SOUTH EAST EUROPEAN CLIMATE OUTLOOK FORUM
SEECOF-27 Online Forum

MONITORING SUMMARY SEECOF-27

for April 2022

Final version

Last update: 30 May 2022

Compiled by

WMO RA VI RCC Toulouse Node on Long Range Forecasting

Météo France

Toulouse, France

South East European Virtual Climate Change Center (SEEVCCC)

hosted by Republic Hydrometeorological Service of Serbia, Republic of Serbia

WMO RA VI RCC Offenbach Node on Climate Monitoring

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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)
- Comments to the draft version of this documents
- Monitoring summary of MedCOF-18

1. Oceanic Analysis

Over the Pacific Ocean: La Niña:

- Below-average sea surface temperatures (SST) persisted during April 2022 across most of the central and eastern Pacific Ocean (Fig. 1.1), showing that La Niña is still present, even strengthening in the eastern part of the basin.
- La Niña in winter 2021/22 had a weaker peak than in winter 2020/21, but the development in the following spring was very different in these two years. In spring 2021, there was a clear tendency to a decay of La Niña, but in spring 2022 an intensification took place, suggesting that La Niña is rather continuing than decaying. Negative SST anomalies are quite strong for this time of year (Fig. 1.2).
- In the subsurface, anomalies in April were weaker than in March in the central Pacific, but spread over a larger area (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:

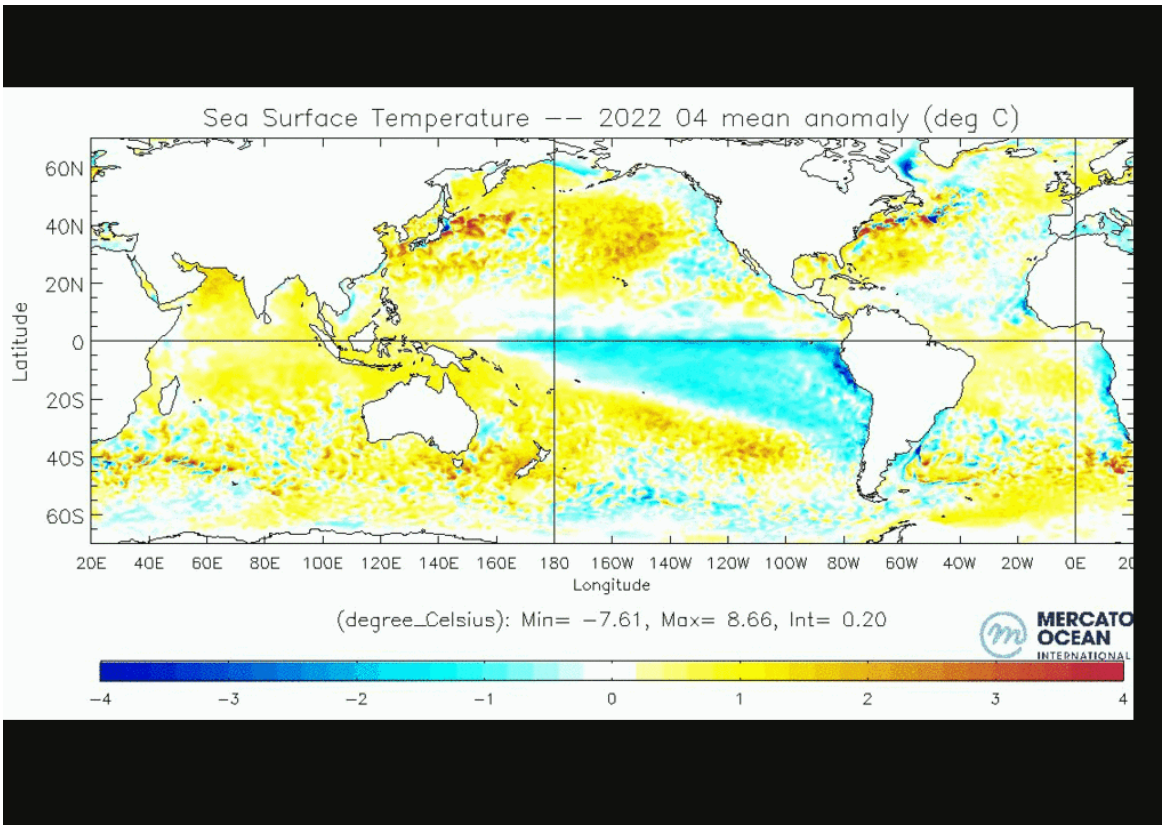
- Anomalies over the tropical Indian Ocean are quite weak.
- Indian Ocean Dipole (IOD) presently neutral, very weak gradient could be a beginning of a development to a negative IOD
- Very high warm anomalies close to India and the Arabic Peninsula (in April stronger than in March), and also warm anomalies around Australia and the maritime continent (little change compared to March)

Over the North Atlantic:

- Mostly weak anomalies in the tropics, warm over the equator except for the Gulf of Guinea (neutral). Neutral to cold anomalies in the tropical North Atlantic.
- Positive anomalies close to France and the North Sea, negative anomalies near the west coast of Iberia and West Africa

Over the Mediterranean and Black Sea:

- Western and central Mediterranean colder than normal
- Eastern Mediterranean and Black Sea close to normal SST.



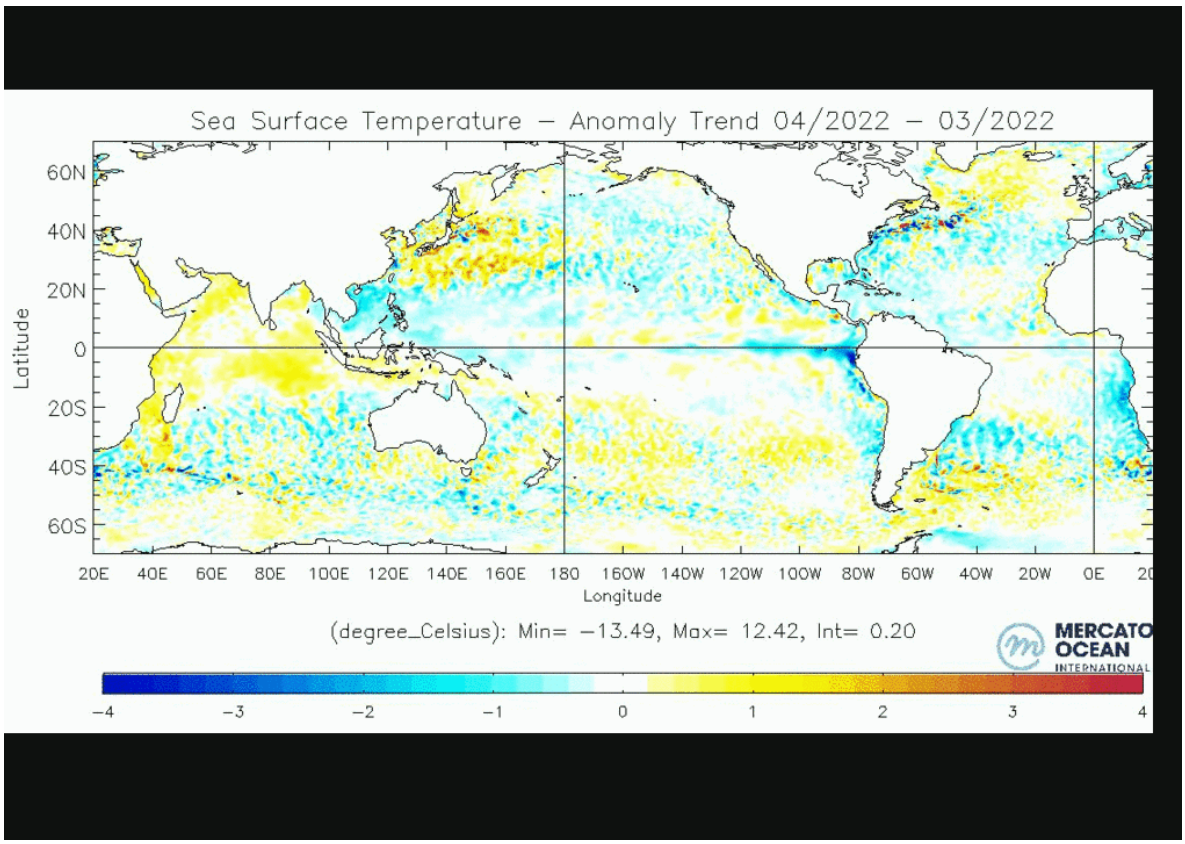


Figure 1.1: Sea surface temperature anomalies for April 2022, 1992-2013 reference (upper map) and anomaly differences April minus March 2022 (anomaly trend). Source: Météo France

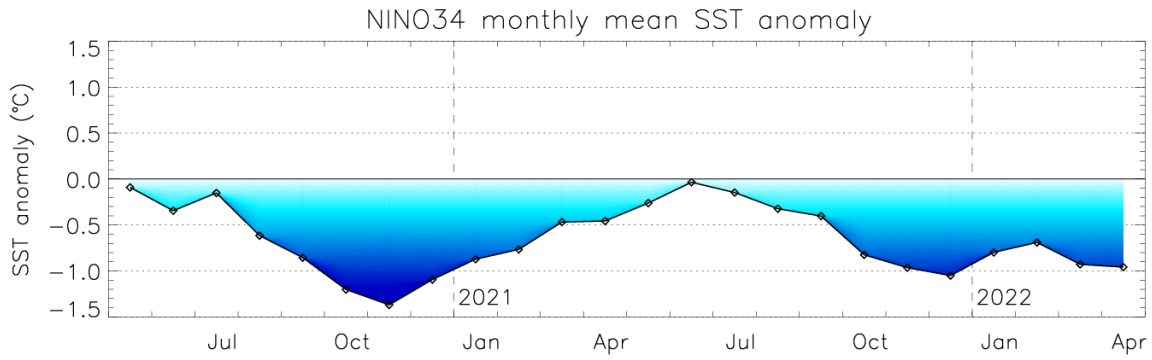


Figure 1.2: Evolution of sea surface temperature anomalies in the Niño3.4 box, 1992-2013 reference. Data from Mercator Ocean, source: Météo France.

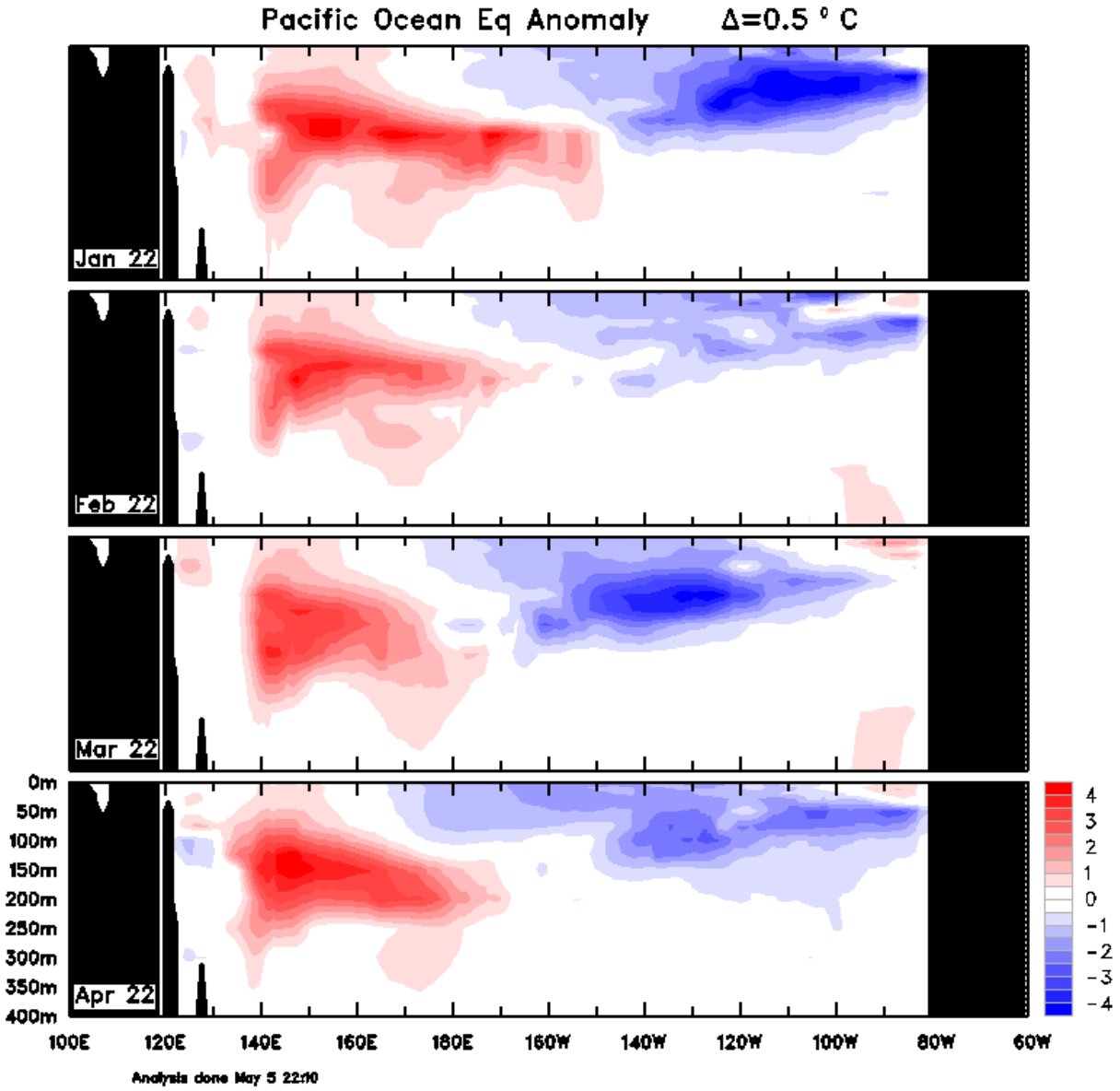


Figure 1.3: Monthly Pacific Ocean temperature anomalies in the sub-surface January-April 2022, 1900-1992 reference (Climatology after Levitus World Ocean Atlas). Source: BOM, http://www.bom.gov.au/climate/enso/index.shtml#tabs=Sea-sub%E2%80%93surface

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 tropical Pacific and close to Australia and the maritime continent, downward over the eastern tropical Pacific. Typical La Niña response and closely related to ocean anomalies.
- Still high positive SOI values (March +1.8, April +1.7 according to NOAA CPC, even stronger than during previous winter 2021/22)
  - https://www.ncdc.noaa.gov/teleconnections/enso/soi
  - http://www.bom.gov.au/climate/enso/index.shtml#tabs=Pacific-Ocean&pacific=SOI
- Another downward anomaly over the southern hemispheric part of the western Indian Ocean can be related to a beginning development of IOD induced circulation (together with the upward anomaly over the maritime continent).

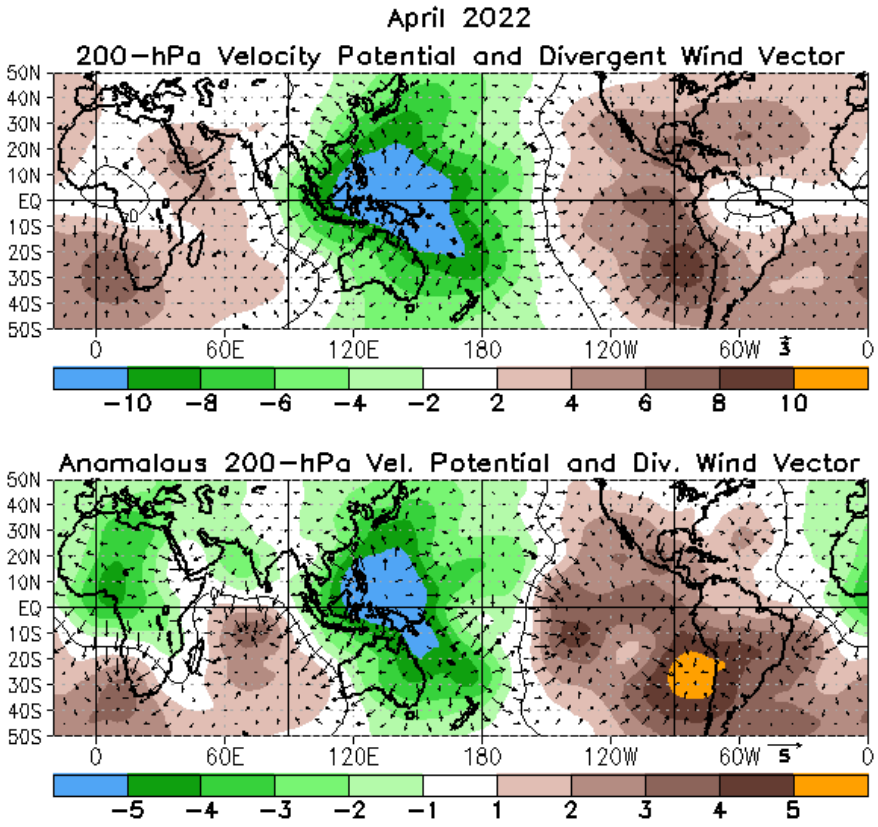


Figure 2.1.a: Velocity Potential monthly mean (upper map) and anomalies (lower map) at 200 hPa and associated divergent circulation mean and anomaly for April 2022. Green (brown) indicates a divergence-upward motion (anomaly) (convergence-downward motion anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

- MJO was weak during April 2022. In May 2022 there was a development first over the Indian Ocean and then further passing the maritime continent and the western Pacific, enhancing the Southern Oscillation upward motion, but at the end of May, MJO weakened again.

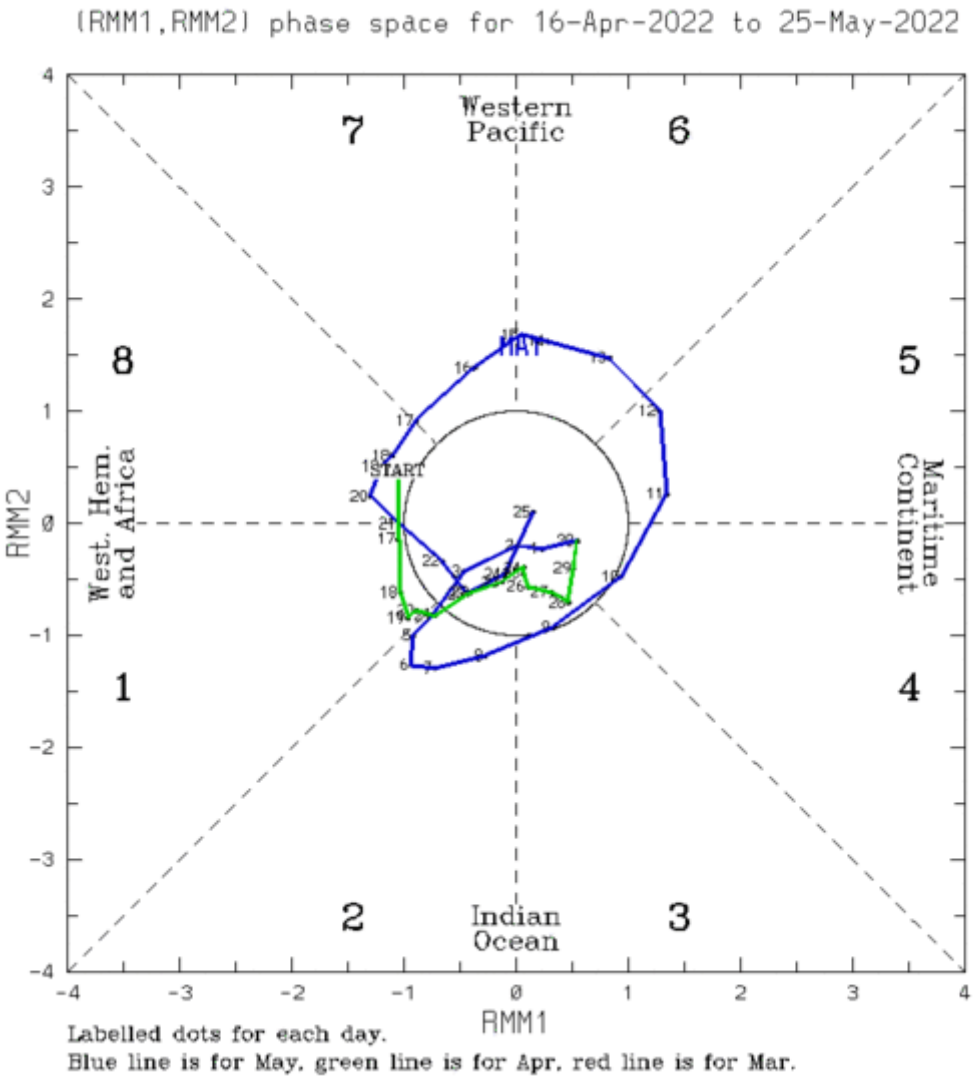


Figure 2.1.b: indices MJO

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

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

Over the eastern Pacific, a teleconnection pattern is visible reaching the middle latitudes in the northern hemisphere.

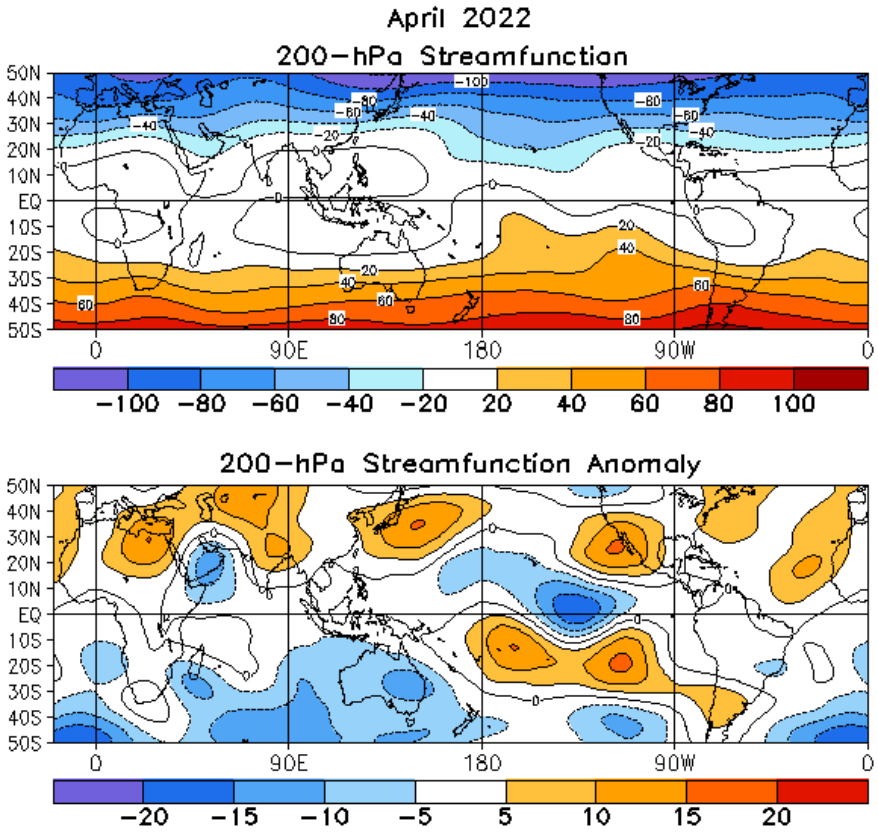


Figure 2.2: Stream Function and anomalies at 200 hPa in April 2022.

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):

- Negative PNA pattern in April 2022 (PNA index -0.74 according to NOAA, https://www.ncdc.noaa.gov/teleconnections/pna/). The shift of the jetstream over the North Pacific can be identified (Fig. 2.3), typical La Niña response.
- Over the North Atlantic and Europe, similar quadrupole structures can be seen, suggesting a propagation of PNA anomaly wave to Europe including the Mediterranean. The pattern is very similar to that of April of last year (2021), also with La Niña and negative PNA.
- Especially over the SEECOF region negative geopotential anomalies from the northern Balkans to the Ukraine, and positive anomalies over the eastern Mediterranean.

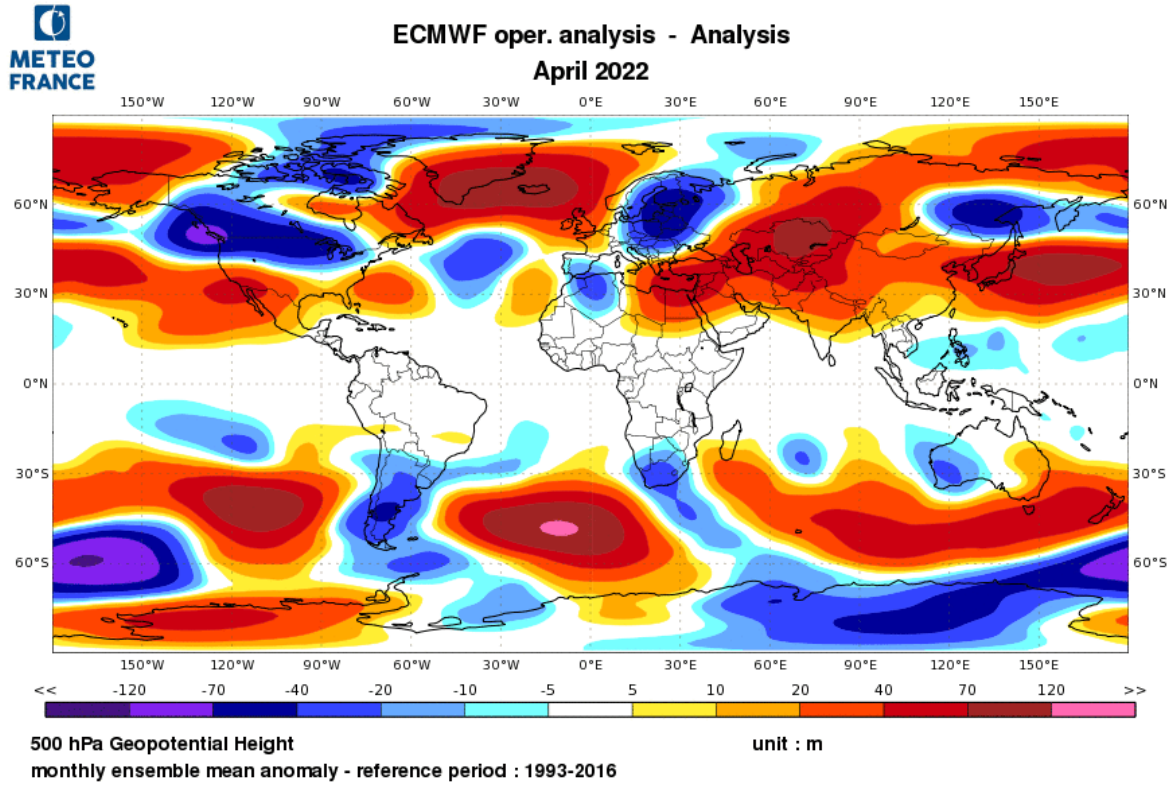


Figure 2.3: Anomalies of Geopotential height at 500hPa (ECMWF data),

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

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

- Rather meridional over the North Atlantic, NAO- and EA-.
- Over Europe and the Mediterranean only weak pressure differences.
- Russian High quite weak in Europe.
- SCAND- pattern brought some cold air advection to Europe
- NAO- and AO- on most days during April 2022, however, change to a positive phase in May.
- Météo France weather type classification shows NAO- and summer blocking as the most frequent types in April. Until late May there was a more frequent occurrence of zonal types then, pointing to a change of circulation from May 2022.

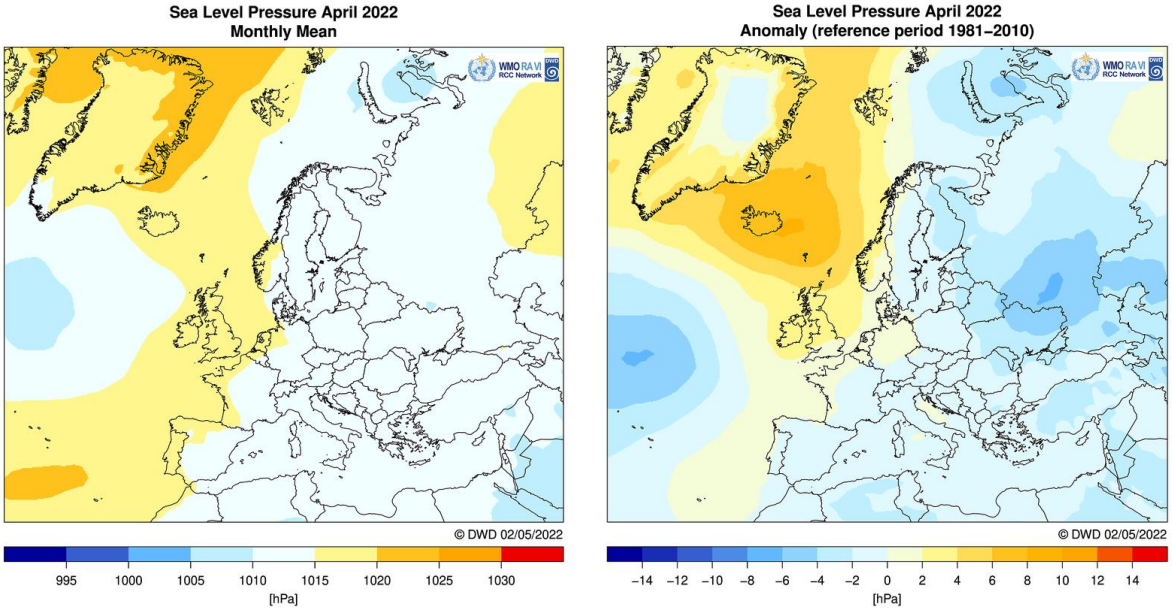


Figure 2.4: Mean sea level pressure over the North Atlantic, Europe and North Africa and 1981-2010 anomalies for April 2022. Source: DWD, https://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ppp.html?nn=490674

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
APR 22	-0.5	-0.9	0.3	-0.7	-1.0	---	-0.1	-0.7	-1.2
MAR 22	0.4	1.5	0.6	0.3	-0.2	---	1.4	1.0	-0.5
FEB 22	1.5	0.2	-0.4	-0.9	0.6	1.8	-0.9	-2.1	-1.6
JAN 22	0.7	-1.4	-1.4	0.5	0.6	0.7	1.1	-0.9	-0.3
DEC 21	0.2	-0.1	0.5	---	-2.9	-0.3	0.0	0.3	-0.5
NOV 21	-0.3	-0.9	-0.1	0.3	0.7	---	0.0	-0.8	0.5
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

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

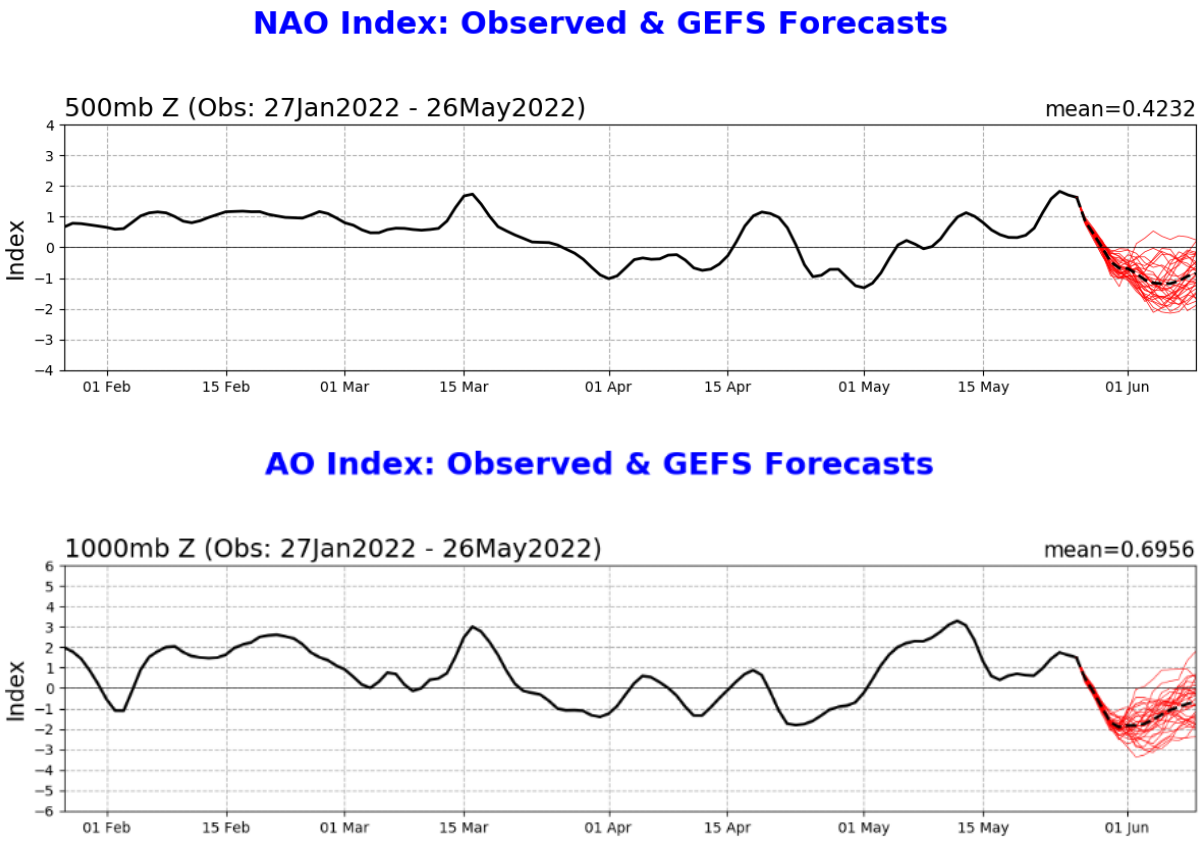


Figure 2.5: North Atlantic Oscillation (NAO) and Arctic Oscillation (AO) indices. Source: NOAA CPC, https://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

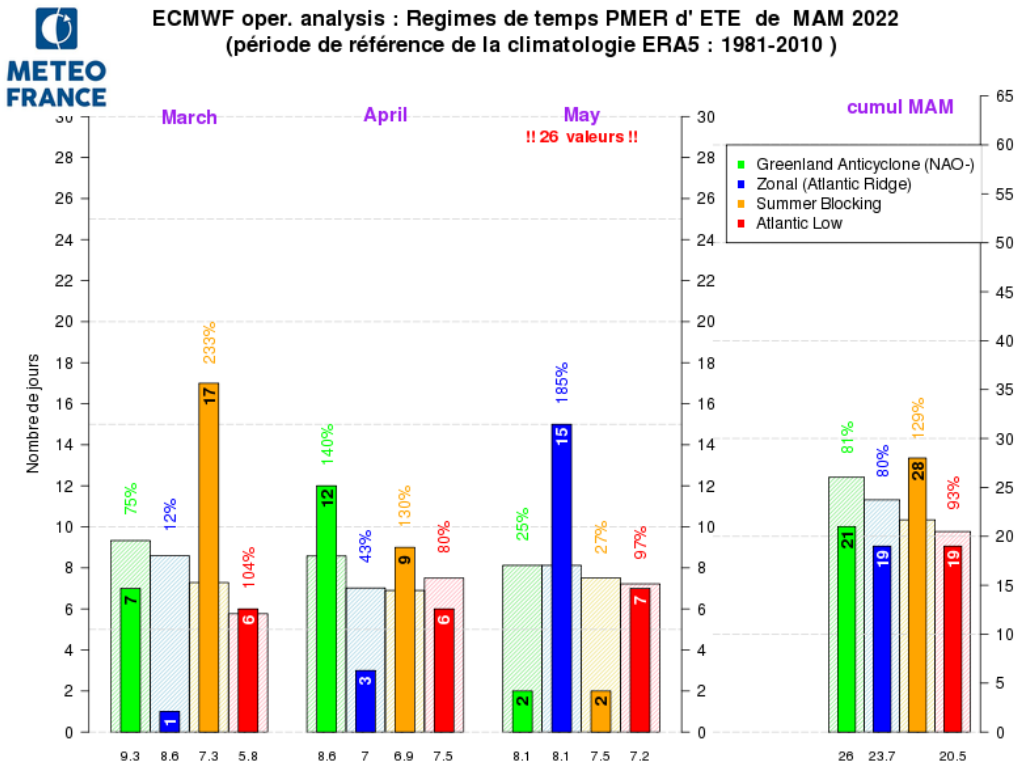


Figure 2.6: Distribution of weather types of Météo France classification (summer regime) for March-May 2022. Source: Météo France, http://seasonal.meteo.fr/en/content/suivi-clim-regimes-trim

3. Precipitation

Monthly precipitation in April 2022 was above normal (1991-2020 reference) in the Ukraine, in Moldova, Romania, northern Bulgaria and European Turkey. In the Ukraine, precipitation was even above the 90th percentile. It was below normal in the Eastern Mediterranean region, namely in southern Albania, North Macedonia, Greece, Turkey, Cyprus, South Caucasus and northern Israel, falling below the 10th percentile in some of these areas. In the other parts of the Balkans, precipitation was around normal. The precipitation distribution is much in line with the geopotential dipole (negative anomalies in the north, positive in the south, see above).

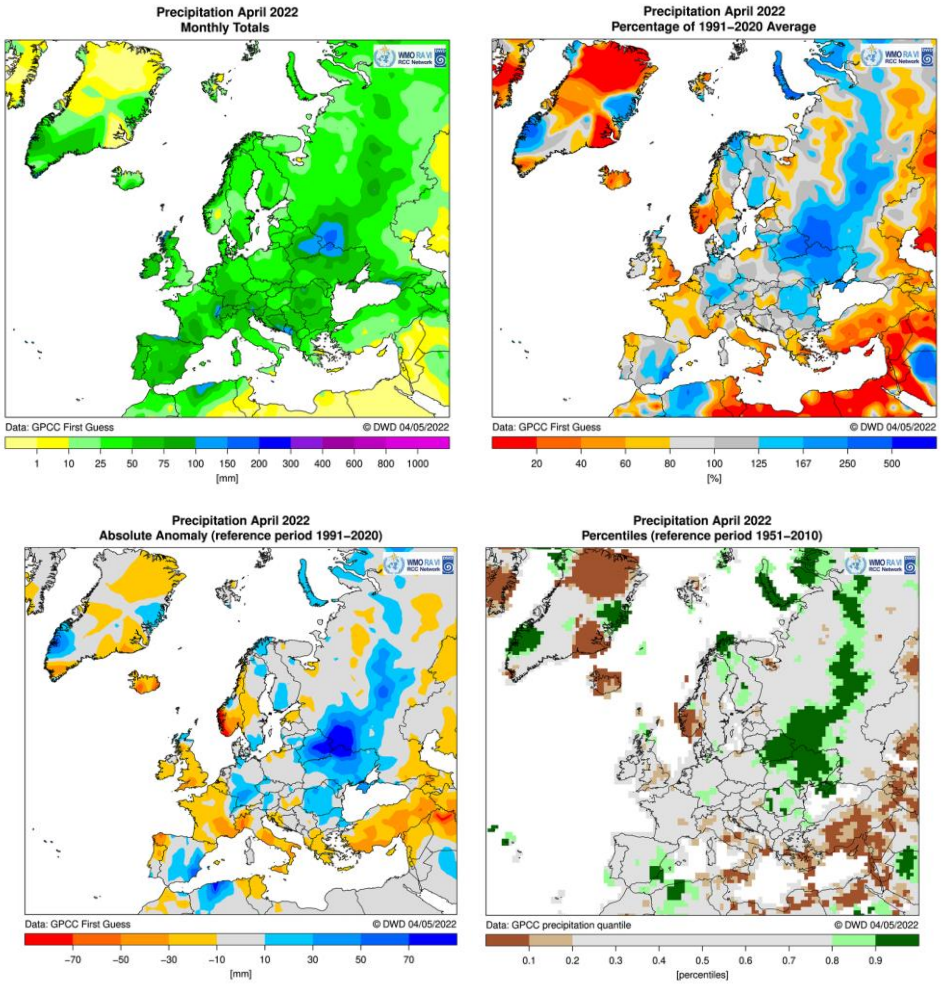


Figure 3a: Monthly precipitation sum (upper left), percentage of normal (upper right), absolute anomalies (lower left), and percentiles (lower right) for April 2022 (1991-2020 reference for percentages and anomalies, 1951-2010 for percentiles) in Europe/RAVI. Data from GPCC (First Guess version). Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_rrr.html?nn=16102

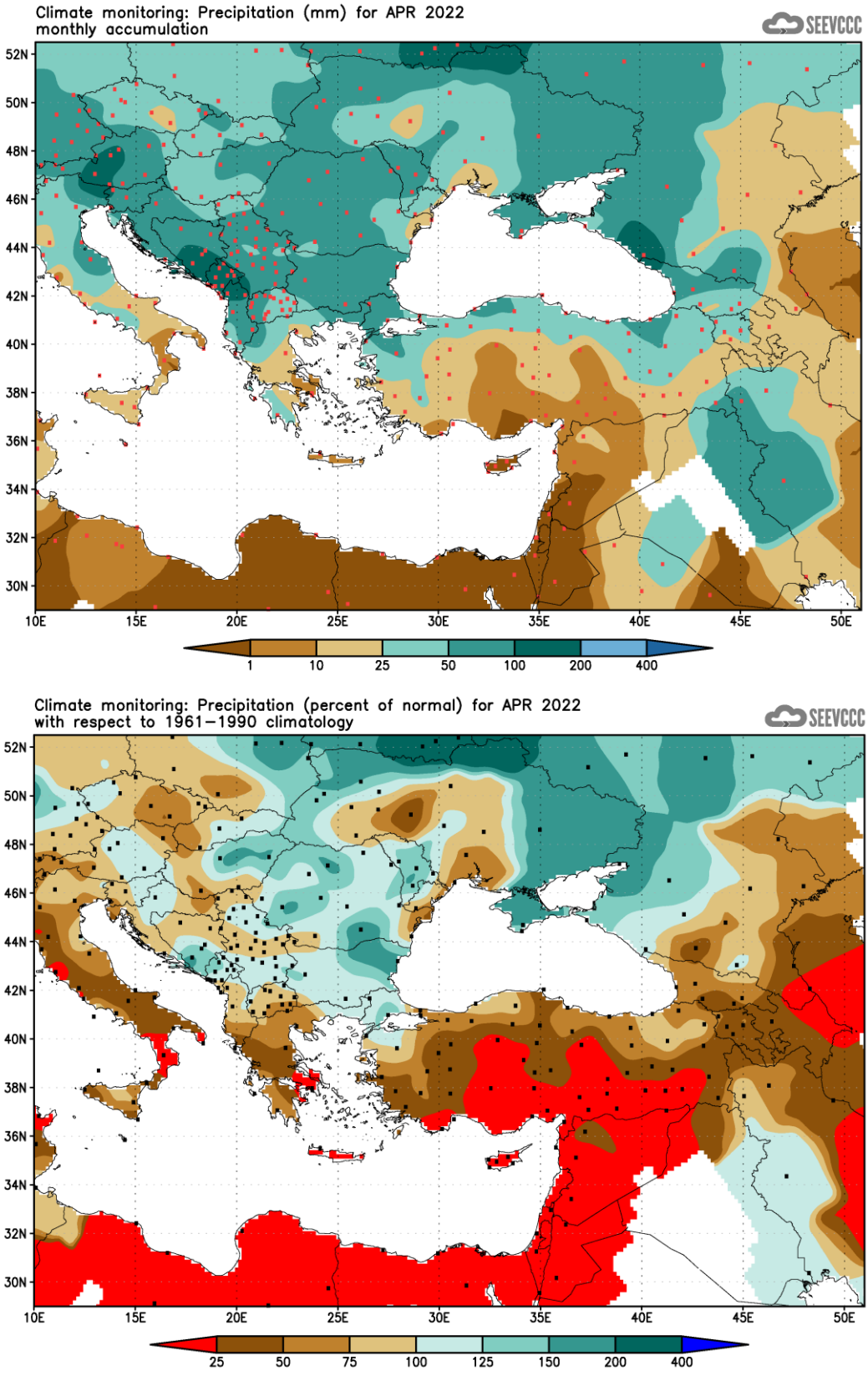


Figure 3b: Monthly precipitation sum in mm and percentage of normal (1961-1990 reference) in the SEECOF domain for April 2022. Source: SEEVCCC, http://www.seevccc.rs/?p=6

4. Temperature

Monthly mean temperature in April 2022 was around normal almost throughout the Balkans, but above normal in Greece, Turkey, South Caucasus and the Middle East. The latter was mainly due to heat waves at the beginning and the end of the month.

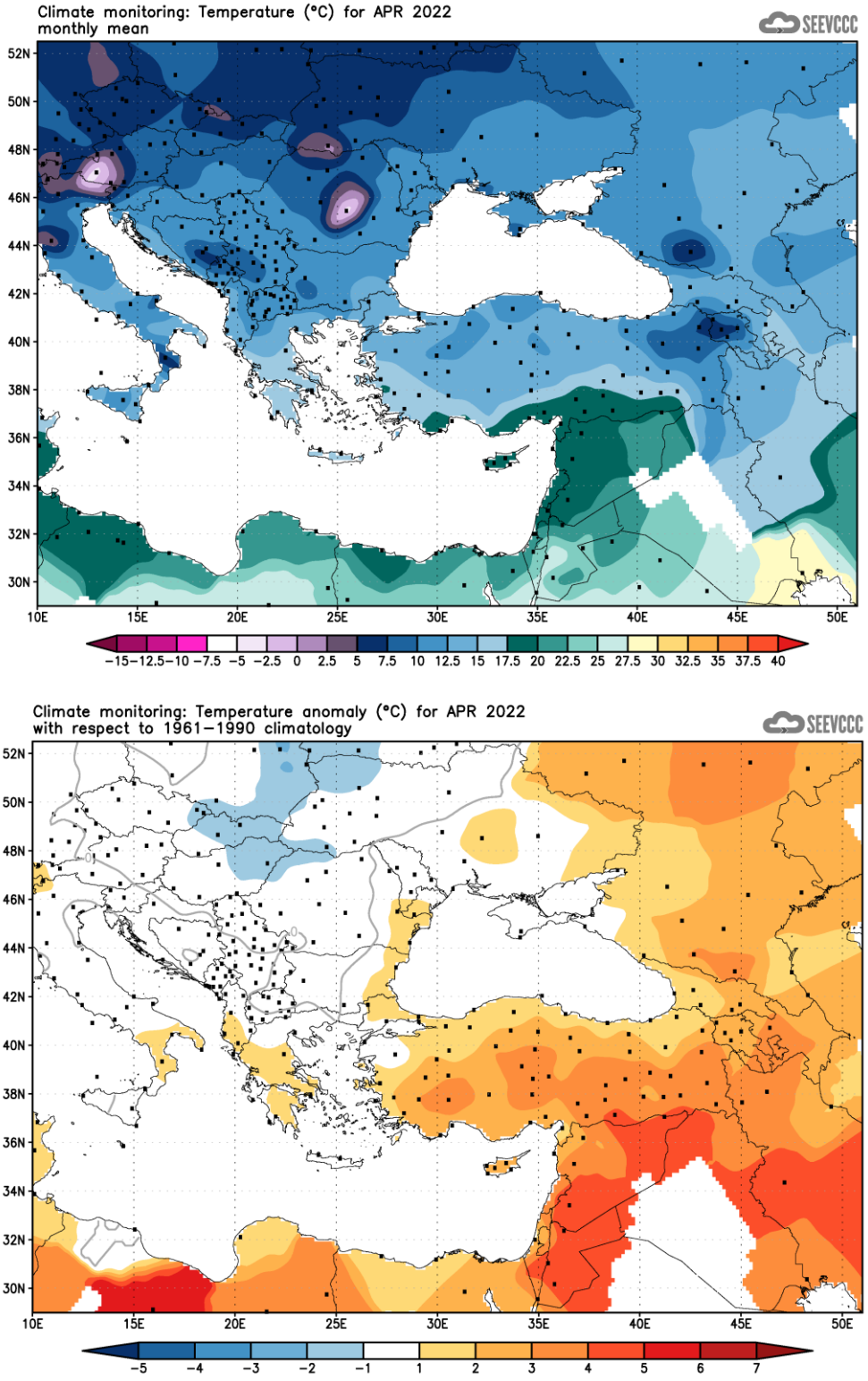


Figure 4: Mean temperature and anomalies (1961-1990 reference) in °C in the SEECOF domain for April 2022. Source: SEEVCCC, http://www.seevccc.rs/?p=6

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 2022, soils (near surface) were particularly drier than normal in the eastern Mediterranean region, especially in Turkey, and west of the Black Sea. Furthermore, some limited areas in Greece had drier-than-normal soils. Northern parts of the Ukraine had wetter-than-normal soils.

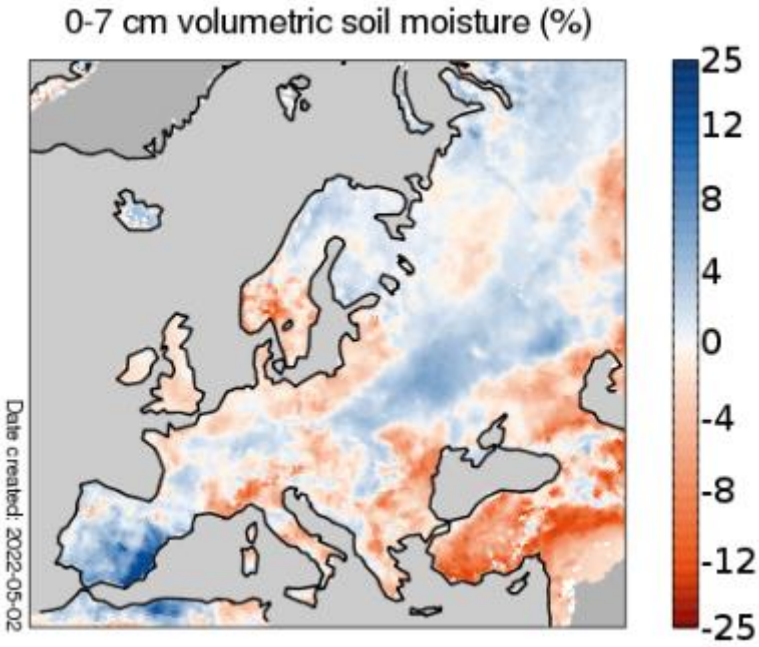


Fig. 5.1: Anomalies of soil moisture in Europe in % of the 1991-2020 normal in a depth layer of 0-7 cm. Data from ERA5 reanalysis. Source: Copernicus, https://climate.copernicus.eu/precipitation-relative-humidity-and-soil-moisture-april-2022

In May, moisture decreased to near normal values in some areas, which had formerly wet soils, like in the northern Ukraine. In the eastern Mediterranean, on the other hand, deficits of soil moisture became smaller due to some precipitation.

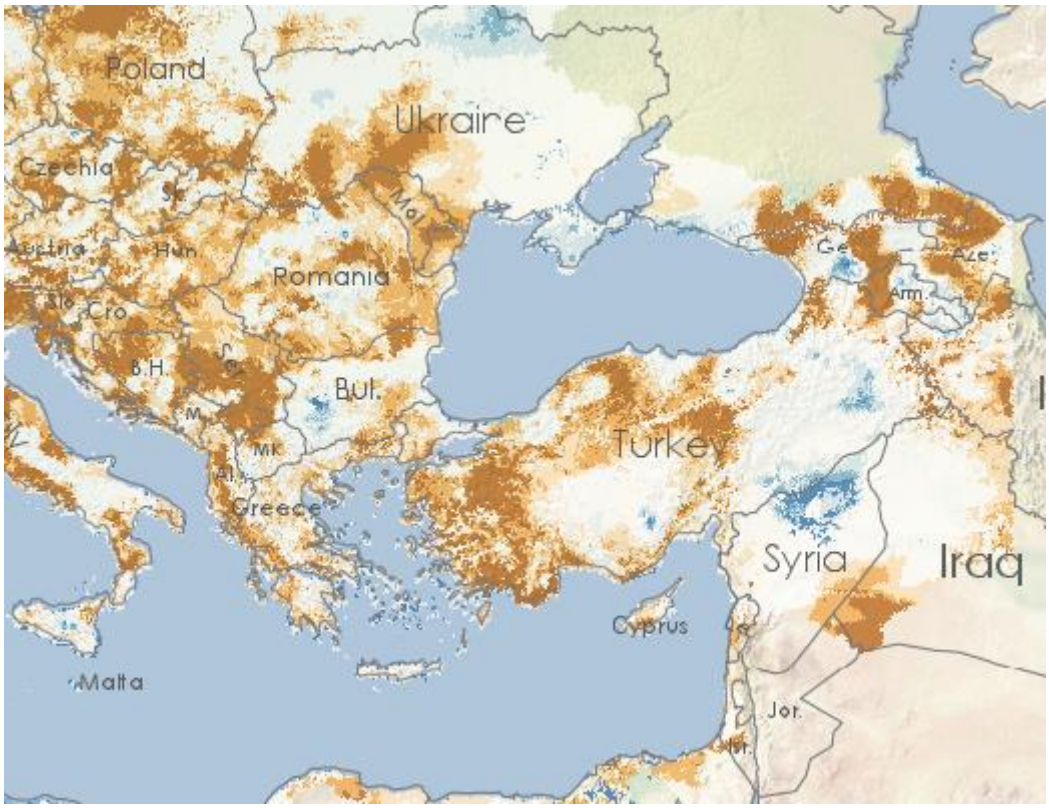


Fig. 5.2: Soil Moisture Index (SMI) anomaly for the second ten-day period of May 2022, 1995-2021 reference. Source: https://edo.jrc.ec.europa.eu/edov2/php/index.php?id=1111

6. Significant Events in April and May 2022 in the SEECOF region

6 April 2022: Several heat waves occurred over large areas in northern Africa and the Arabian Peninsula that month, and this affected also the Middle East countries Israel and Jordan. Daily maxima of 42.0 °C were recorded in both countries on 6 April 2022, record heat for that time of year.

20 April 2022: Serbia was under unusual wintry conditions with frost and snow on the mountains. Fresh snow on mountains in Serbia led to significant snow depths: Kopaonik 35 cm, Karajukica Bunari 22 cm, Kukavica 20 cm.

23-26 April 2022: Another heat wave came up late in the month from 23 April 2022, affecting particularly Turkey and Cyprus with daily maxima up to above 35 °C. Adana in Turkey measured 37.8 °C that day, Lefkoniko in Cyprus 34.8 °C on 24 April.
The heat wave extended even further north up to the Caucasus region. Temperatures around or above 30 °C in these days were measured in several places in Georgia, Azerbaijan, Armenia.

25 April 2022: Several dust storms (Saharan dust) had been observed in the Mediterranean region in late April. In particular, severe dust storms were affecting parts of the Middle East. On Monday, 25 April 2022, authorities in Jordan ordered schools in the south of the kingdom to close due to the heavy spread of dust. Especially schools in the governorates of Karak, Tafila, Aqaba and Maan were closed.

13 May 2022: Hungary noted a new local daily record for minimum temperature in the capital Budapest on 13 May 2022. After a summery warm day, the night to 13 May was also very mild in most of the country. Budapest temperature dropped to only 20.9 °C, setting the highest daily minimum temperature record in the capital. The previous record was 18.2 °C, which was recorded in 1958 at Budapest Istvánmező, Budapest Highway, and in 2003 also at Mellmányos station.

20 May 2022: Some frosts were recorded in Turkish Highlands, also +0.6°C at Ankara Airport. Very cold and rainy in Georgia, only 12.2°C the maximum temperature at Kutaisi, very rare for late May.

References:

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

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/