MEDITERRANEAN CLIMATE OUTLOOK FORUM
MEDCOF-14 Online Forum

MONITORING SUMMARY MEDCOF-14

for April 2020

Final version

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Compiled by

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The following MedCOF monitoring summary is based on

- climate monitoring working reports from RA I NA RCC Node-CM, RA VI RCC Node-CM and RA VI RCC Node-LRF

1. Oceanic Analysis

Over the Pacific Ocean: neutral "El Niño" conditions:

- Temperatures in the tropical Pacific were mostly warmer than normal and anomalies were generally weak in April 2020.
- Anomalies in the west were higher than in the east. In the very eastern tropical Pacific (near the Peruvian coast), cooling was in progress and led to a weak cold anomaly.
- In the Niño 3.4 region, anomalies always were close to the El Niño threshold of +0.5°C from January to April 2020. The present value for April 2020 was +0.55°C after NOAA CPC, +0.5 after BOM and +0.4°C after Mercator Ocean PSYV4R2 analysis (different reference periods are used).
- In the subsurface, there was notable cooling from January to April 2020, especially in the layer between 100 and 200m depth in much of the equatorial basin. The cold anomaly propagated from the west to the central part of the basin, lately also to the east. According to BOM analysis, this cooling went on in May.
- Present ENSO indicators still show neutral ENSO conditions. However, the notable cooling of the equatorial Pacific, particularly in the subsurface, gives some potential for a beginning La Niña development, and also some model forecasts show this. However, for summer 2020, neutral conditions are still likely. For more details see: http://www.bom.gov.au/climate/enso/index.shtml#tabs=Sea-sub%E2%80%93surface, https://www.ncdc.noaa.gov/teleconnections/enso/indicators/sst/ .

Over the Maritime Continent and the Indian Ocean:

- The tropical part of the Indian Ocean was still warmer than normal. There was only a slight northwest-southeast gradient in SST. This could be a first observational sign for a beginning development of a negative Indian Ocean Dipole (IOD).
- The IOD was still neutral in April 2020. However, some models forecast a negative IOD at least temporarily for July and August 2020. See http://www.bom.gov.au/climate/enso/index.shtml#tabs=Indian-Ocean for more details. Similar results for DMI Index.
- Generally cold anomalies in the subtropics of the southern hemisphere (extending from south of Africa to the south of Australia).

Over the Atlantic:

- In the tropical Atlantic still positive, but mostly weak anomalies.
- From March to April 2020, there was a cooling in the northern tropics, especially close to the African coast.
- Outside the tropics, a dipole of anomalies existed with negative anomalies over the middle latitudes (north of 45°N) and positive anomalies over the subtropics. This pattern, which continued in May 2020, tends to favour an East Atlantic (EA) circulation pattern (Duchez et al., 2016) and blocking regimes (Guemas et al., 2010).

Over the Mediterranean and Black Sea:

- The western Mediterranean had above-normal temperatures in April, while the eastern Mediterranean temperatures were around normal. The Black Sea was warmer than normal.

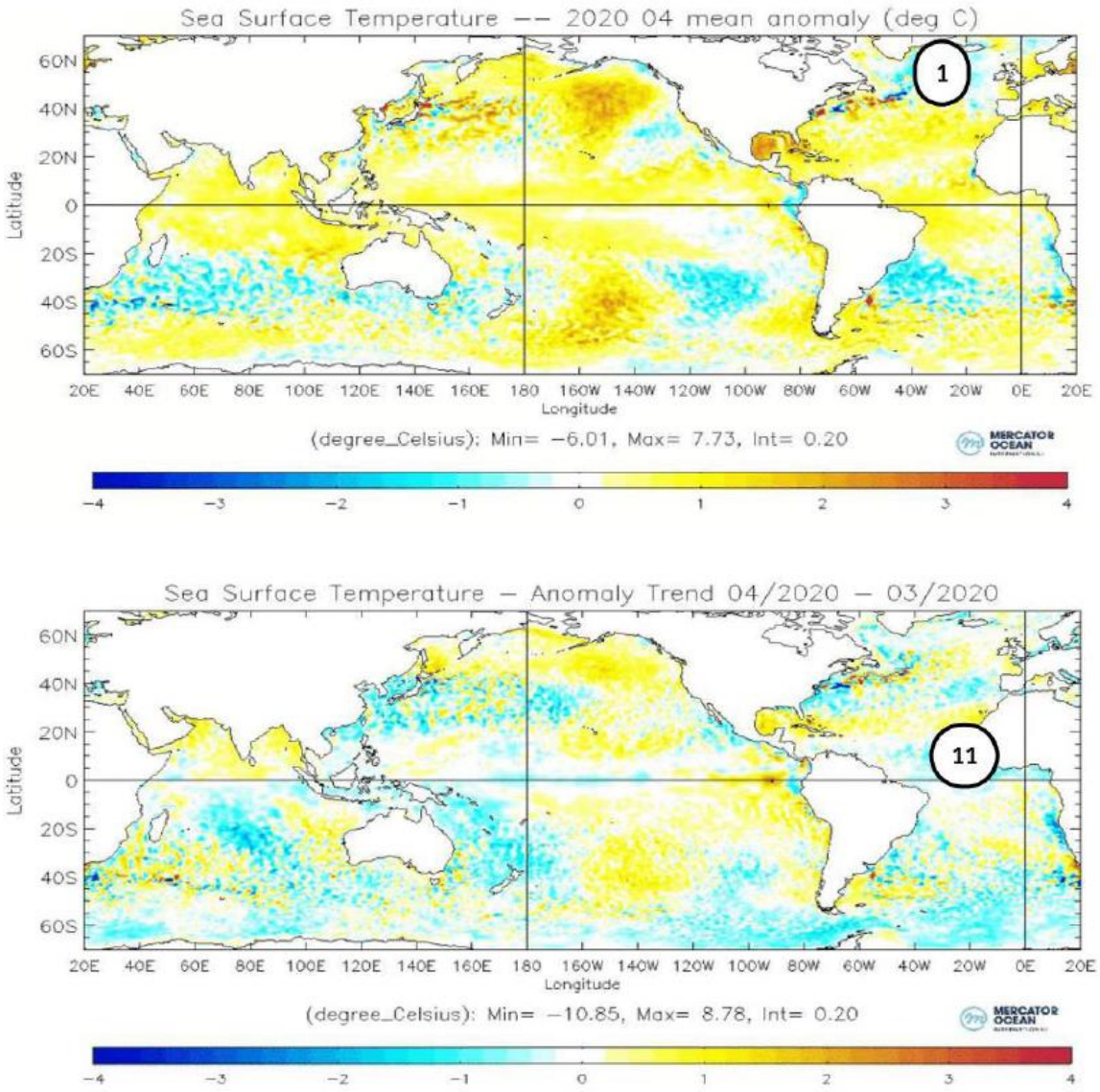

Figure 1.1: Sea surface temperature anomalies for April 2020, 1992-2013 reference (upper map) and anomaly differences April minus March 2020 (anomaly trend). Data from Mercator Ocean, source: Météo France. Numbers: 1 – slight strengthening of the cold anomaly, 11 – quite strong cooling in April

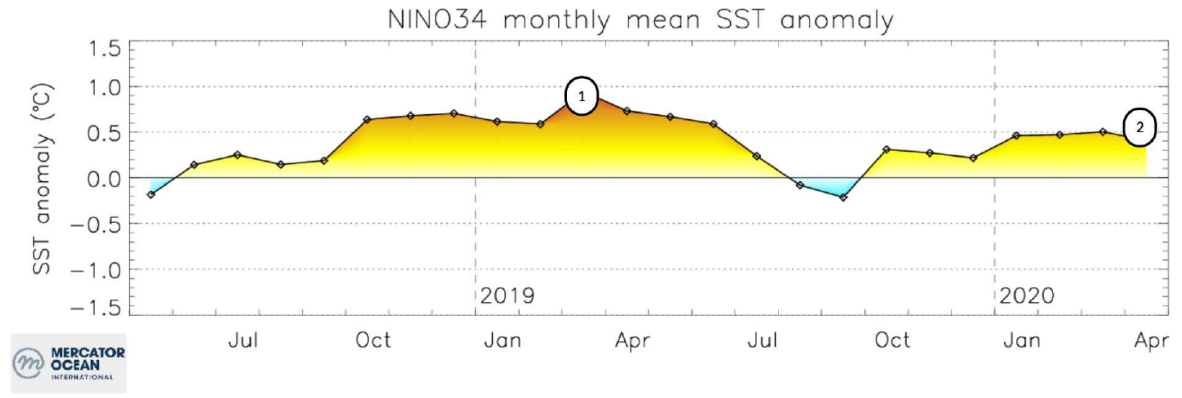

Figure 1.2: Evolution of sea surface temperature anomalies in the Niño3.4 box, 1992-2013 reference. Data from Mercator Ocean, source: Météo France. Numbers: 1 – weak El Niño during winter 2018/19 and spring 2019, 2 – current neutral conditions

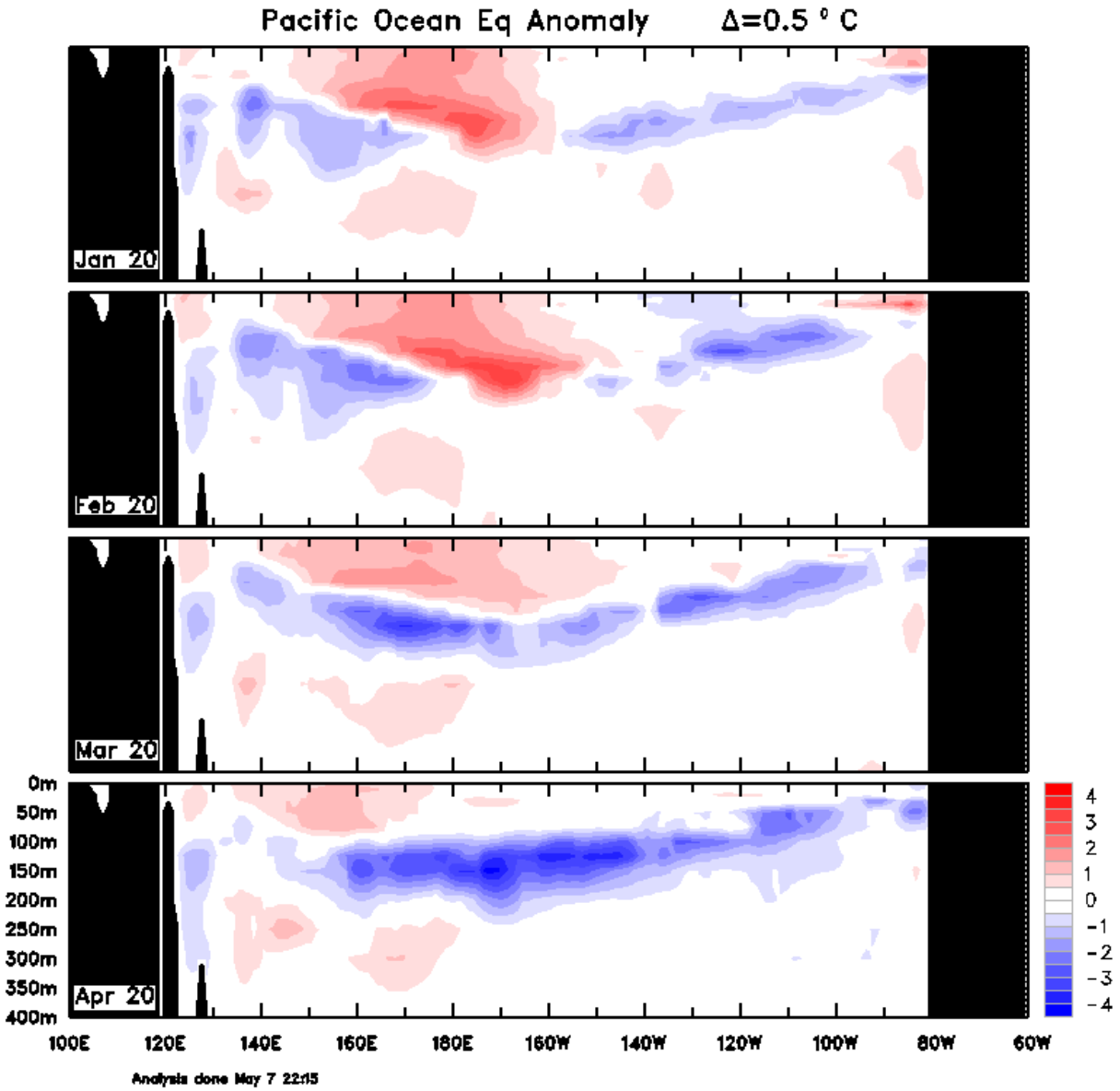

Figure 1.3: Monthly Pacific Ocean temperature anomalies in the sub-surface January-April 2020, 1900-1992 reference (Climatology after Levitus World Ocean Atlas). Source: BOM, http://www.bom.gov.au/climate/enso/index.shtml#tabs=Sea-sub%E2%80%93surface

2. Atmospheric Circulation Analysis

Velocity Potential Anomaly field in the high troposphere (fig. 2.1 – insight into Hadley-Walker circulation anomalies) and SOI:

- Upward motion anomaly over the eastern tropical Atlantic, Africa, the Indian Ocean, the maritime continent and western Pacific, downward over the eastern Pacific, Central and South America. This is in line with SST anomalies (cooling near South America, warm anomalies elsewhere in the tropics. Most velocity potential anomalies are relatively weak, but there seems to be a well-established ocean-atmosphere coupling.
- Monthly SOI for April 2020 was -0.5 for BOM, +0.2 for NOAA, which is close to zero and means mainly neutral ENSO conditions, see https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/ , http://www.bom.gov.au/climate/current/soihtm1.shtml

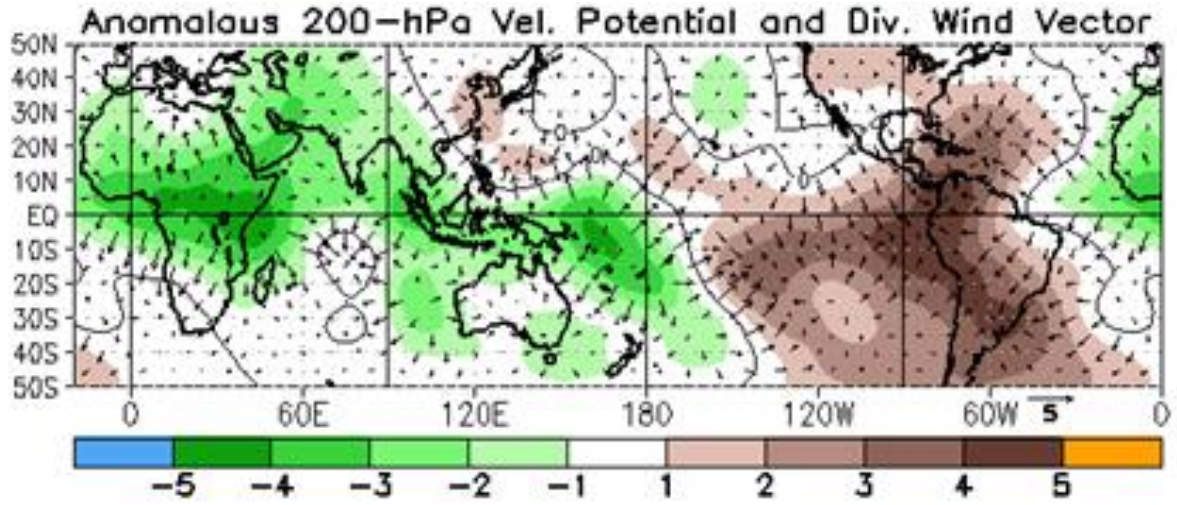

Figure 2.1.a: Velocity Potential anomalies at 200 hPa and associated divergent circulation anomaly for April 2020. Green (brown) indicates a divergence-upward motion anomaly (convergence-downward motion anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

MJO (fig. 2.1.b)

- MJO became active in April 2020 and moved from the western Pacific over Africa to the Indian Ocean. It could have contributed to some of the upward motion anomalies during the month.

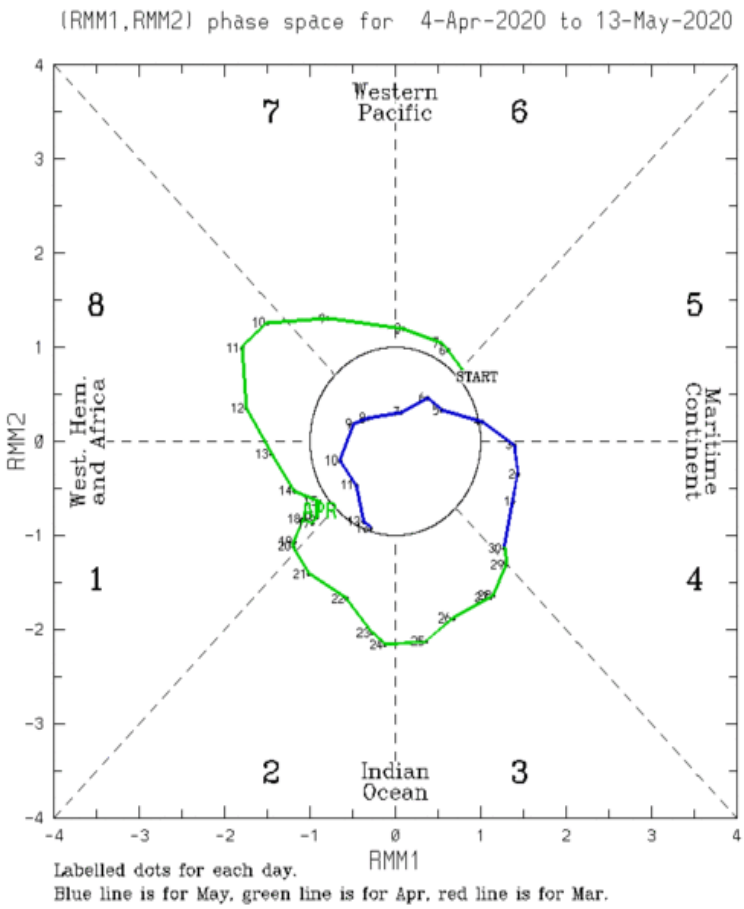

Figure 2.1.b: indices MJO

http://www.bom.gov.au/climate/mjo/

Stream Function anomalies in the high troposphere (fig. 2.2 – insight into teleconnection patterns tropically forced):

Generally rather weak anomalies in the tropics and hence no significant teleconnections.

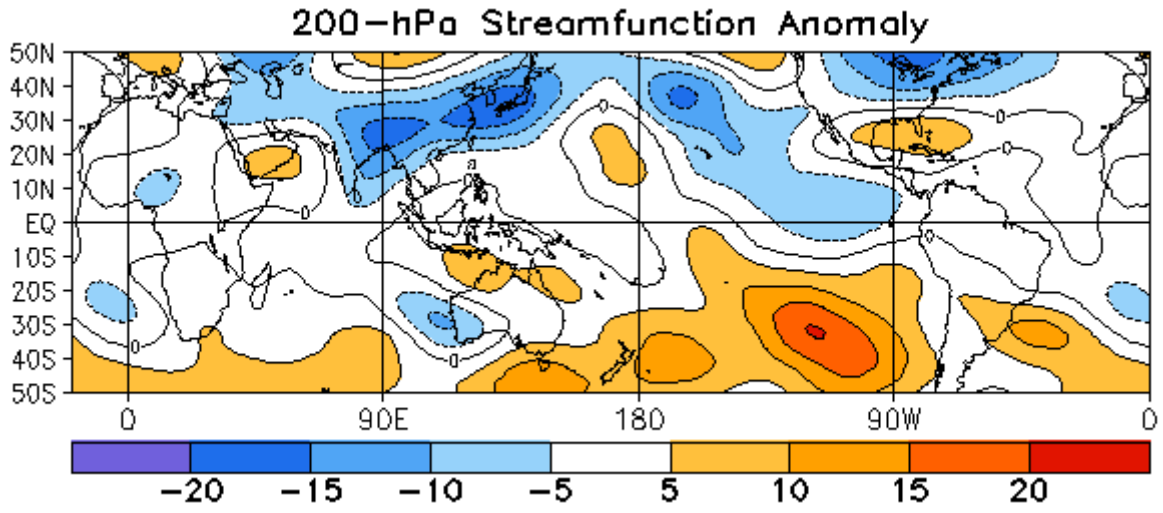

Figure 2.2: Stream Function Anomalies at 200 hPa in April 2020.

http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 2.3 – insight into mid-latitude general circulation):

- An anticyclonic anomaly extended from Northwestern to Southeastern Europe. Eastern parts of the domain (especially eastern Ukraine, South Caucasus, eastern Turkey, Middle East and eastern parts of North Africa), but also some western parts (southwestern Iberia, Morocco) were under above-normal cyclonic influence on monthly average.

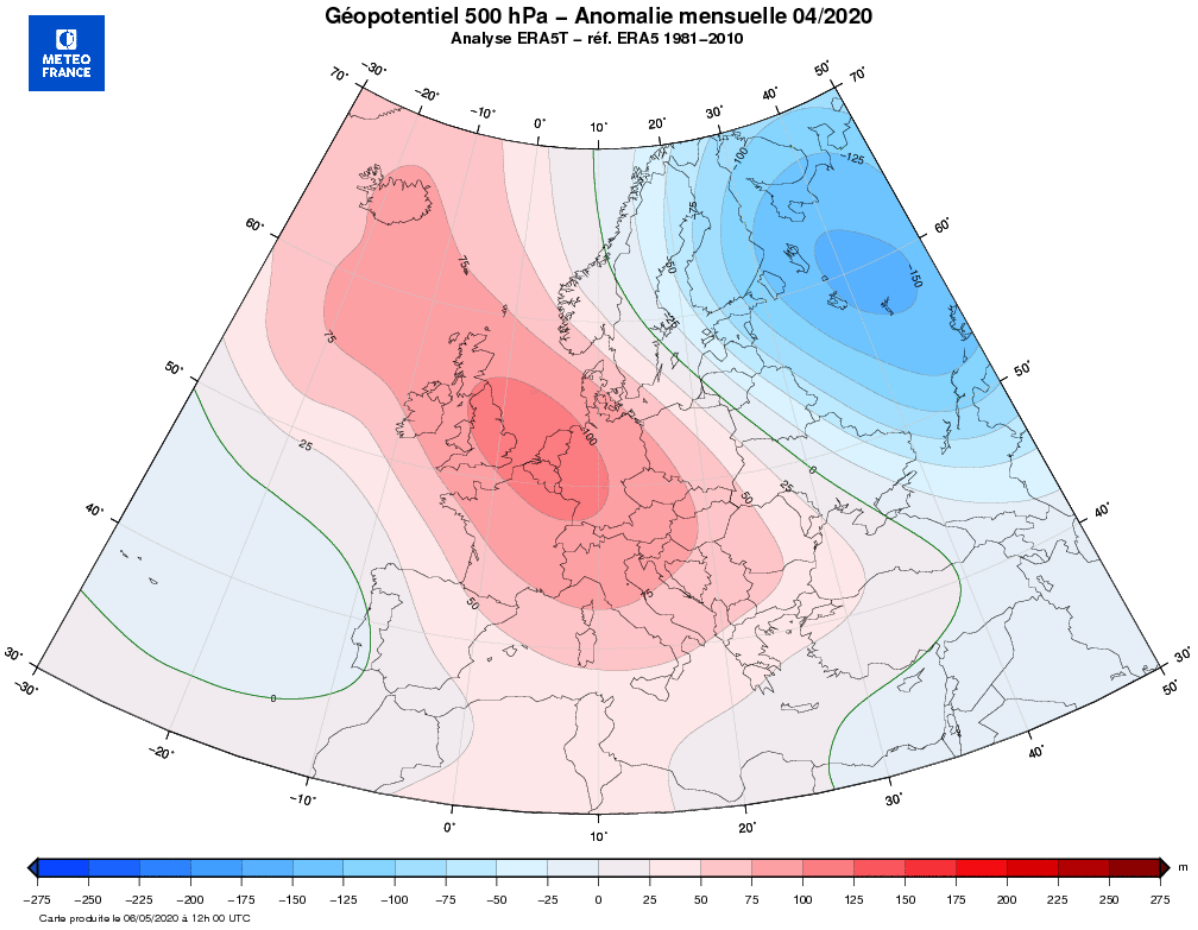

Figure 2.3: Anomalies of Geopotential height at 500hPa (Météo-France)

Sea level pressure and circulation types relevant for the domain

- High pressure conditions extended over the whole Balkan Peninsula and Italy.
- Intense low pressure area over Russia also affected the northeastern Ukraine
- Low pressure influence also over the eastern Mediterranean region including Turkey, southern South Caucasus, Middle East and Egypt, and over western Iberia.
- The main circulation types in April 2020 relevant for Europe were the following:
    - NAO-: after a long NAO+ phase during the whole winter 2019/20, circulation changed in late March 2020 and westerly flow from the Atlantic to Europe stopped,
    - EA/WR+: strong dipole with high pressure over the North Sea and low pressure over western Russia caused inflow of cold air into Eastern Europe,
    - SCAND-: low pressure over western Russia also extended to Scandinavia.

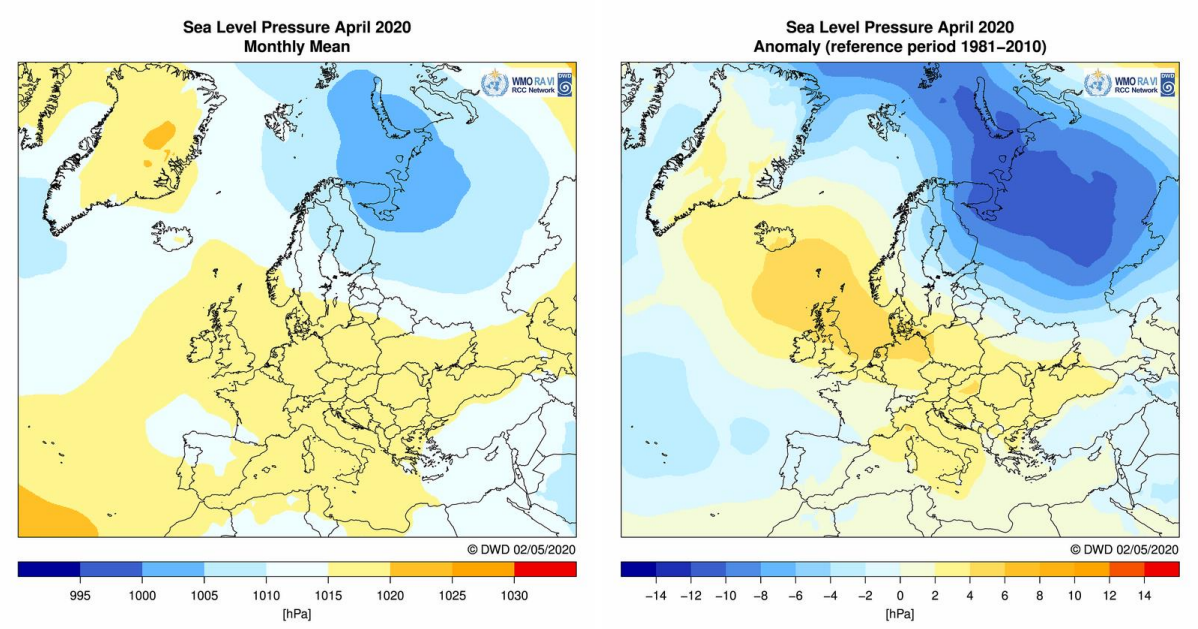

Figure 2.4: Mean sea level pressure over the North Atlantic, Europe and North Africa and 1981-2010 anomalies for April 2020. Source: DWD, https://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ppp.html?nn=490674

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
APR 20	-1.3	0.6	-1.3	1.5	-1.4	---	1.8	-1.5	0.5
MAR 20	0.7	-0.1	1.3	0.4	-2.4	---	0.6	-0.9	1.8
FEB 20	1.0	1.4	1.5	-1.8	-0.1	1.7	-0.1	-2.7	-0.4
JAN 20	1.1	1.7	0.7	-0.6	-1.0	-0.9	0.7	-0.5	0.2
DEC 19	1.0	0.8	0.7	---	-0.1	-0.2	0.1	0.8	-0.4
NOV 19	0.2	0.1	-0.1	1.9	-0.1	---	-0.6	1.5	1.0
OCT 19	-1.0	0.7	-0.8	-0.5	-1.0	---	-0.5	0.2	-0.2
SEP 19	0.0	2.2	0.9	-1.5	1.6	---	0.8	-0.5	-0.1
AUG 19	-1.6	1.9	-2.2	-1.2	1.2	---	-1.7	-2.1	0.3
JUL 19	-1.4	0.1	-0.3	0.1	0.6	---	1.0	-0.7	-1.5
JUN 19	-0.8	1.3	-1.9	1.7	0.2	---	0.3	-0.2	-0.5
MAY 19	-2.4	-0.6	-0.6	0.3	-0.2	---	-0.7	-0.1	-0.8
APR 19	0.4	-1.0	-1.3	0.7	-0.8	---	0.8	2.1	-0.4

Table 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

NAO was in a negative phase especially in the first half of the month. In the second half, NAO became neutral. AO was neutral or slightly in a positive phase in April 2020.

In the first half of May 2020, both indices had a temporary negative phase, implying a relatively strong meridionalisation. Forecasts for the second half of May show likely a neutral phase for NAO and AO.

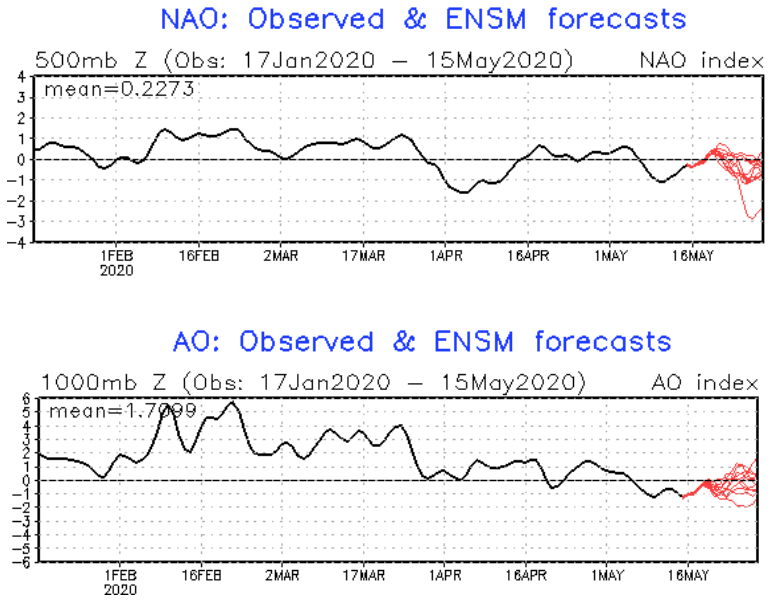

Figure 2.5: North Atlantic Oscillation (NAO) and Arctic Oscillation (AO) indices. Source: NOAA CPC, http://www.cpc.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

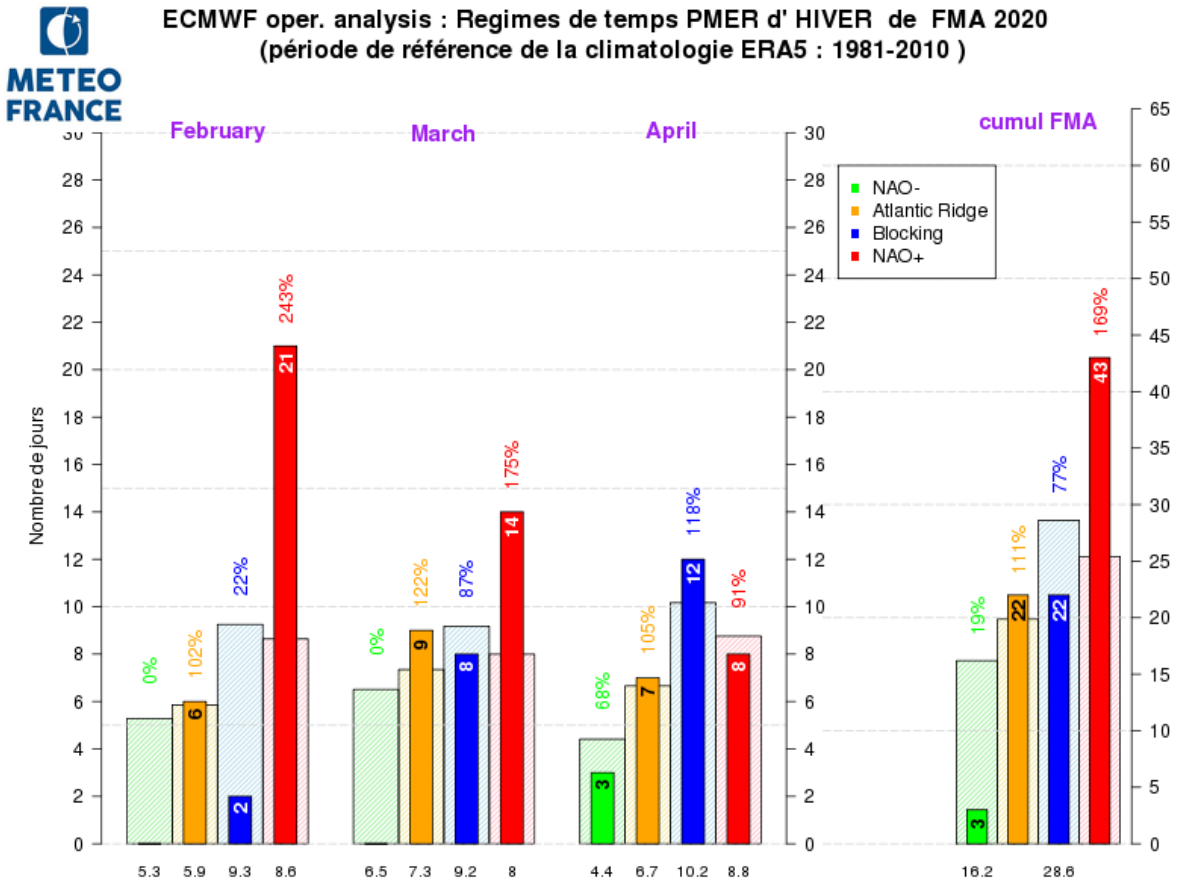

Figure 2.6: Distribution of weather types of Météo France classification (winter regime) for February-April 2020.

Source: Météo France, http://seasonal.meteo.fr/en/content/suivi-clim-regimes-trim

Météo France weather type classification shows a decrease in the number of NAO+ types from February to April and an increase of blocking types in the same period.

3. Precipitation

Europe/RA VI domain

Monthly precipitation totals in April 2020 were lowest in some northern parts (Hungary, Romania, Moldova, Ukraine) and in eastern parts of the Middle East (Jordan) with less than 10mm each, and highest in western Iberia, Armenia and eastern Turkey (above 100mm). It was much drier than normal all over the north of the domain (France, parts of Italy, northern Balkan Peninsula and Eastern Europe), with partly less than 20% of normal precipitation. It was also drier than normal in western and central Turkey, locally with less than 60% of the normal. Iberia, central Italy, southern Balkans/Greece (except the west), much of the South Caucasus and eastern Turkey had above-normal precipitation, and also parts of the Middle East. In absolute terms, the highest precipitation deficit was recorded in the western Balkans with down to -70mm locally. Iberia, Greece, Armenia and Azerbaijan had a surplus up to above +50mm. Precipitation anomalies were partly extreme. The low precipitation in the north was mainly below the 10th percentile and the high precipitation over Iberia, the Aegean Sea region and South Caucasus locally above the 90th percentile.

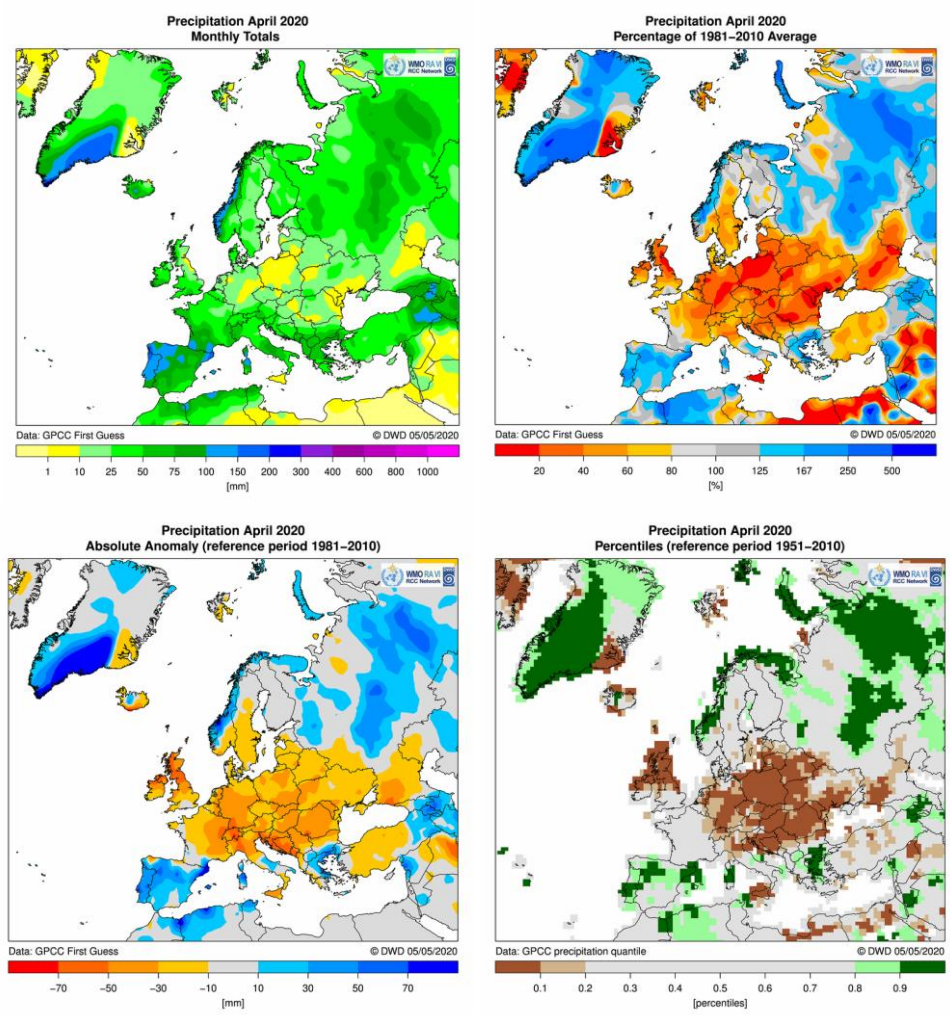

Figure 3.1: Monthly precipitation sum (upper left), percentage of normal (upper right), absolute anomalies (bottom left), and percentiles (bottom right) for April 2020 (1981-2010 reference for percentages and anomalies, 1951-2010 for percentiles) in Europe/RAVI. Data from GPCC (First Guess version). Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_rrr.html?nn=16102

Precipitation in North Africa

Monthly precipitation totals in April 2020 in the North African domain were mostly below 20 mm. In some parts of northern Morocco, the coastal zone of Algeria and north of Tunisia, rainfall amounts exceeding 40 mm were registered.

Anomalies (1981-2010 reference) were mostly below normal during this month of the year with less than 20% of the normal. In some parts of the center and the east of Egypt, some parts of southwestern Libya and in the south and some parts of the western regions of Algeria, anomalies were near normal. These regions received between 75% and 125% of the normal.

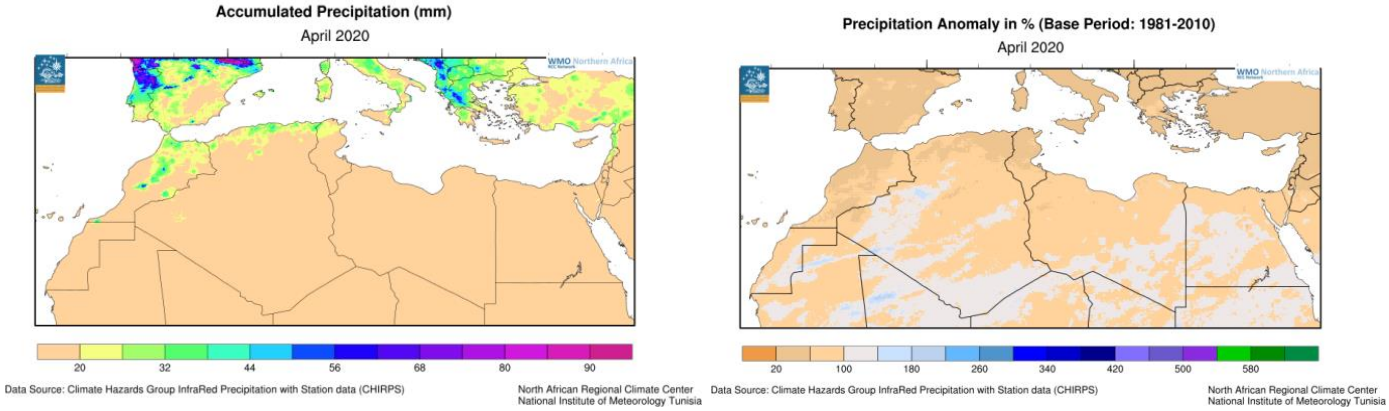

Figure 3.2: Left: Total precipitation; Right: Absolute anomalies of precipitation in the RAI-NA Region (North Africa)
Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010)
https://www.meteo.tn/en/climate-monitoring-watch

4. Temperature

Europe/RA VI domain

Monthly mean temperature in April 2020 varied between around 7°C in the northern Ukraine and around 20°C in southern Israel and Jordan.

Most eastern parts of the domain had temperatures around normal (-/+1°C anomalies). It was more than 1°C colder than normal in the eastern Ukraine and the South Caucasus due to cold air inflow related to the Russian low pressure and it was more than +1°C warmer in the western Balkans within the high-pressure zone.

In western parts of the domain temperature anomalies varied from close to zero in southwestern Portugal to more than +4°C in central France. Much of this area (except the south) was more than +1°C warmer than normal.

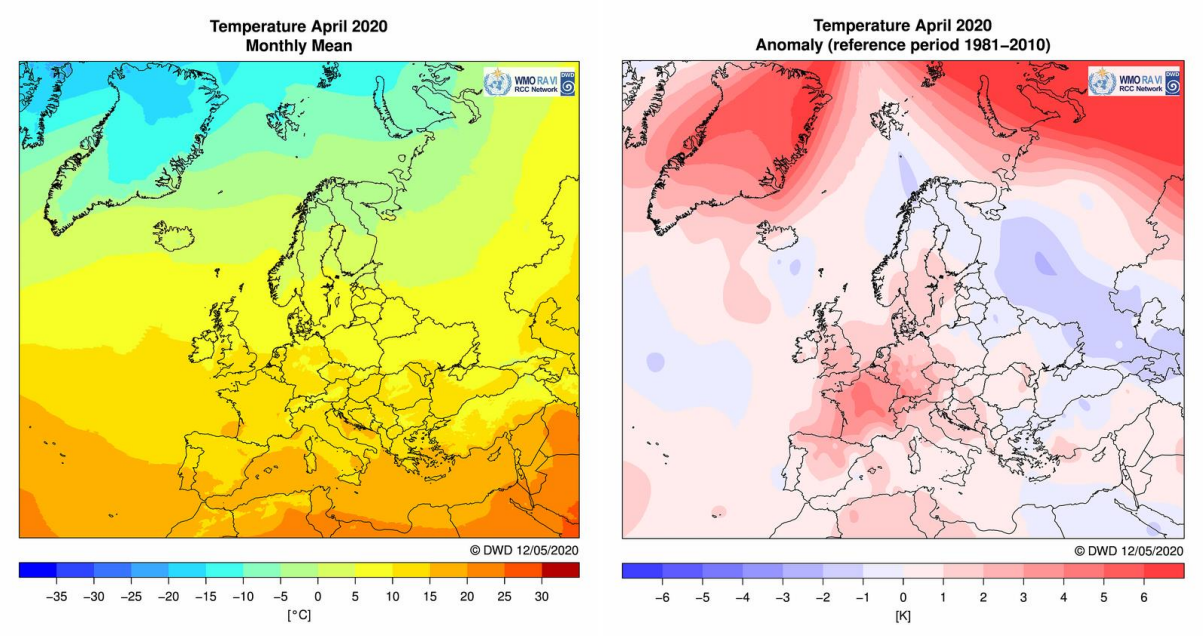

Figure 4.1: Mean temperature (left) and anomalies (1981-2010 reference, right) in °C in the RA VI Region (Europe) interpolated from CLIMAT station data, for April 2020. Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ttt.html?nn=490674.

Temperature in North Africa

The graph in Fig. 4.2 shows the monthly trend of air temperature anomaly in degrees Celsius in April from 1979 to 2020. 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 April 2020, the land mean temperature of the North African region was above the normal 1981-2010, it has reached +0.6 °C. The warming rate was about +0.38°C per decade.

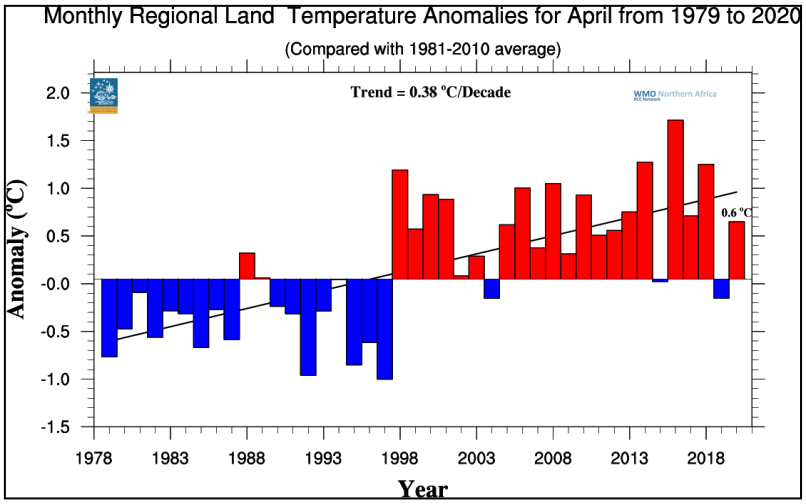

Figure 4.2: Monthly mean temperature anomaly (April 1979-2020) time series plot with trend line

Monthly mean temperature in April 2020 mostly ranged from 15°C to 28 °C, in small parts reaching 10°C, especially in northern Morocco and in the northeast of Algeria. In some parts of the north-eastern and the southern Algeria and in the extreme south west of Libya, 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. They were in a range between +1 and +2°C in Tunisia, most part of Morocco and Algeria, the west part of Libya, between +2 and +3 °C in the center of Libya and in the south east of Algeria. Temperature anomalies were below normal and mostly ranged between 0 and -1°C in the centre of Morocco, the southwest of Algeria, the west of Libya and the most parts of Egypt, between -1 and -2°C in the south of Egypt, small parts in southwestern Libya and locally in the center of Morocco .

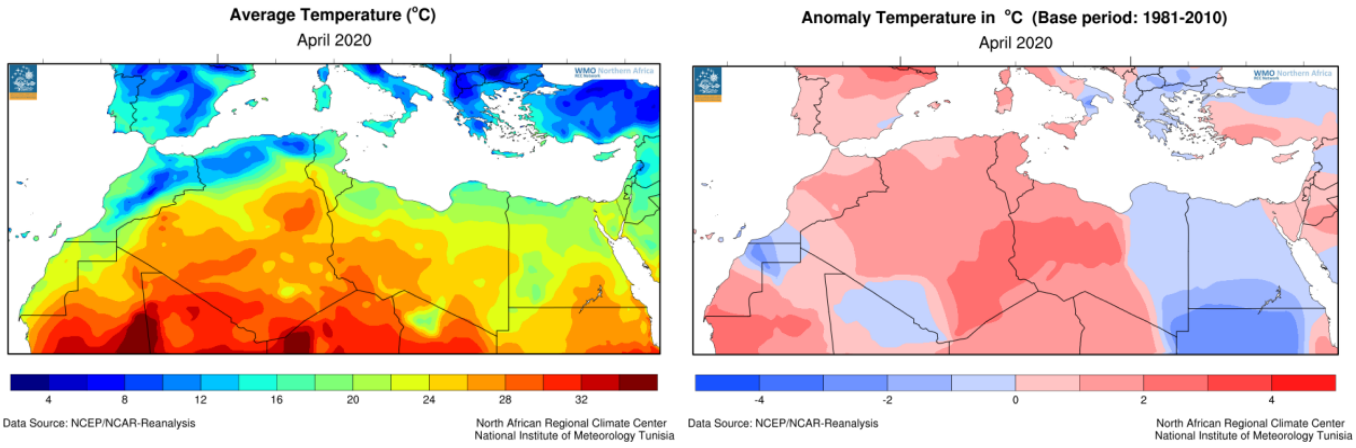

Figure 4.3: Left: Mean temperature; Right: Absolute anomalies of temperature in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010),

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

5. Soil moisture

In those parts of the domain, where precipitation was very low, the upper layers of soil dried out considerably during April 2020. In early May 2020, soil moisture was below normal particularly in parts of Italy, the northern Balkans and parts of Eastern Europe (Fig. 5). A dry soil has less potential evaporation, which causes a lower latent heat flux into the atmosphere, and therefore less cooling of the soil and near surface air by evaporation. This means that low soil moisture can amplify positive surface air temperature anomalies, even in the following summer, causing increased risk of heatwaves.

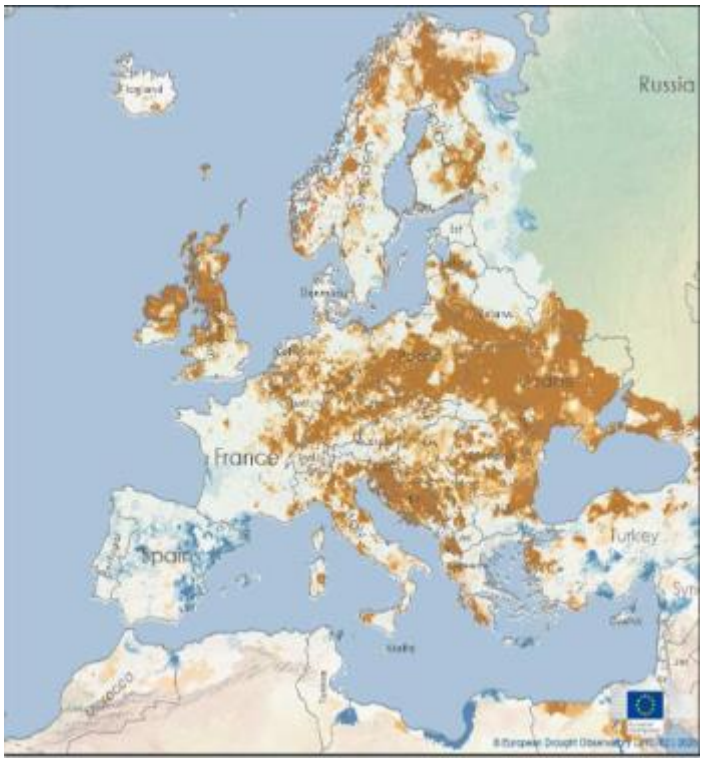

Figure 5: Soil moisture index (SMI) anomaly for the first ten-day period of May 2020. Source: https://edo.jrc.ec.europa.eu/edov2/php/index.php?id=1111

References:

Météo France Monthly Seasonal Forecast Bulletin and climate monitoring maps: http://seasonal.meteo.fr (password protected)

WMO RA I RCC Node on Climate Monitoring Website with monitoring results: https://www.meteo.tn/en/climate-monitoring-watch

WMO RA VI RCC Node on Climate Monitoring Website with monitoring results: http://www.dwd.de/rcc-cm

GPCC: http://gpcc.dwd.de

EDO (EU European Drought Observatory): https://edo.jrc.ec.europa.eu

Duchez, A. *et al.,* 2016 : *Environ. Res. Lett.* **11** 074004. https://iopscience.iop.org/article/10.1088/1748-9326/11/7/074004

Guemas, V., Salas-Mélia, D., Kageyama, M. *et al., 2010:* Summer interactions between weather regimes and surface ocean in the North-Atlantic region. *Clim Dyn* **34,** 527–546. https://doi.org/10.1007/s00382-008-0491-6