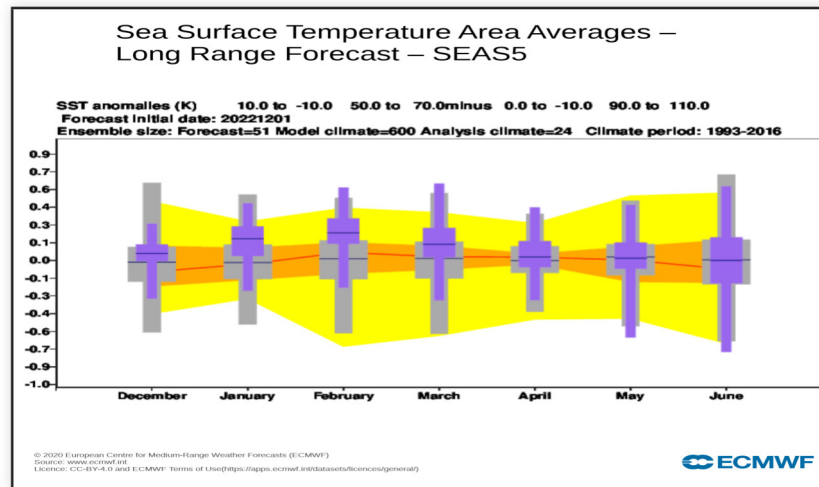
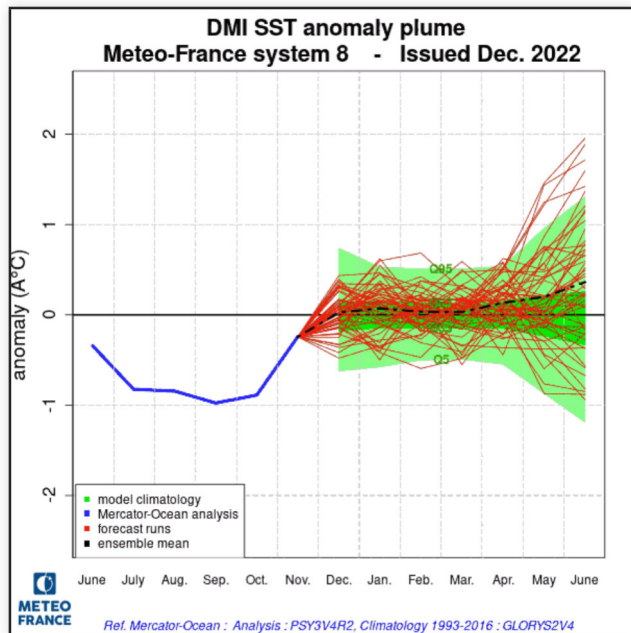
IRI forecast : about 50 % chance of "La Nina" and 50 % of neutral condition for JFM.



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

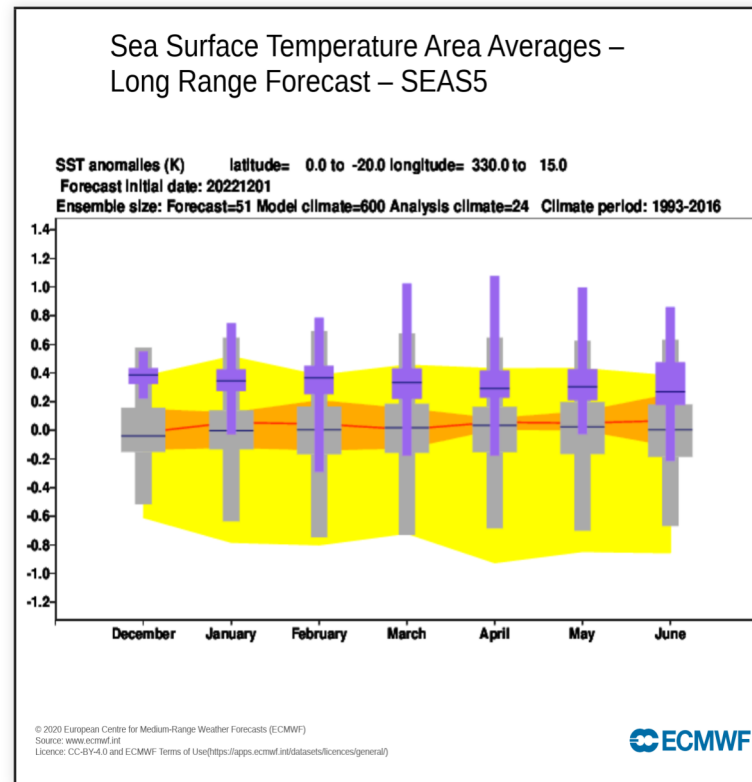
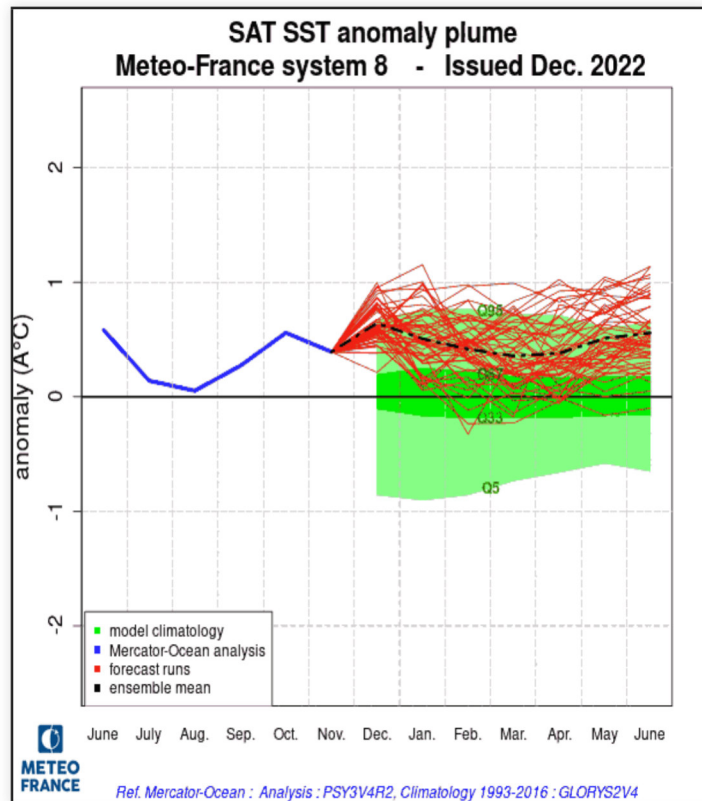
Neutrality for both models.



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

Oceanic forecast : Atlantic ocean - SAT evolution

A weak positive anomaly is forecasted. It is in the upper tercile of its climatology.



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

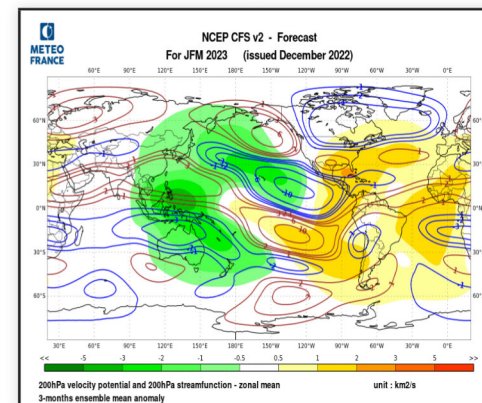
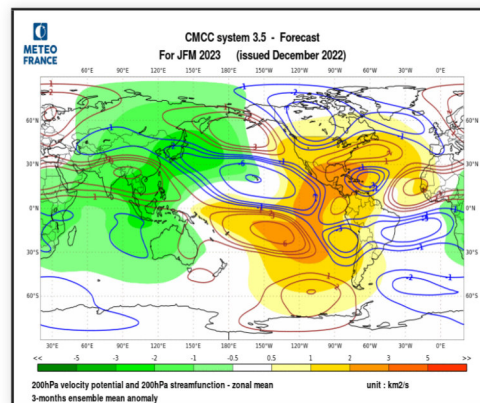
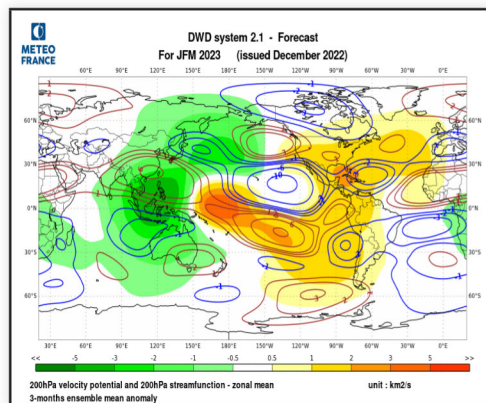
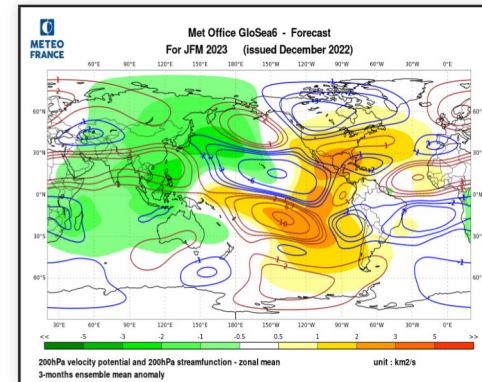
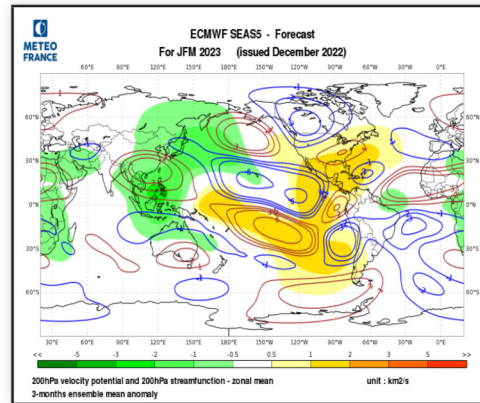
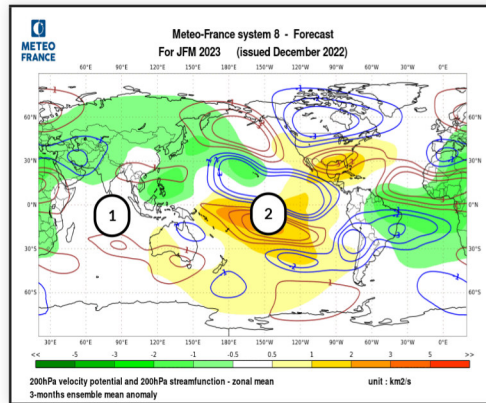
Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : The dipole associated with "La Niña" is still present, with a downward motion anomaly over the Pacific and an upward motion anomaly over the Maritime Continent and sometimes over the Equatorial Atlantic.

Streamfunction : Associated with La Niña, the dipoles over the Pacific, the Maritime Continent and the Atlantic are marked. They are extended by teleconnections to the North Pacific and the North Atlantic.

On the North Pacific there is a structure in PNA- in response to the SST anomaly type La Niña.

In the vicinity of Europe, mosts of models place a cyclonic circulation centered on Gibraltar. Most of them also place an anticyclonic circulation around Scandinavia.



MF8,SEASS, 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).

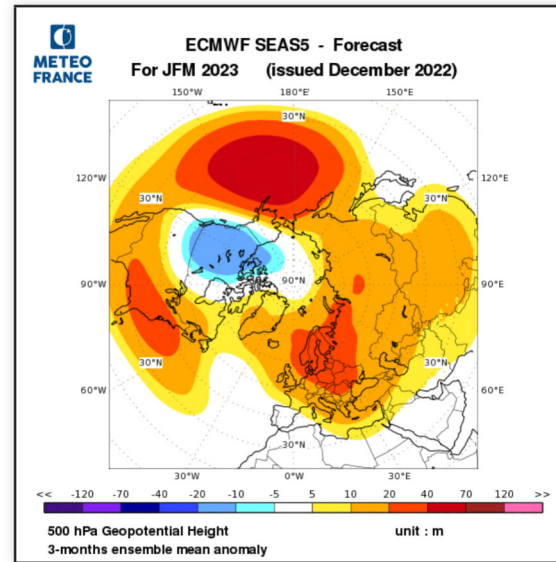
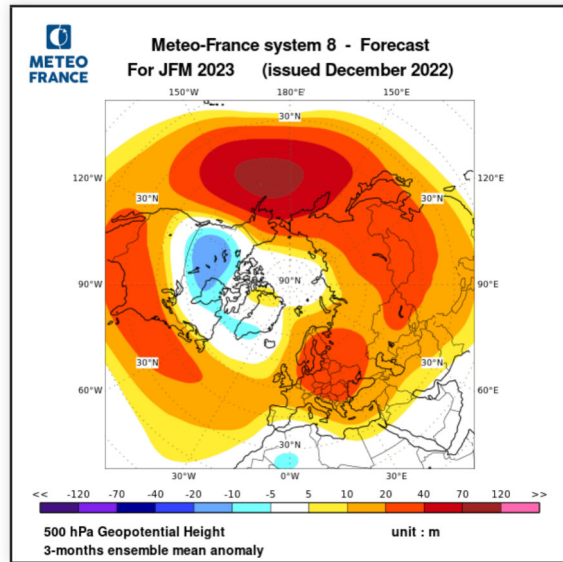
1 - VP : upward motion anomaly related to La Nina and the SST anomaly gradient in the Indian Ocean

2 - VP : downward motion anomaly related to La Nina

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Good agreement between the two models on the North American continent, Pacific and Eurasia (negatif PNA pattern, positive anomaly on eastern Europe)

Differences are clear on the Atlantic : MF8 look like NAO+ pattern, unlike SEAS5.

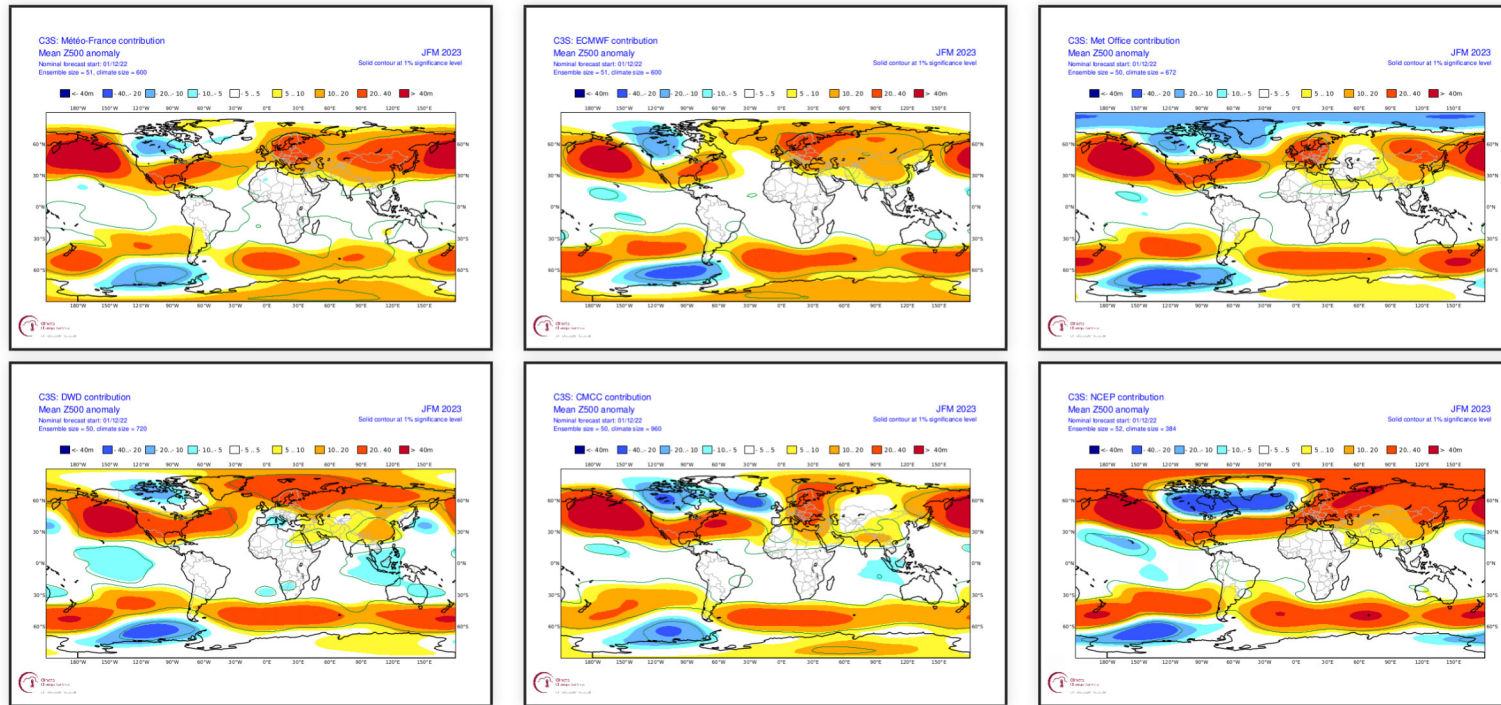


polar projection of MF8 and SEAS5 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies in C3S models

Very good agreement between all models for the PNA- pattern on the North American continent.

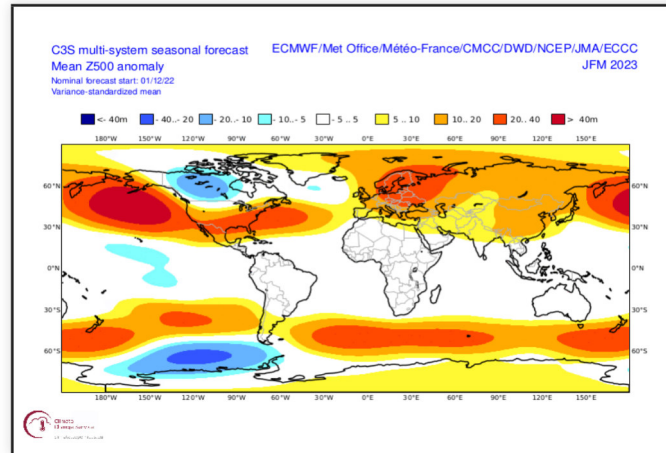
over Europe, differences are visible, depending on the presence or not of a negative anomaly over the Maghreb (related to the cyclonic anomaly in PV200) and, consequently, on the position of the positive anomaly over Europe.



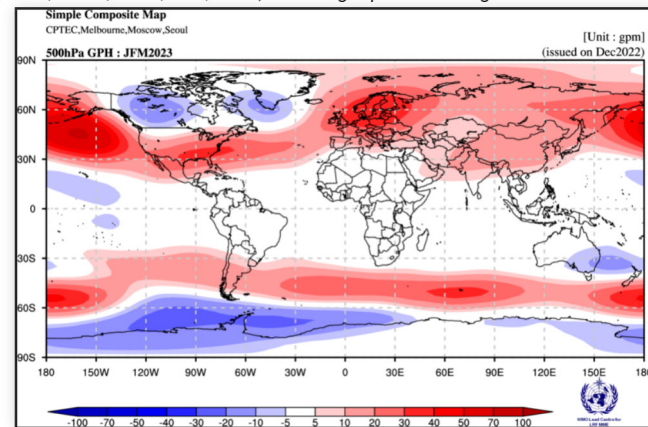
MF-S8, SEAS5, UKMO, DWD, CMCC and NCEP 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : Z500 anomalies multi-systems

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



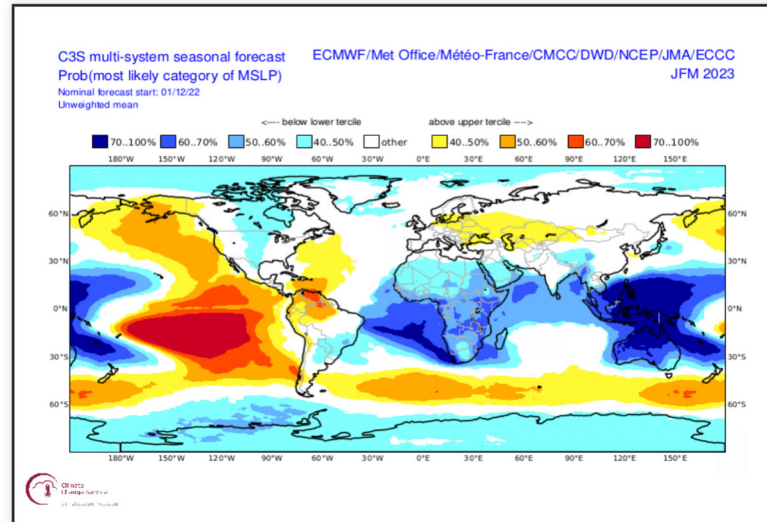
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



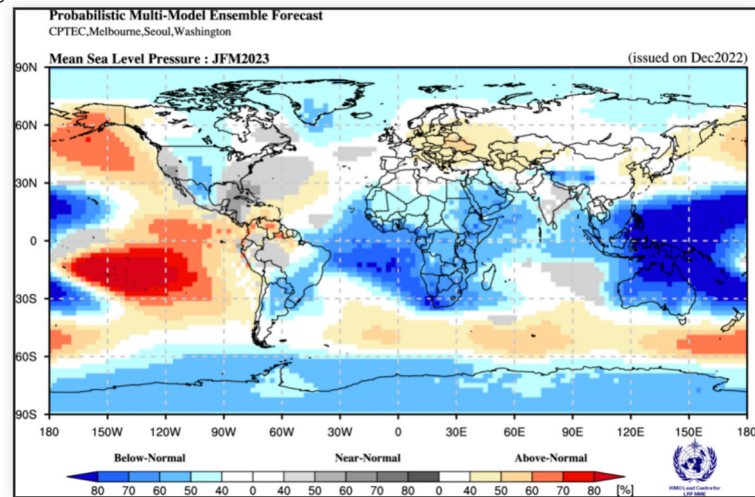
Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilities multi-systems

Good agreement between multi-models.



C3S multi-models MSLP terciles probability.



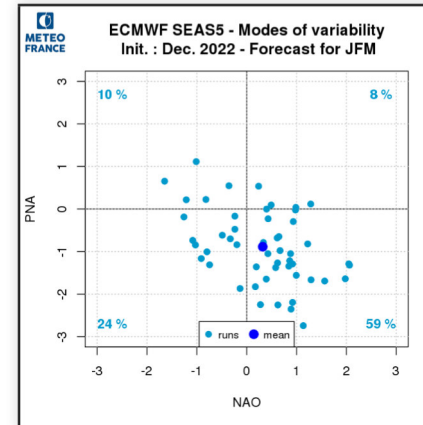
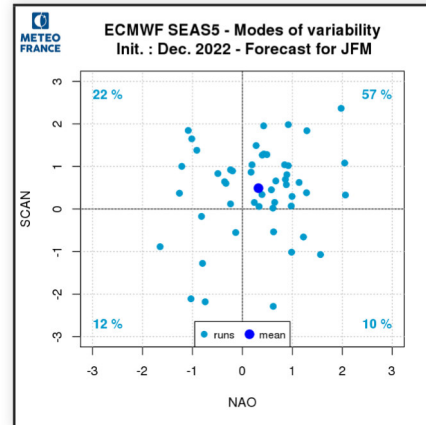
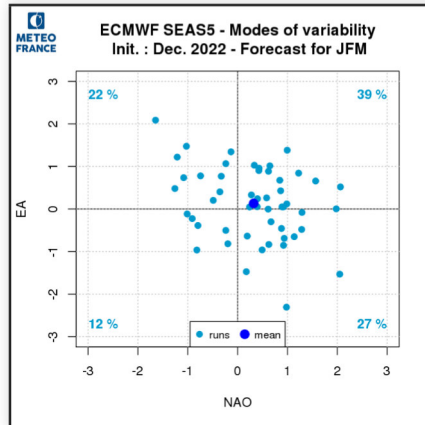
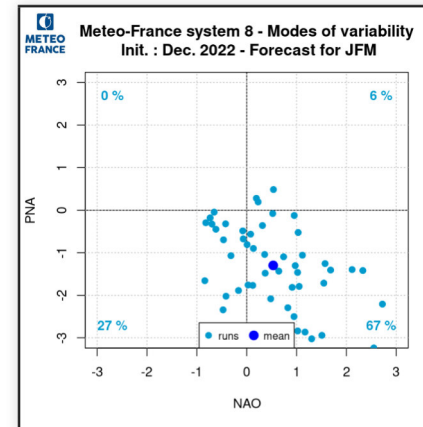
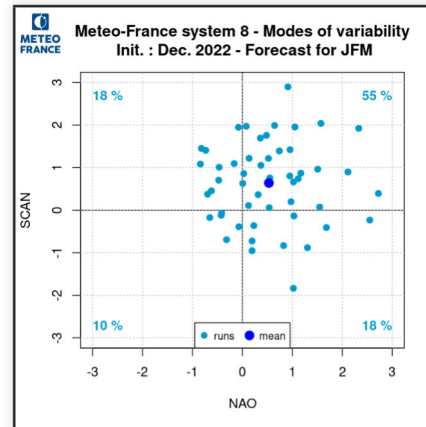
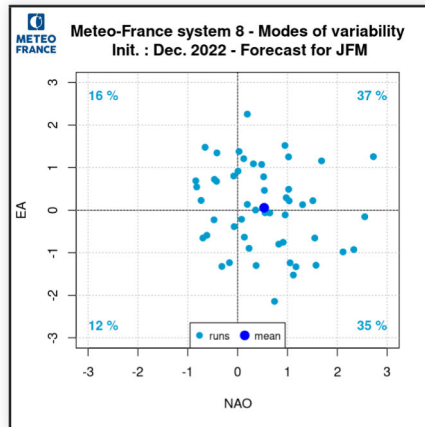
Others models of WMO multi-models MSLP terciles probability.

Modes of variability : forecast

Both models agree on a PNA-.

Both models also provide a SCAN+ mode and a NAO+ mode.

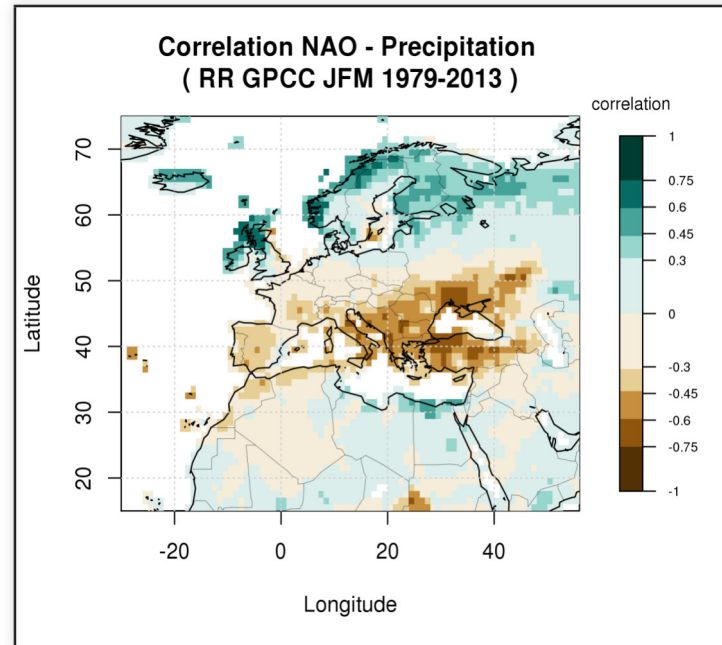
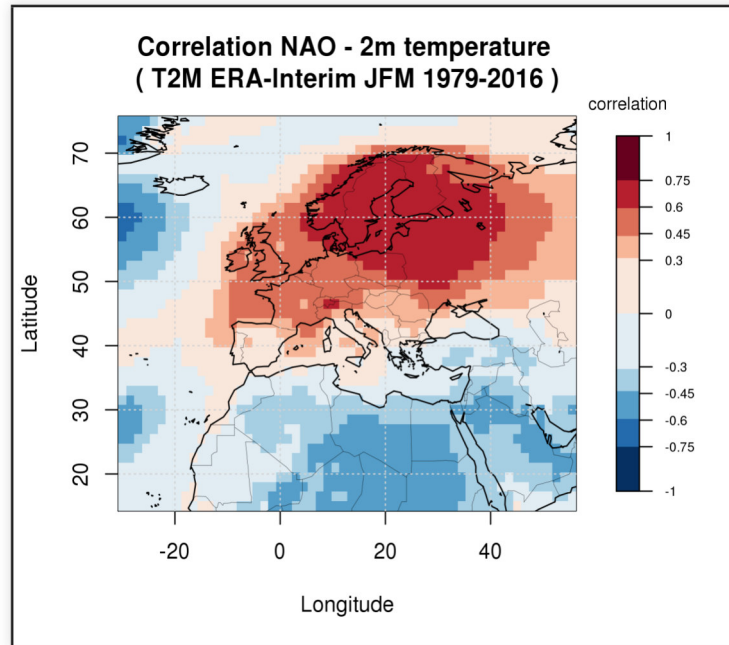
EA is close to zero on average.



See the modes of variability patterns

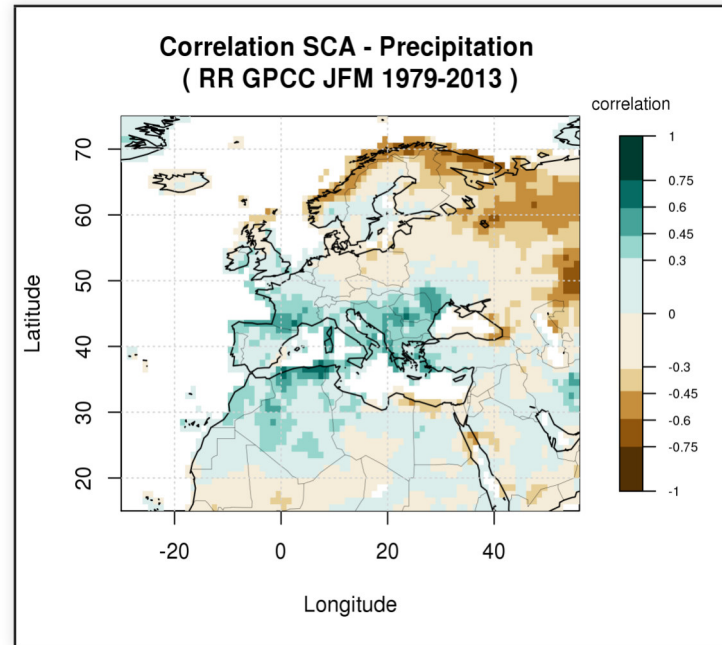
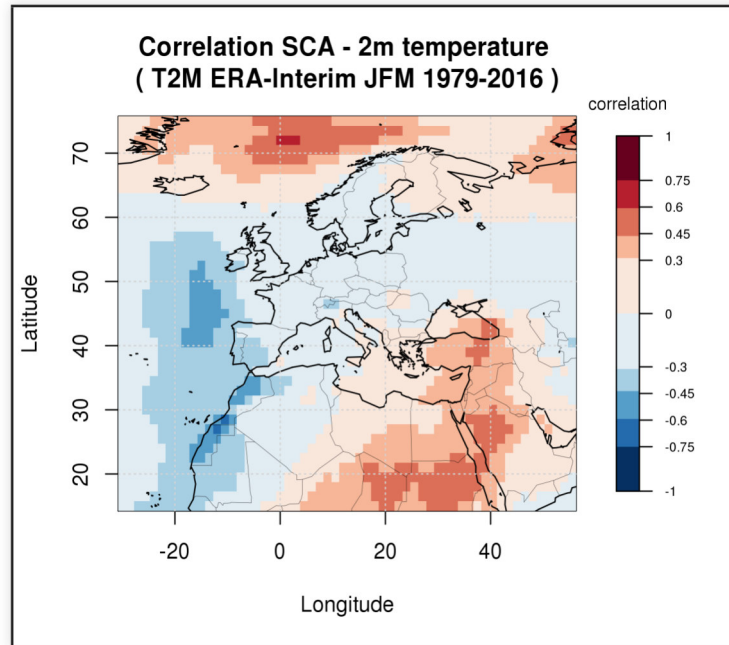
Modes of variability : NAO impacts

Positive phase of the NAO next quarter



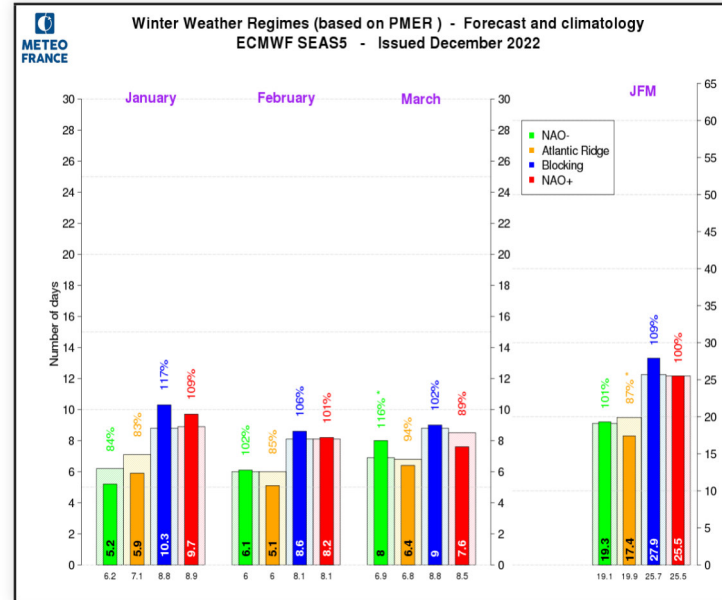
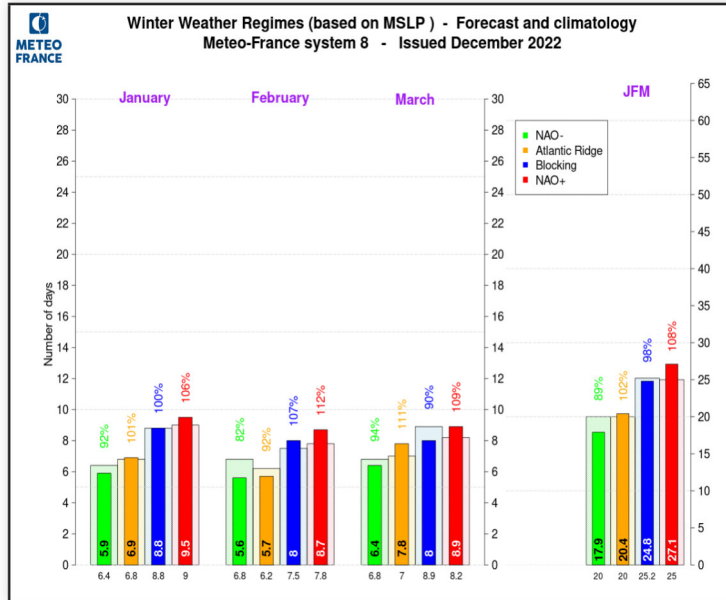
Modes of variability : SCA impacts

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



Weather regimes : winter MSLP

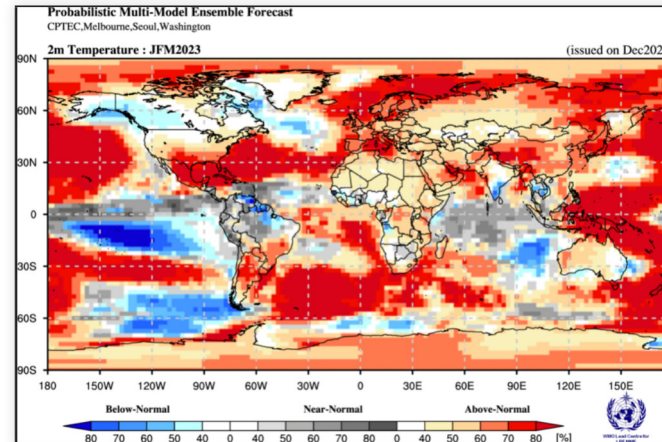
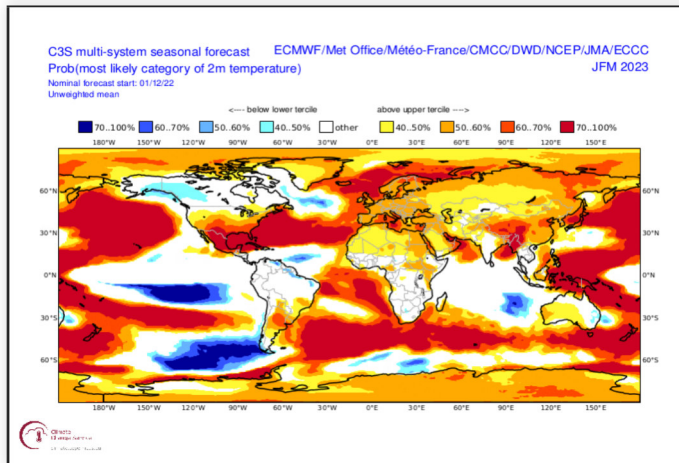
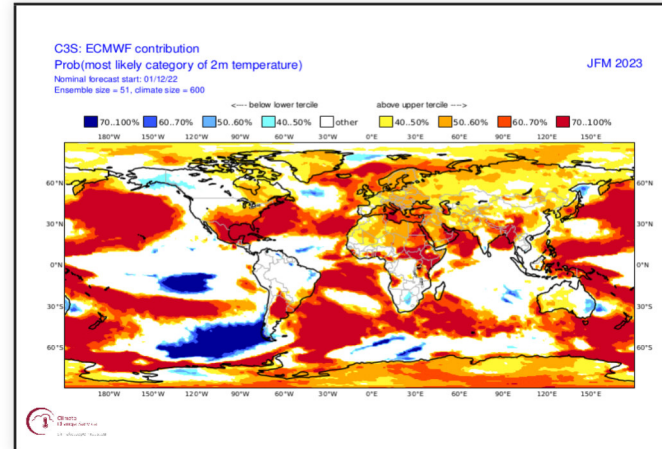
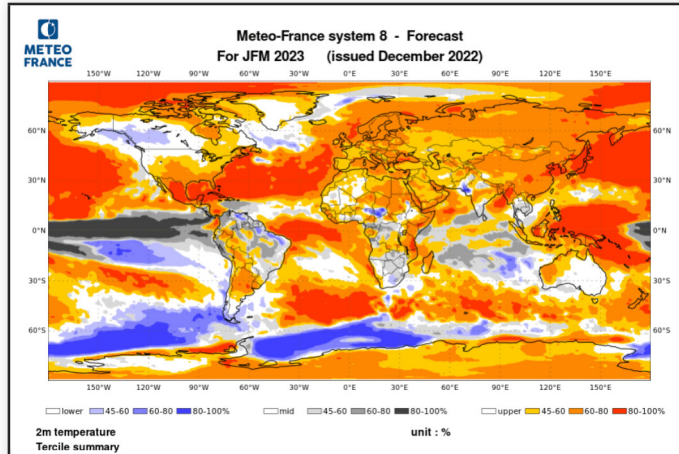
None of the regimes are significantly different from its climatology except Atlantic Ridge less likely with SEAS5



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).

Forecast of climatic parameters : Temperature probabilities

The models agree on the main anomalies.

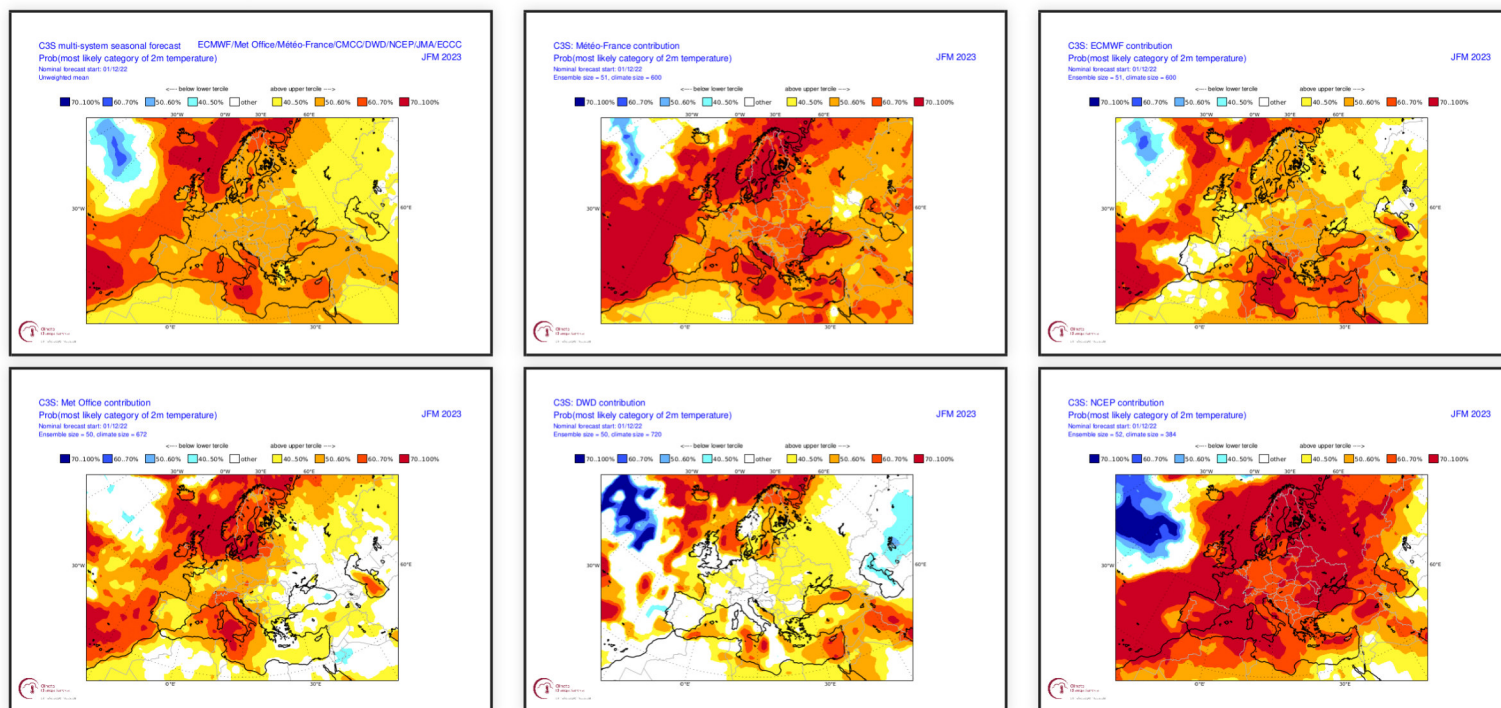


2m temperature probability map from MF-S8 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

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

The highest probability of a warm tercile is over the maritime areas and is related to the positive SST anomalies forecast. The models are converging to give a warm signal over Scandinavia. This is consistent with the blocking regime that is favored by the models, taking into account the climate trend.

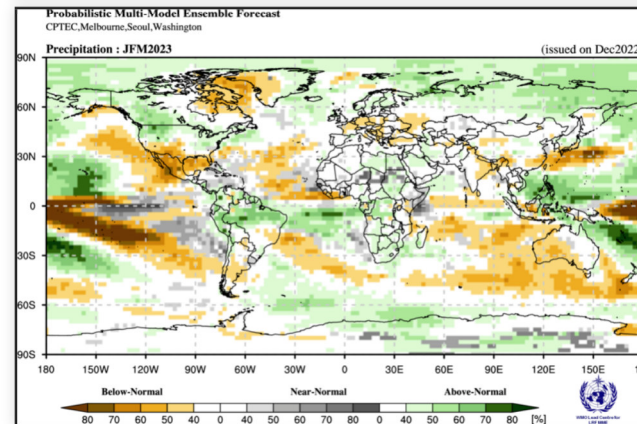
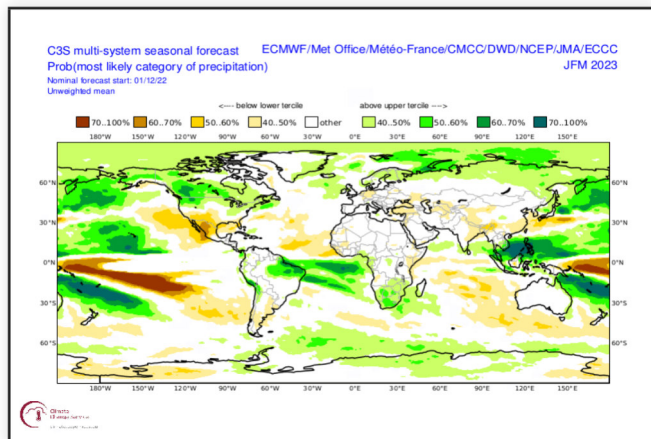
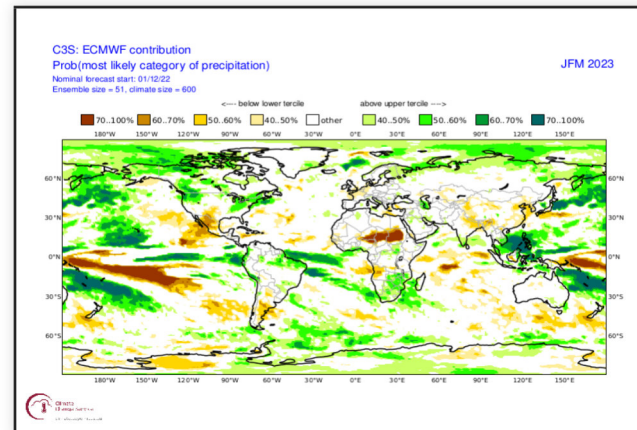
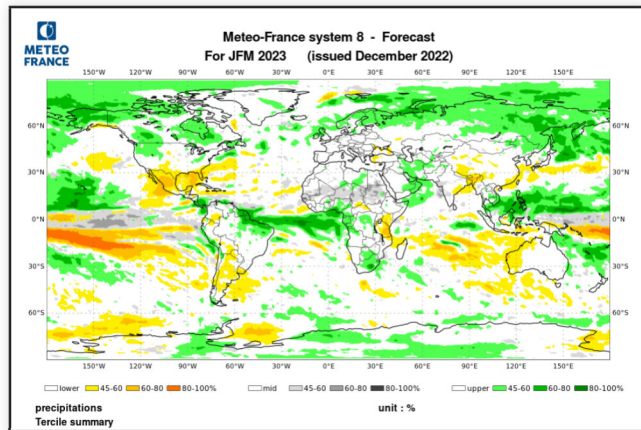
Elsewhere on the European continent there are significant differences between models that favour and extended warm signal (like NCEP or MF8) and others without signal (DWD, Met Office)



C3S multi-models probability map (top left) and MF-S8, ECMWF-SCAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Precipitation

The models converge on the main anomalies in the tropics. On North America the models propose the same dipole in connection with the negative phase of the PNA. On Eurasia a wet signal is present at high latitudes.

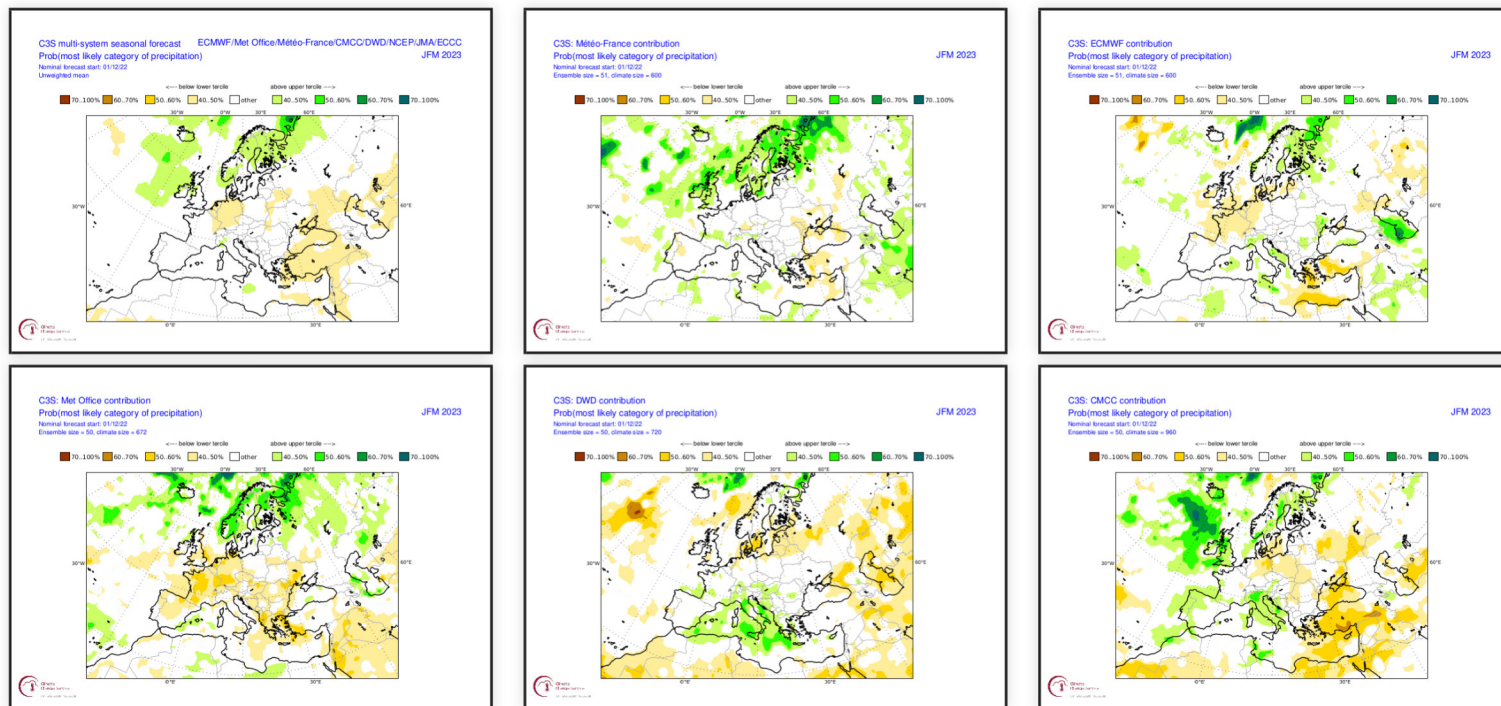


precipitation probability map from MF-S8 (top left), ECMWF-SEASS (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

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

The models agree on a wetter than normal signal over Northern Europe.

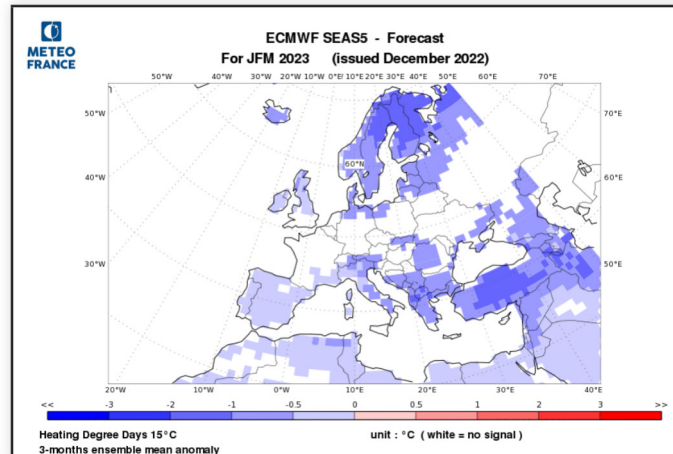
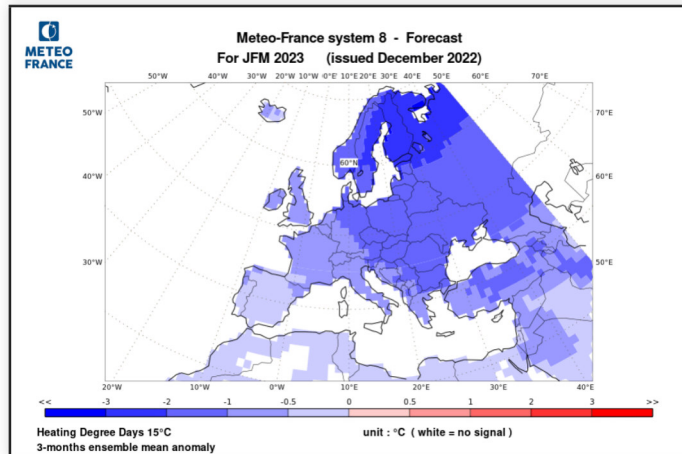
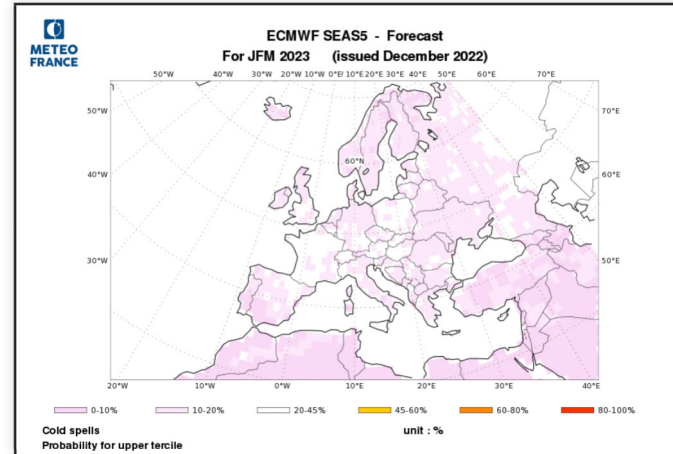
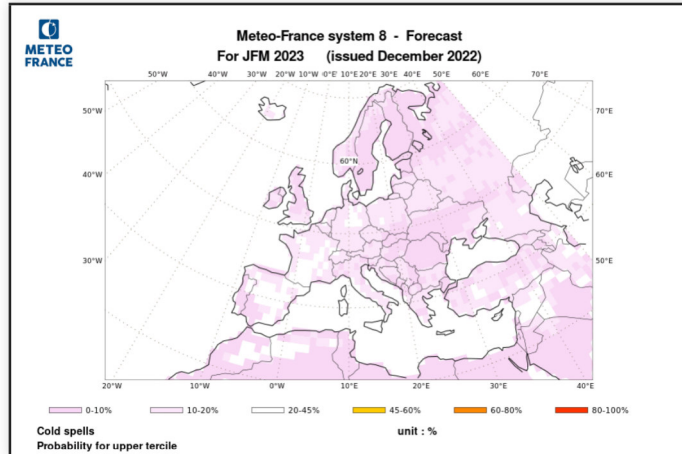
Elsewhere the models are different. Nevertheless a drier than normal signal is most likely from Turkey to the Caspian Sea.



C3S multi-models probability map (top left) and MF-S8, SLAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : cold spell

Less risk of cold waves on Eastern Europe with MF8.



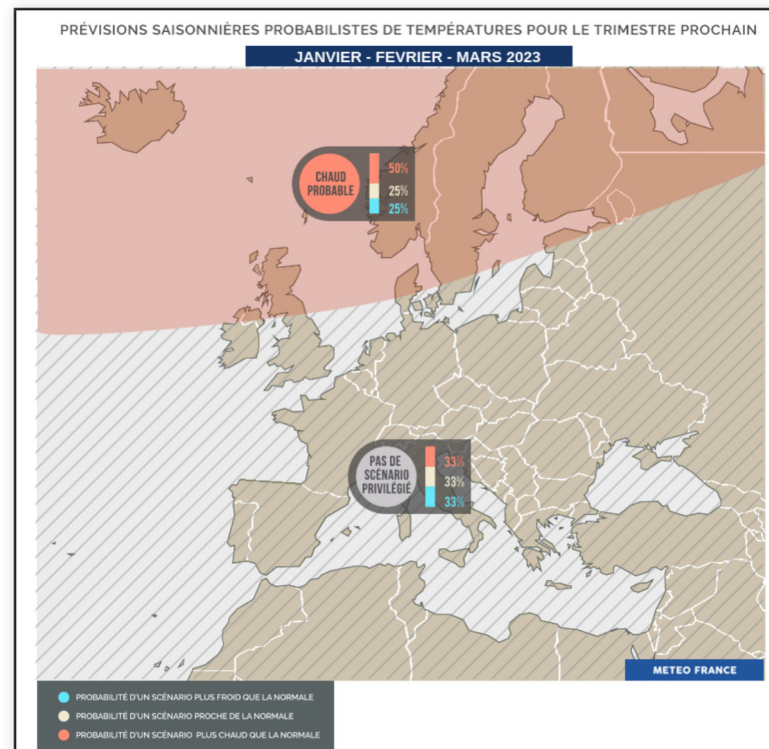
Above, cold wave probability and below, heating degree-days (base 15°C) for MF7 (right) and ECMWF (left)

Synthesis map for Europe : Temperature

Two types of circulation are more likely : the positive mode of NAO and the positive mode of Blocking. These two modes often have inverse impacts on climatic parameters on Europe.

A warm scenario emerges on the northern extremity of Europe in connection with a reinforced zone flow on average (dominant NAO+ effect) and also higher than normal sea temperatures.

No scenario emerges over the rest of the continent.

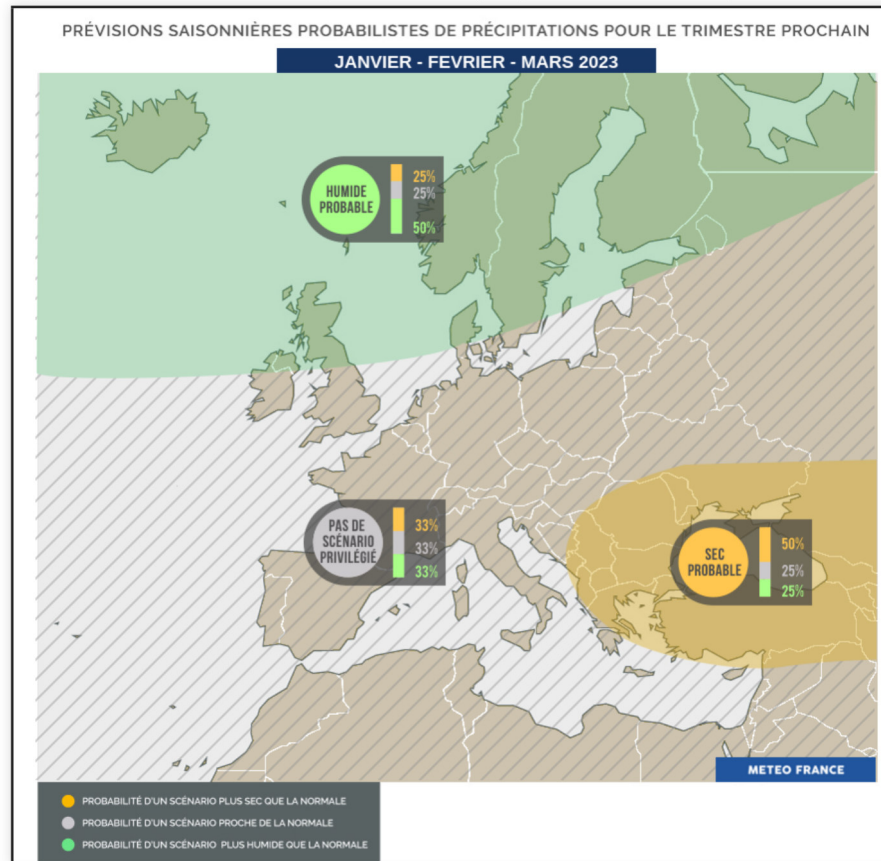


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

The effect of positive NAO slightly dominates that of positive blocking.

Wet conditions are most likely over the far north of Europe. Conversely dry conditions are expected over southeastern Europe.



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