



# Météo-France Seasonal Forecast Bulletin

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### General synthesis : FMA 2023

In the Pacific Ocean, the negative phase of ENSO, "La Niña", ends at the end of this quarter, while in the Indian Ocean conditions remain neutral.

However, teleconnections are still visible, especially in the Pacific and Atlantic basins.

#### A) Oceanic forecast :

- ENSO: end of La Niña during the quarter.
- IOD : neutral conditions.
- Tropical Atlantic : small positive anomaly

### **B) Drivers :**

- weakening "La Niña".

#### C) Atmospheric circulation :

Related to La Niña, the negative phase of the PNA remains in place around Alaska. A positive Z500 anomaly stretches from the US to Europe and Russia. This circulation is associated with a NAO+ phase and a positive Scandinavian Blocking phase.

#### D) Most likely conditions :

Temperatures : Warmer than normal conditions are expected from southern Scandinavia to the Mediterranean basin. No scenario elsewhere.

Precipitations : Wetter than normal conditions are expected over northern Europe. No scenario elsewhere.

Next bulletin : scheduled on February 21st

### Oceanic analysis of November 2022 : SST anomalies

#### **Current ENSO situation : moderate La Niña**

In the Pacific Ocean : The pattern of the negative phase of ENSO, "La Niña", is still well in place (a cold anomaly along the equator and warm anomalies on both sides of the mid-latitudes. In the northern hemisphere, the PDO- pattern is also visible with a warm anomaly around the 40th North in the center of the basin and a cold anomaly near the American coasts.

In the Indian Ocean: Little signal and little east/west contrast

In the Atlantic Ocean :Not much signal along the equator. In the northern hemisphere, the warm anomaly off the US coast is fading.



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

The cold anomaly reached the South American coasts. The eastward propagation is being completed.



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

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 : -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 November 2022 : 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 )

![](_page_8_Figure_3.jpeg)

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 cold anomaly in the Equatorial Pacific has almost disappeared. The negative phase of ENSO is over. On the other hand, there is still a strong warm anomaly in the Northern Hemisphere and a small cold anomaly near the American coasts, a pattern of the PDO- still in place.

In the Indian Ocean : neutral conditions.

In the Atlantic Ocean : Small positive anomaly in the equatorial zone. In the northern hemisphere, the warm anomaly is preponderant for both models, but more marked with MF8. A cold anomaly is marked south of Greenland, stronger with ECMWF.

![](_page_9_Figure_5.jpeg)

### Oceanic forecast : NINO3.4 Plume diagrams

Both models agree on a return to slightly higher values at the end of the period.

![](_page_10_Figure_2.jpeg)

![](_page_10_Figure_3.jpeg)

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

Back to neutral this quarter. Switching to positive values in April, except for DWD and NCEP models which remain cooler.

#### The most likely phase for the next three months : Neutral

![](_page_11_Figure_3.jpeg)

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 80 % of neutral condition for FMA.

![](_page_12_Figure_2.jpeg)

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

Neutral conditions for both models, with a significant spread.

![](_page_13_Figure_2.jpeg)

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

Both models forecast a positive anomaly, in the warm tercile.

![](_page_14_Figure_2.jpeg)

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 related to the "la Niña" phase is still well visible for all models but of variable intensity. Those like MF8 or ECMWF, which predict a faster warming have a weaker and less extended signal.

Streamfunction : The dipole over the Pacific is seen by all models, as well as teleconnections to North America (PNA- pattern), in connection with "la Niña", while over the Maritime Continent, the dipole is more or less present depending on the model. There is also a dipole over the Atlantic with teleconnections to Europe and an anticyclonic curve over Scandinavia.

![](_page_15_Figure_3.jpeg)

![](_page_15_Figure_4.jpeg)

![](_page_15_Figure_5.jpeg)

![](_page_15_Figure_6.jpeg)

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 : weakening upward motion anomaly 2 - VP : downward motion anomaly related to La Nina

### Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

Both models agree on the PNA- pattern over the western North American continent.Both models agree on the PNA- pattern over the western North American continent. They are also close over Russia and Eastern Europe.

However, there are big differences over the Atlantic: opposite anomalies over Greenland and a NAO+ pattern for ECMWF.

![](_page_16_Figure_3.jpeg)

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

![](_page_16_Figure_5.jpeg)

### Atmospheric circulation forecasts : Z500 anomalies in C3S models

Very good agreement between the models for the PNA- pattern, even if the cold anomaly is less marked with MF8.

Over Europe and the Atlantic, there are similarities (positive anomaly over Scandinavia) but also a big difference over Greenland: MF8 is the only model to predict a positive anomaly there. All other models provide an NAO+ pattern.

![](_page_17_Figure_3.jpeg)

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.

![](_page_18_Figure_2.jpeg)

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

![](_page_18_Figure_4.jpeg)

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

### Atmospheric circulation forecasts : MSLP probabilites multi-systems

Good agreement between multi-models.

![](_page_19_Figure_2.jpeg)

C3S multi-models MSLP terciles probability.

![](_page_19_Figure_4.jpeg)

Others models of WMO multi-models MSLP terciles probability.

### Modes of variability : forecast

Dispersion is lower with the ECMWF model. Both models agree on a PNA-.

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

#### EA is close to zero on average.

![](_page_20_Figure_4.jpeg)

![](_page_20_Figure_5.jpeg)

![](_page_20_Figure_6.jpeg)

See the modes of variability patterns

## Modes of variability : NAO impacts

Positive phase of the NAO next quarter

![](_page_21_Figure_2.jpeg)

### Modes of variability : SCA impacts

The models all agree on a wetter scenario over northern Europe, linked to the NAO+ mode.

Over the western Mediterranean basin, wetter-than-normal scenarios are envisaged, but over limited areas that vary from one model to another. Given these uncertainties, no scenario is considered over this basin.

![](_page_22_Figure_3.jpeg)

### Weather regimes : winter MSLP

For the quarter, the dominant regime is not the same for both models: NAO- regime for MF8 and zonal regime for ECMWF. This is mainly due to the results for the month of February where the NAO+ regime clearly dominates for ECMWF. However, the results do not deviate significantly from the models' climatology.

![](_page_23_Figure_2.jpeg)

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 blocking regime is slightly favored by MF8 for this quarter.

![](_page_24_Figure_2.jpeg)

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

### Weather regimes : Impacts

This NAO+ regime is slightly dominant for ECMWF-SEAS5.

![](_page_25_Figure_2.jpeg)

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

### Forecast of climatic parameters : Temperature probabilities

The models agree on the main anomalies, except over eastern Canada, warmer with MF8 in connection with the positive anomaly in Z500 over this area.

![](_page_26_Figure_2.jpeg)

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 warmer-than-normal scenario probabilities correspond to marine areas where positive SST anomalies are expected. In connection with these areas, the climate trend and the dominant NAO+ mode, a warmer-than-normal scenario is expected over a large part of southwestern Europe (from southern Scandinavia to the Mediterranean).

![](_page_27_Picture_2.jpeg)

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

### Forecast of climatic parameters : Precipitation

The models agree on the main probabilities. The main difference comes from MF8 and is over eastern Canada and Greenland with a stronger wet signal.

![](_page_28_Figure_2.jpeg)

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

The models all agree on a wetter scenario over northern Europe, linked to the NAO+ mode.

Over the western Mediterranean basin, wetter-than-normal scenarios are envisaged, but over limited areas that vary from one model to another.

![](_page_29_Figure_3.jpeg)

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

### Synthesis map for Europe : Temperature

The two modes NAO+ and Scandinavian Blocking are preferred. Their temperature impacts are very different, even opposite. The proposed scenario is therefore based on the results of the multi-models, and to a lesser extent on the impacts of the NAO+ mode, with a warmer than normal scenario expected from Scandinavia to the Mediterranean Sea. Elsewhere, no scenario emerges.

![](_page_30_Figure_2.jpeg)

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

### Synthesis map for Europe : Precipitation

A wetter-than-normal scenario is most likely over northern Europe (agreement between the multi-model and NAO+ mode impacts).

Most of the models foresee a wetter-than-normal scenario over sectors of the western Mediterranean Basin, but with variable extents and locations. This does not allow us to identify a scenario over this area.

![](_page_31_Figure_3.jpeg)

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