MEDITERRANEAN CLIMATE OUTLOOK FORUM
MEDCOF-17 Online Forum

MONITORING SUMMARY MEDCOF-17

for October 2021

First draft

Last update: 17 Nov 2021

Compiled by

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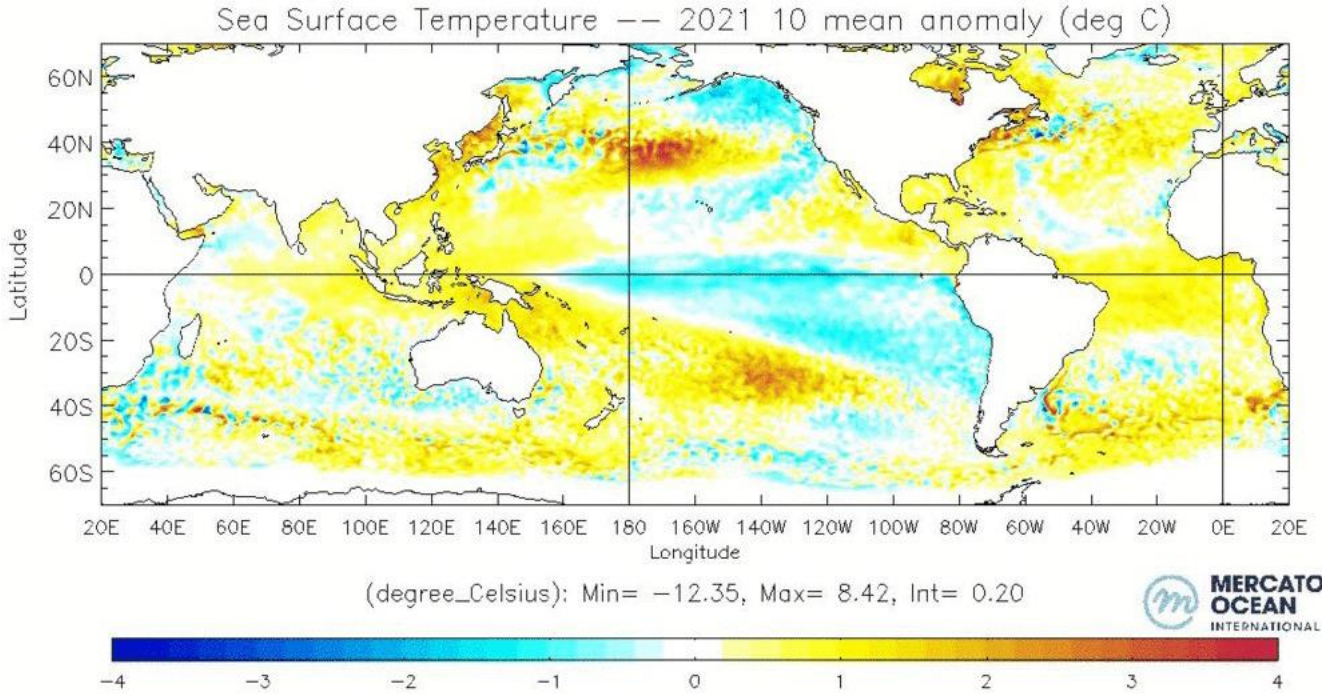
The following MedCOF monitoring summary is based on

- climate monitoring results from RA VI RCC Node-CM at DWD,
- analysis of the state of the oceans in October 2021 and some drivers for the climate situation of the following summer 2021 from RA VI RCC Node-LRF at Météo France,
- verification bulletin with information about large-scale circulation for February-April 2021, https://nextcloud.meteo.fr/s/4iyANafsXD3FxyZ .
- Assessments from NOAA CPC and BOM Australia

1. Oceanic Analysis

1.1 Sea Surface Temeprature (SST) anomalies

- **In the Pacific Ocean**: the cold anomaly in the Central and East Pacific became stronger, the La Niña pattern is now well marked. Over the North Pacific, there has been a strong cooling over the highest latitudes, leading to a distinct PDO- pattern (see October SST anomaly map).
- **In Indian Ocean:** slight warm anomalies from India to the Maritime Continent, and near normal to the west.
- **In the Atlantic Ocean**: the strong positive anomaly along the equator hasn't clearly evolved in October



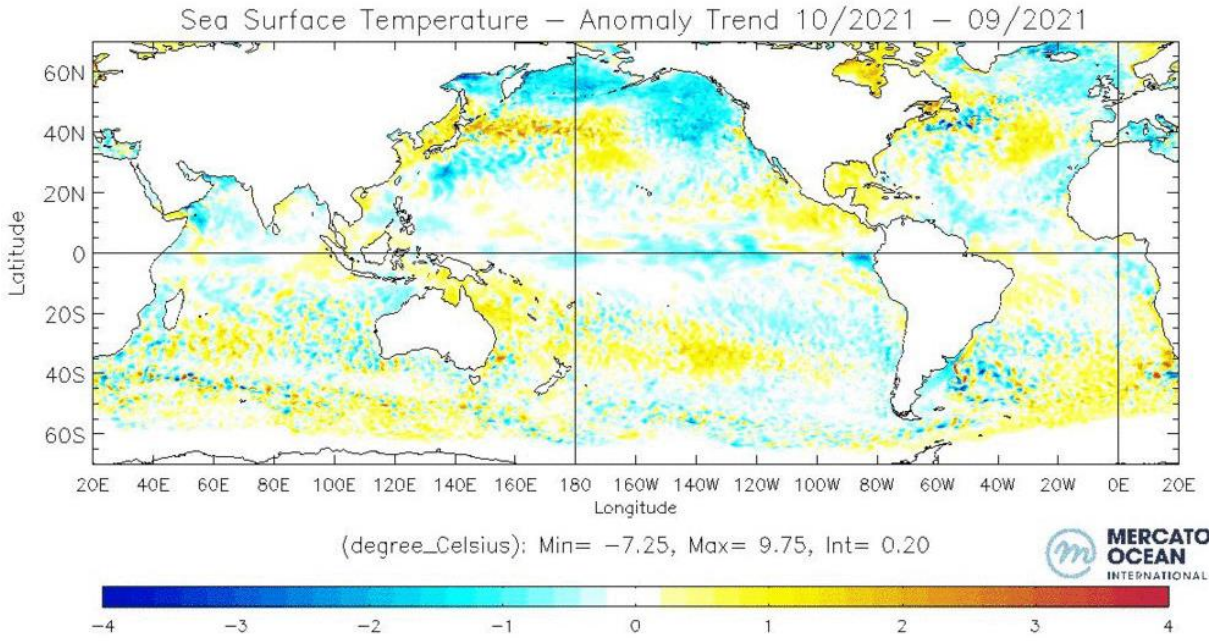


Figure 1.1: Sea surface temperature anomalies for October 2021, 1992-2013 reference (upper map) and anomaly differences October minus September 2021 (anomaly trend). Data from Mercator Ocean, source: Météo France

1.2 ENSO analysis:

Cold anomaly in the Niño3.4 box started increasing again in June. Anoamlies are more pronounced in October, with a clear La Niña pattern in place, which is expected to remain along the next winter.

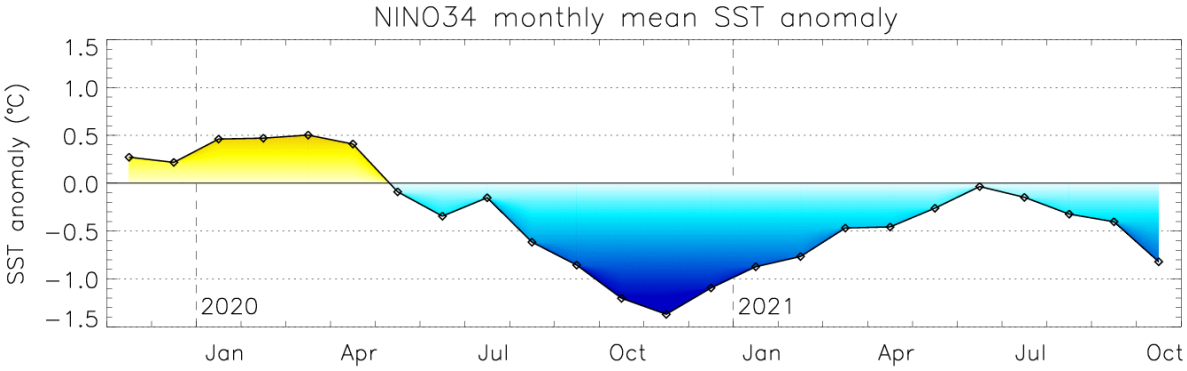


Figure 1.2: Evolution of sea surface temperature anomalies in the Niño3.4 box, 1992-2013 reference. Data from Mercator Ocean, source: Météo France.

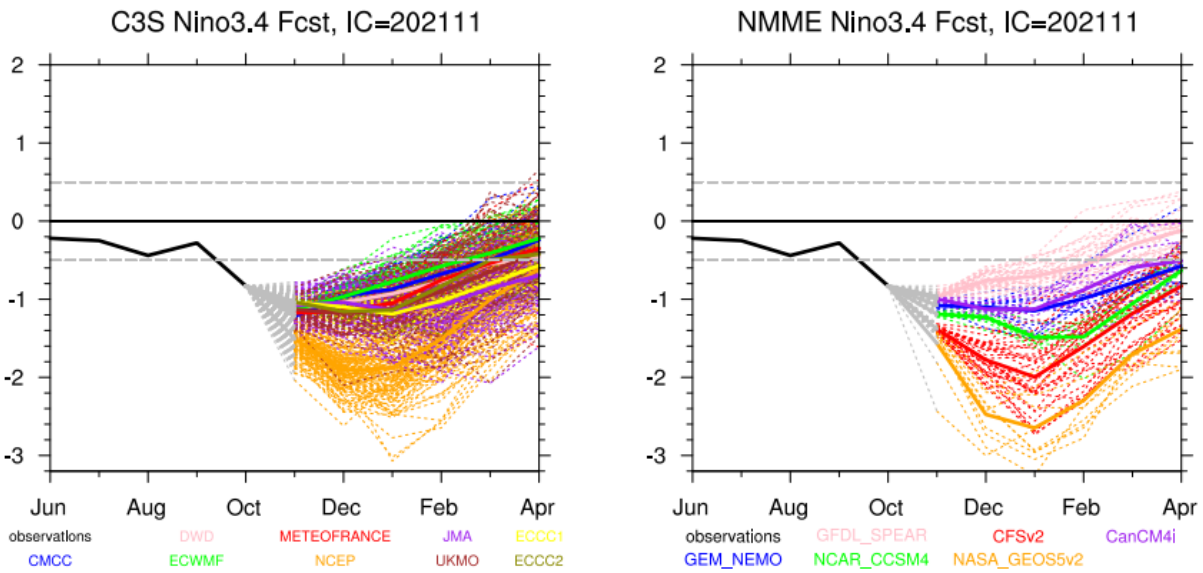


Figure 1.3: Evolution of El Niño3.4 expected temperature from C3S (left) and NMME (right) until April 2022. Soruce: Mediterranean Seasonal Climate Update (https://www.medscope-project.eu/wp-content/uploads/2021/11/MSCU_Mediterranean_Seasonal_Climate_Update_202111.pdf)

1.3 PDO analysis:

Cold anomalies developed over Northern Pacific Ocena in October led to a distnitive PDO pattern. Curren PDO value is -3.06.

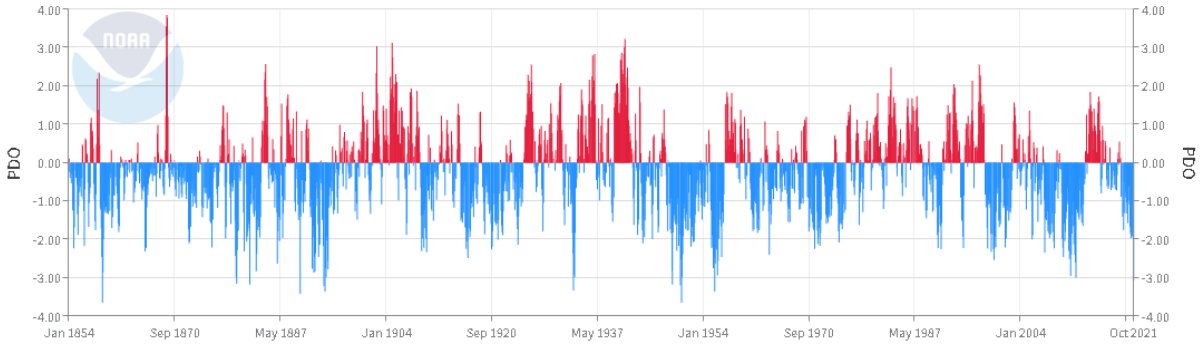


Figure 1.4: Evolution of PDO index, soruce https://www.ncdc.noaa.gov/teleconnections/pdo/

Figure 1.3: Evolution of Dipole Mode Index. Data from Mercator Ocean, source: Météo France.

1.4 Indian Ocean Dipole:

Slight warm anomalies over Eastern part of the Basin lead to a slightly negative DMI index

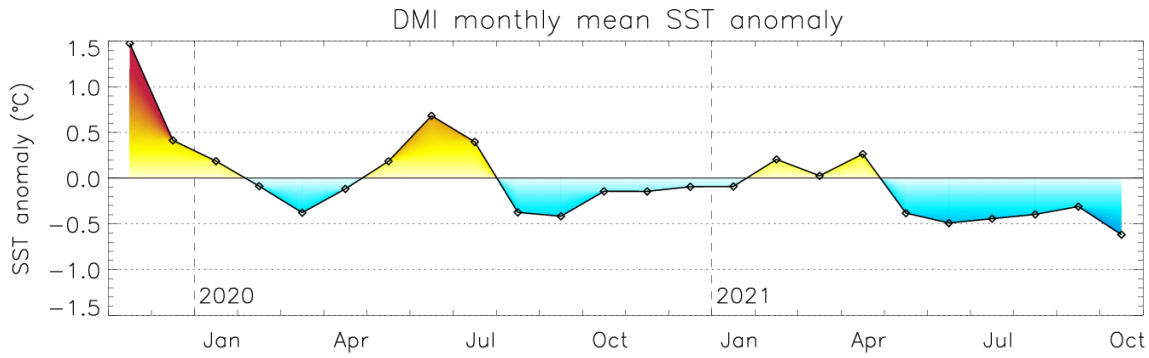


Figure 1.5: Observed evolution of DMI index, soruce Mercator Ocean

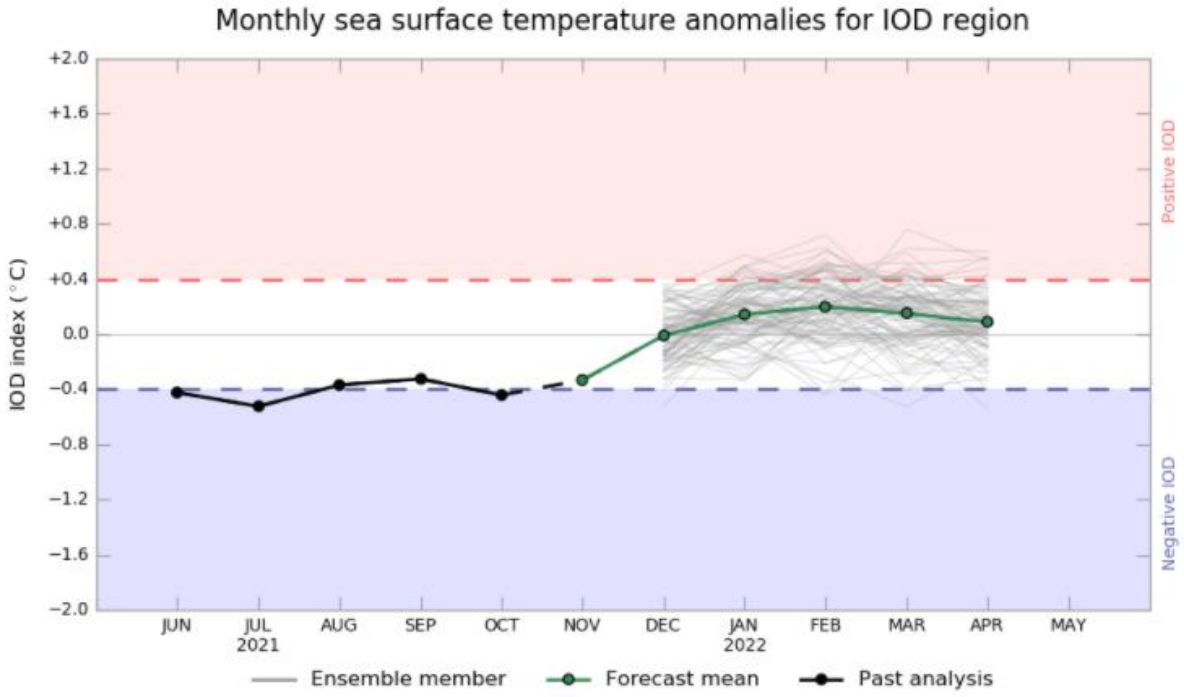


Figure 1.6 Observed and expected evolution of Indian Ocean Dipole (source BOM, http://www.bom.gov.au/climate/enso/index.shtml#tabs=Indian-Ocean)

2. Atmospheric Circulation Analysis

2.1 Velocity Potential Anomaly field in the high troposphere

The impact of La Nina and of the negative phase of IOD (probably linked) on large scale convection in the tropics was already present in the last months : see the dipole of anomaly on the ASO VP200hPa chart (coloured areas). However, no clear teleconnection is in place in the North Pacific in link with this dipole of anomalies.

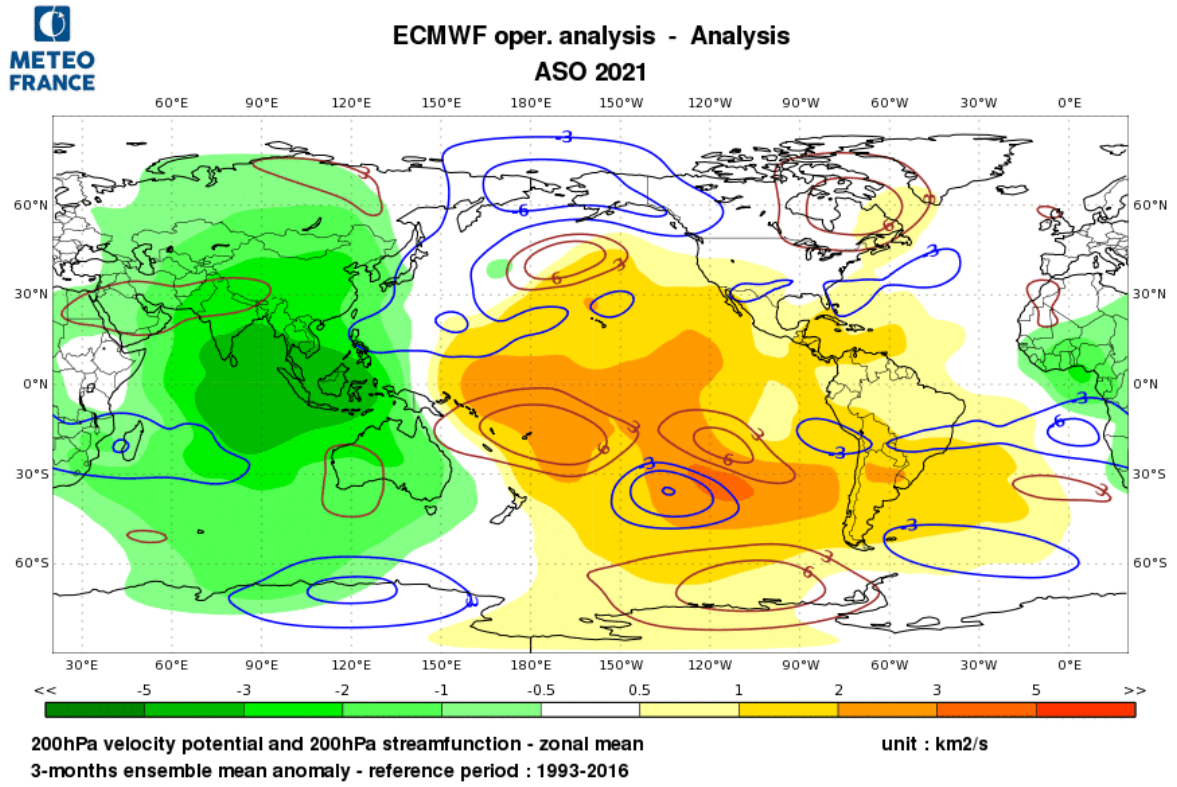


Figure 2.1: Averaged anomalies of stream function (contours) and velocity potential (shaded) average during ASO 2021. Positive shaded values: convergence/downward motions. Negative ones: divergence (upward motions). Positive contours: anticlyclonic circulation. Negative contours: cyclonic circulation. Source: Météo France.

2.2 SOI index:

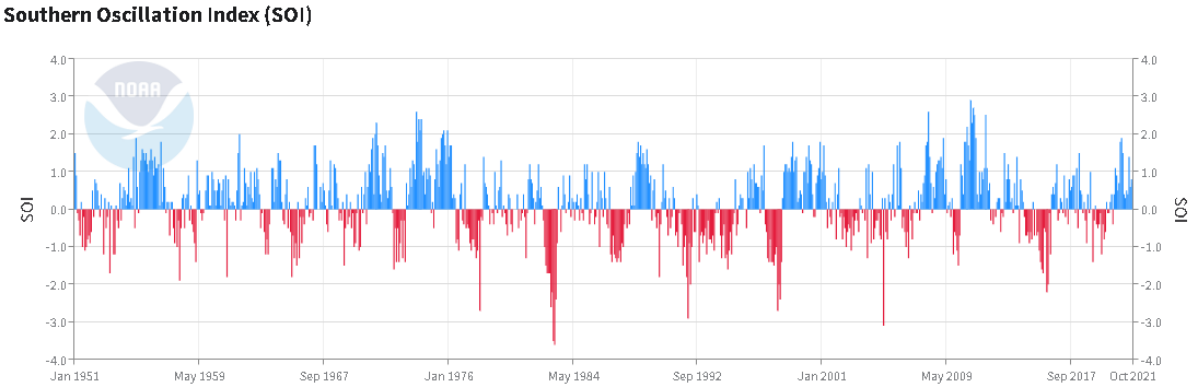


Figure 2.2: Southern Oscillation Index (SOI). Positive values mean La Niña response, negative values El Niño response. Source: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/

SOI index in October was 0.7, weakening from 0.8 in September, not reflexting the progress of negative SST anomalies over El Niño 3.4 box.

2.3 Geopotential height at 500 hPa:

Negative geopotential anomalies have been dominant over central Mediterranean, and positive ones over large parts of western and eastern MedCOf domain.

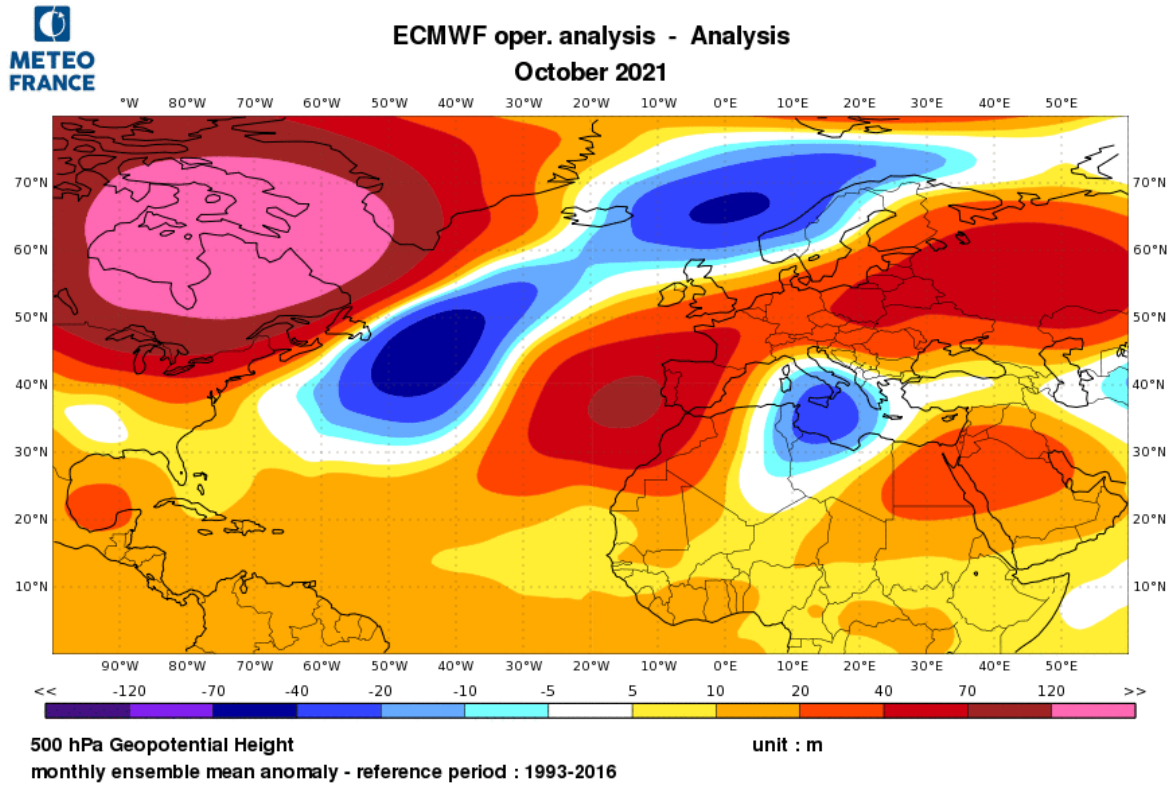


Figure 2.3: Anomalies of Geopotential height at 500hPa (Source: Météo-France, http://seasonal.meteo.fr/content/suivi-clim-cartes-ref93-16 , data from ECMWF)

2.4 Sea level pressure:

Dominant zonal flow over northwester of MedCOF domain. High pressures present over the eastern part of the domain in October.

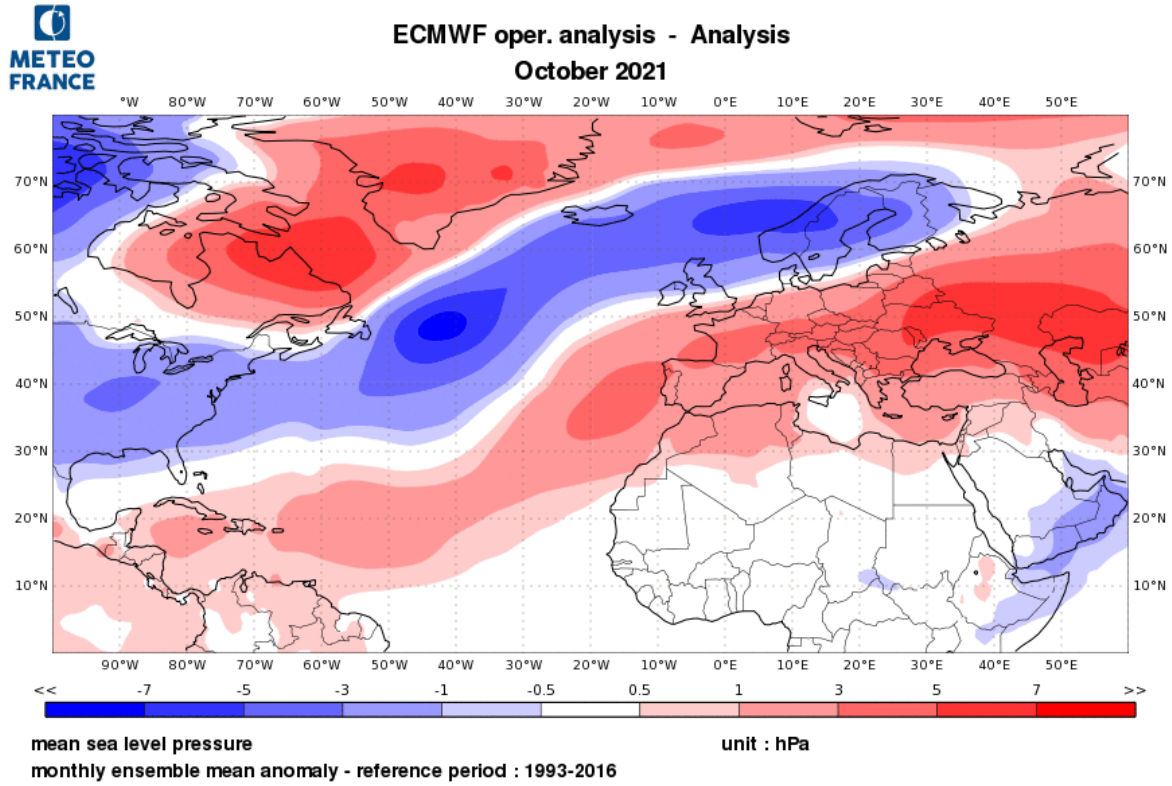


Figure 2.5: Mean sea level pressure anomalies (ref 1993-2016) over the North Atlantic, Europe and North Africa for October 2021. Source: DWD, http://seasonal.meteo.fr/content/suivi-clim-cartes-ref93-16

2.6 Circulation patterns

Clearly negative NAO pattern present in October, despite dominance of zonal flow over northwestern Europe, probably associated with the negative geopotential anomalies east of Terranova. Positive values of EA and neutral Scandinavian and Polar/Eurasia pattern.

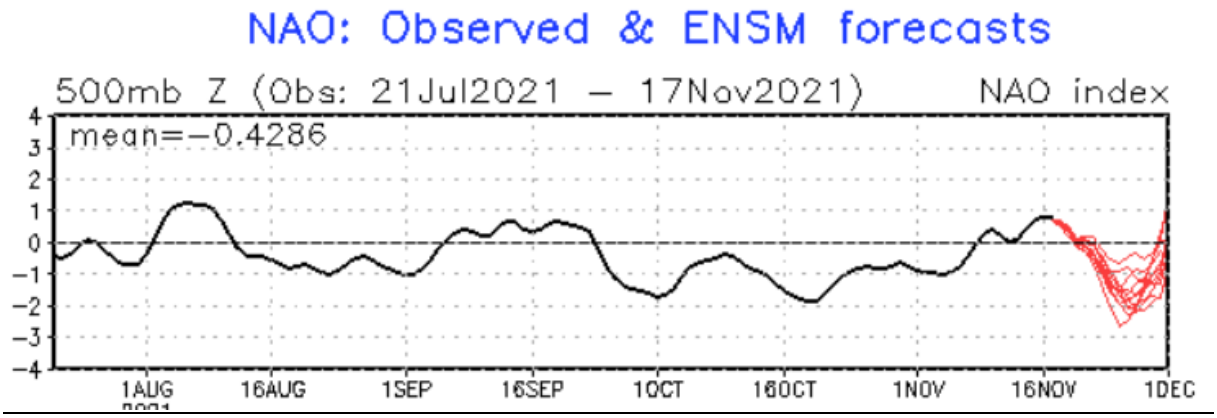
OCTOBER 2021

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
OCT 21	-2.0	0.9	1.7	-2.4	1.4	---	-0.6	-0.2	-0.5
SEP 21	-0.1	1.7	-0.7	-1.9	0.3	---	0.5	-0.1	-1.0
AUG 21	-0.5	1.1	-1.9	-1.8	0.9	---	-2.4	-1.4	-0.5
JUL 21	0.1	2.2	-0.4	-1.3	0.1	---	-0.5	1.5	0.8
JUN 21	1.1	1.0	-0.8	-0.3	0.8	---	-1.8	-0.1	0.9
MAY 21	-1.1	0.8	0.2	0.0	-1.1	---	-1.2	-1.1	-0.5
APR 21	-1.7	0.3	-0.1	0.8	-1.3	---	-0.4	-1.2	-0.2
MAR 21	0.4	-0.2	2.1	-1.3	-1.2	---	3.0	-0.9	0.6
FEB 21	-0.3	1.2	0.8	-0.8	-0.7	1.3	0.8	0.3	-3.2
JAN 21	-1.8	0.0	2.5	-0.7	-0.4	-0.1	-1.3	0.3	-1.6
DEC 20	-0.4	-0.8	1.0	---	1.3	0.2	-1.1	2.3	0.1
NOV 20	2.5	0.0	0.7	-0.7	0.2	---	0.1	-0.1	-0.6
OCT 20	-0.2	-0.2	-1.2	0.6	-1.1	---	-1.8	1.5	-1.0

Table 2.1: Evolution of the main atmospheric indices for the Northern Hemisphere for the last months:
http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml

North Atlantic Oscillation and Artic Oscillation :

NAO negative over most of October and beggining of November. Currently positive values. Both NAO and AO forecasted to take negative values for the second half of November.



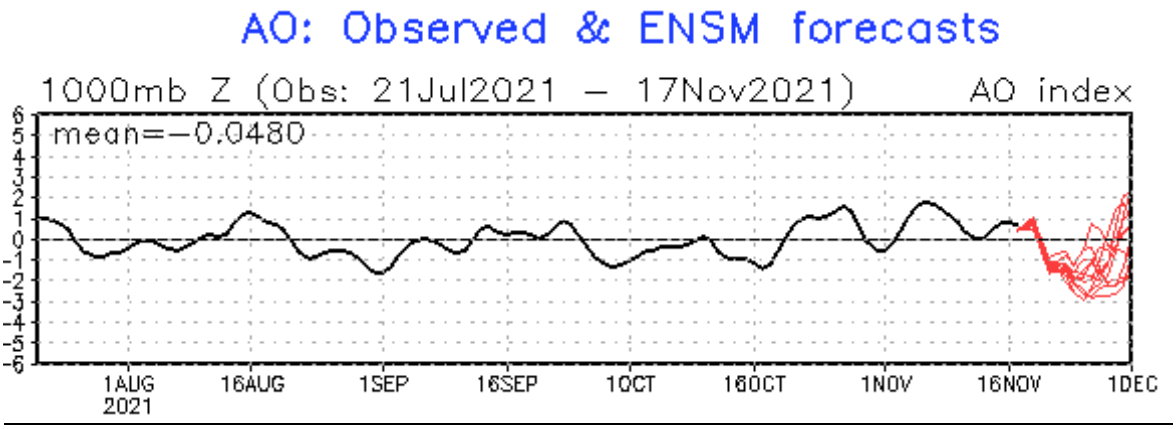


Figure 2.6: North Atlantic Oscillation (NAO) and Arctic Oscillation (AO) indices. Source: NOAA CPC, https://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/ao.shtml

2.7 Weather regimes

Over North Atlantic and Europe, weather regime frequencies show an important intra-seasonal variability during the ASO season. Zonal dominated over August, blocking on September and Atlantic Low in October.

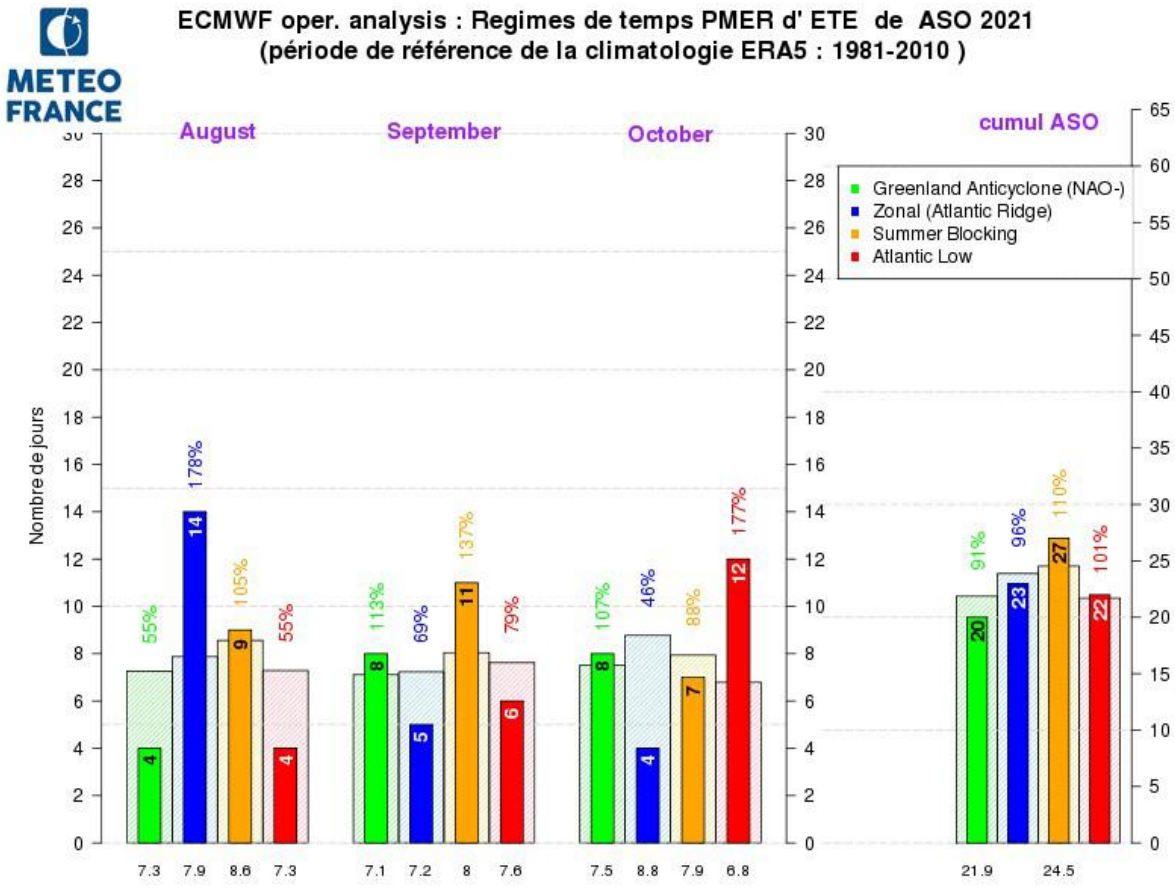


Figure 2.7: Weather regimes frequencies during ASO 2021, source: Météo France.

3. Drivers

Weak La Niña in place, in a strengthening phase ==> it tends to favour Atlantic Ridge circulation for DJF

East QBO since summer 2021 ==> it tends to slow down the polar vortex, so to enhance SSW probability, so higher probability of NAO- circulations than normal

Negative phase of IOD (cf DMI) and strong positive anomaly over the equatorial Atlantic ==> modification of Hadley-Walker circulation ==> could lead to teleconnections from tropics toward mid-latitudes, so more predictability at seasonal scale over Europe and the Mediterranean Basin

polar vortex : minor SSW observed in end October. Return to normal conditions at the beginning of November.

4. Temperature

Europe/RA VI domain

According to Copernicus data, October 2021 was 0.42ºC warmer than the 1991-2020 average, and the thrid warmest October since 1979 (marginally cooler than 2015 and 2019. However, for Europe, it was close to normal (0.11 above 1991-2020 average), and the coolest October since 2016.

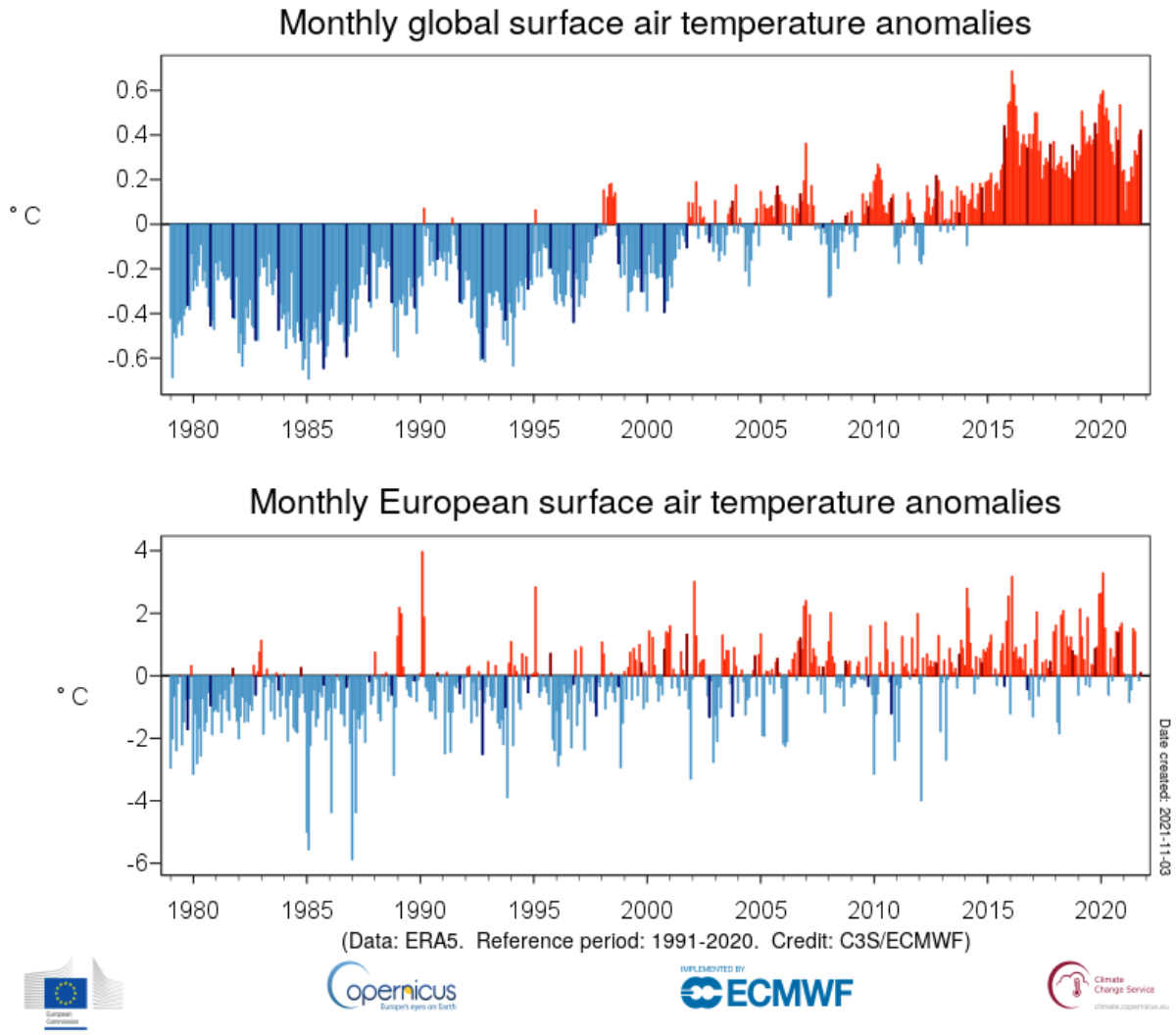


Fig. 4.1: Monthly Global and European-mean surface air temperature anomalies relative to 1991-2020, from January 1979 to October 2021. The darker coloured bars denote the October values. Data source: ERA5. Credit: Copernicus Climate Change Service/ECMWF, https://climate.copernicus.eu/surface-air-temperature-october-2020

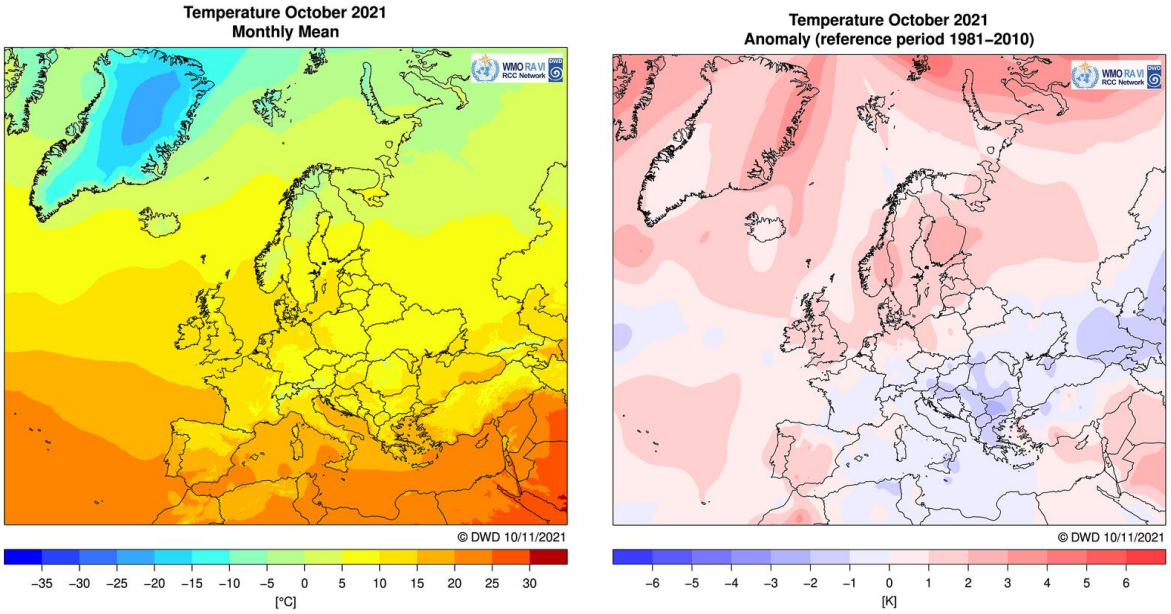


Fig. 4.2: Mean temperature (left) and anomalies (1981-2010 reference, right) in °C in the RA VI Region (Europe) interpolated from CLIMAT station data, for October 2020. Source: DWD, http://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_ttt.html

Positive anomalies dominated over Northern Europe, Iberian Peninsula and Middle East, and negative anomalies were present over Southern Europe. The Balkans showed the coldest anomalies, below 2ºC less than normal in October in some areas, and Scandinavia was the warmest area, with some regions surpassing anomalies of +2 degrees.

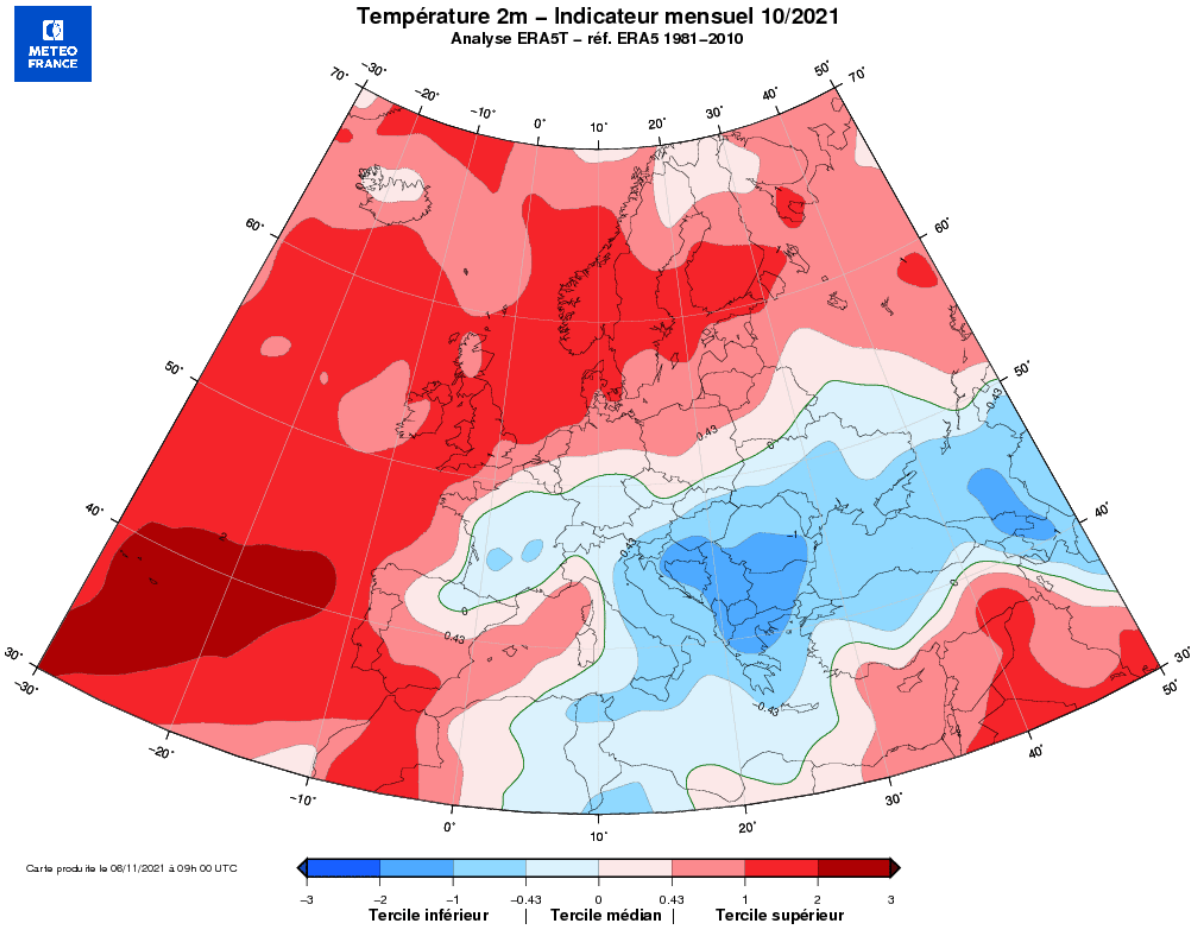


Fig. 4.3 : Mean standardized temperature anomalies with terciles for October 2021. Source : Météo France, http://seasonal.meteo.fr/content/suivi-clim-cartes-ERA5 , data source : ERA5, ERA5T

A clear north/south distribution of temperature anomalies can be seen over Europe. Cold tercile was observed over Italy, the Balkans, and aprts of Ukranie, Turkey, Georgia, Azerbaijan, Armenia and SouthWestern Russia. Wamr tercile was observed in October over Southern and Western Iberia, The Netherlands, North of Germany and Poland, the Baltic Countries, Scandinavia, United Kingdom and Ireland.

Temperature in North Africa

The graph n°1 shows the monthly trend in anomaly air temperature in degrees Celsius of October since 1979 through 2021. For each year, the positive anomaly is indicated by the red vertical bars and the negative anomaly is indicated by the blue vertical bars. The black line tracks the changes in the trend over time.

For October the land mean temperature of North Africa region was above the normal 1981-2010, has reached +0.5 °C. The warming rate was about 0.4°C per decade.

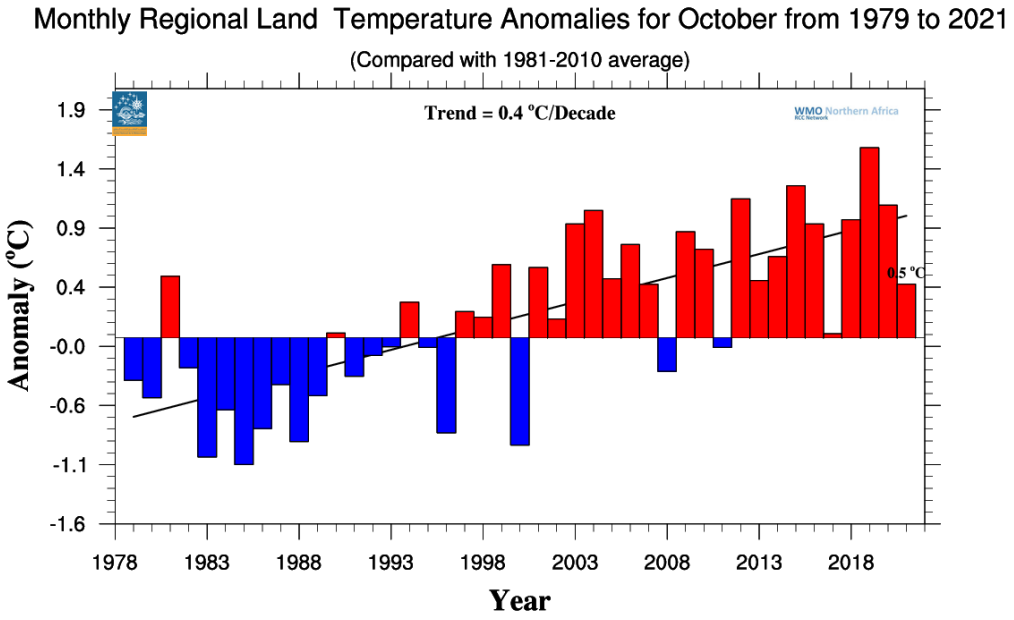


Figure 4.4: Monthly anomaly mean temperature (October 2021) time series plots with trend line

Monthly mean temperature in October 2021 mostly ranged from 14°C to 28 °C, in small parts reaching 10°C, especially in the center of Morocco. In some parts of the southern Algeria and in the south east of Egypt, the mean temperature was above 30°C and locally in southern Algeria even 32 °C.

Compared to 1981-2010 reference, Temperature anomalies were mostly above normal. It was in a range between +1 and +2°C, in Egypt, most part of Morocco and Algeria, the west part of Libya. Temperature anomalies were below normal and mostly ranged between 0 and -2°C in Tunisia, the south of Morocco, the south west of Algeria, the west of Libya and even -3°C in the north west of Libya.

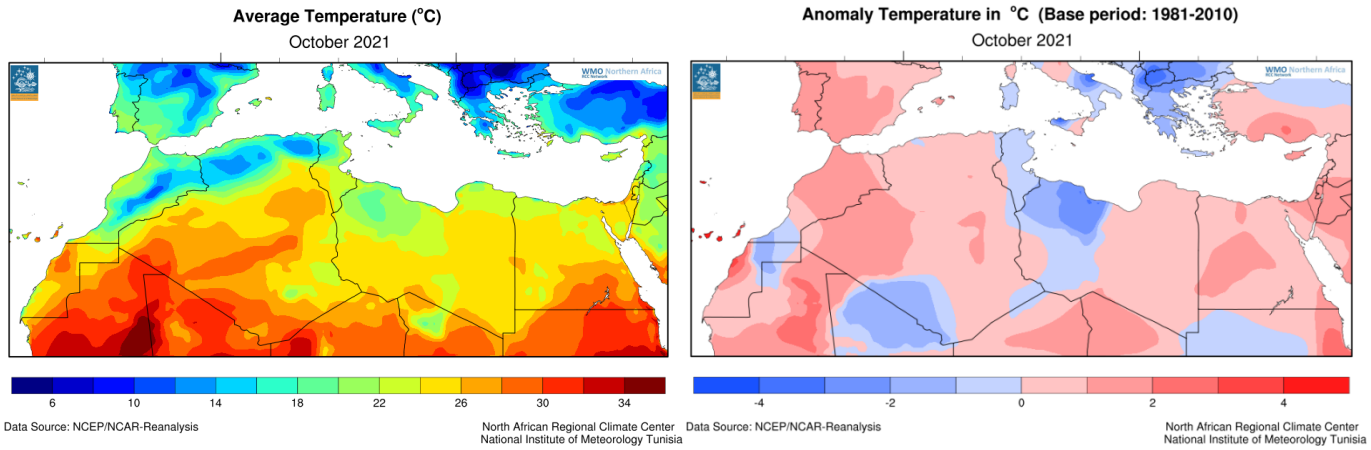


Figure 4.5: Left: Mean temperature; Right: Absolute anomalies of temperature in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010),

https://www.meteo.tn/en/climate-monitoring-watch

5. Precipitation

Europe/RA VI domain

Large parts of RAVI domain were received less precipitation than normal in October. Only Scandinavia, parts of United Kingdom and Belgium, the Blakans and Azerbaijan received precipitations above average. However, parts of Scandinavia and the Balkans accumulated more than twice the normal precipitation for October. Over most of the rest of the domain, accumulated precipitation was below normal, with Ukraine, parts of Belarus, Poland and Sothwestern Russia, Turkey and the Middle East receiving less than 20% of the usual October precipitation.

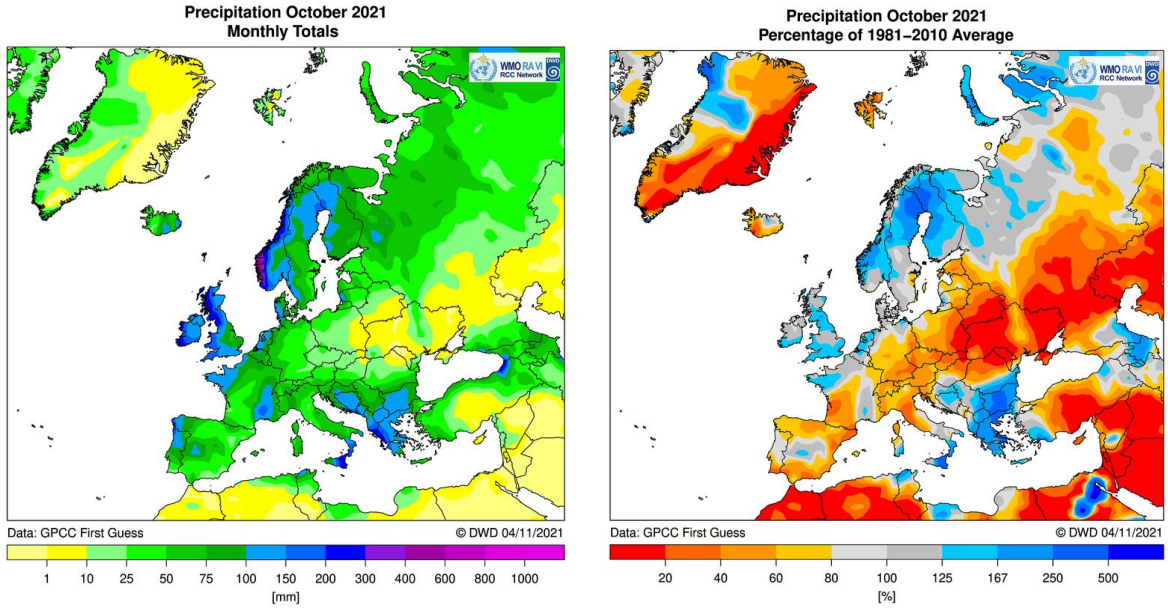


Fig. 5.1: Monthly precipitation totals (left) and percentage of 1981-2010 normal (right) for October 2021 in Europe/RAVI. Data from GPCC (First Guess version). Source: DWD, http://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_rrr.html

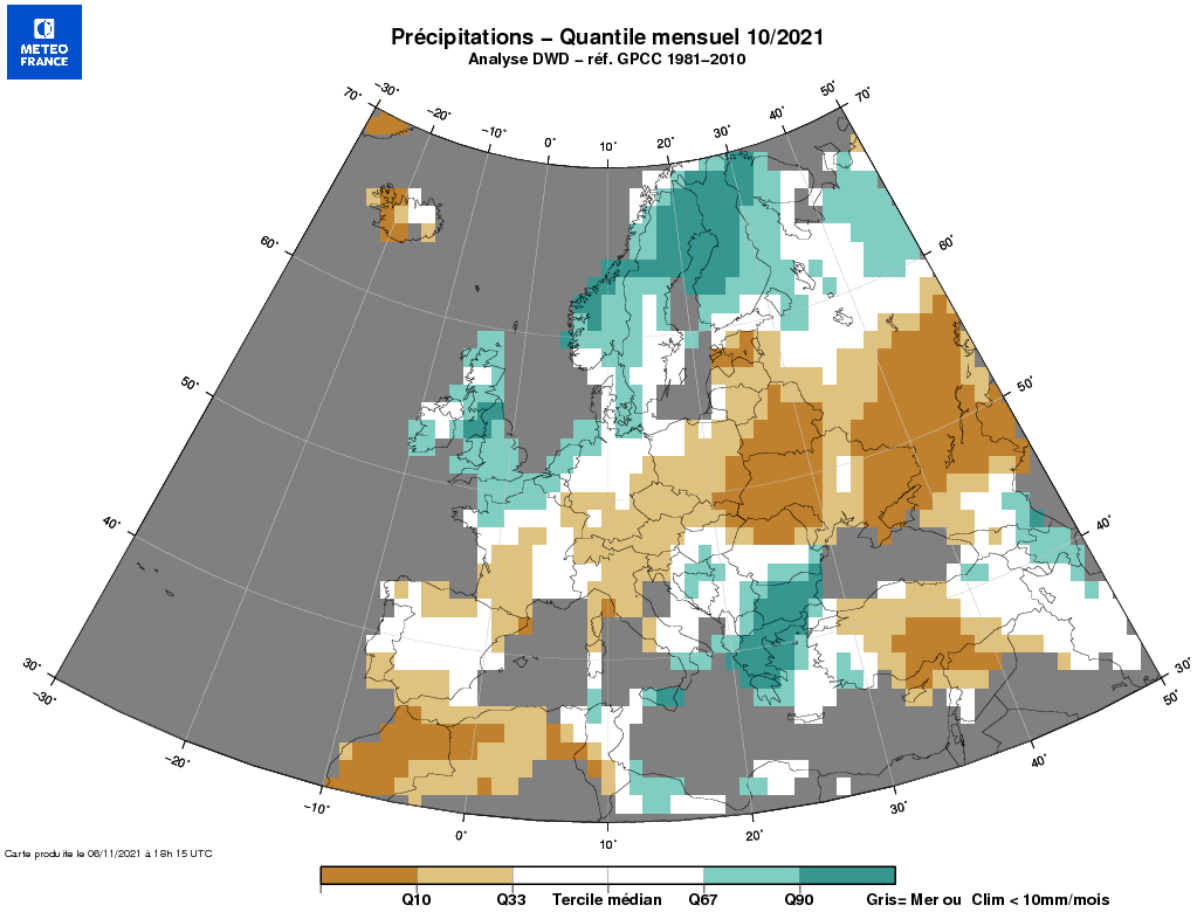


Fig. 5.2 : Quantiles of monthly precipitation totals for October 2021. Source : Météo France, http://seasonal.meteo.fr/content/suivi-clim-cartes-ERA5 , data source : GPCC

In terms of terciles (Fig. 5.2), precipitation totals were in the upper tercile over Scandinavia, The Balkans and United Kingdom, and below normal over parts of Iberia, France, Italy, and Central Europe, with large parts of Ukraine, Belarus, Turkey and Southwestern Russia below 10th percentile.

Precipitation in North Africa

In October 2021 the North African domain was very dry. The precipitation totals was below 20 mm over the most part of the domain and does not exceeding 40 mm in some region of northern Morocco, some places in both the coastal zone and the south of Algeria ,north of Tunisia the rainfall amounts exceeding 40 mm were registered.

Anomalies (1981-2010 reference) were mostly below normal during this month of the 2021 year with less than 20% of the normal. In Egypt and Libya, the anomalies were a mixture between the below normal to slightly above normal, these regions received between 75% and 125% of the normal. Elsewhere in Morocco, Algeria and Tunisia precipitations were below normal.

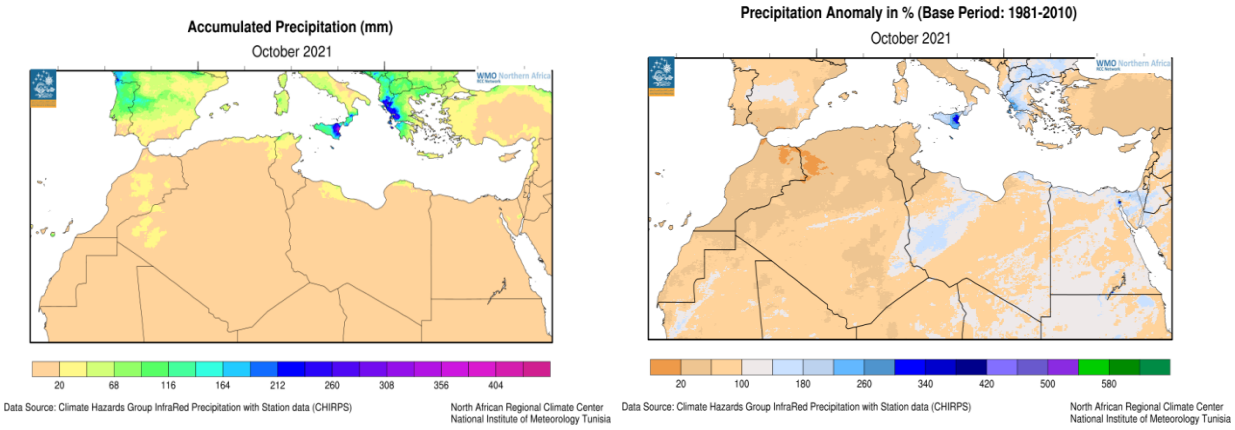
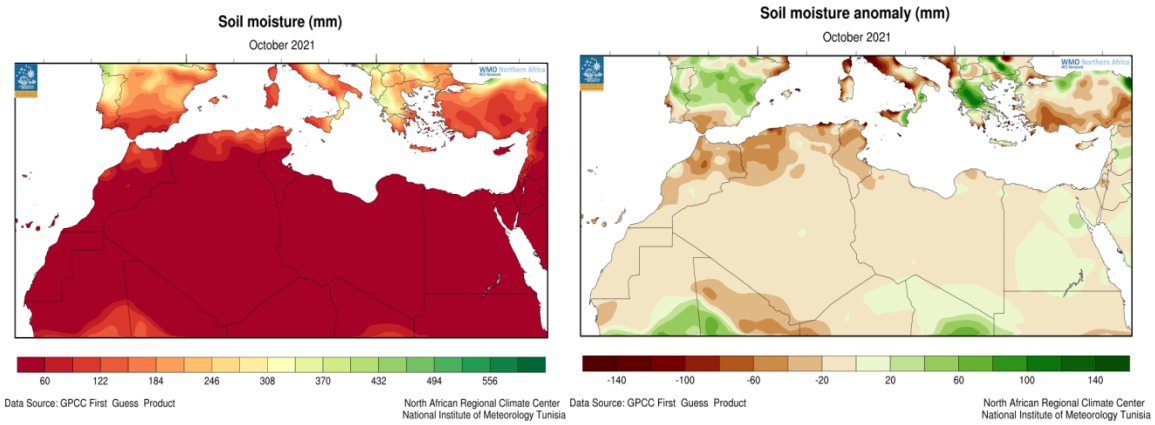


Figure 3.1: Left: Total precipitation; Right: Absolute anomalies of precipitation in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010)
https://www.meteo.tn/en/climate-monitoring-watch

6. Soil moisture

Europe/RA VI domain

North Africa/RA I domain



7. Figure 4: October 2021 soil moisture, left: monthly total, right: monthly anomalies with reference period: 1981-2010.

In October 2021, soil moisture anomalies were slightly above normal over the north east and the middle regions of the southern Egypt and over the south east of Algeria. Elsewhere over the most parts of Algeria, Tunisia, Morocco and Libya the anomalies were below normal.

Figure 5: Soil moisture index (SMI) anomaly for the third ten-day period of April 2021. Source: https://edo.jrc.ec.europa.eu/edov2/php/index.php?id=1111

6. Drivers summary

• Weak La Niña in place, in a strengthening phase ==> it tends to favour Atlantic Ridge circulation for DJF

• East QBO since summer 2021 ==> it tends to slow down the polar vortex, so to enhance SSW probability, so higher probability of NAO- circulations than normal

• negative phase of IOD (cf DMI) and strong positive anomaly over the equatorial Atlantic ==> modification of Hadley-Walker circulation ==> could lead to teleconnections from tropics toward mid-latitudes, so more predictability at seasonal scale over Europe and the Mediterranean Basin

• polar vortex : minor SSW observed in end October. Return to normal conditions at the beginning of November.

References:

WMO RA I RCC Node on Climate Monitoring Website with monitoring results:

https://www.meteo.tn/en/climate-monitoring-watch