SOUTH EAST EUROPEAN CLIMATE OUTLOOK FORUM
SEECOF-29 Online Forum

MONITORING SUMMARY SEECOF-29

for April 2023

Draft version

Last update: 17 May 2022

Compiled by

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Météo France

Toulouse, France

South East European Virtual Climate Change Center (SEEVCCC)

hosted by Republic Hydrometeorological Service of Serbia, Republic of Serbia

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The following SEECOF monitoring summary is based on

- Monitoring information from RA VI RCC Node-CM
- Contribution from Météo France (draft of LRF bulletin)
- Further information from various sources (BOM, NOAA-CPC)

1. Oceanic Analysis

Over the Pacific Ocean:

- In the equatorial area, the traces of "La Niña" are dissipated. An intense warm anomaly can be found near the coasts of South America for April 2023 and has further developed since last month (Fig. 1.1). In the other parts of the equatorial Pacific, sea surface temperature (SST)was close to normal. In summary, the current ENSO situation is neutral. The Nino3.4 index from Mercator Ocean PSYV4R2 analysis is close to +0.2°C for April 2023 (Fig. 1.2), according to NOAA CPC +0.4°C.
- In the subsurface, too, cold anomalies in the equatorial Pacific have disappeared in April, whereas warm anomalies have expanded to the east. This might be a beginning of an El Niño development (Fig. 1.3).
- In the North Pacific, a PDO- (negative Pacific decadal oscillation) pattern still exists.
- For more details see:
    - http://seasonal.meteo.fr/slides/BulTech (password protected)
    - https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.shtml
    - http://www.bom.gov.au/climate/enso/index.shtml#tabs=Pacific-Ocean
    - PDO: https://www.ncdc.noaa.gov/teleconnections/pdo/

Over the Maritime Continent and the Indian Ocean:

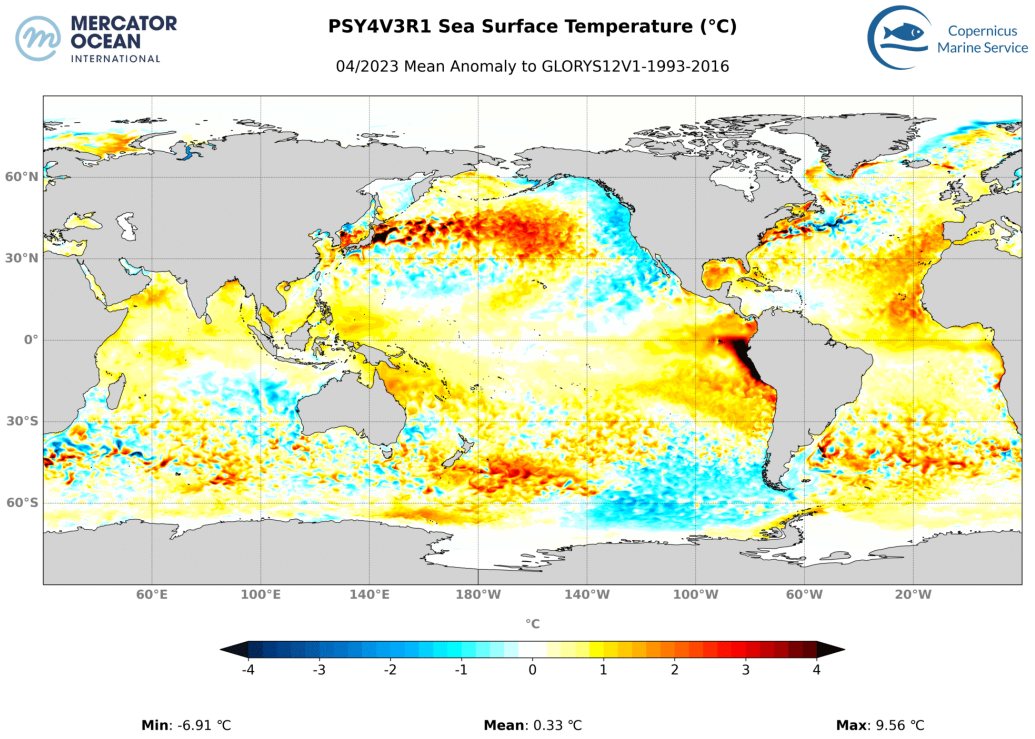
- Anomalies over the tropical Indian Ocean are quite weak.
- Indian Ocean Dipole (IOD) presently neutral.
- A cooling took place in the eastern part of the basin close to Australia. This can be the beginning of a positive IOD phase.

Over the North Atlantic:

- A cooling has occurred in the western parts of the North Atlantic, whereas a warm anomaly close to Africa and Iberia has increased.

Over the Mediterranean and Black Sea:

- The western Mediterranean was slightly warmer than normal
- SST in the central and eastern Mediterranean was close to normal.
- The Black Sea was slightly warmer than normal.



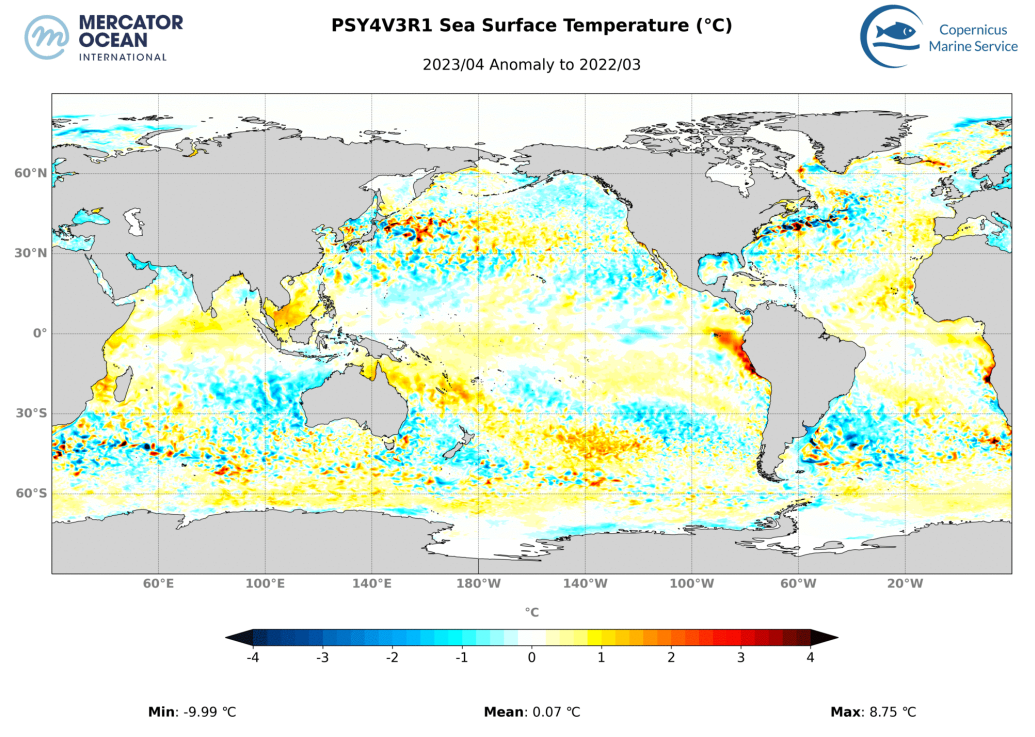


Figure 1.1: Sea surface temperature anomalies for April 2023, 1992-2013 reference (upper map) and anomaly differences April minus March 2023 (anomaly trend). Source: Météo France

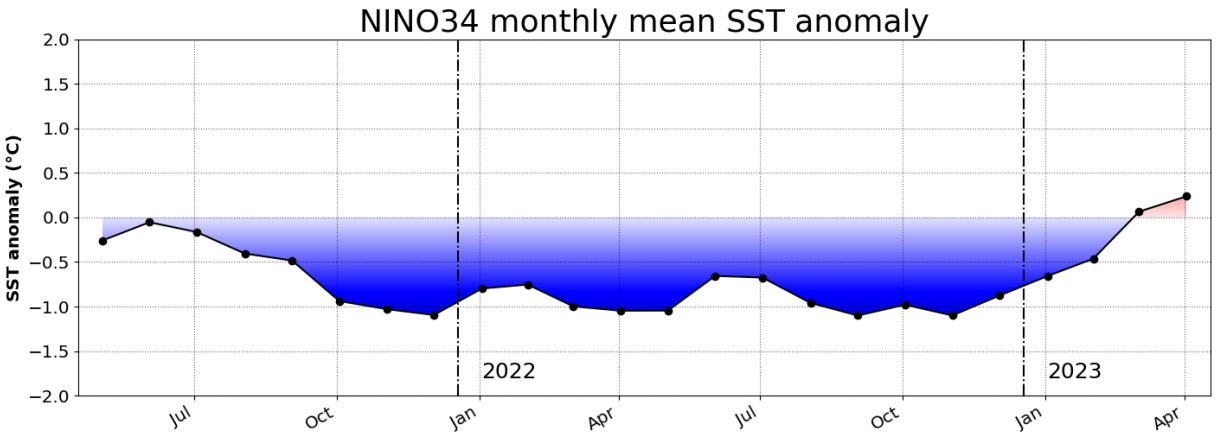


Figure 1.2: Evolution of sea surface temperature anomalies in the Niño3.4 box, 1992-2013 reference. Data from Mercator Ocean, source: Météo France.

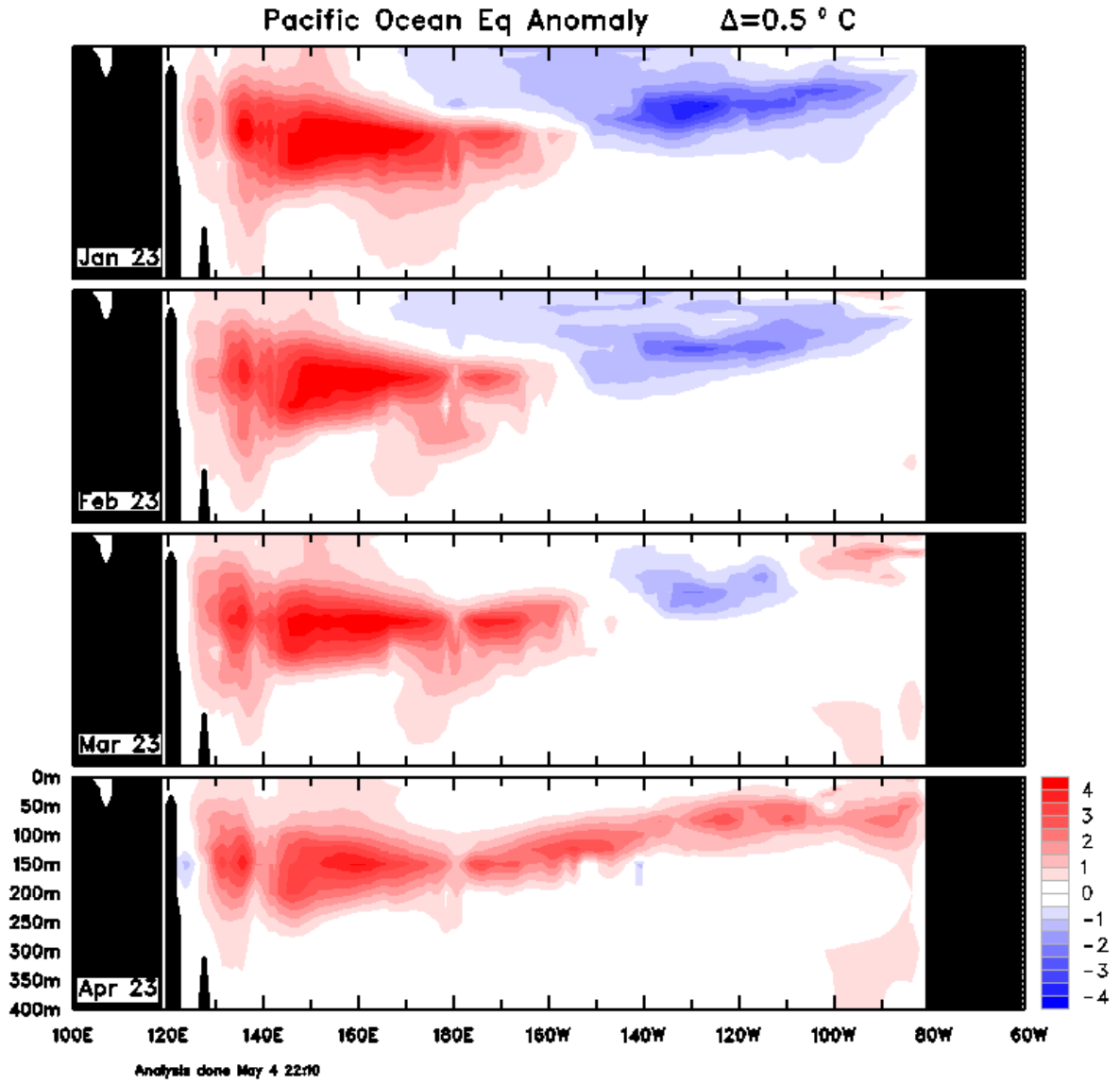


Figure 1.3: Monthly Pacific Ocean temperature anomalies in the sub-surface January-April 2023, 1900-1992 reference (Climatology after Levitus World Ocean Atlas). Source: BOM, http://www.bom.gov.au/climate/enso/index.shtml#tabs=Sea-sub%E2%80%93surface

2. Atmospheric Circulation Analysis

Velocity Potential Anomaly field in the high troposphere (fig. 2.1a – insight into Hadley-Walker circulation anomalies), Southern Oscillation Index (SOI) and Madden-Julian Oscillation (MJO) (fig. 2.1.b)

- Upward motion anomaly over the western and central tropical Pacific and close to Australia and the maritime continent, downward over both the eastern tropical Pacific and the Indian ocean. While the upward anomaly over the central tropical Pacific and the strong downward anomaly over the Indian Ocean point to El Niño conditions, the downward anomaly over the eastern Pacific is rather typical for La Niña and does not correspond to the ocean warm anomaly in that region. This means that the atmosphere is still in a transitional state between La Niña and El Niño, and an El Niño atmospheric circulation has not fully developed yet.
- SOI values were close to zero for both March and April 2023 (+0.2 for both months according to NOAA CPC)
  - https://www.ncdc.noaa.gov/teleconnections/enso/soi
  - http://www.bom.gov.au/climate/enso/index.shtml#tabs=Pacific-Ocean&pacific=SOI
- The downward anomaly over the Indian Ocean together with a weak upward anomaly over Africa implies also a development of a positive IOD phase.

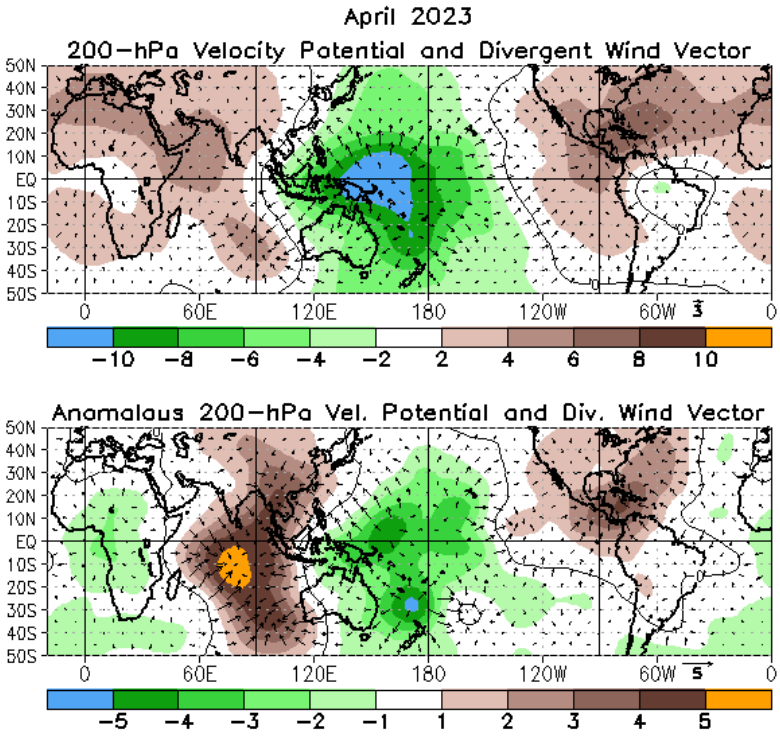


Figure 2.1.a: Velocity Potential monthly mean (upper map) and anomalies (lower map) at 200 hPa and associated divergent circulation mean and anomaly for April 2023. Green (brown) indicates a divergence-upward motion (anomaly) (convergence-downward motion anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

- MJO was active during April 2023, but not particularly strong. In early May 2023, a strong MJO pulse lied over the Maritime Continent and is forecast to move into the western Pacific region in the next few days and weaken marginally. An MJO pulse over the western Pacific would likely weaken trade winds across the equatorial Pacific Ocean. This, in turn, would result in further warming of the equatorial Pacific Ocean and hence drive further development towards El Niño. At the end of May, the MJO is forecast to be strong over eastern parts of the Pacific and might induce an upward circulation there.

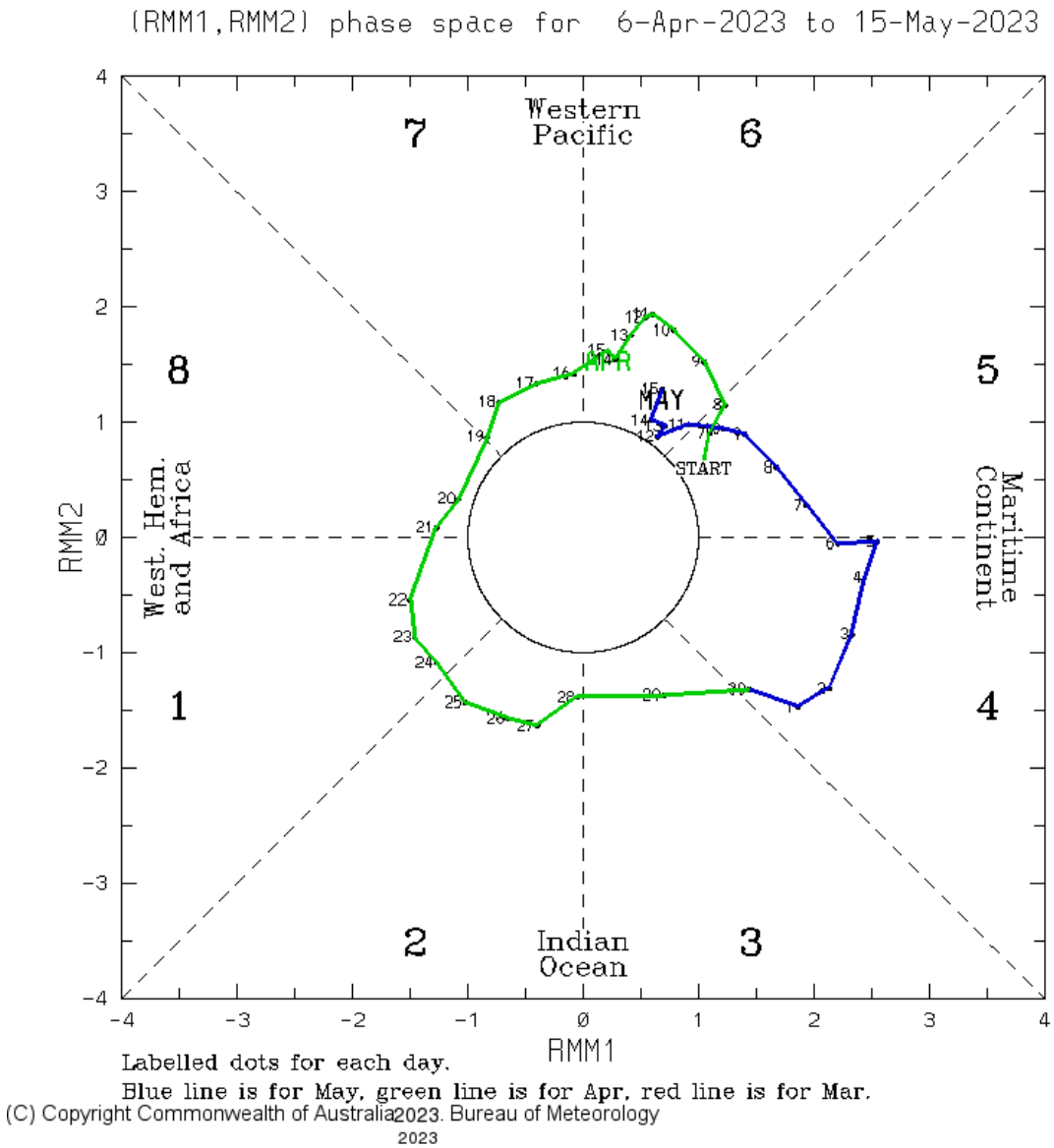


Figure 2.1.b: indices MJO

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

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

A chance of presently weak teleconnection might be over the central Pacific

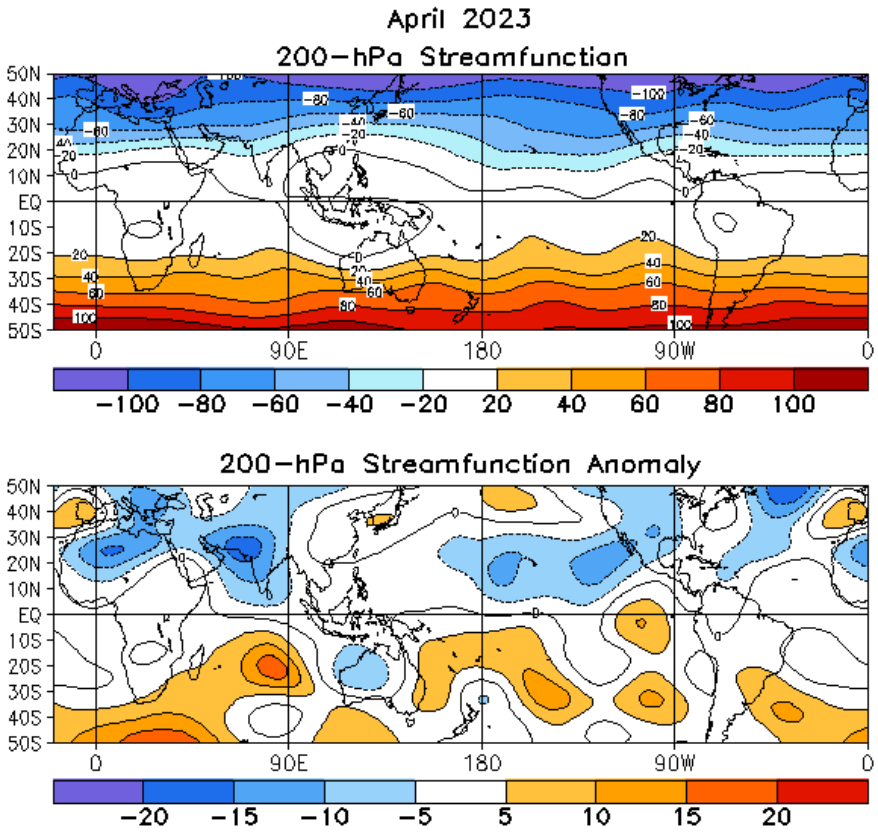


Figure 2.2: Stream Function and anomalies at 200 hPa in April 2023.

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):

- Weak negative PNA pattern in April 2023 (PNA index -0.42 according to NOAA, https://www.ncdc.noaa.gov/teleconnections/pna/).
- From North America a large wave propagated over the North Atlantic to Europe and Asia, inducing a pronounced meridional circulation with NAO-/AO-.
- Most dominant patterns for Europe were NAO- and Scandinavian blocking.
- Over much of the SEECOF region negative geopotential anomalies (large trough on monthly average).

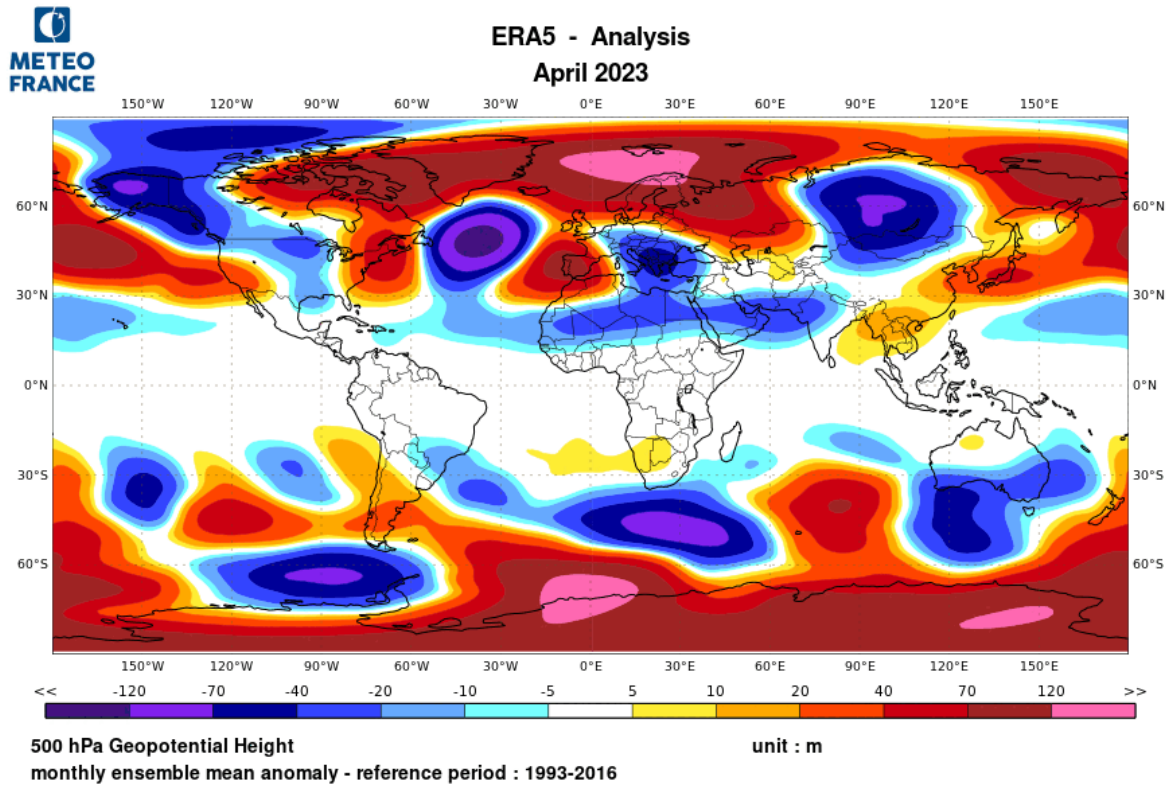


Figure 2.3: Anomalies of Geopotential height at 500hPa (ERA5 data),

Source: Météo-France, http://seasonal.meteo.fr/content/suivi-clim-cartes-ref93-16

Sea level pressure (SLP) and circulation types relevant for Europe

- Outstanding low pressure area over the North Atlantic.
- Intense high-pressure over Scandinavia/Northern Europe, resulting in NAO- and SCAND+ patterns.
- NAO-/AO- were especially intense in the second half of April and early May 2023.
- Over the SEECOF region mostly cyclonic influence.
- Cold airflow from northeast affected the SEECOF region.

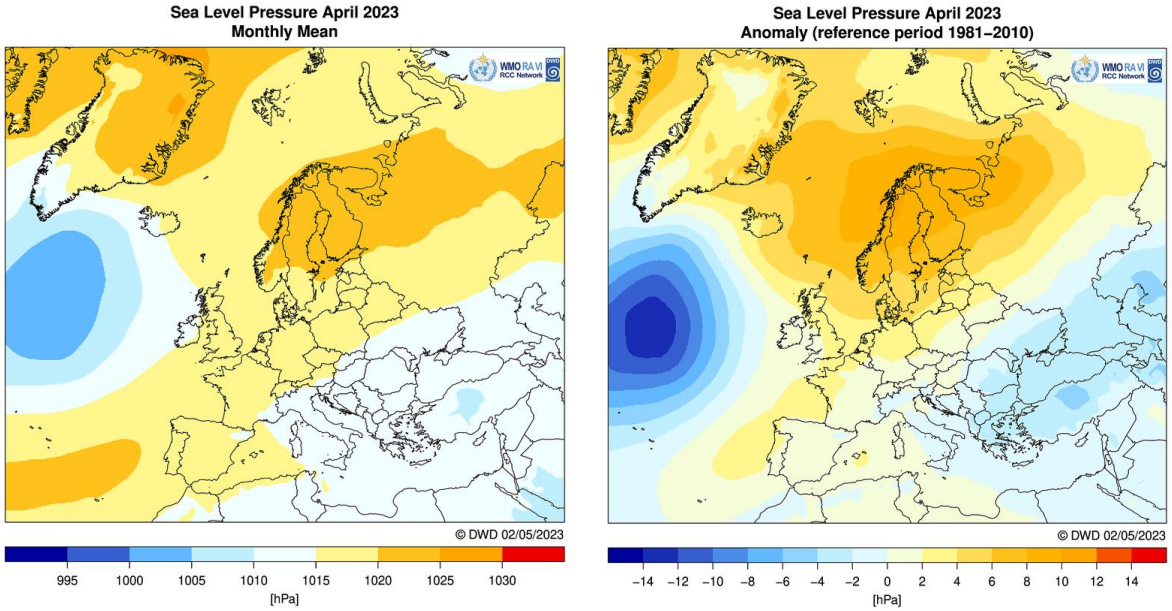


Figure 2.4: Mean sea level pressure over the North Atlantic, Europe and North Africa and 1981-2010 anomalies for April 2022. Source: DWD, https://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ppp.html?nn=490674

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
APR 23	-0.8	-0.2	-0.2	-0.7	-0.7	---	-0.2	1.3	-0.7
MAR 23	-1.6	0.5	0.6	0.4	-1.9	---	2.0	-2.1	0.9
FEB 23	0.6	-0.8	2.5	-0.5	-1.2	1.7	1.5	-0.7	-0.9
JAN 23	0.9	-1.0	2.0	1.4	-0.4	-0.4	-0.6	0.7	-1.1
DEC 22	-0.2	0.0	0.0	---	-1.0	-0.7	-1.2	0.9	-1.2
NOV 22	0.6	1.2	0.3	0.4	-0.7	---	0.8	1.6	-0.3
OCT 22	-0.3	0.2	1.0	-0.1	0.3	---	-0.7	-0.2	1.1
SEP 22	-1.4	-1.2	1.8	-0.8	0.1	---	-1.1	0.5	-0.6
AUG 22	1.8	1.4	-0.4	-1.1	0.8	---	-3.4	1.0	-0.3
JUL 22	-0.1	1.4	-0.5	-1.6	2.0	---	-1.2	-0.5	0.0
JUN 22	0.2	0.5	-1.7	0.0	-0.2	---	-0.5	0.0	-1.3
MAY 22	0.7	0.2	-1.4	-0.3	-0.6	---	0.9	-1.5	-0.3
APR 22	-0.5	-0.9	0.3	-0.7	-1.0	---	-0.1	-0.7	-1.2

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

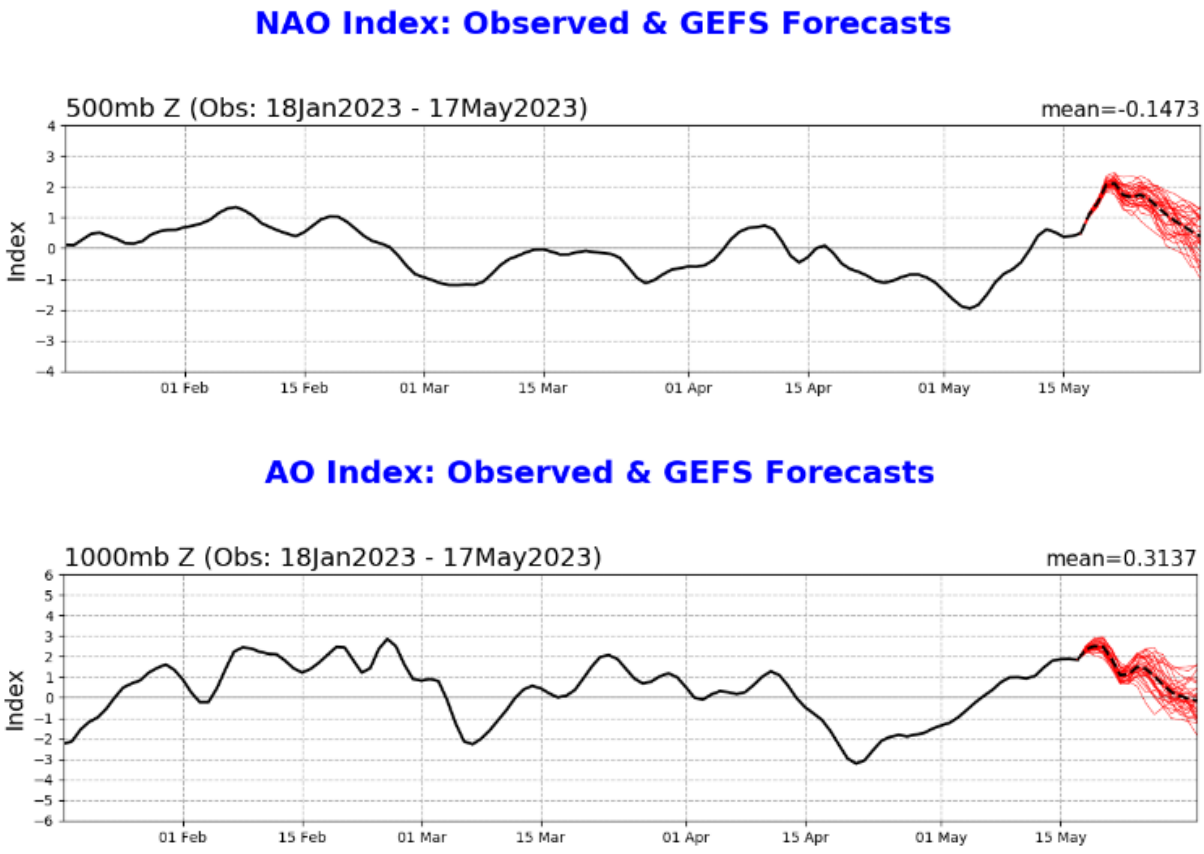


Figure 2.5: North Atlantic Oscillation (NAO) and Arctic Oscillation (AO) indices. Source: NOAA CPC, https://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

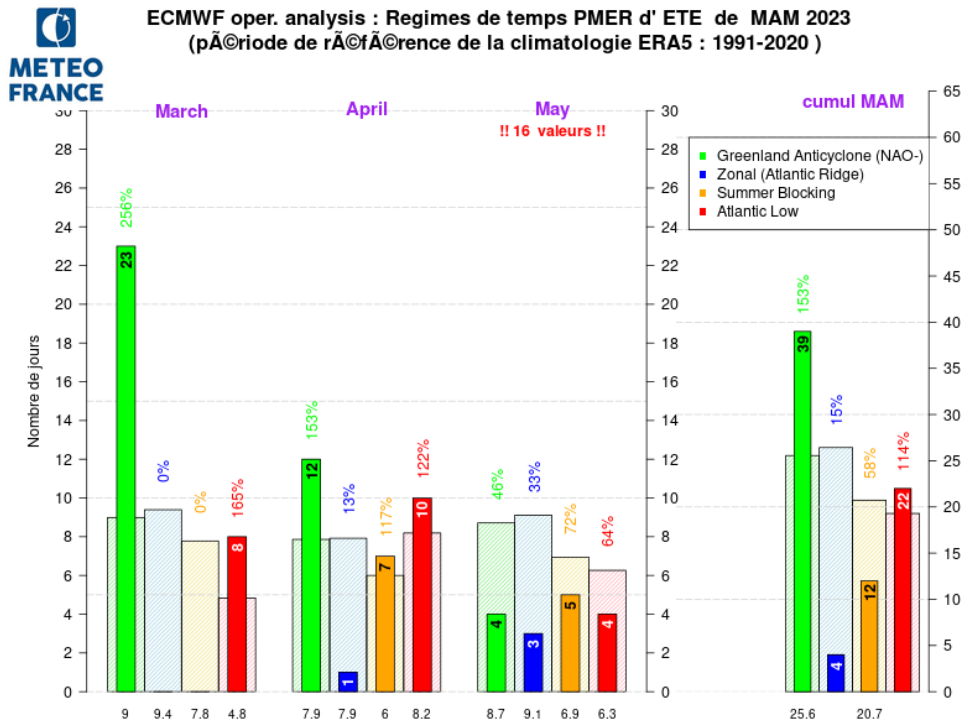


Figure 2.6: Distribution of weather types of Météo France classification (summer regime) for March-May 2022. Source: Météo France, http://seasonal.meteo.fr/content/suivi-clim-regimes-trim

3. Precipitation

Monthly precipitation in April 2023 was above normal (1991-2020 reference) in almost the entire SEECOF domain with particularly high anomalies around the Black Sea and exceeding the 90th percentile. Also, Israel and Jordan received high monthly totals, mainly due to a heavy rain event. Precipitation was below normal along the west Balkan coast, parts of Hungary, and Azerbaijan.

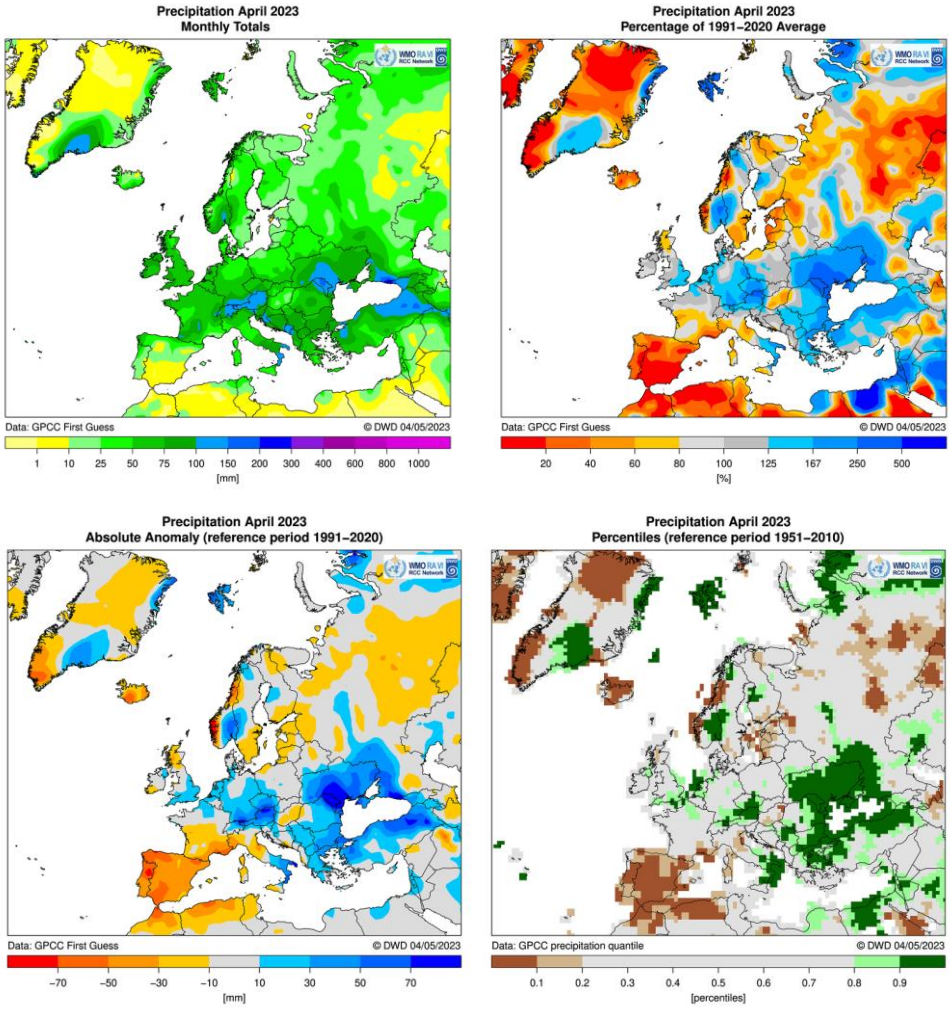
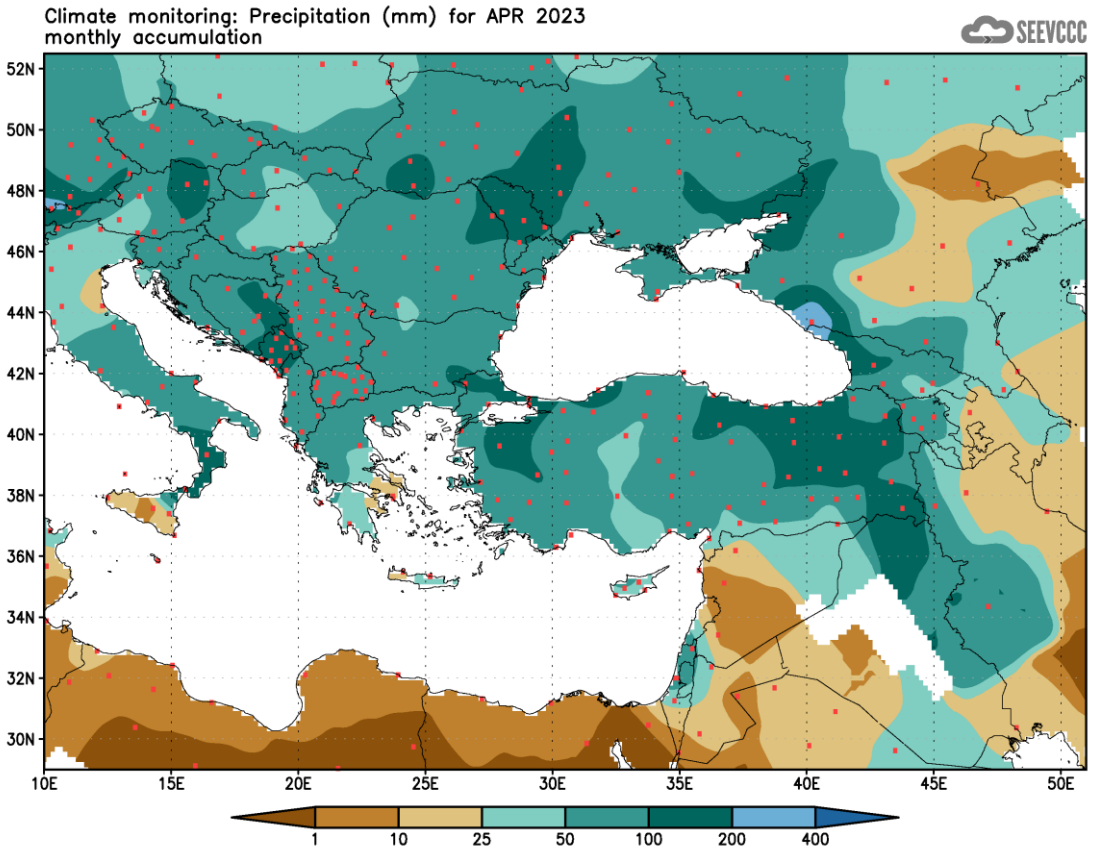


Figure 3a: Monthly precipitation sum (upper left), percentage of normal (upper right), absolute anomalies (lower left), and percentiles (lower right) for April 2023 (1991-2020 reference for percentages and anomalies, 1951-2010 for percentiles) in Europe/RAVI. Data from GPCC (First Guess version). Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_rrr.html?nn=16102



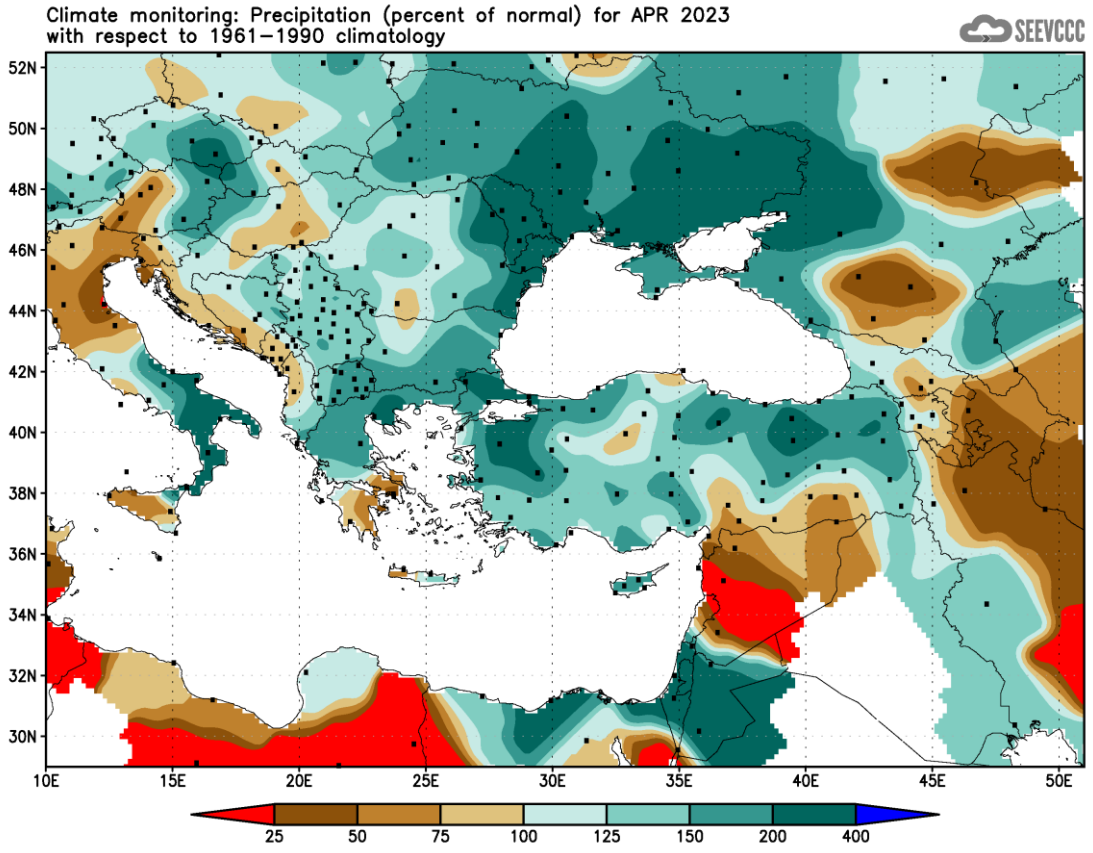


Figure 3b: Monthly precipitation sum in mm and percentage of normal (1961-1990 reference) in the SEECOF domain for April 2023. Source: SEEVCCC, http://www.seevccc.rs/?p=6

4. Temperature

Monthly mean temperature in April 2023 was below normal in western parts of the domain, particularly on the Balkan Peninsula. In eastern parts (eastern Ukraine, South Caucasus, Türkiye, Cyprus, Israel, Jordan), temperature was around or slightly above normal.

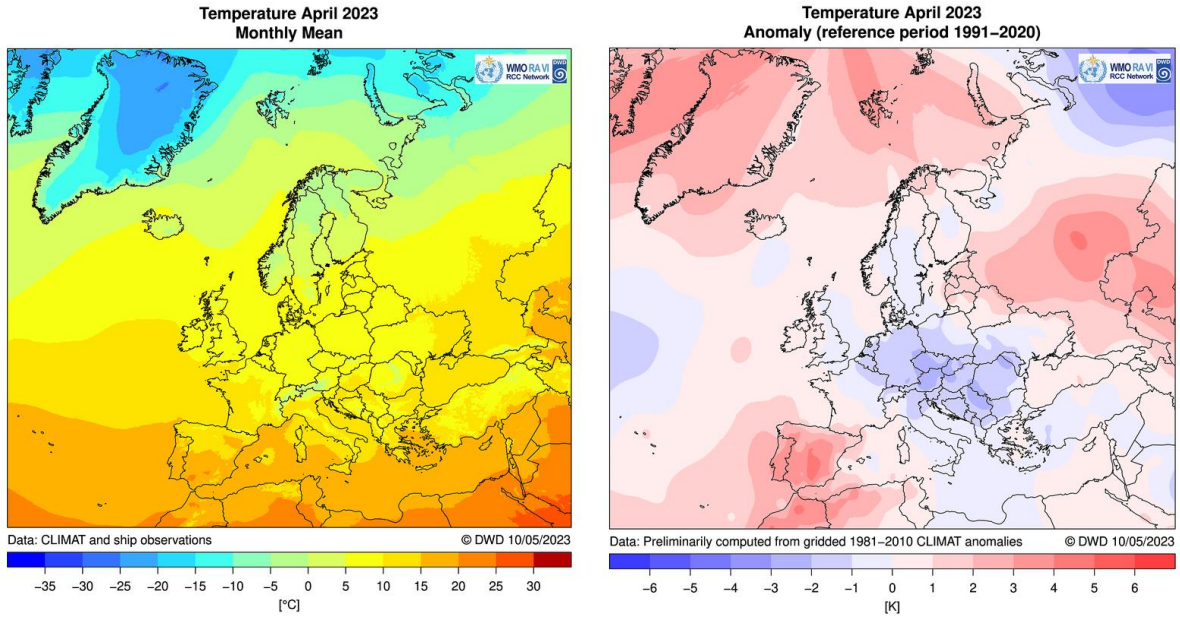


Figure 4a: Mean temperature and anomalies (1991-2020 reference) in °C in the RA VI domain for April 2023. Source: DWD, https://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ttt.html?nn=490674

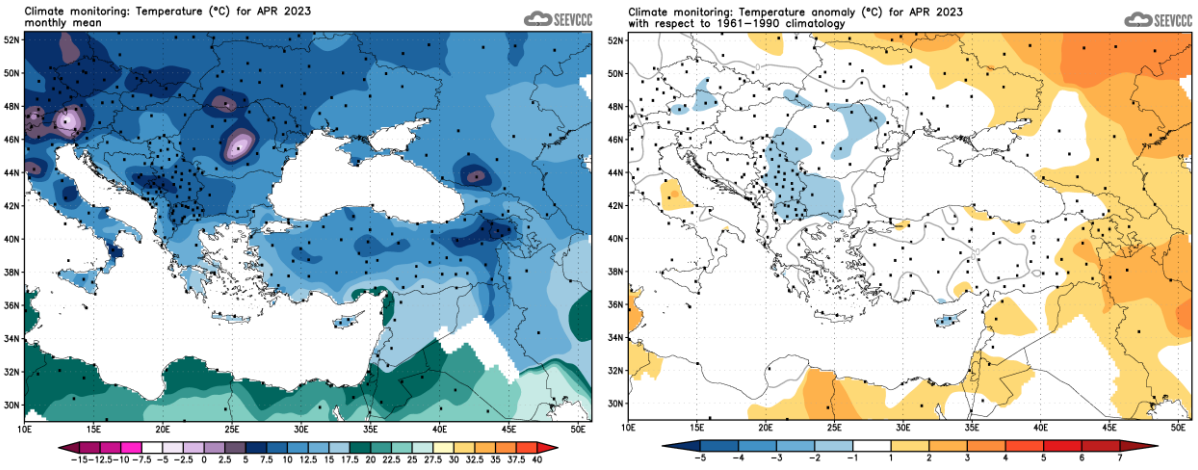


Figure 4b: Mean temperature and anomalies (1961-1990 reference) in °C in the SEECOF domain for April 2023. Source: SEEVCCC, http://www.seevccc.rs/?p=6

5. Soil moisture

Soil moisture is not only important for agrometeorology, but also for climate diagnostics. In case of long-lasting anticyclonic periods, a dry soil may amplify positive temperature anomalies (and the risk of heat waves) due to missing cooling by less evaporation. It has also impact on precipitation because less evaporation causes a lower water vapour content in the atmosphere and hence less precipitation (which dries out the soils further).

In April 2023, soils (near surface) were wetter than normal in almost the entire domain, except for Azerbaijan and elsewhere only in a few places.

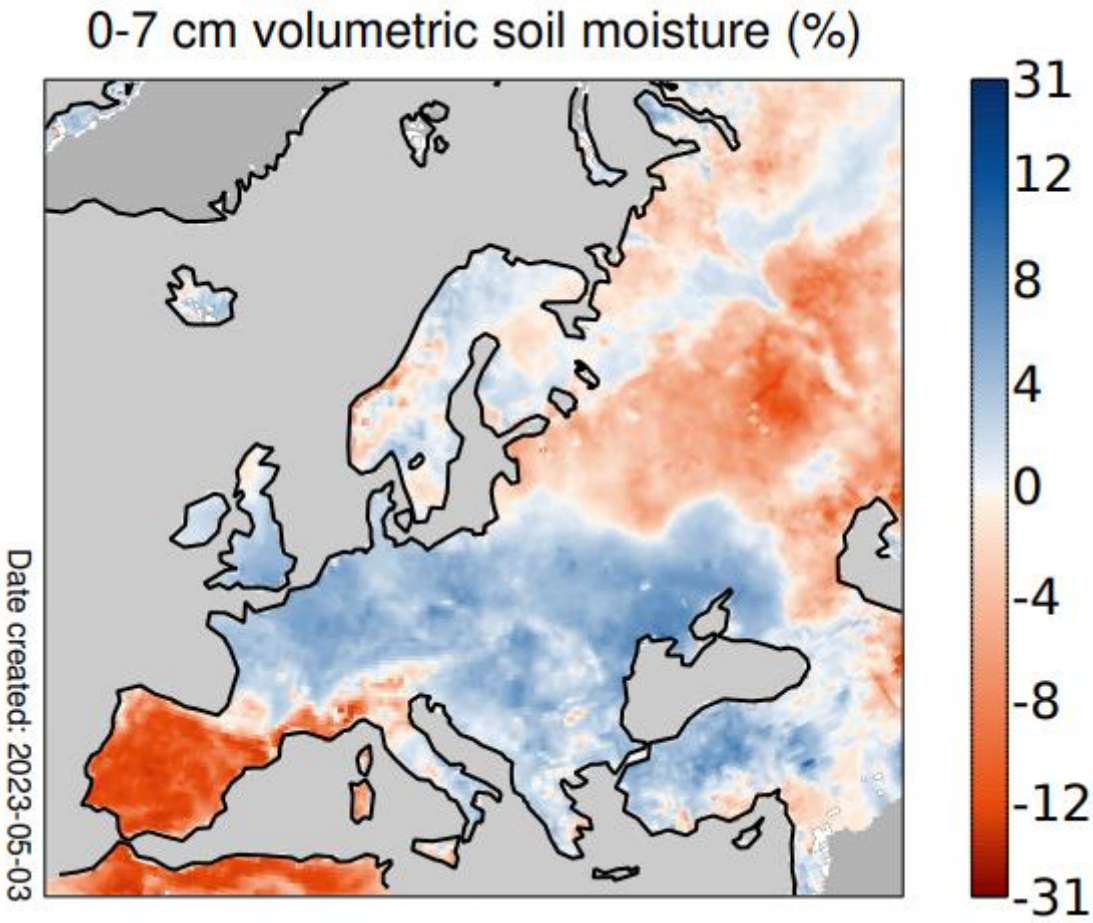


Fig. 5.1: Anomalies of soil moisture in Europe in % of the 1991-2020 normal in a depth layer of 0-7 cm. Data from ERA5 reanalysis. Source: Copernicus, https://climate.copernicus.eu/precipitation-relative-humidity-and-soil-moisture-april-2023

In May, moisture decreased to near normal values in most areas, except for some parts, like in the Ukraine. Soil moisture was mostly below normal in Armenia and Azerbaijan.

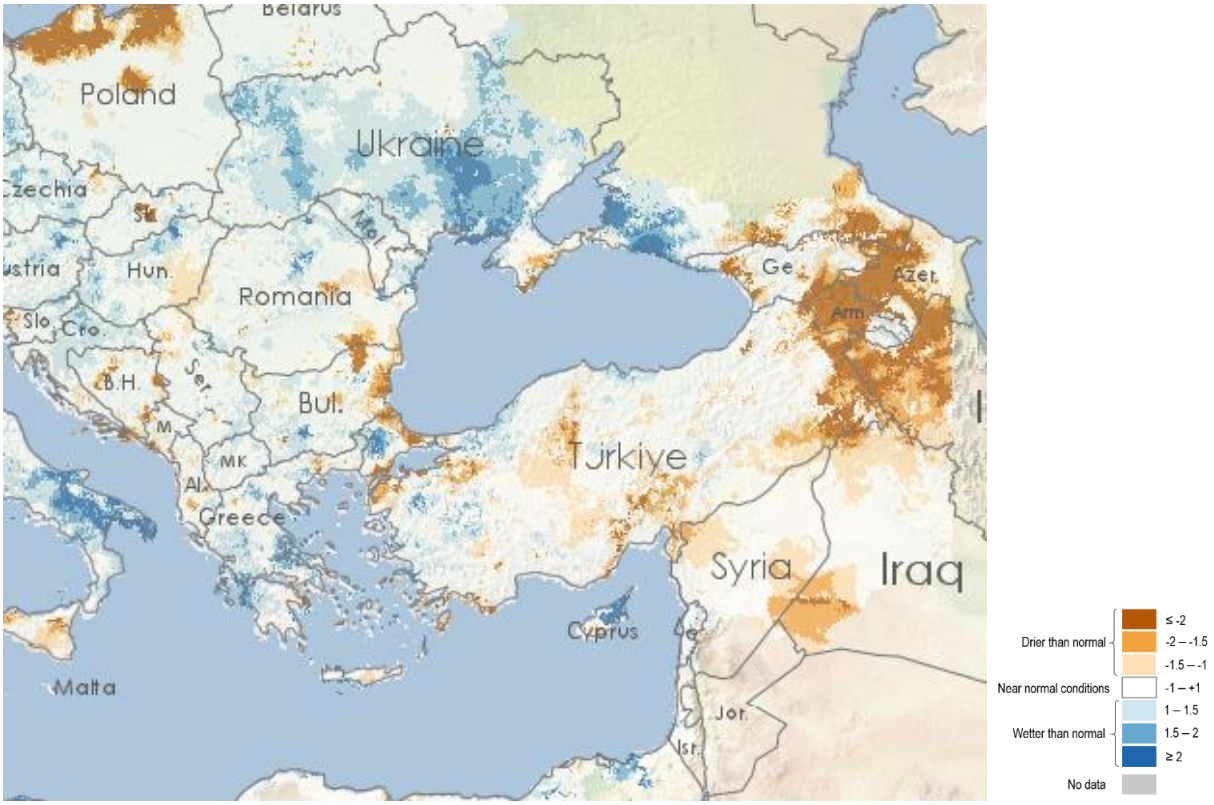


Fig. 5.2: Soil Moisture Index (SMI) anomaly for the first ten-day period of May 2023, 1995-2022 reference. Source: https://edo.jrc.ec.europa.eu/edov2/php/index.php?id=1111

6. Significant Events in April 2023 in the SEECOF region

4 April 2023: Serbia has been hit by huge snowfalls, and Belgrade reached 17cm of snow, the maximum snow depth ever recorded in April, with data since late 1800s.

10–12 April 2023: Heavy rainfall affected the far southern Israel (in particular the Southern Negev Region) on 10–12 April 2023, causing river overflows and flash floods that have resulted in casualties and damage. At least two fatalities had been reported across the Southern Negev Region, where the most affected areas were the towns of Eilat and Paran and the Aravah region.

14 April 2023: In Slovenia, 70 cm of fresh snow fell in 24 hours to 14 April 2023 on the Kredarica Mountain (2513 m altitude). The absolute depth on Kredarica was 330 cm on 18 April 2023.

16 April 2023: Several rivers in Ukraine broke their banks causing flooding in eight regions of the country, including the region around Kyiv. In total, around 950 households were affected. Teams from the State Emergency Service pumped water from hundreds of houses and yards across affected areas and helped to evacuate over 200 residents from flooded homes. Among the hardest hit areas was Chernihiv Oblast where 474 households had been impacted by overflows from the Dnipro, Desna, Seim, Sozh and Vyt rivers. Transport connections were disrupted leaving 29 settlements isolated. Wide areas of agricultural land had been flooded, including 7 198 hectares in Volyn Oblast and 3 065 hectares in the Rivne region.

20 April 2023: A large tornado (F1 on Fujita scale) hit the earthquake-relief camp in the area of Pazarcik City, Kahramanmaras Province, southeastern Türkiye on 20 April 2023, resulting in casualties and widespread damage. The tornado was strong enough to overturn cars and large vehicles, and devastated tents and containers, which had temporarily become the home of earthquake survivors. Roofs which were in construction were lifted and metal roof pieces were thrown onto tents. At least three fatalities were reported and about 150 injured people, including eight seriously injured. The province was previously hit by an extremely damaging earthquake and a series of destructive aftershocks in early February 2023, leaving over 47 000 people dead.

27 April 2023: At the end of the month, another cold spell spread over large parts of Central and Southeastern Europe, with daily minima around 0 °C or lower. Karajukića Bunari in southwestern Serbia recorded −3.2 °C in 2 m height above ground in the morning of 27 April while Kosanica in northern Montenegro recorded −8.1 °C.

7. Likely evolution of large-scale climate patterns in the next months (June–August 2023)

- El Niño will develop;
- Positive IOD will develop;
- Summer Blocking weather types more likely than others

References:

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

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

GPCC: http://gpcc.dwd.de

South East European Virtual Climate Change Center (SEEVCCC): http://www.seevccc.rs/

NOAA CPC NCEP ENSO discussion: http://www.seevccc.rs/SEECOF/SEECOF-29/STEP-2/CPC-NCEP-ENSO-diagnostic-discussion-11-May-2023.pdf

WMO Global Seasonal Climate Update: http://www.seevccc.rs/SEECOF/SEECOF-29/STEP-2/CPC-NCEP-ENSO-diagnostic-discussion-11-May-2023.pdf

BOM Climate Driver Update: http://www.bom.gov.au/climate/enso/index.shtml#tabs=Overview

Copernicus monthly report: https://climate.copernicus.eu/surface-air-temperature-april-2023