

Météo-France Seasonal Forecast Bulletin

JULY - AUGUST - SEPTEMBER 2023

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2. Oceanic forecast

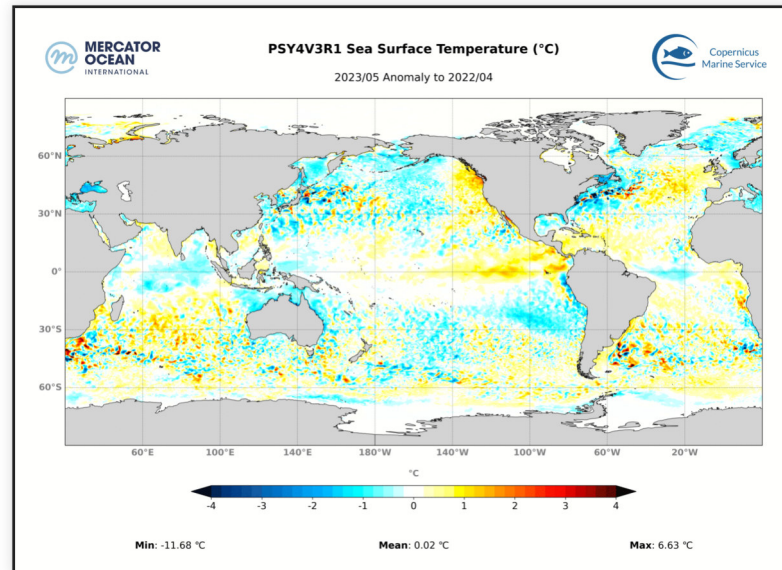
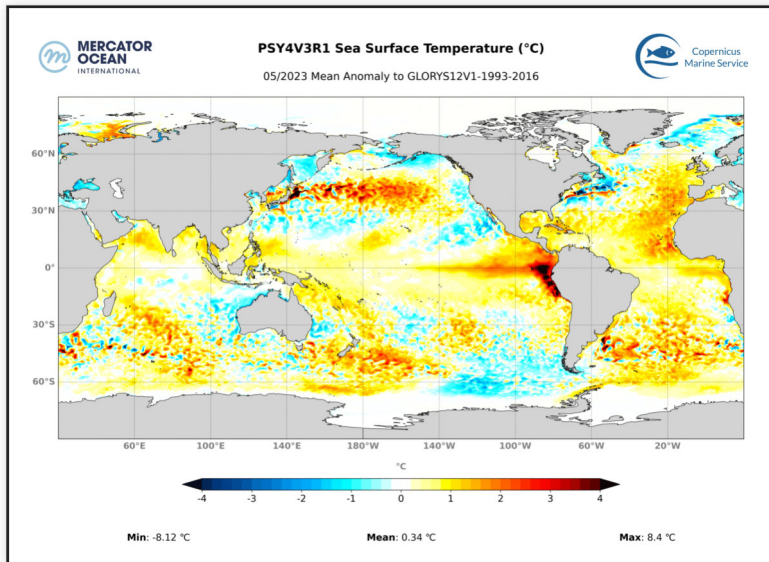
Oceanic analysis of April 2023 : SST anomalies

Current ENSO situation : ENSO positive phase initiation

In the Pacific Ocean : In the eastern part of the equatorial area, the warm anomaly is now clearly visible and continues to strengthen. In the Northern Hemisphere, the PDO- pattern persists, even if it is weakening.

In the Indian Ocean : A positive West/East gradient is in place, indicating the positive phase of the IOD.

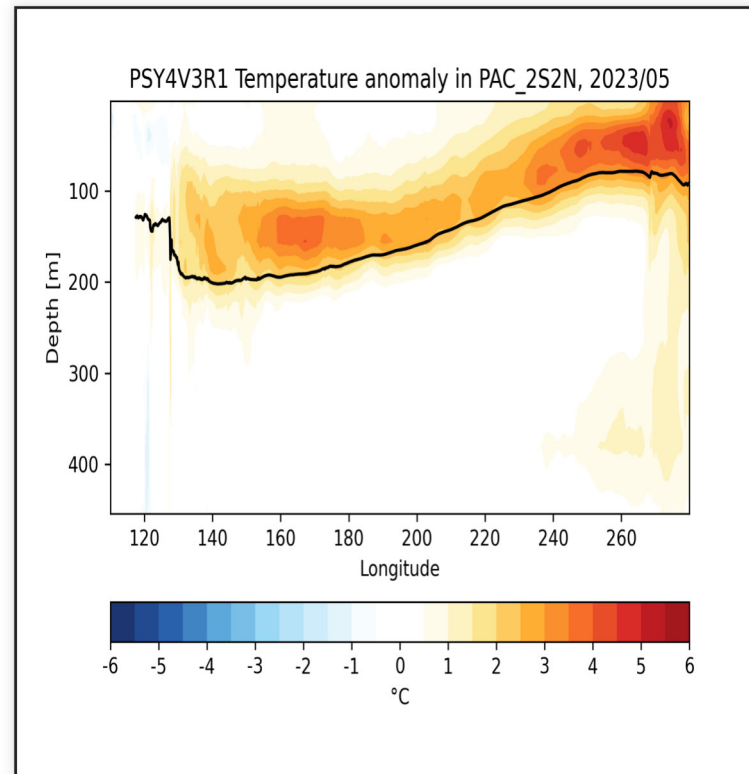
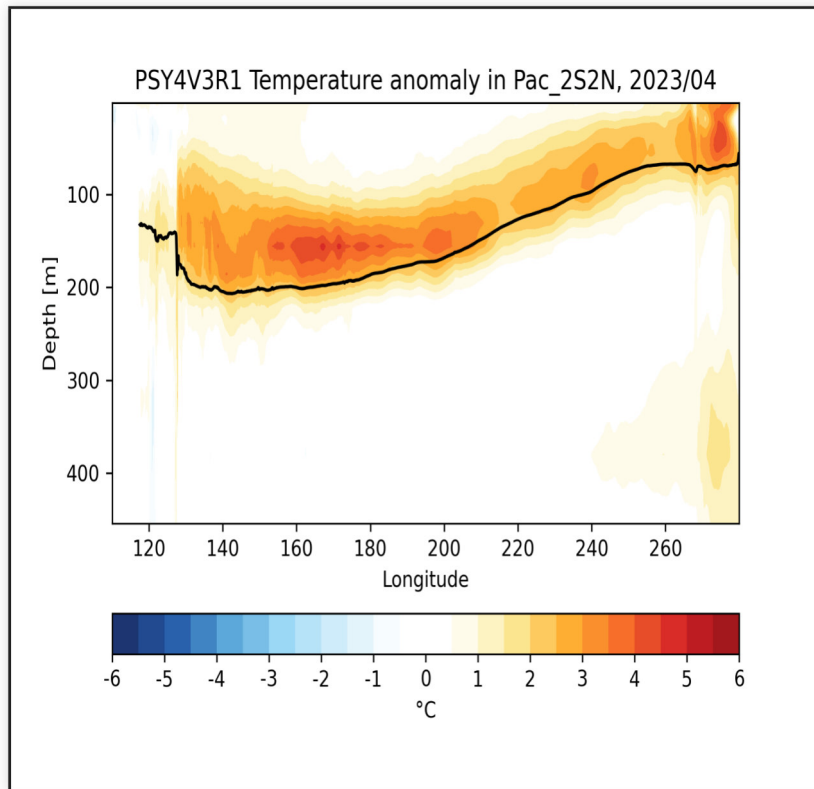
In the Atlantic Ocean : A positive anomaly is positioned from the West African coast to the Iberian Peninsula.



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

Oceanic analysis of April 2023 : Pacific vertical section

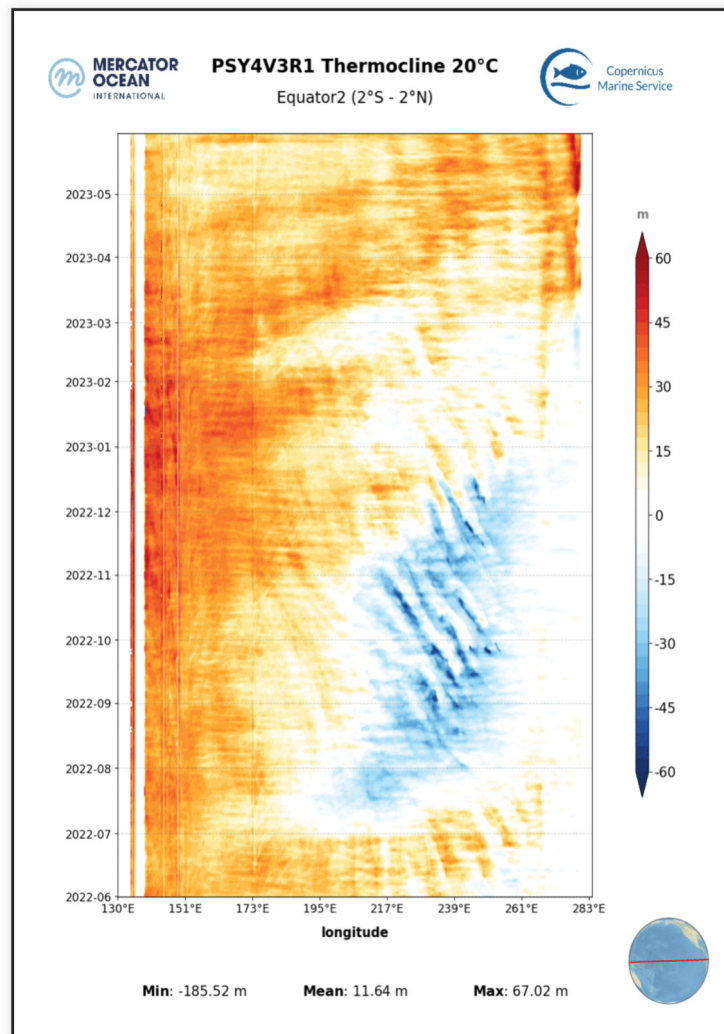
The warm subsurface anomaly is strengthening near the South American coasts, while tending to weaken near the Maritime Continent.



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

Oceanic analysis of April 2023 : Hovmöller diagram of the 20°C isotherm

The 20°C thermocline is deeper than normal over the entire Pacific.

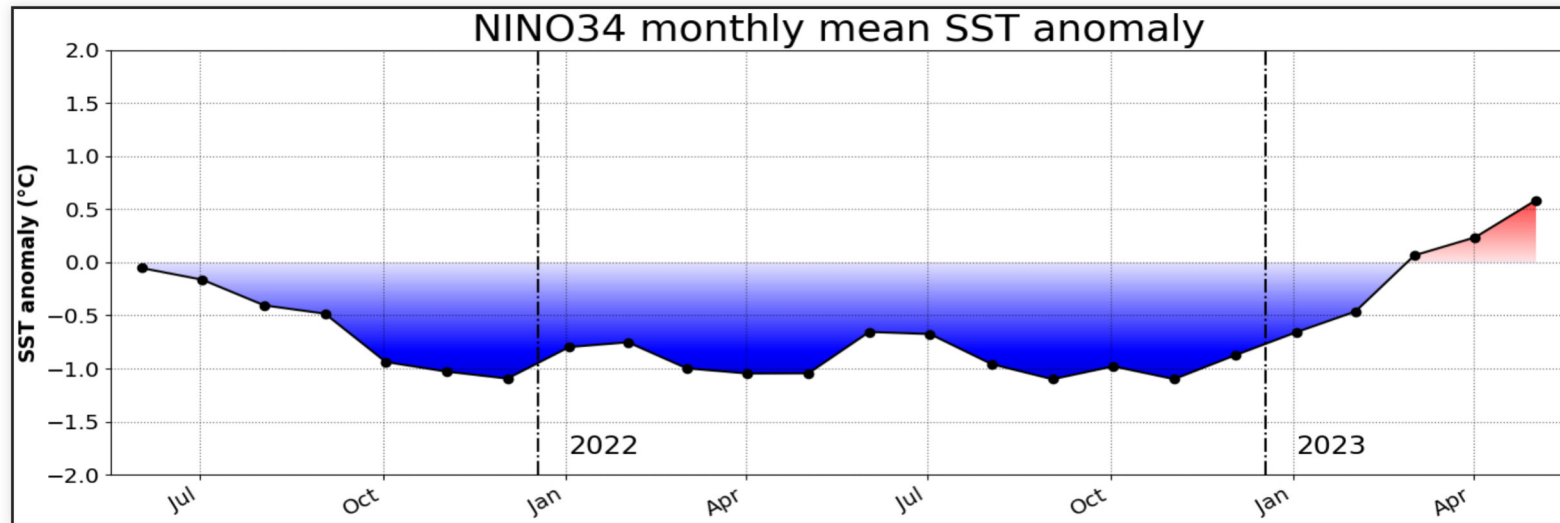


Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 °C isotherm) (c) Mercator-Ocean

Oceanic analysis of April 2023 : Pacific Ocean - Nino3.4 index history

Nino3.4 index issued from Mercator Ocean PSYV4R2 analysis : close to 0.6°C

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

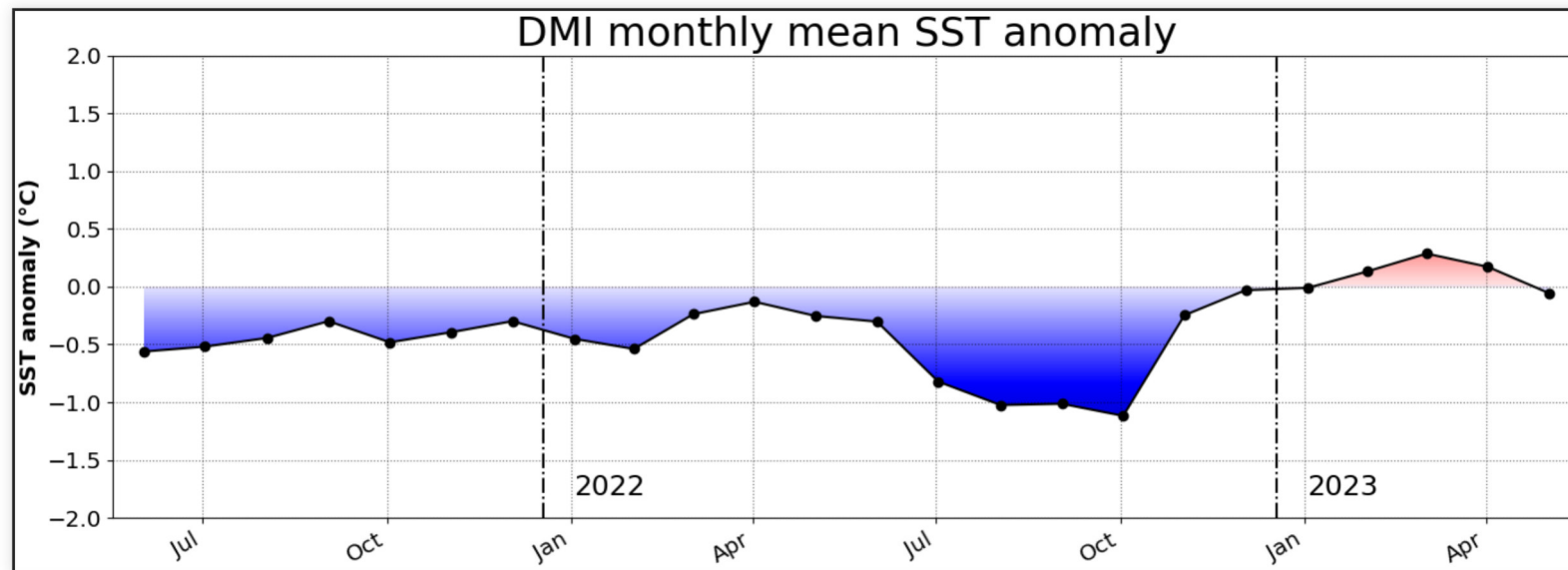


Evolution of SST in the NINO3.4 box (c) Mercator-Ocean

Oceanic analysis of April 2023 : Indien Ocean - DMI index history

DMI Index issued from Mercator Ocean PSYV4R2 analysis : -0.1°C

(see BOM site for weekly values : <http://www.bom.gov.au/climate/enso/monitoring/iod1.png>)

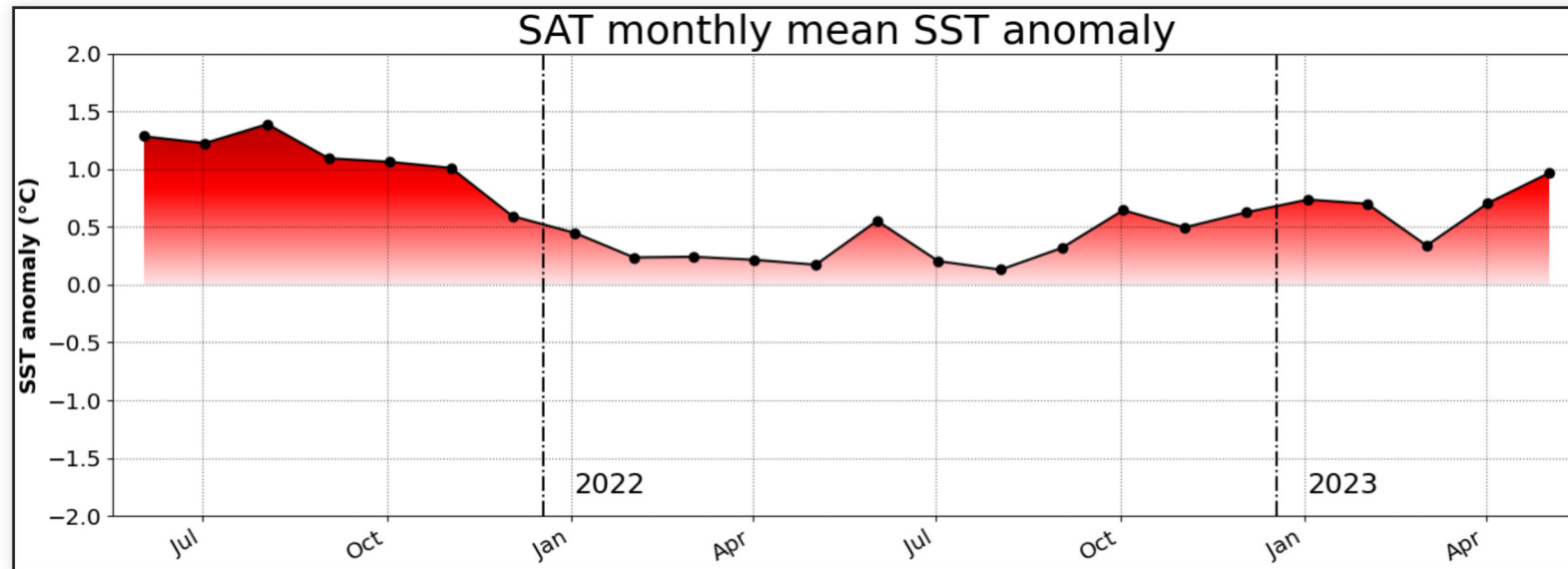


Evolution of SST in the DMI box (c) Mercator-Ocean

Oceanic analysis of April 2023 : Atlantic Ocean - SAT index history

SAT index issued from Mercator Ocean PSYV4R2 analysis : $+1.0^{\circ}\text{C}$

This anomaly becomes strong compared to the variability in this area.



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

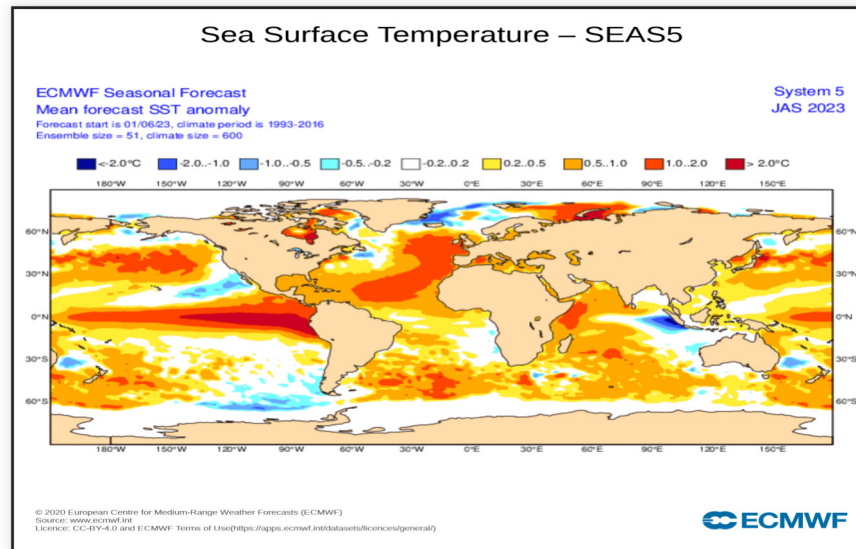
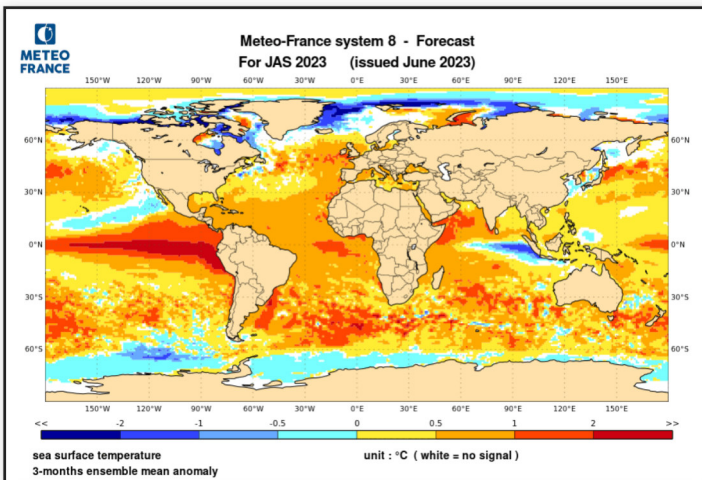
Oceanic forecast : SST anomaly

Good agreement between MF-S8 and ECMWF-SEAS5 in the main anomaly patterns, except in the Atlantic Ocean.

In the Pacific Ocean : The positive anomaly over the eastern Equatorial Pacific Ocean continues to develop over the next quarter, while in the Northern Hemisphere, the PDO- pattern continues.

In the Indian Ocean : The East/West contrast, with a cold anomaly along Sumatra and a warm anomaly near the Horn of Africa, is amplifying and marks the positive phase of the IOD.

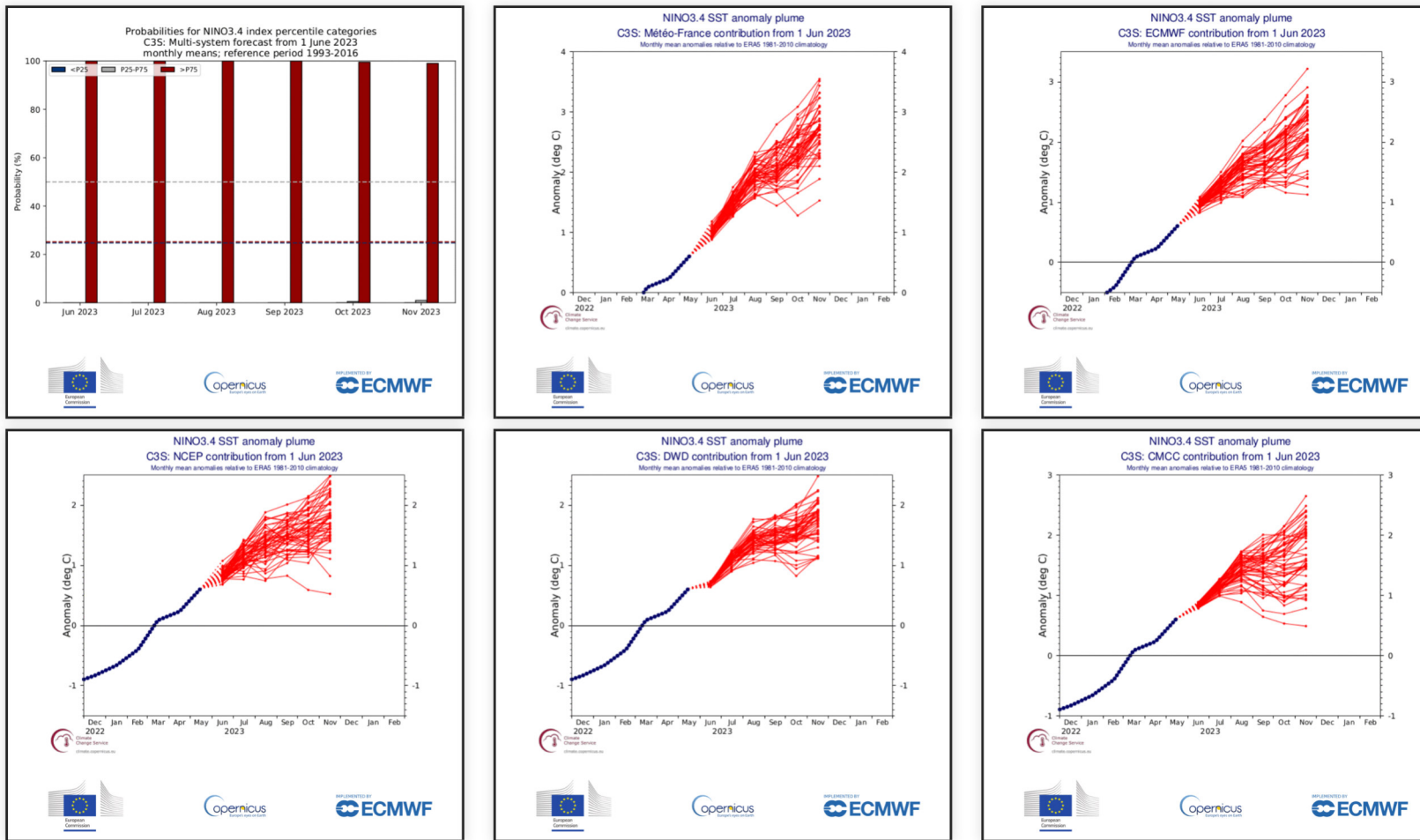
In the Atlantic Ocean : For MF8, the positive anomaly is homogeneous from the intertropical region to the European coasts, including around the equator. For ECMWF, the positive anomaly is more pronounced, but concentrated in the eastern North Atlantic. It is weaker near the equator.



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

All models predict a rapid increase in the index. This is most pronounced with ECMWF, and even more so with MF8.

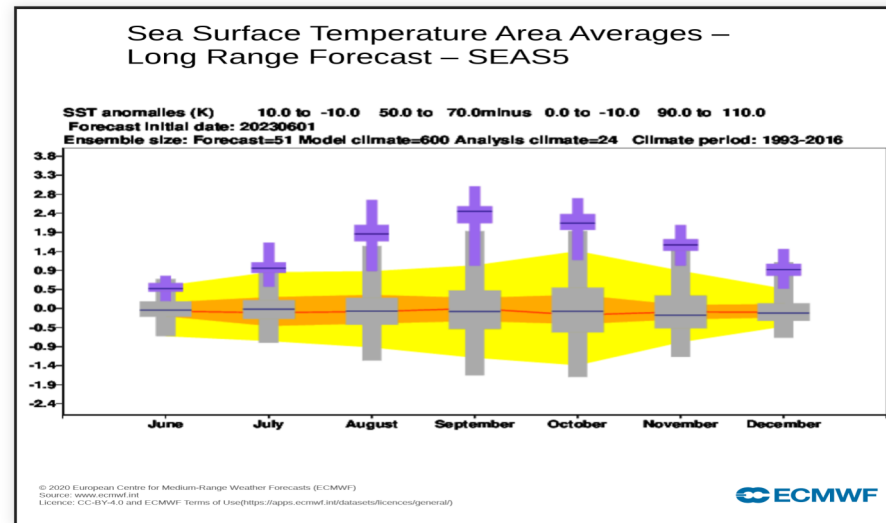
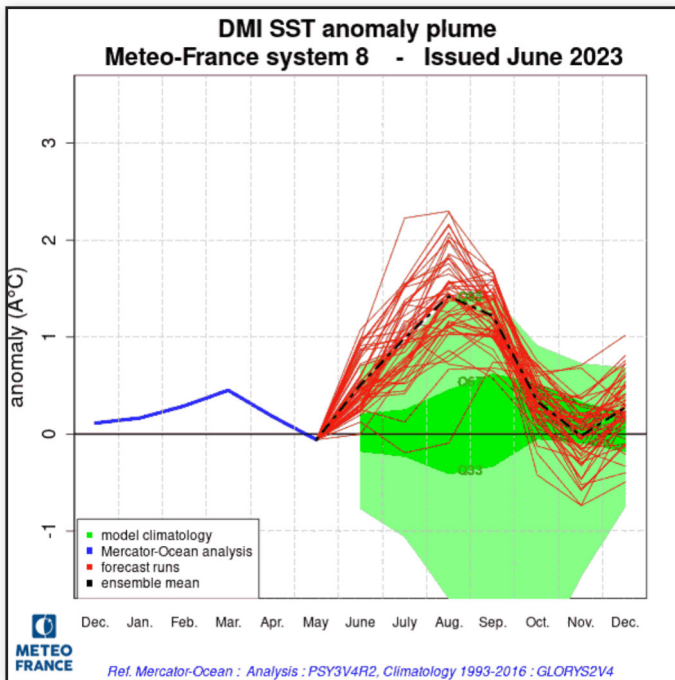
The most likely phase for the next three months : Positive phase



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 : Indian ocean - DMI evolution

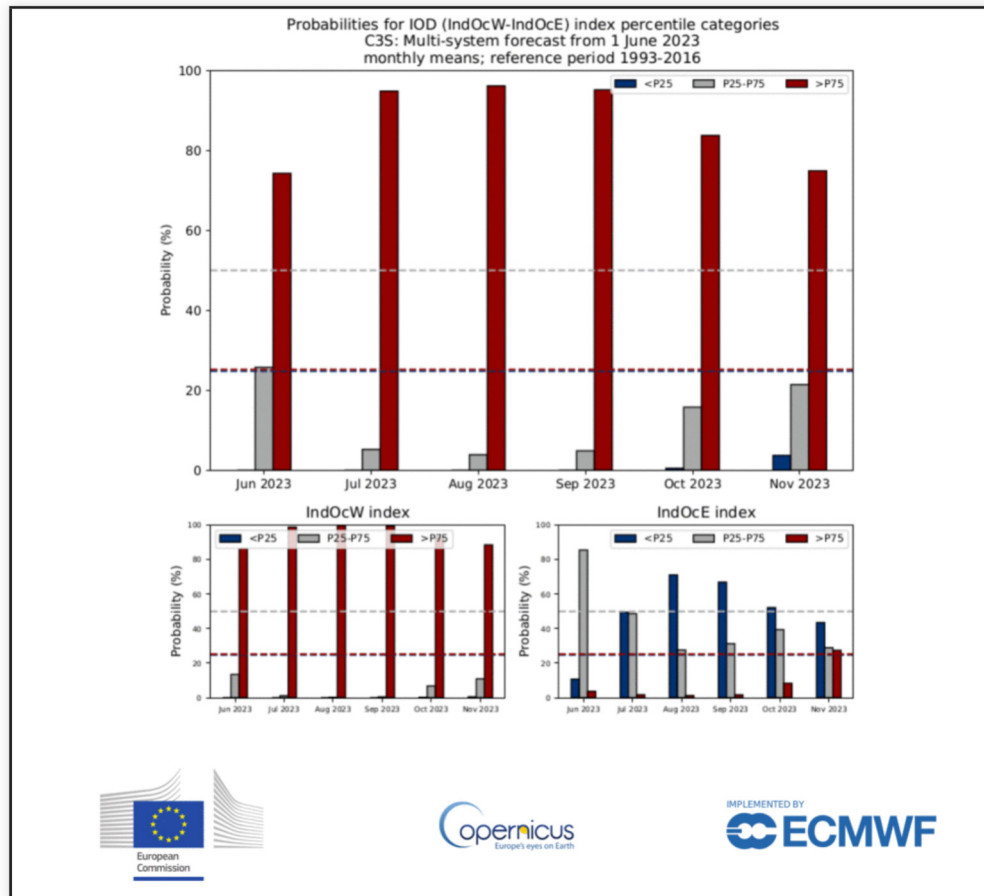
Both models forecast a rapid rise in the DMI index, reaching a maximum at the end of the period, at the limit of climatology.



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

Expected Phase for the next three months : the positive phase is the most likely.

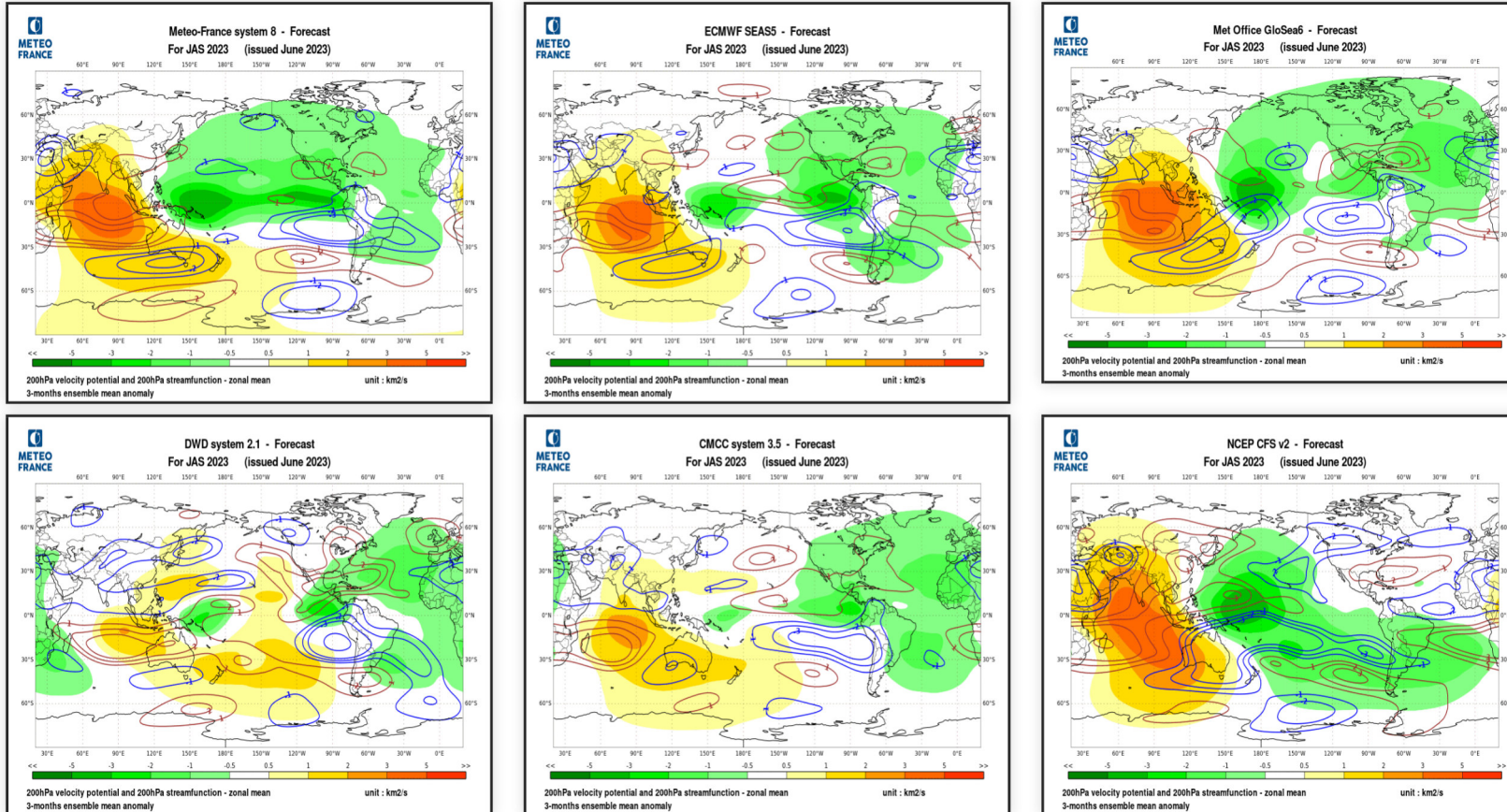


C3S multi-system probability forecast for IOD , west box and east box Index

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

Velocity Potential : The dipole downward motion anomaly over the eastern Indian Ocean / upward motion anomalies over the Pacific is confirmed by most models (linked to El Niño). The DWD model is close to the other models for the evolution of the NINO3.4 index, but the impact on the VP200 is still weak. The CMCC model has moved closer to the DWD model.

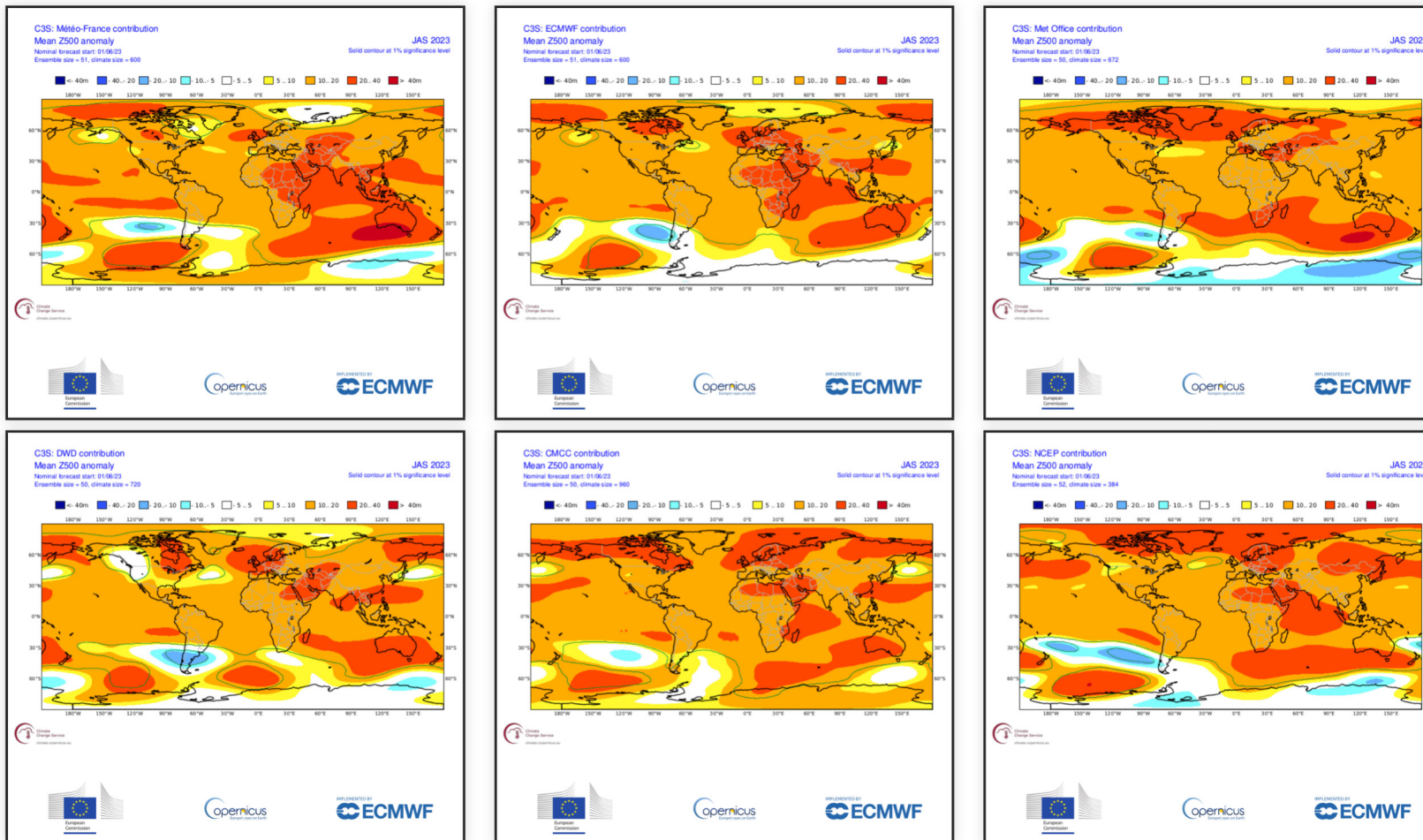
Streamfunction : Two dipoles are forming on either side of the equator: one, with an anticyclonic curve, over the eastern Equatorial Pacific and the Caribbean, and the other, with a cyclonic curve, over the Indian Ocean and as far as North Africa and the Mediterranean basin. Teleconnections are visible in the Southern Hemisphere, but not in the Northern Hemisphere.



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).

Atmospheric circulation forecasts : Z500 anomalies in C3S models

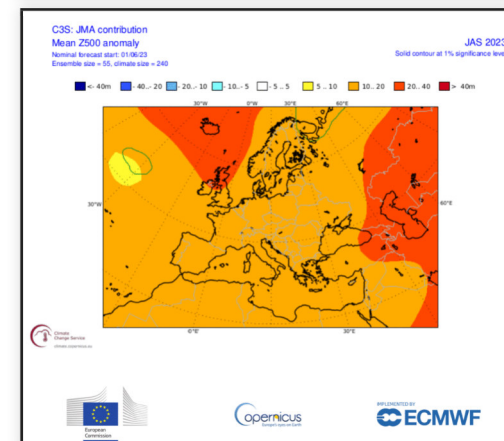
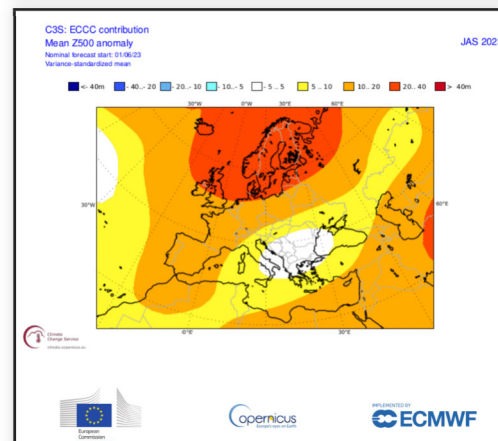
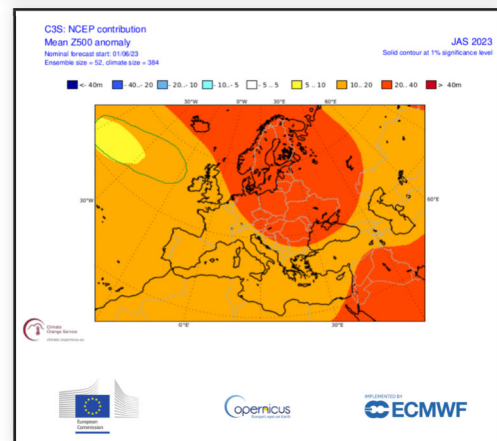
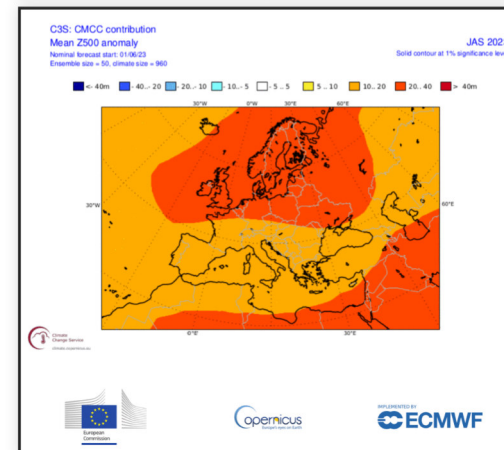
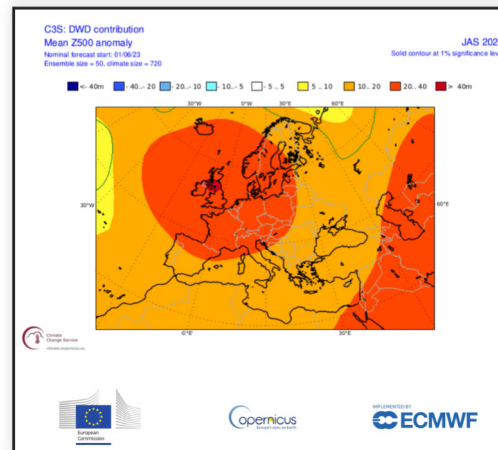
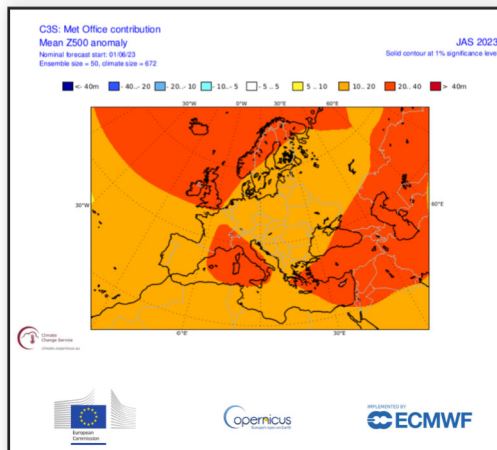
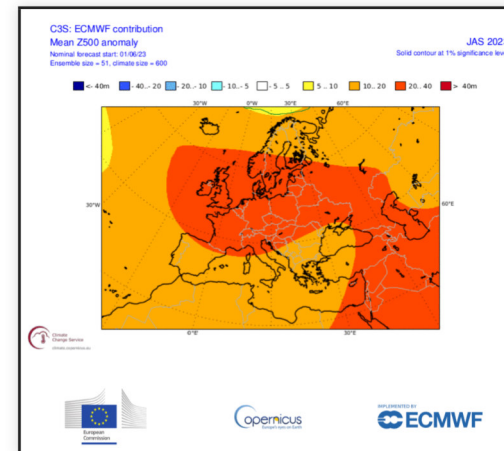
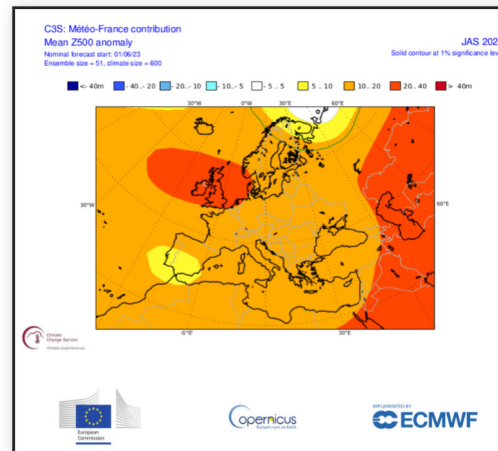
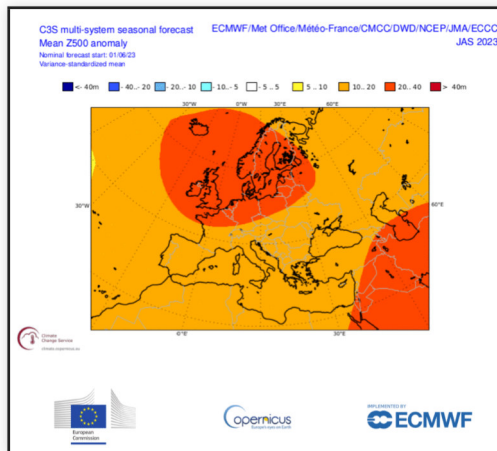
In the northern hemisphere, there are no very strong signals. However, there is a small positive anomaly over central Canada and northern Europe, and another centered over the Middle East, as well as a relative minimum off Newfoundland.



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

Atmospheric circulation forecasts : Z500 anomalies in C3S models

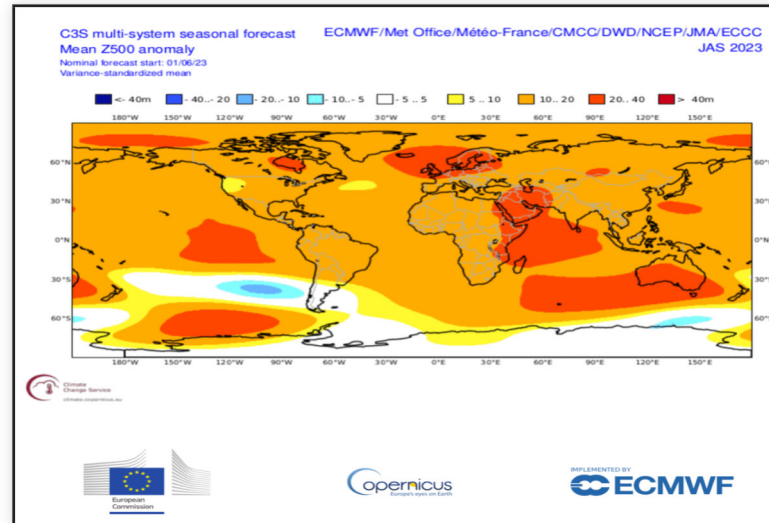
Although the signals are attenuated, most models suggest a positive anomaly around the British Isles and North Sea, and another over the Near East.



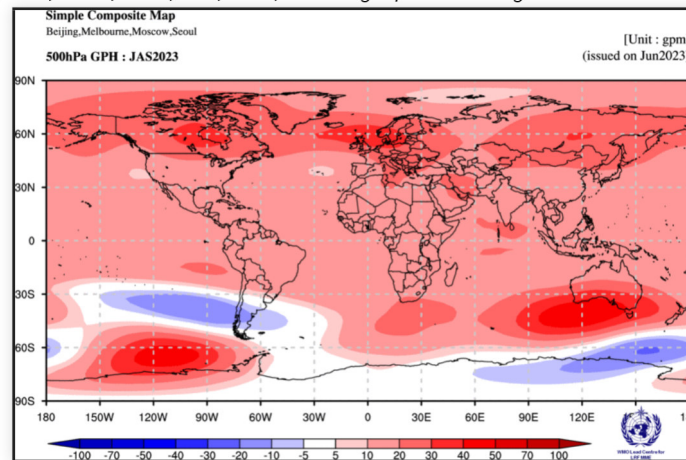
multi-models 500hPa geopotential height anomalies

Atmospheric circulation forecasts : Z500 anomalies multi-systems

In the northern hemisphere, signals are attenuated. However, both multi-models show a stronger positive anomaly around the North Sea and a small weakness in the center of the North Atlantic basin.



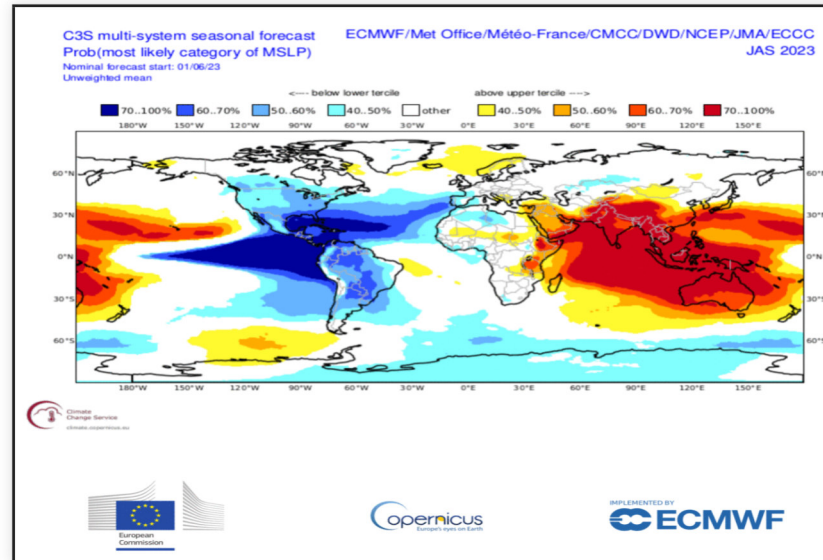
C3S multi-models (MF-S8, ECMWF-SEAS5, UKMO, DWD, CMCC, NCEP, JMA, ECCC) 500hPa geopotential height anomalies.



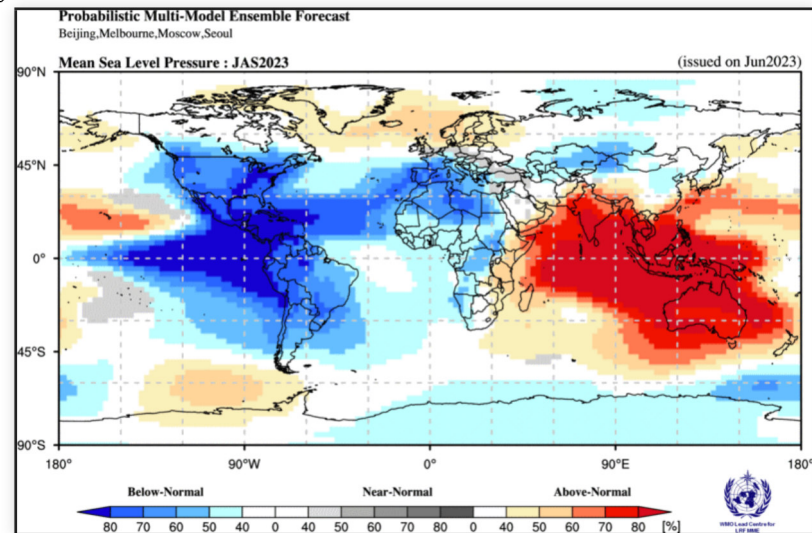
Others models of WMO multi-models 500hPa geopotential height anomalies.

Atmospheric circulation forecasts : MSLP probabilities multi-systems

Both multi-models agree on the MSLP anomalies between the tropics. They also agree over Europe, with a probable positive anomaly over northern Europe and a negative one over the Mediterranean regions.



C3S multi-models MSLP terciles probability.

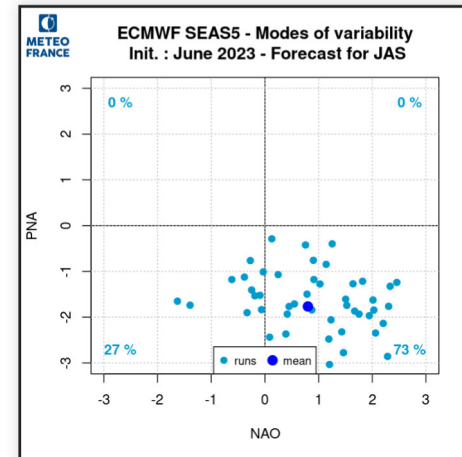
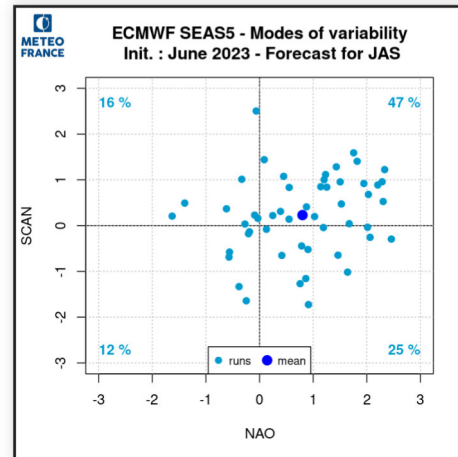
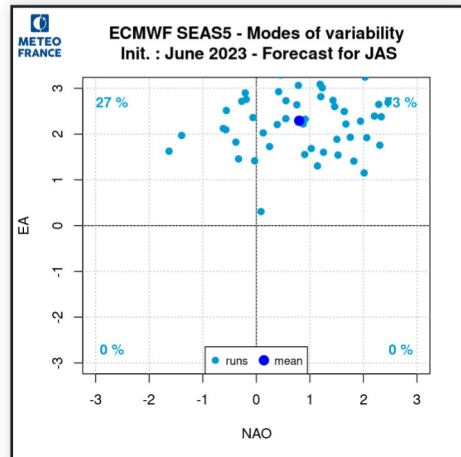
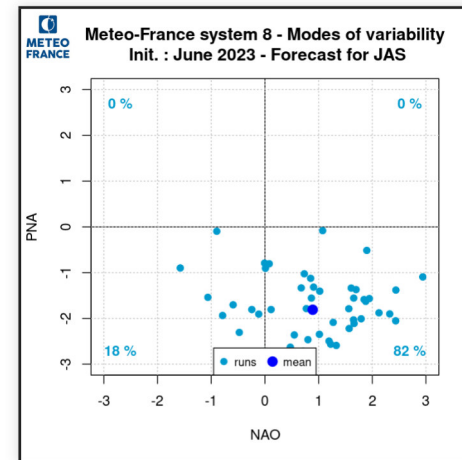
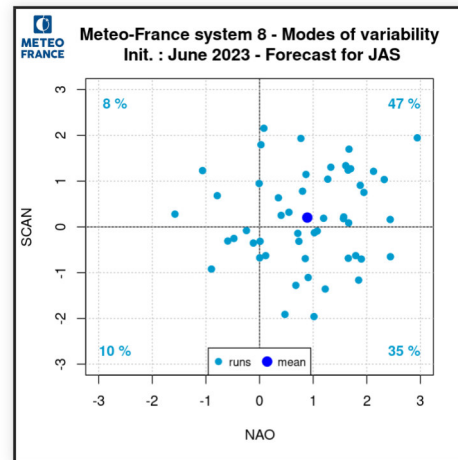
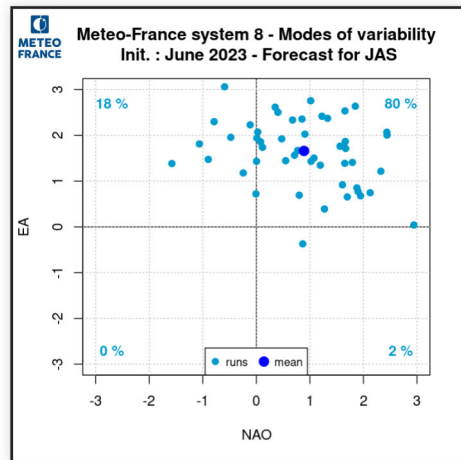


Others models of WMO multi-models MSLP terciles probability.

Modes of variability : forecast

EA+ and PNA- modes, and to a lesser extent NAO+ mode, are preferred.

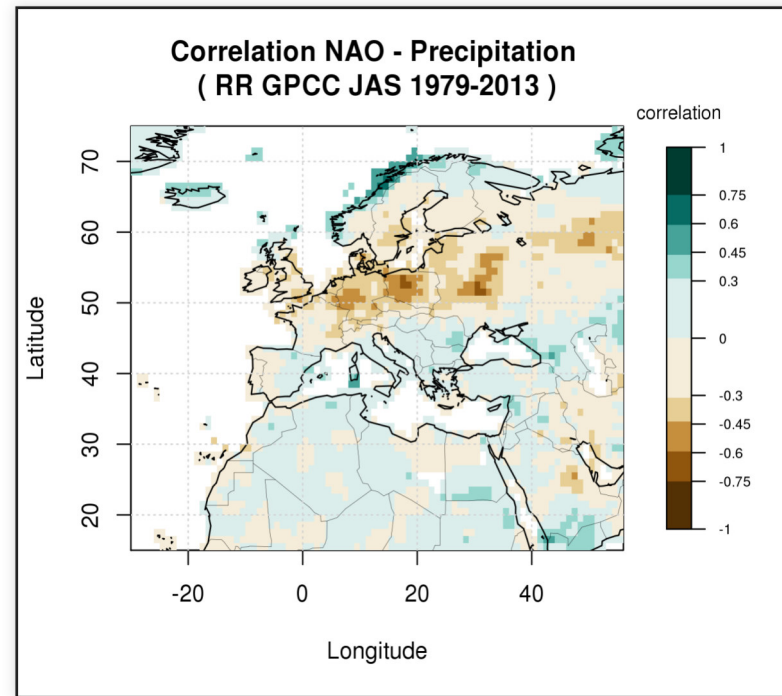
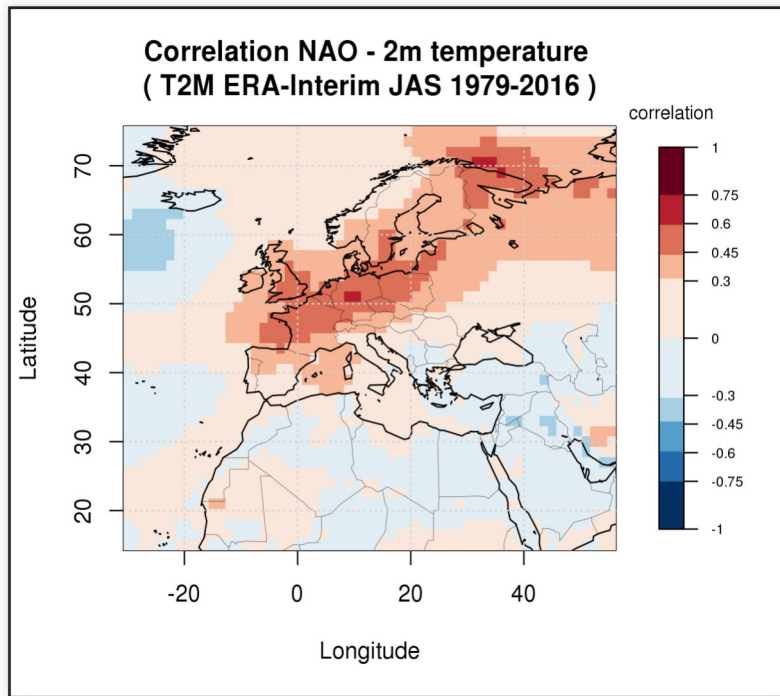
No signal for SCAN.



See the modes of variability patterns

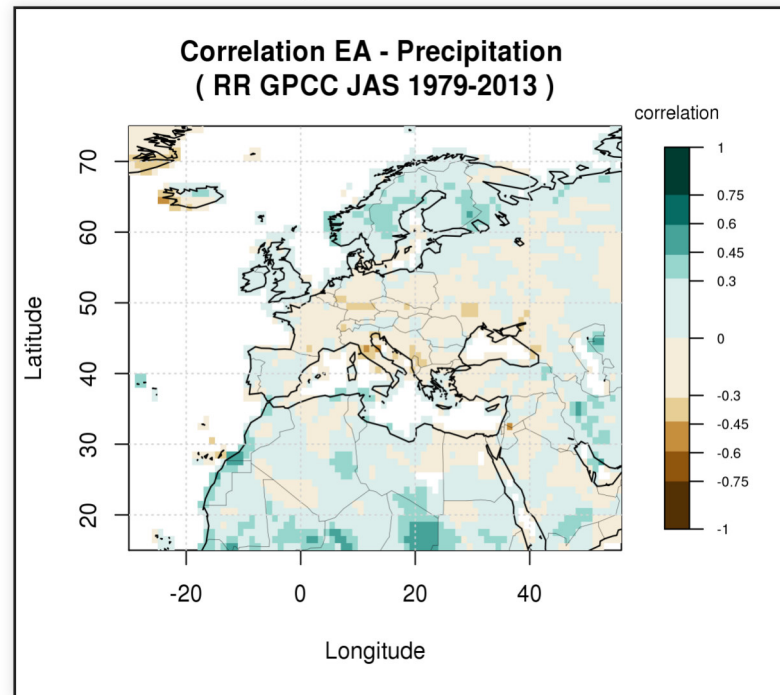
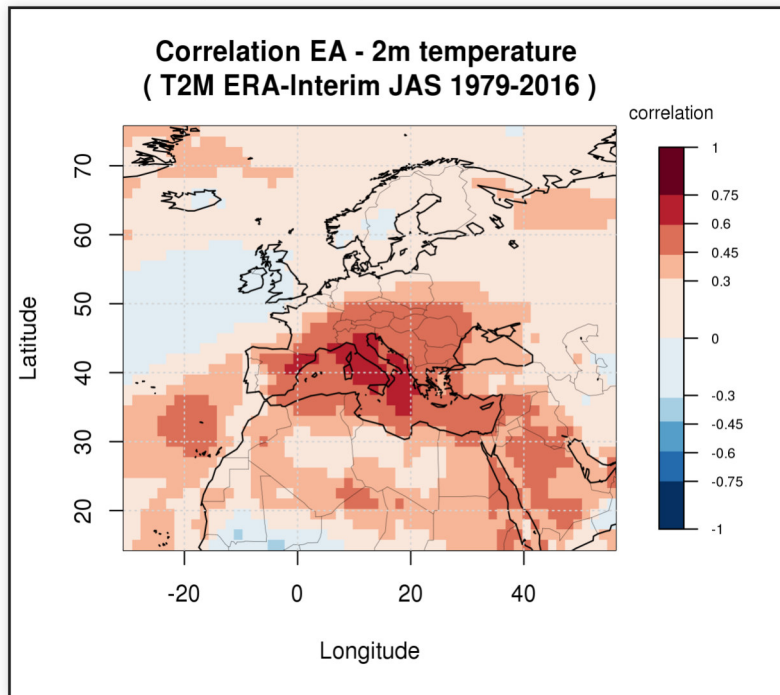
Modes of variability : NAO impacts

Positive phase of the NAO next quarter



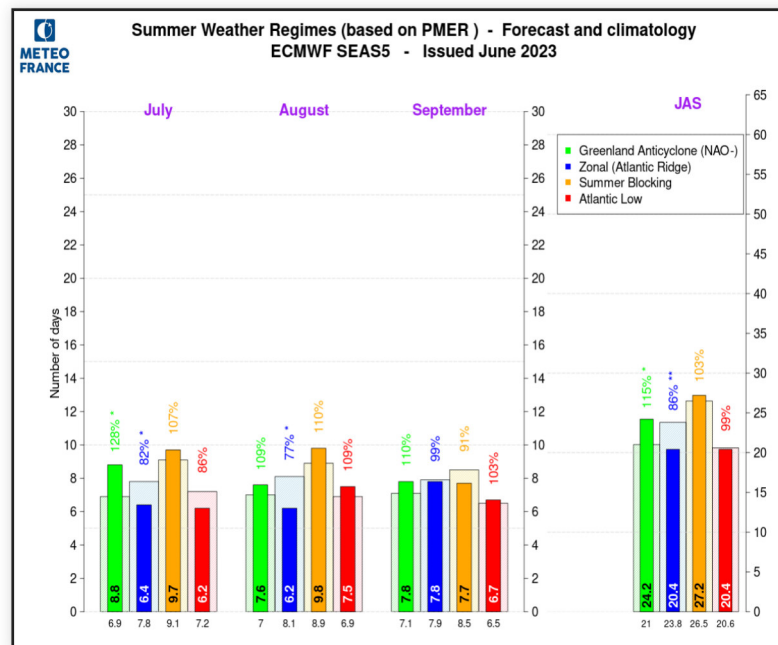
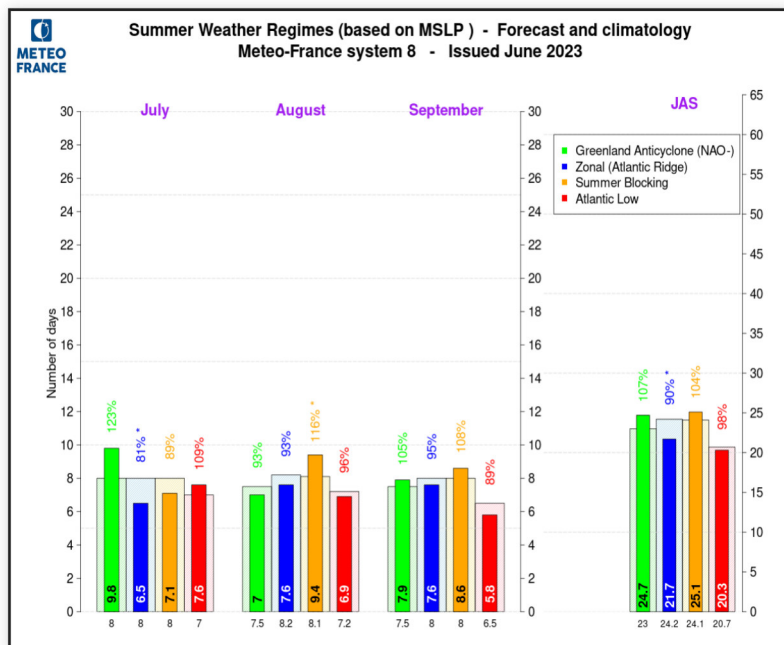
Modes of variability : EA impacts

Positive EA is expected next quarter. This mode has a strong influence in particular on the temperature on the south of Europe.



Weather regimes : summer MSLP

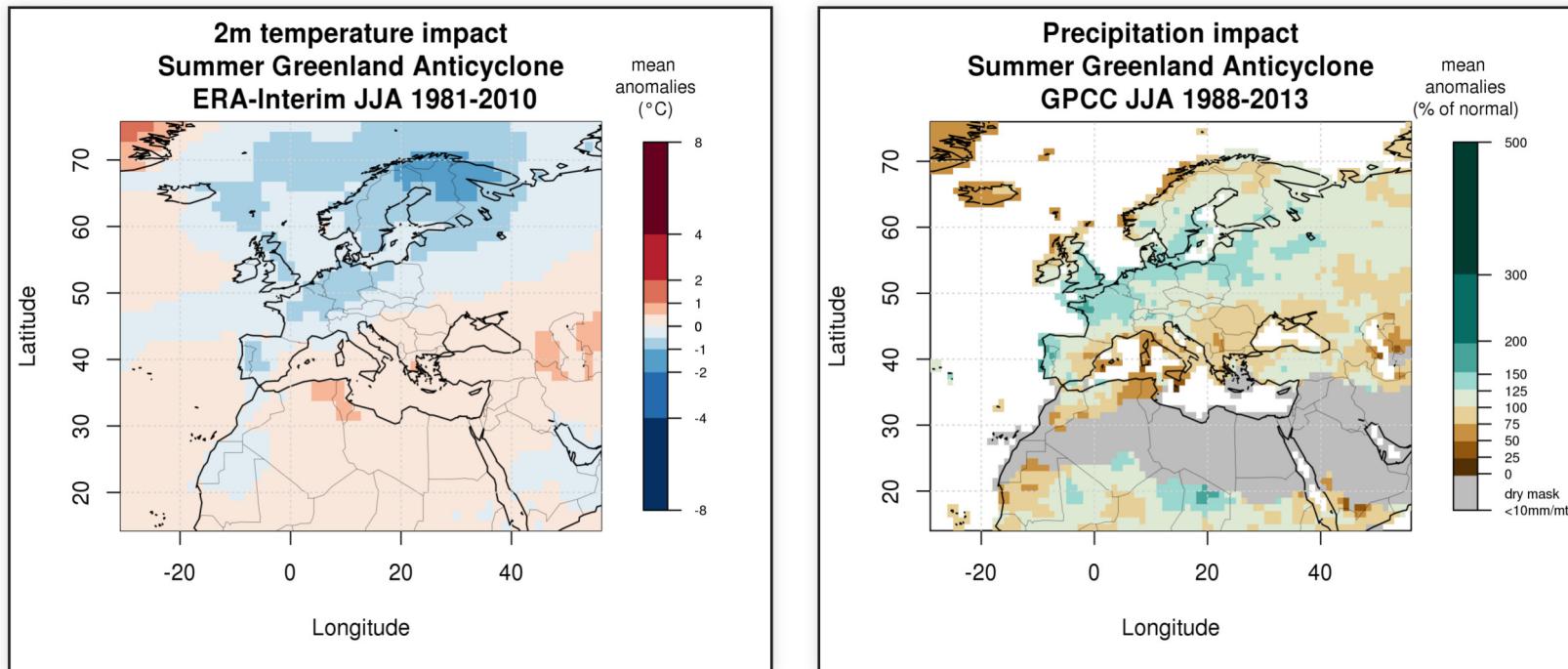
The "zonal" regime is significantly under-represented for both models, while the "Greenland anticyclone" regime is significantly above its climatology only for ECMWF.



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

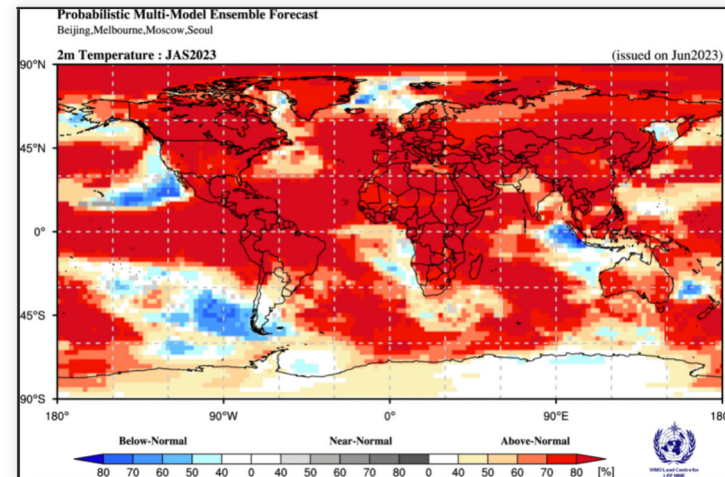
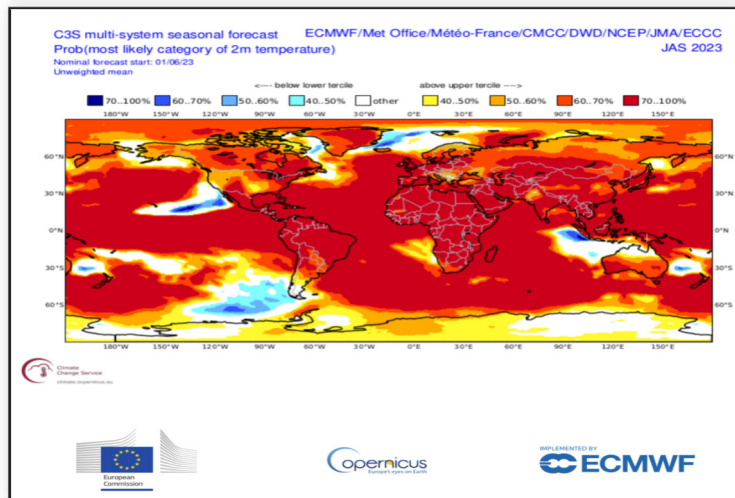
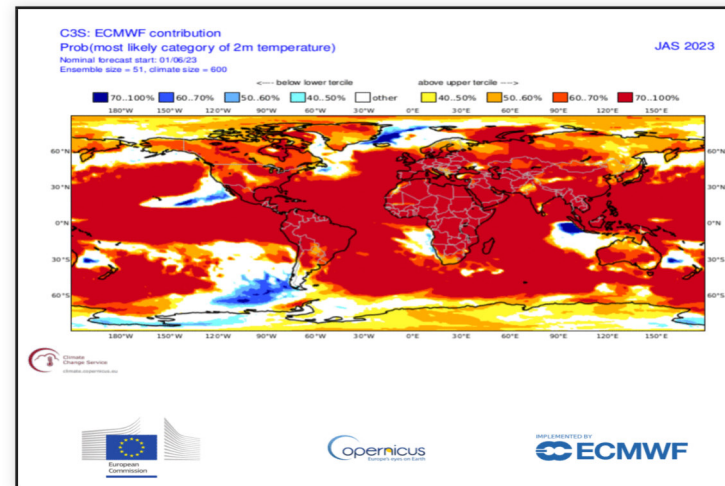
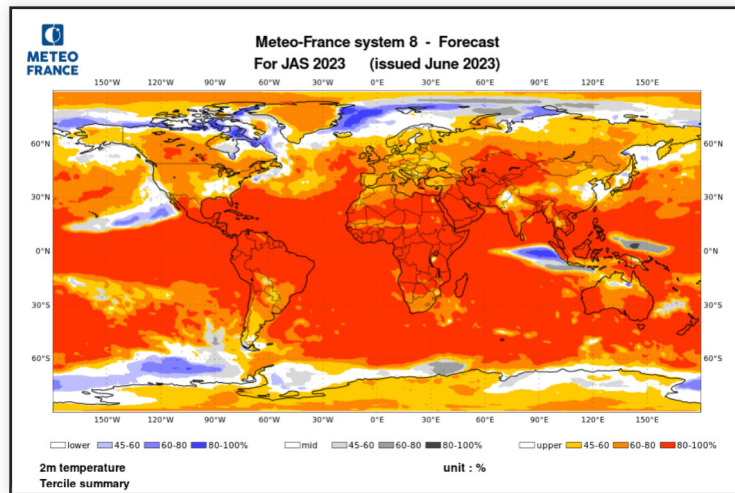
The summer greenland anticyclonic regime favors cold temperature over much of northwestern Europe and rather wet conditions over Europe.



Impact of Summer Atlantic Low weather regime on temperature and precipitation. (ref ERA-interim 1981-2010 and GPCC 1988-2013)

Forecast of climatic parameters : Temperature probabilities

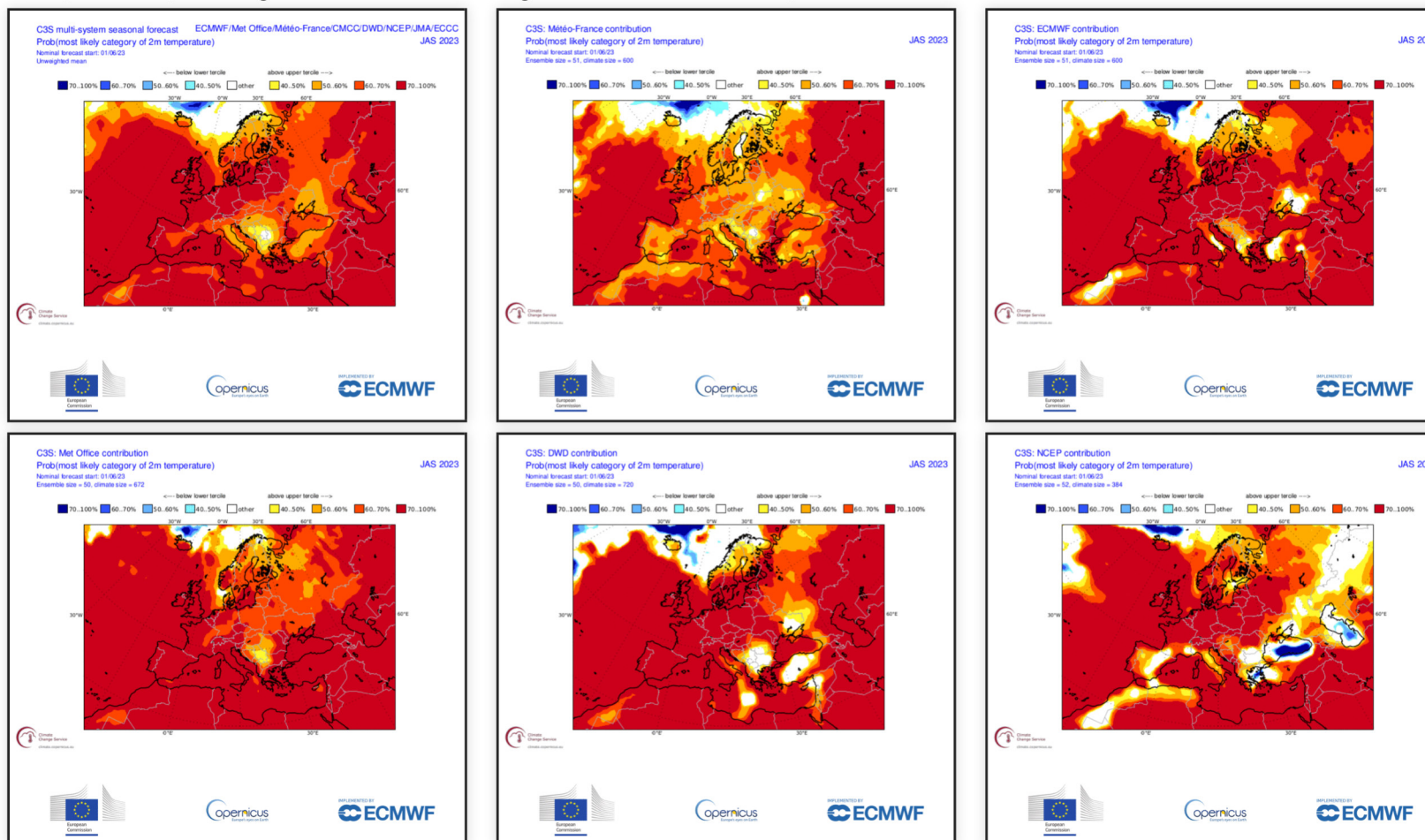
In the inter-tropical zone, the probability of a hot signal is almost generalized, except in the Indian Ocean off Sumatra. Elsewhere, the warm signal is also predominant.



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

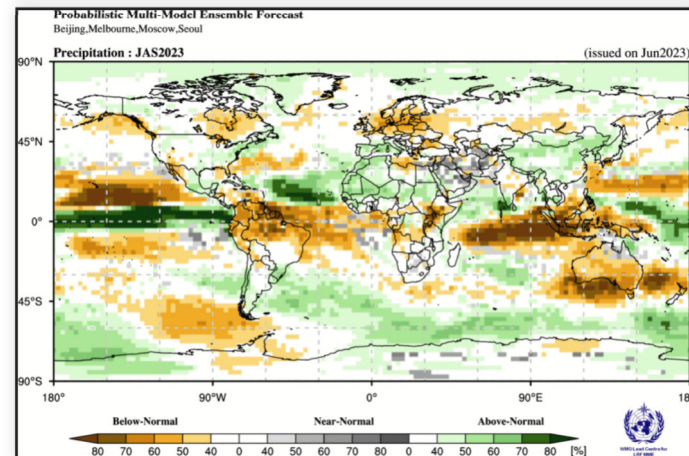
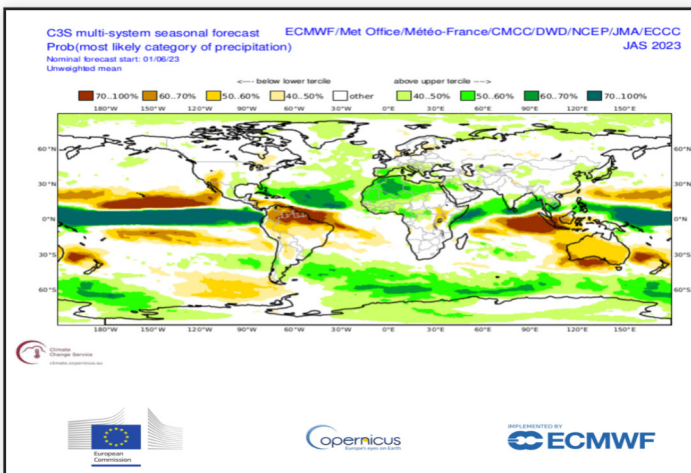
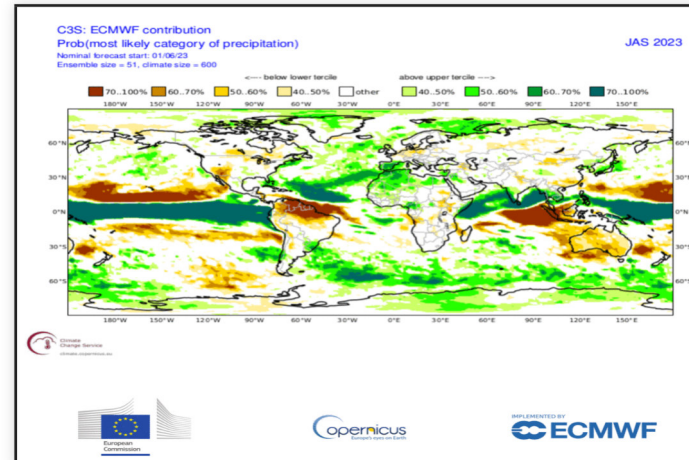
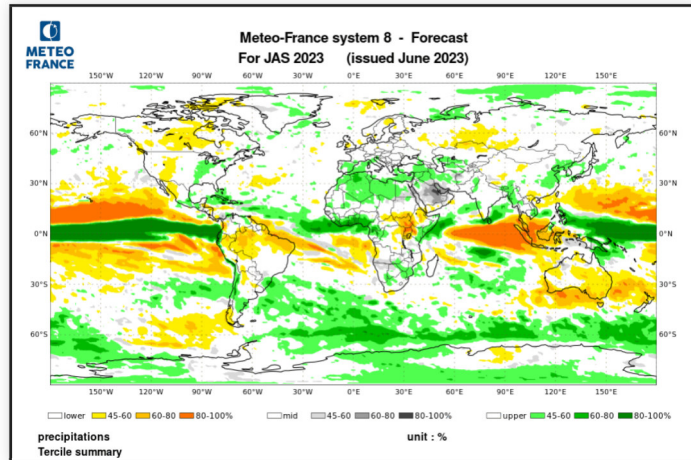
The probability of being in the warm tercile is high over almost all of Europe and the Mediterranean Basin.



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

Forecast of climatic parameters : Precipitation

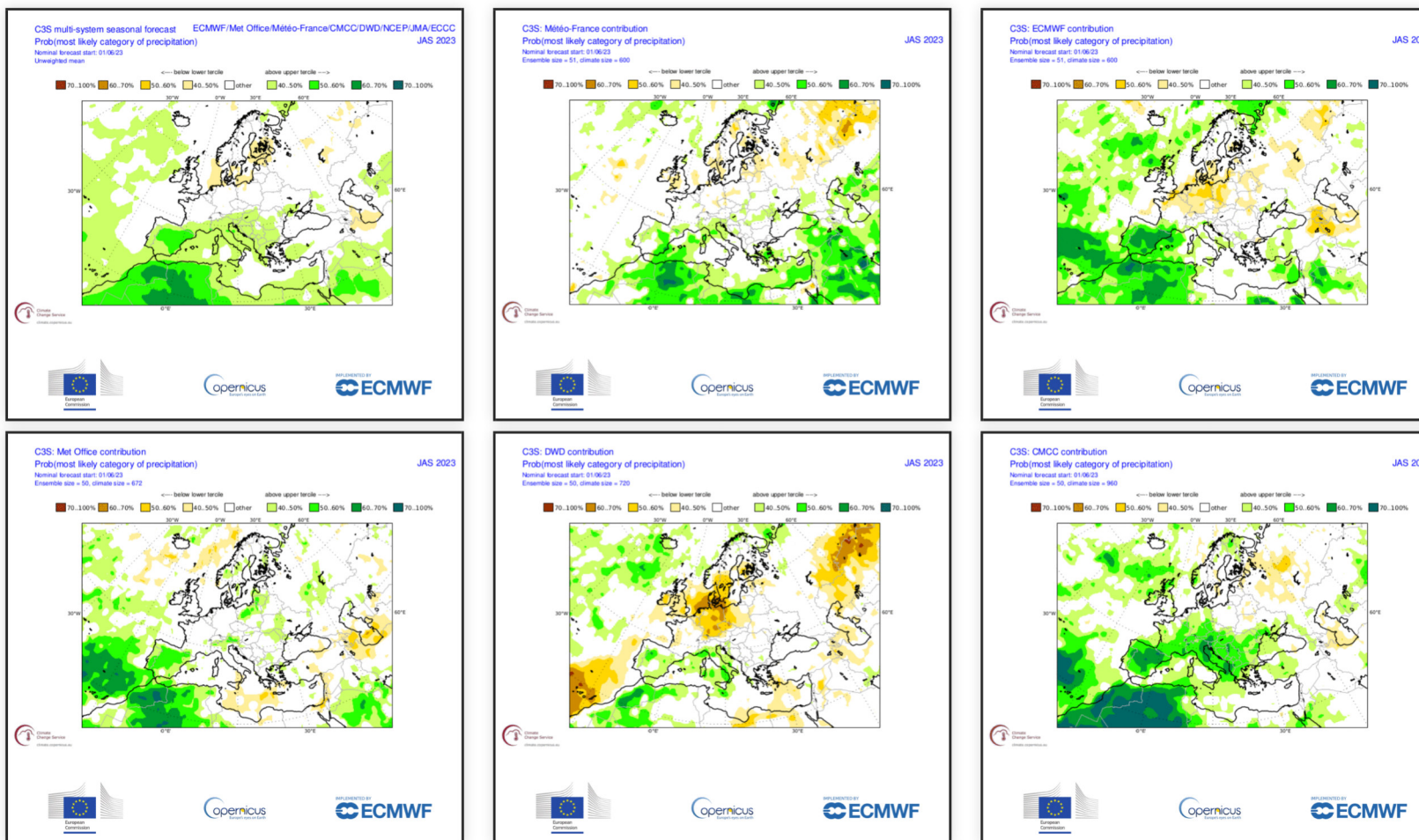
The models agree in intertropical regions. In the mid-latitudes of the northern hemisphere, the signals are weaker. Only the regions around the Mediterranean basin (particularly North Africa) have a significant probability of a wetter-than-normal signal, linked to cyclonic circulation at 200hPa.



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

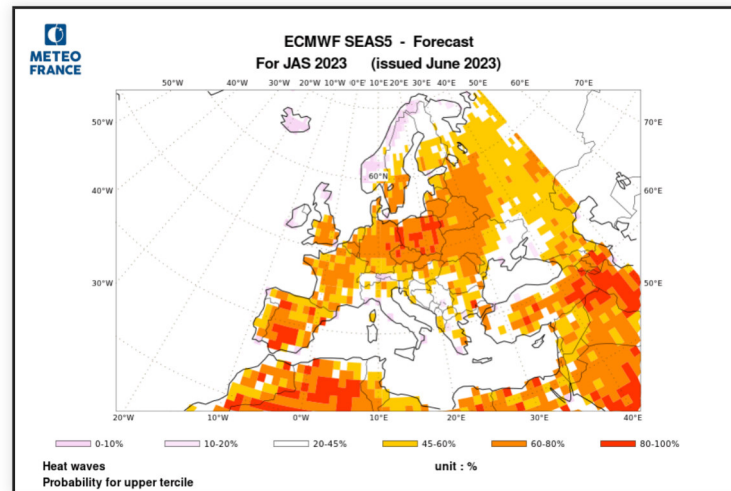
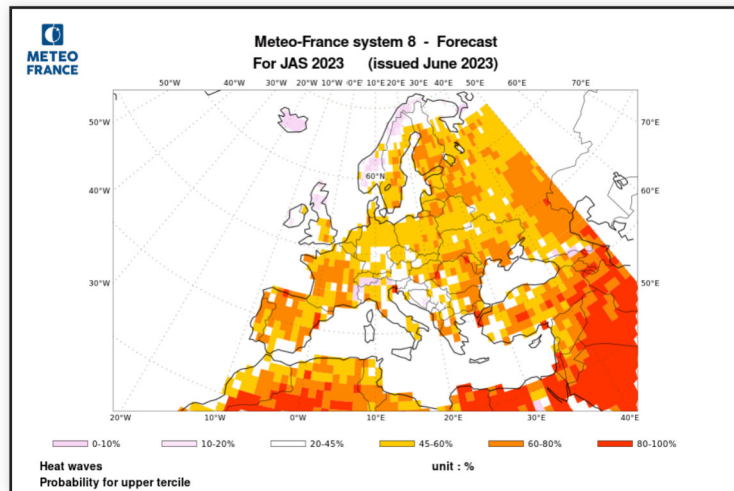
A wetter-than-normal signal (or, more accurately, a drier-than-normal one, given the season and the regions concerned) is likely over much of the region around the Mediterranean Sea. Further north, a drier-than-normal signal is envisaged by some models, such as ECMWF, in connection with anticyclonic circulation at 200 hPa.



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

Forecast of climatic parameters : Heat waves

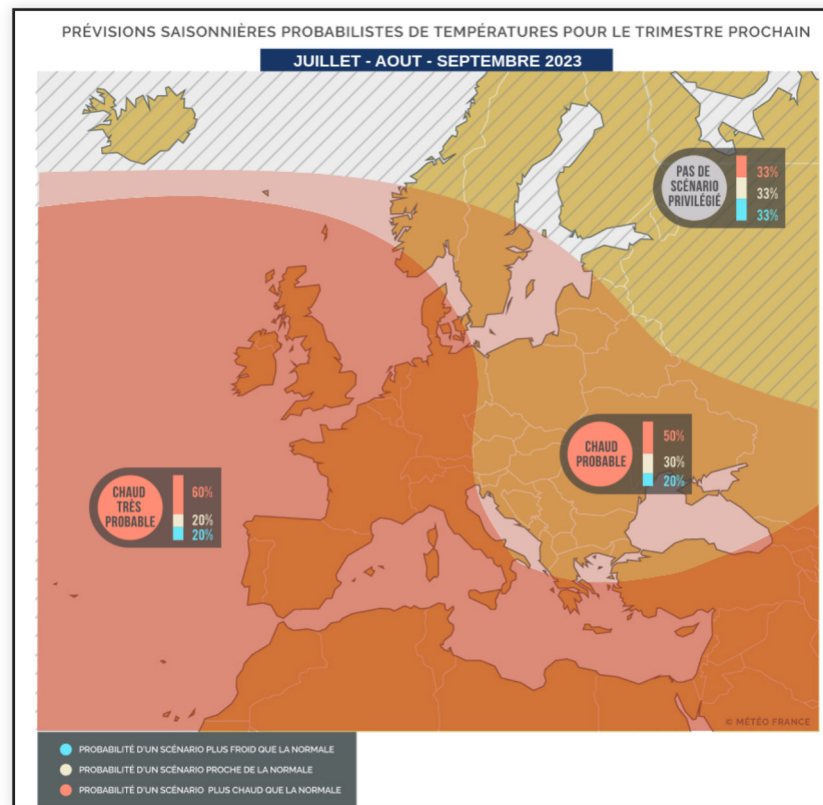
The probability of heat waves is higher than climatology over most of Europe for both models.



Heat wave probability for MF8 (right) and ECMWF (left). A heat wave is detected if the corrected T2M is above the daily 90th percentile and a fixed 20°C threshold. [more details here](#)

Synthesis map for Europe : Temperature

A warmer-than-normal scenario is likely, if not very likely, over Western Europe and most Mediterranean regions.

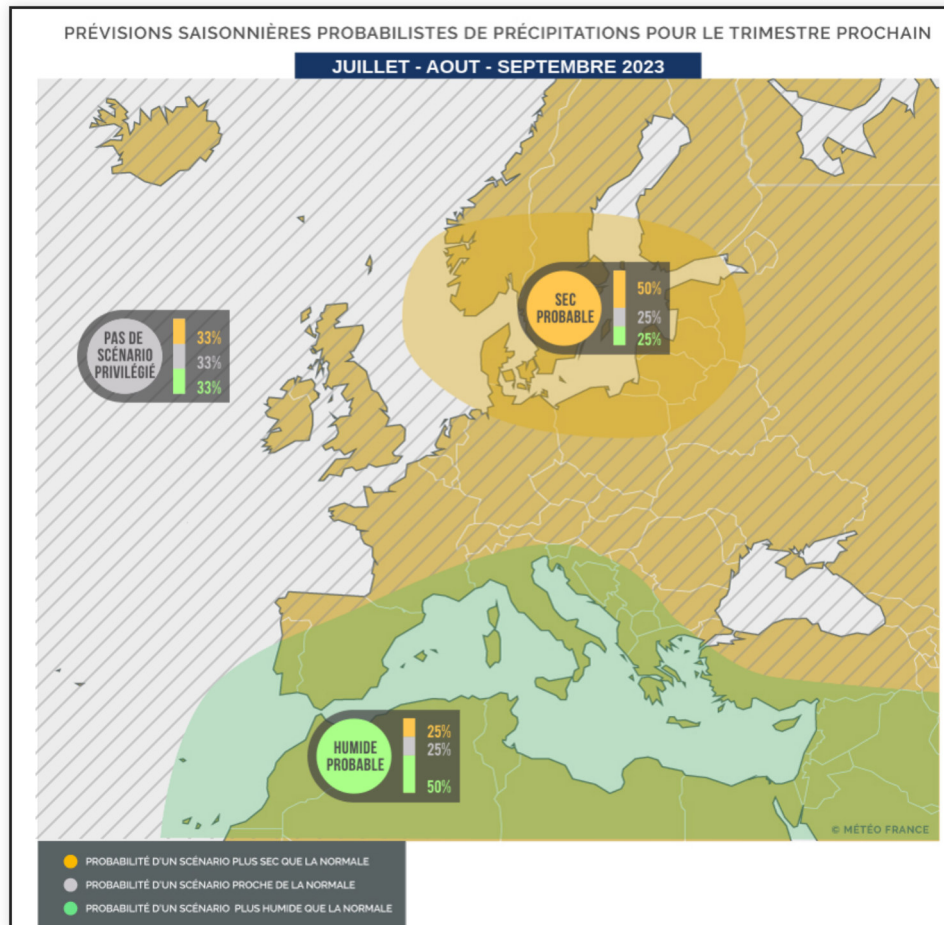


Synthesis map of probabilistic forecast for Europe. (c) Météo-France/DCSC/ACS

Synthesis map for Europe : Precipitation

Most models converge on a wetter (or less dry) than normal scenario for the Mediterranean basin.

A drier-than-normal signal is also retained around the Baltic Sea, in line with the forecast atmospheric circulation.



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