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Annual Bulletin on the Climate in WMO Region VI

– Europe and Middle East –

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Albania
Armenia
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Denmark
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Israel
Italy
Latvia
Lithuania
Luxembourg
Moldova
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Romania
Russia
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Türkiye
Ukraine
United Kingdom

Contents

1. Introduction

The Annual Bulletin on the Climate in WMO Regional Association VI (RA VI Europe with 50 Members) provides an overview of climate characteristics and phenomena in Europe (as defined by the area of the WMO RA VI region, see **Fehler! Verweisquelle konnte nicht gefunden werden.**) for the preceding year. It is mainly based on dedicated national reports from RA VI National Meteorological and Hydrological Services (NMHSs) as well as general climate monitoring information from their official websites. The Annul Bulletin provides an excellent example of international collaboration across cultural and political borders since its first publication in 1994. The Annual Bulletin is seen as a regional contribution to WMO's climate system monitoring, complementing and detailing well-known regular global assessments, such as WMO's annual "State of the Global Climate" (WMO 2023b), the "State of the Climate" published in the Bulletin of the American Meteorological Society (BAMS, Bissolli 2023), and the new regional "State of the Climate in Europe" report (WMO 2023a), published jointly by WMO and Copernicus. The evolution of the RA VI Regional Climate Centre Network (RCC Network) allowed adding a couple of RA VI-wide maps in order to provide a certain degree of consistency across the information and the national borders. Otherwise, basic methodologies for, and operations of, climate monitoring activities still differ among the various RA VI NMHSs. Maps and information compiled in this Annual Bulletin are the result of a selection process and are mainly taken from reports, maps and statistics provided by the NMHSs, websites of NMHSs as well as the webpages of the RA VI RCC Network (RCC website), The Annual Bulletin is intended to serve primarily NMHSs in the RA VI Region but it might also be interesting for public institutions, research institutes, universities and others.

This structure of the Annual bulletin has been revised and includes now the following major sections: "Major circulation patterns", "Climate in the RA VI region" and "Extreme and high-impact events". The long time series of temperature, precipitation and sunshine duration provided by NMHSs in order to illustrate long-term variability up to 2022 (previously presented in section 5) will be made available on the RA VI webpages.

Notes:

Maps of the RA VI RCC Network are based on the following data sources:

- Temperature: CLIMAT data and ship observations provided by the Global Collecting Centre (GCC), operated by the Deutscher Wetterdienst
- Precipitation: Global Precipitation Climatology Centre (GPCC; Schneider et al. 2018), operated by the Deutscher Wetterdienst
- Sunshine: Meteosat satellite data (introduced in 2018).

1.1. Definition of subregions

The following subregions are used in this bulletin:

Western Europe (6 countries):

Ireland, United Kingdom, Netherland, Belgium, Luxembourg, and France

Central Europe (7 countries):

Germany, Switzerland, Austria, Poland, Czechia, Slovakia, and Hungary

Nordic and Baltic Region (9 countries/territories):

Denmark, Estonia, Finland, Greenland, Iceland, Latvia, Lithuania, Norway, and Sweden

Iberia (3 countries):

Andorra, Portugal, and Spain

Central Mediterranean region (12 countries):

Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Italy, Malta, Monaco, Montenegro, North Macedonia, Serbia, and Slovenia

Eastern Europe (6 countries):

Belarus, European Russia, Moldova, Romania, Ukraine, and western Kazakhstan

Middle East (5 countries):

Cyprus, Israel, Jordan, Lebanon, and Syria

Türkiye and South Caucasus (4 countries):

Armenia, Azerbaijan, Georgia, and Türkiye

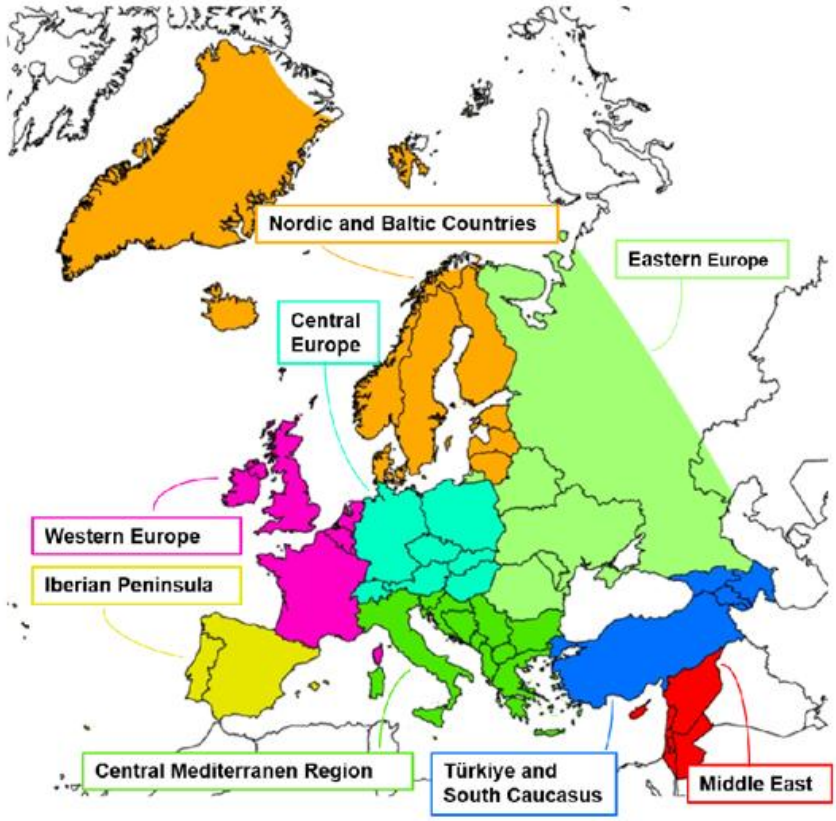

Figure 1-1: *Definitions of the eight subregions used in this bulletin.*

1.2. The climate in 2022 – Overview

Unless stated otherwise, 1991–2020 is the base period used throughout this report. All seasons mentioned refer to the Northern Hemisphere.

1.2.1. Anomalies

Temperature

Based on the data provided by the WMO RA VI RCC Node on Climate Monitoring (RCC-CM), the RA VI land areas experienced their fourth warmest year since 1981 with an anomaly of +0.8°C. Temperature were higher than normal across the whole RA VI land areas. Largest anomalies occurred over large parts in the southwest as well as over some parts in the northeast and southeast with anomalies between +1 °C and +2 °C. For the Iberian Peninsula and Western Europe, it was the warmest year on record. Many countries in these subregions, but also in others, reported their warmest year on record (see **Table 3-1**). Spain, France and Switzerland were among the countries reporting the largest national anomalies (+1.6°C to 1.7 °C). All seasons except spring were warmer than normal in all subregions. Summer was the second warmest on record for RA VI land areas. The highest positive seasonal anomaly occurred over the Iberian Peninsula in summer (+2 °C), the highest negative anomaly over Eastern Europe in spring with −0.9°C.

Precipitation

Precipitation amounts across the RA VI Region were mostly near normal or lower than normal in 2022. For the RA VI land areas as a whole, the annual precipitation was below normal (93%). Only Eastern Europe had slightly more rainfall than normal with an anomaly of 103% of normal (due to notably wetter-than-normal winter and autumn seasons), all other subregions saw less precipitation than normal. Spring and Summer were particularly dry with large areas receiving only 60% to 80% of normal precipitation, marking the fourth and second driest on record for the RA VI land areas as a whole. For several countries these two seasons ranked among the top five driest on record.

Sunshine Duration

Sunshine totals were mostly above normal during 2022, especially in Central and Western Europe as well as the Central Mediterranean Region: In parts of these subregions, anomalies between 200 and 500 hours were recorded, for example in Germany, France, the Benelux countries, Switzerland and northern Italy. The lowest sunshine duration anomalies occur in autumn. Parts of Eastern Europe, Türkiye and the Iberian Peninsula, on the contrary, saw below-normal sunshine totals.

1.2.2. Selected significant events

- March saw extreme drought conditions over large parts of the RA VI Region
- Warmer-than-normal summer with severe heatwaves and forest fires in the southern parts
- Heavy precipitation affected Slovenia and Croatia in September 2022
- Cold wave in December caused anomalies up to −5 °C in Iceland

The events listed above are described in more detail in section 4. More events with detailed descriptions can be found in the Monthly Event Calendar on the RCC website.

2. Major circulation patterns

This chapter about atmospheric circulation provides information on selected northern hemisphere teleconnection indices relevant for WMO RA VI and discusses influences of circulation patterns upon anomalies and outstanding events. The discussion partly refers to atmospheric circulation patterns in the mid-/upper troposphere not shown here (see NOAA NCEI Products and NOAA CPC Products).

2.1. Seasonal sea level pressure anomalies and circulation indices

Winter. The 2021/2022 winter was characterised by above-normal surface pressure positive western Europe and below-normal surface pressure over the Nordic countries and eastern Europe. As a result, dry and warmer-than-average conditions prevailed over western Europe (in particular Spain). Fennoscandia, the Baltic countries and eastern Europe, in contrast, saw colder- and wetter-than-average conditions. Both the NAO and the AO were positive, particularly due to a strong positive phase in February, which was accompanied by a strong jet stream and contributed to strong storm activity in northern Europe.

Spring saw higher-than-normal surface pressure especially in the North Sea Region. This so-called Scandinavian Blocking pattern contributed to warmer-than-average temperatures in northern Europe while southeastern and eastern Europe saw below-average temperatures. Due to the prevailing anticyclonic conditions large parts of the RA VI Region experienced drier-than-normal conditions

Summer. Anticyclonic conditions prevailed especially over southwestern parts of the RA VI Region, associated with positive surface pressure anomalies stretching from the North Atlantic, over the United Kingdom, Ireland and the Baltic countries to northwestern Russia. These atmospheric conditions contributed to record-breaking temperatures and dry conditions affecting large parts of the RA VI Region during these months.

Autumn. The circulation during autumn was dominated by negative surface pressure anomalies over Greenland and the North Atlantic to the west of the United Kingdom and Ireland, and positive pressure anomalies over the Mediterranean and southern Europe. This pattern was associated with warm southwesterly winds blowing towards western Europe, bringing warmer-than-average conditions to this part of the continent, particularly in October.

Table 2-1: *Seasonal mean values of selected northern hemisphere teleconnection indices standardized to the 1981–2010 reference. Blue and yellow colours indicate index values lower than −1 and greater than 1 respectively.*

Season	AO	NAO	EA	EA/WR	SCA	POL
Winter 2021/2022	0.86	0.79	-0.42	0.05	-0.89	-0.83
Spring 2022	0.31	0.19	0.23	0.74	-0.42	-0.73
Summer 2022	-0.07	0.63	1.10	-1.70	0.16	-0.53
Autumn 2022	0.34	-0.37	0.09	-0.33	0.64	0.08

Note that all values are standardized with the reference 1981–2010. North Atlantic Oscillation (NAO); East Atlantic Pattern (EA); East Atlantic/West Russia Pattern (EA/WR); Scandinavia Pattern (SCA); Polar/Eurasia Pattern (POL); Arctic Oscillation (AO)
(**Sources**: NOAA CPC Indices and NOAA CPC Monthly AO Index)

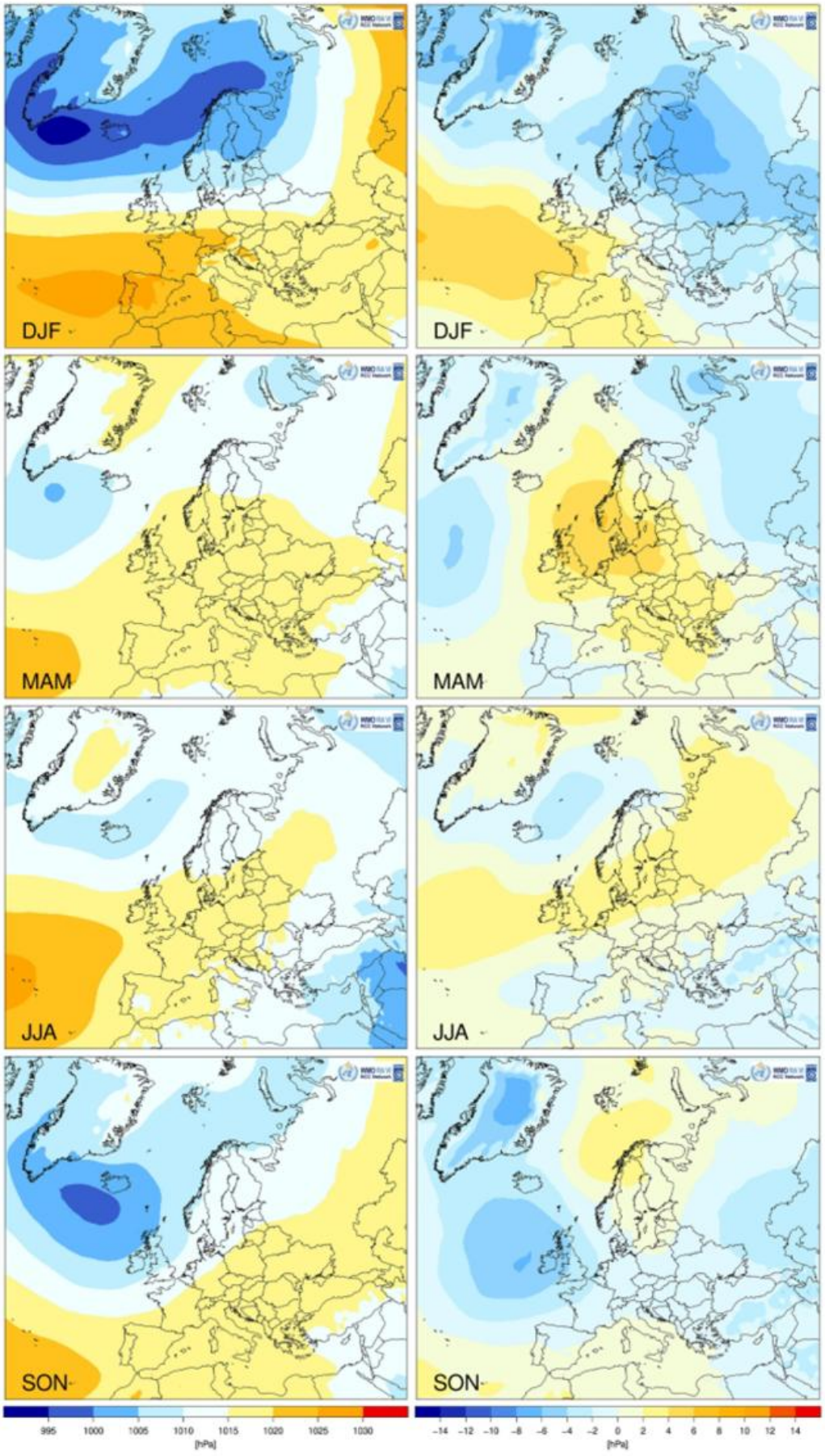

Figure 2-1: *Seasonal sea level pressure in hPa (left) and anomalies in hPa relative to 1981–2010 (right) for winter (DJF), spring (MAM), summer (JJA) and autumn (SON) 2022. Winter values relate to December 2022 – February 2022. Source: RCC-CM website.*

2.2. Monthly sea level pressure anomalies and circulation indices

Monthly anomalies reveal atmospheric circulation patterns not always captured by the seasonal averages. The discussion below focuses on those months when circulation anomalies or the anomalies used to describe the climate in the RA VI Region (temperature, precipitation and sunshine) were most pronounced.

February: Positive NAO phase. The month was dominated by above-normal surface pressure over southwestern Europe and below-normal pressure over northern parts. This pattern resulted in a stronger-than-normal westerly flow advecting warm maritime air over Europe especially over western and central parts and causing several intense storms affecting Northwestern and Central Europe.

March: **Scandinavian Blocking**. Persistent high pressure over Scandinavia caused warm anomalies in northern Europe and cooler temperatures in the south

June–July: Anticyclonic dominance. High-pressure systems over western/northwestern Europe favoured anticyclonic dry weather and led to record-breaking heatwaves, with June and July ranking among the warmest months in many countries (see **Table 3-5**).

October: Warm airflow: Negative pressure anomalies over the eastern North Atlantic and positive anomalies over southern Europe channelled warm air into western Europe, making it the warmest October on record for the RA VI land areas as a whole. Due to a combination of scarce rainfall and unusually high temperatures, surface soils stayed dry across much of the RA VI Region-including the Iberian Peninsula, the Central Mediterranean, and the Middle East-even though they would normally be expected to become wetter.

December: **Negative NAO/AO phases**. High surface pressure over Greenland and low pressure over the North Atlantic brought cold spells to northern Europe, while southern regions remained anomalously warm

More details on the monthly circulation and sea level pressure anomalies can be found in the 'Monthly Bulletins of the individual months.

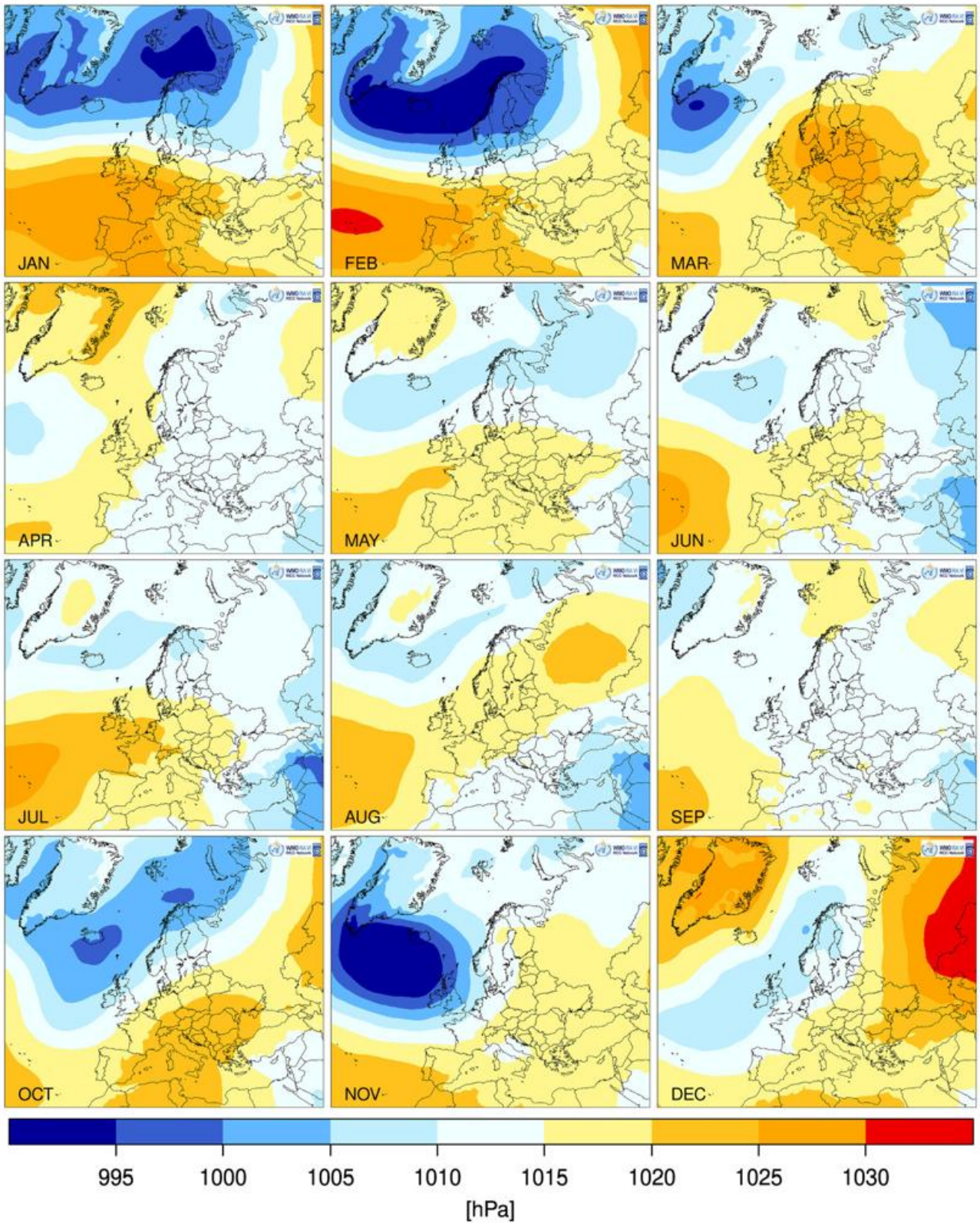

Figure 2-2: *Monthly mean sea level pressure in hPa for each month of the year 2022. Source: RCC-CM website.*

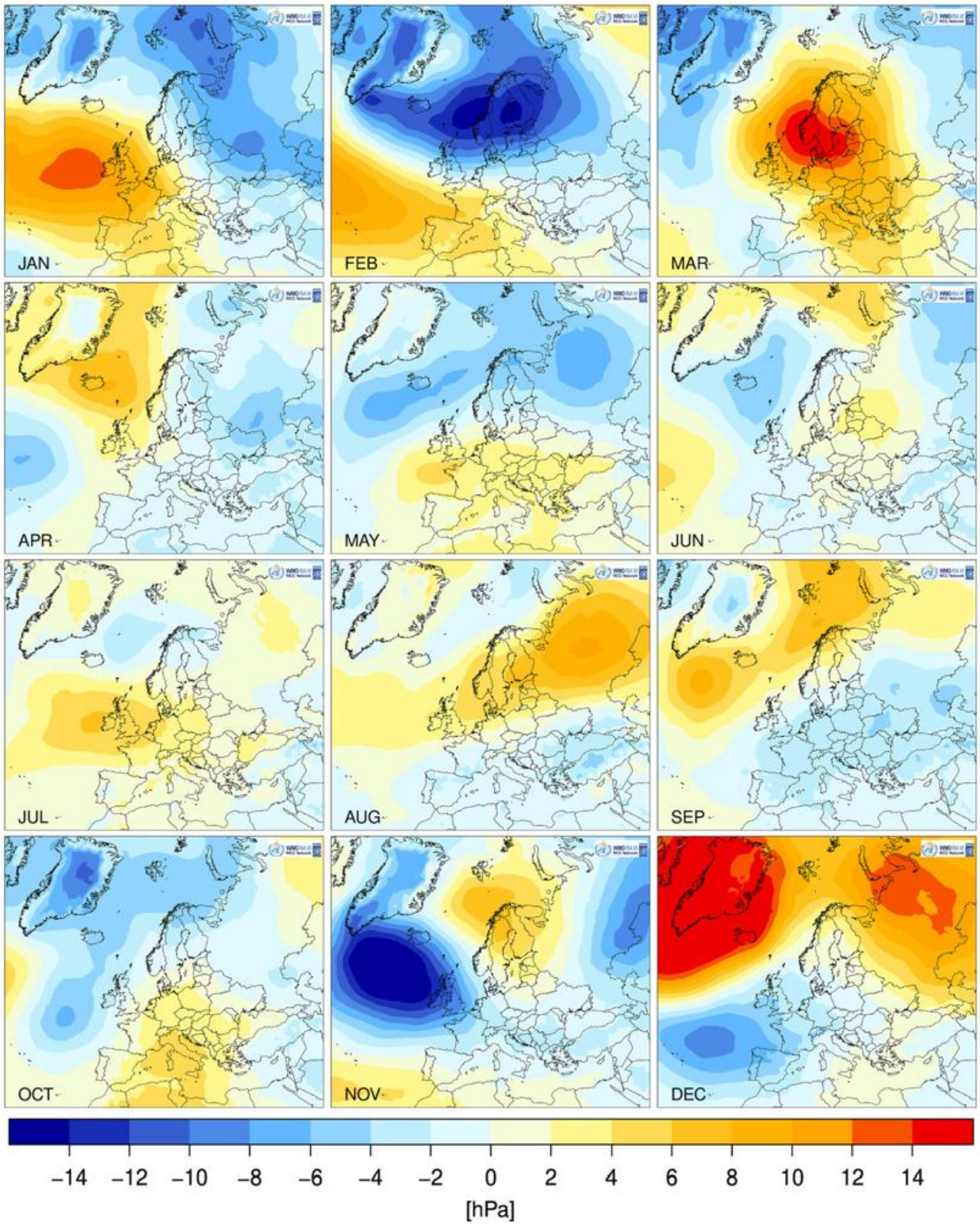

Figure 2-3: *Monthly anomalies of sea level pressure in hPa relative to 1981–2010 for each month of the year 2022. Source: RCC-CM website.*

Table 2-2: *Monthly values of selected northern hemisphere teleconnection indices standardized to the 1981–2010 reference including the Arctic Oscillation, from January to December 2022.*

Year	Month	AO	NAO	EA	EA/WR	SCA	POL
2022	1	0.85	0.74	-1.42	1.11	-0.93	-0.35
2022	2	1.54	1.46	0.22	-0.92	-2.07	-1.63
2022	3	0.31	0.40	1.45	1.41	0.96	-0.52
2022	4	-0.60	-0.54	-0.93	-0.09	-0.72	-1.16
2022	5	1.22	0.71	0.18	0.90	-1.50	-0.52
2022	6	-0.07	0.19	0.51	-0.51	0.04	-1.28
2022	7	0.03	-0.06	1.42	-1.17	-0.54	0.03
2022	8	-0.17	1.76	1.37	-3.43	0.99	-0.35
2022	9	-0.66	-1.42	-1.17	-1.05	0.50	-0.57
2022	10	1.35	-0.27	0.21	-0.74	-0.17	1.12
2022	11	0.34	0.59	1.24	0.80	1.60	-0.30
2022	12	-2.72	-0.22	-0.01	-1.15	0.91	-1.20

North Atlantic Oscillation (NAO); East Atlantic Pattern (EA); East Atlantic/West Russia Pattern (EA/WR); Scandinavia Pattern (SCA); Polar/Eurasia Pattern (POL); Arctic Oscillation (AO)
(**Sources**: NOAA CPC Indices and NOAA CPC Monthly AO Index)

3. Climate in the RA VI Region

This section presents an overview of the spatial patterns of mean annual climate conditions in 2022 and anomalies of the climate variables surface air temperature, precipitation, sunshine duration and snow. Throughout this report, 1991–2020 is the baseline reference period used unless otherwise specified. All seasons mentioned in this section refer to the Northern Hemisphere. Anomaly information has been taken from the and aggregations of CLIMAT station data when national reports are not available. The long time series of temperature, precipitation and sunshine duration provided by NMHSs in order to illustrate long-term variability up to 2022 are available on the RA VI webpages.

3.1. Temperature

3.1.1. Annual survey

Globally, the annual mean near-surface temperature in 2022 was between 1.02 °C to 1.28 °C above the 1850–1900 pre-industrial average according to six global temperature datasets including four independent global in situ surface temperature analyses and two global atmospheric reanalyses (WMO 2023b). The year 2022 was either the fifth or the sixth warmest year on record, despite the cooling effect of La Niña. The years 2015 to 2022 were the eight warmest years on record in all data sets.

For the RA VI land areas as a whole (without Greenland), 2022 was the fourth warmest year since at least 1981 (see **Figure 3-2**) considering the RCC-CM temperature data (based on CLIMATs). An evaluation of several (both station-based as well as reanalysis) datasets showed that the 2022 annual average temperature for the RA VI region was between the second and fourth highest on record, with an anomaly between +0.7°C and +0.9°C compared to the 1991–2020 average (WMO 2023). Based on the Global Historical Climate Network (GHCN) v4.0.1 dataset (Menne et al. 2018), Europe (36°N–72°N, 23°W–60°E) experienced its second warmest year in its record with an anomaly of +1.0°C (Dunn et al. 2023). Almost the entire RA VI Region saw above-normal annual temperatures in 2022 (w.r.t. 1991-2020). Anomalies were between +1 °C and +2 °C especially in the southwestern part and some parts in the east of the RA VI Region and reached values up to +1 °C elsewhere. For many countries the year finished warmest on record: Germany (+2.3 °C w.r.t. 1961-1990), Spain (+1.7 °C w.r.t. 1981-2010), Switzerland (+1.6 °C), France (+1.6 °C), Portugal (+1.4 °C w.r.t. 1971 2000), Slovenia (+1.2 °C), Croatia (+1.2 °C), Italy (+1.1 °C), Bosnia and Herzegovina (+1.1 °C), United Kingdom (+0.9 °C), and Ireland (+0.7 °C) see also **Table 3-1**.

In 2022, all subregions within the RA VI Region showed positive anomalies ranging from +0.6 °C for Türkiye and South Caucasus to +1.4 °C for the Iberian Peninsula (see **Table 3-2**).

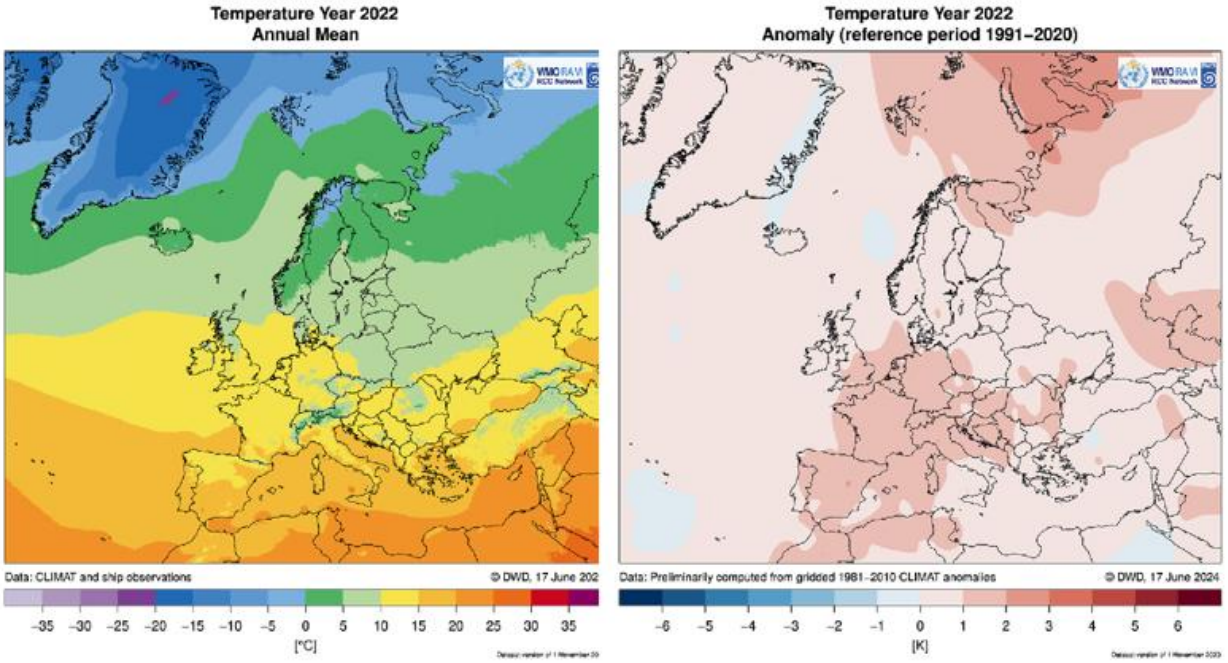

Figure 3-1: *Annual mean temperature in °C (left) and anomalies in °C relative to 1991–2020 (right) for the year 2022. Source: RCC-CM website.*

The annual mean temperature over **Central Europe** was 10.0 °C and thus 1.1 °C warmer than normal. Some countries showed even higher anomalies and reached new records. In Germany (+2.3 °C w.r.t. 1961-1990) and Switzerland (+1.6 °C) it was the warmest year since start of the measurements.

Western Europe recorded the second highest anomaly with +1.3 °C. For five of the six countries, the year 2022 represents the warmest year on record. In France, the annual temperature anomaly (+1.6 °C) was the highest followed by Belgium (Uccle, +1.2 °C).

The **Nordic and Baltic Region** recorded an anomaly of +0.7 °C. Denmark and Sweden reported their third and fourth warmest year with anomalies of 1.2 °C (w.r.t. 1981-2010) and +0.8 °C respectively.

The **Iberian Peninsula** saw the highest anomaly among the subregions with a mean temperature anomaly of +1.4 °C. 2022 was the warmest year for Spain (+1.7 °C (w.r.t. 1981-2010) since 1961 and also for Portugal (+1.37 °C w.r.t. 1971–2000) since 1931.

For the **Central Mediterranean Region,** the average anomaly was +1.1 °C. The year 2022 was the warmest on record for several countries: Slovenia (+1.2 °C), Croatia (+1.2 °C), Montenegro (+1.2 °C), Italy (+1.1 °C), Bosnia and Herzegovina (+1.1 °C).

In **Eastern Europe,** 2022 was 0.9 °C warmer than normal. The largest anomaly was reported for West-Kazakhstan with +1.3 °C followed by Moldova (+1.0 °C) and Rumania (+1.0 °C).

The **Middle East** Region was on average 0.8 °C warmer than normal. For Israel the temperature conditions were around normal (+0.1 °C).

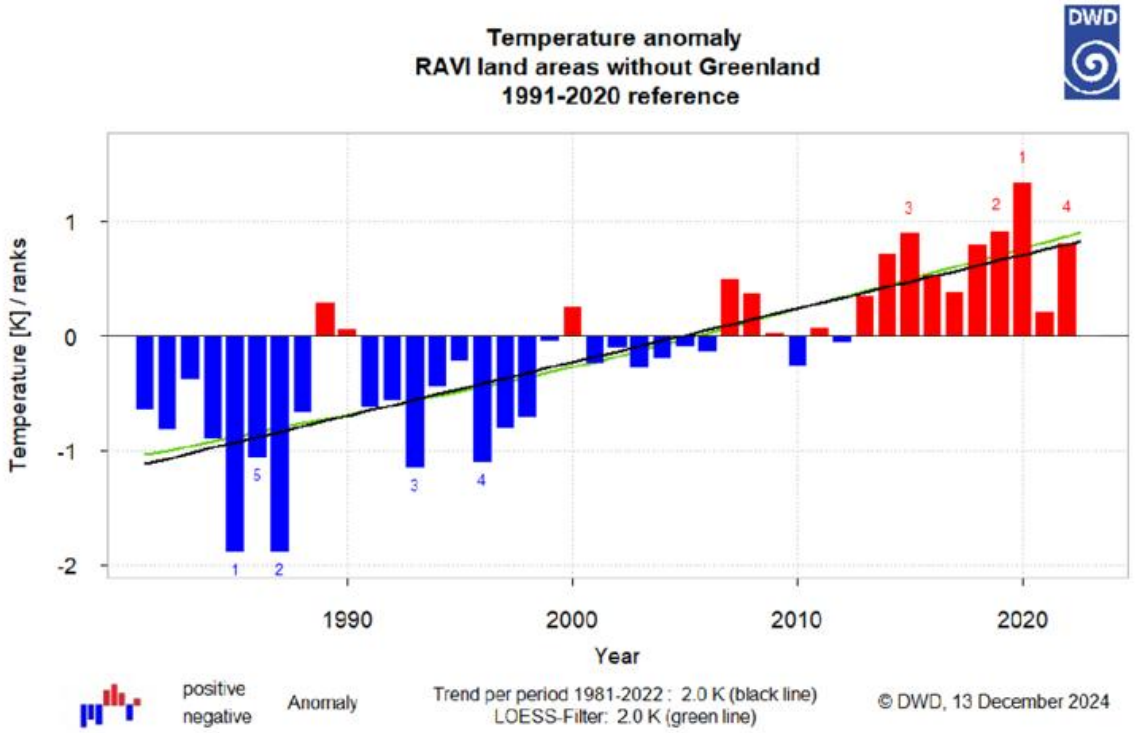

Figure 3-2: Annual temperature anomalies in° C relative to 1991–2020 for the years 1981–2022 for Europe (RA VI land areas without Greenland) based on CLIMAT. Source: DWD.

Table 3-1: Rank statistics and anomalies of annual temperature in 2022 as reported by the National Meteorological and Hydrological Services (NMHSs). Information about all-time temperature records as provided by the individual NMHSs can be found here: RCC-CM website.

Country	Rank (warmest)	Annual Anomaly [°C]	Reference period	Start of time series
RA VI Region	4	+0.8	1991–2020	1981
Albania	-	-	1961-1990	1963
Armenia	5	+1.7°C	1991-2020	1934
Austria	3	+1.1°C	1991-2020	1767
Azerbaijan	-	-	-	-
Belarus	-	-	-	-
Belgium (Uccle)	1	+1.2°C	1991-2020	1833
Bosnia and Herzegovina	1	+1.1°C	1991-2020	1950
Bulgaria	4	+0.8°C	1991-2020	1930
Croatia	1	+1.2°C	1991-2020	1961
Cyprus	14	+0.6°C	1981-2010	2000
Czechia	5	+0.9°C	1991-2020	1961
Denmark	3	+1.2°C	1981-2010	1874
Estonia	8	+0.7°C	1991-2020	1961
Finland (Helsinki)	-	+0.9°C	1991-2020-	1900
France	1	+1.6°C	1991-2020	1900
Georgia	-	-	-	-
Germany	1	+2.3°C	1961-1990	1881
Greece	5	+0.7°C	1981-2010	1960

Country	Rank (warmest)	Annual Anomaly [°C]	Reference period	Start of time series
Hungary	3	+1.1°C	1991-2020	1901
Iceland	31	+0.1°C	1991-2020	1874
Ireland	1	+0.7°C	1991-2020	1900
Israel	19	+0.1°C	1991-2020	1950
Italy	1	+1.1°C	1991-2020	1961
Jordan (Amman)	-	-	-	1981
Kazakhstan	-	-	-	-
Latvia	12	+0.5°C	1991-2020	1924
Lebanon	-	-	-	-
Lithuania	11	+0.5°C	1991-2020	1961
Luxembourg (Findel)	1	+1.1°C	1991-2020	1838
Malta	-	-	-	-
Moldova (Chisinau)	4	+0.9°C	1991-2020	1886
Monaco	1	+1.4°C	1991-2020	1969
Montenegro (Podgorica)	1	+1.2°C	1991-2020	1949
Netherlands	3	+1.1°C	1991-2020	1901
North Macedonia	12	+0.7°C	1981-2010	1981
Norway	9	+0.7°C	1991-2020	1900
Poland	7	+0.8°C	1991-2020	1951
Portugal	1	+1.4°C	1971-2000	1931
Romania	3	+1.0°C	1991-2020	1961
Russia	-	+0.8°C	-	1936
Serbia	2	+1.0°C	1991-2020	1951
Slovakia	4	+1.0°C	1991-2020	1951
Slovenia	1	+1.2°C	1991-2020	1961
Spain	1	+1.7°C	1981-2010	1961
Sweden	5	+0.8°C	1991-2020	1860
Switzerland	1	+1.6°C	1991-2020	1864
Syria	-	-	-	-
Türkiye	7	+0.6°C	1990-2020	1971
Ukraine	19	+0.7°C	1991-2020	1891
United Kingdom	1	+0.9°C	1991-2020	1884

3.1.3. Seasonal survey

In 2022, the mean annual temperatures were higher than normal across the RA VI Region with anomalies ranging from +1.4 °C for the Iberian Peninsula to +0.6 °C for the Türkiye and the South Caucasus sub-region. In winter (2021/2022), summer and autumn, the anomalies were positive for all sub-regions with highest anomalies occurring over the Iberian Peninsula in summer (+2.0 °C). Spring was the only season with notably negative anomalies. These occurred in Eastern Europe (−0.9 °C) and Türkiye and the South Caucasus (−0.8 °C). In Central Europe and the Central Mediterranean Region, anomalies were close to normal with −0.1 °C (Fehler! Verweisquelle konnte nicht gefunden werden.).

Table 3-2: Seasonal and annual average of temperature anomalies over land areas in °C for each subregion in the year 2022 (reference period: 1991-2020; definitions of the subregions see Figure 1-1: Definitions of the eight subregions used in this bulletin.).

Region	Year	Winter	Spring	Summer	Autumn
Central Europe	+1.1	+1.7	−0.1	+1.7	+1.0
Central Mediterranean Region	+1.1	+1.0	−0.1	+1.6	+1.1
Eastern Europe	+0.9	+1.7	−0.9	+1.7	+0.5
Iberian Peninsula	+1.4	+1.0	+0.5	+2.0	+1.8
Middle East	+0.8	+0.7	0.0	+0.7	+1.3
Nordic and Baltic Region	+0.7	+0.1	+0.5	+1.0	+0.9
Türkiye and South Caucasus	+0.6	+0.9	−0.8	+0.6	+1.3
Western Europe	+1.3	+1.0	+1.0	+1.9	+1.7

Winter 2021/2022 was warmer than normal in most parts of the RA VI Region. Largest anomalies occurred over Eastern Europe (+1.7 °C), Central Europe (+1.7 °C) and in the Middle East (+1.8 °C). In these regions, for some countries (Moldavia and Romania) the winter season 2021/2022 ranked as the fifth warmest. Over the Iberian Peninsula, Portugal recorded its fourth warmer winter since 1931. Much of the RA VI Region saw anomalies between +1 °C and +2 °C. In Central Europe (especially Germany and the Czechia) and Eastern Europe, anomalies partly exceeded +2 °C, over southeastern parts of European Russia and West-Kazakhstan even +3 °C. Only Iceland, northern parts of Scandinavia were colder than normal.

The **spring season** saw the lowest anomalies for most sub-regions and was the only season with negative anomalies in some sub-regions. The anomalies ranged from −0.87 °C in Eastern Europe to +1.03 °C in Western Europe. In Central Europe, spring 2022 was among the five warmest spring seasons in Austria (+1.7 °C) and Switzerland (+1.2 °C). The warmest spring since 1969 was recorded in Monaco with an anomaly of 1.67 °C. Largest negative anomalies occurred over European Russia, Belarus, Ukraine and parts of Türkiye and Georgie with temperature of 1 °C or more below normal. For Belarus as a whole spring was 1.27 °C colder than normal.

Summer 2022 saw anomalies between +1 °C and +2 °C for most regions. Only the Middle East and Türkiye and South Caucasus had anomalies below +1 °C (0.7 and 0.6 °C respectively). The largest anomalies occurred in Western Europe (+1.9 °C) and over the Iberian Peninsula (+2.0 °C). Hungary,

(+2.0 °C), Slovakia (+1.8 °C) and Spain (+2.2°C w.r.t. 1981-2010) reported their warmest summer on record. High anomalies also occurred in the Central Mediterranean Region (+1.6 °C) and the Central Europe (+1.7 °C) as well. For many countries in the RA VI Region, summer 2022 was among the top five warmest summers on record (see Fehler! Verweisquelle konnte nicht gefunden werden.). In contrast, Iceland reported close-to-normal temperatures with an anomaly of −0.13 °C.

Temperature anomalies in **autumn** were also consistently positive, but not as pronounced as in summer. Regional mean anomaly values ranged from +0.5 °C in Eastern Europe to +1.8 °C over the Iberian Peninsula. Autumn 2022 was the warmest on record in Spain (+2.0 °C w.r.t. 1981-2010), and second warmest in Armenia (+2.3 °C), France (+2.1 °C), Italy (+1.3 °C) and Monaco (+1.5 °C).

Table 3-3: Seasonal rank statistics for temperature (2021/2022) as provided by the NMHSs including countries with rankings among the top 5 (ranks 1–5) since start of the time series.

Country	Rank	Anomaly [°C]	Reference period
	winter		
Czechia	4.-5. (warmest)	+2.0	1991-2020
Moldova	5 (warmest)	+2.3	1991-2020
North Macedonia	2 (coldest)	+0.5	1981-2010
Portugal	4 (warmest)	+1.4	1971-2000
Romania	5 (warmest)	+1.0	1991-2020
	spring		
Austria	4 (warmest)	+1.7	1991-2020
Belgium	5 (warmest)	+0.8	1991-2020
France	4 (warmest)	+1.1	1991-2020
Monaco	1 (warmest)	+1.7	1991-2020
Switzerland	4 (warmest)	+1.2	1991-2020
United Kingdom	5 (warmest)	+0.8	1991-2020
	summer		
Armenia	5 (warmest)	+2.3	1961-1990
Austria	5 (warmest)	+1.7	1991-2020
Belgium	3 (warmest)	+1.7	1991-2020
Belarus	3 (warmest)	+1.4	1991-2020
Bosnia Herzegovina	2 (warmest)	+1.9	1991-2020
Croatia	2 (warmest)	+1.9	1991-2020
Estonia	2.-6. (warmest)	+1.7	1991-2020
France	2 (warmest)	+2.3	1991-2020
Germany	3 (warmest)	+1.7	1991-2020
Greece	5 (warmest)	+1.0	1981-2010
Hungary	1 (warmest)	+2.0	1991-2020
Italy	2 (warmest)	+2.1	1991-2020
Latvia	3 (warmest)	+1.4	1991-2020

Country	Rank	Anomaly [°C]	Reference period
Lithuania	5 (warmest)	+1.2	1991-2020
Luxembourg	5 (warmest)	+2.0	1991-2020
Moldova	5 (warmest)	+1.1	1991-2020
Monaco	1 (warmest)	+2.1	1991-2020
Netherlands	2 (warmest)	+8.7	1991-2020
Poland	3 (warmest)	+1.3	1991-2020
Portugal	4 (warmest)	+1.7	1971-2000
Romania	2 (warmest)	+1.6	1991-2020
Serbia	3 (warmest)	+1.5	1991-2020
Slovakia	1 (warmest)	+1.8	1991-2020
Slovenia	2 (warmest)	+2.0	1991-2020
Spain	1 (warmest)	+2.2	1981-2010
Switzerland	2 (warmest)	+2.3	1991-2020
United Kingdom	4 (warmest)	+1.1	1991-2020
	autumn		
Armenia	2 (warmest)	+2.3	1961-1990
Belgium	3 (warmest)	+1.6	1991-2020
Bosnia Herzegovina	4 (warmest)	+1.0	1991-2020
Croatia	3 (warmest)	+1.2	1991-2020
Denmark	4 (warmest)	+1.7	1981-2010
France	2 (warmest)	+2.1	1991-2020
Germany	3 (warmest)	+1.4	1991-2020
Ireland	4 (warmest)	+1.1	1991-2020
Italy	2 (warmest)	+1.3	1991-2020
Luxembourg	4 (warmest)	+1.2	1991-2020
Monaco	2 (warmest)	+1.5	1991-2020
Netherlands	3 (warmest)	-5.4	1991-2020
Slovenia	5 (warmest)	+1.3	1991-2020
Spain	1 (warmest)	+2.0	1981-2010
Switzerland	3 (warmest)	+1.7	1991-2020
United Kingdom	3 (warmest)	+1.3	1991-2020

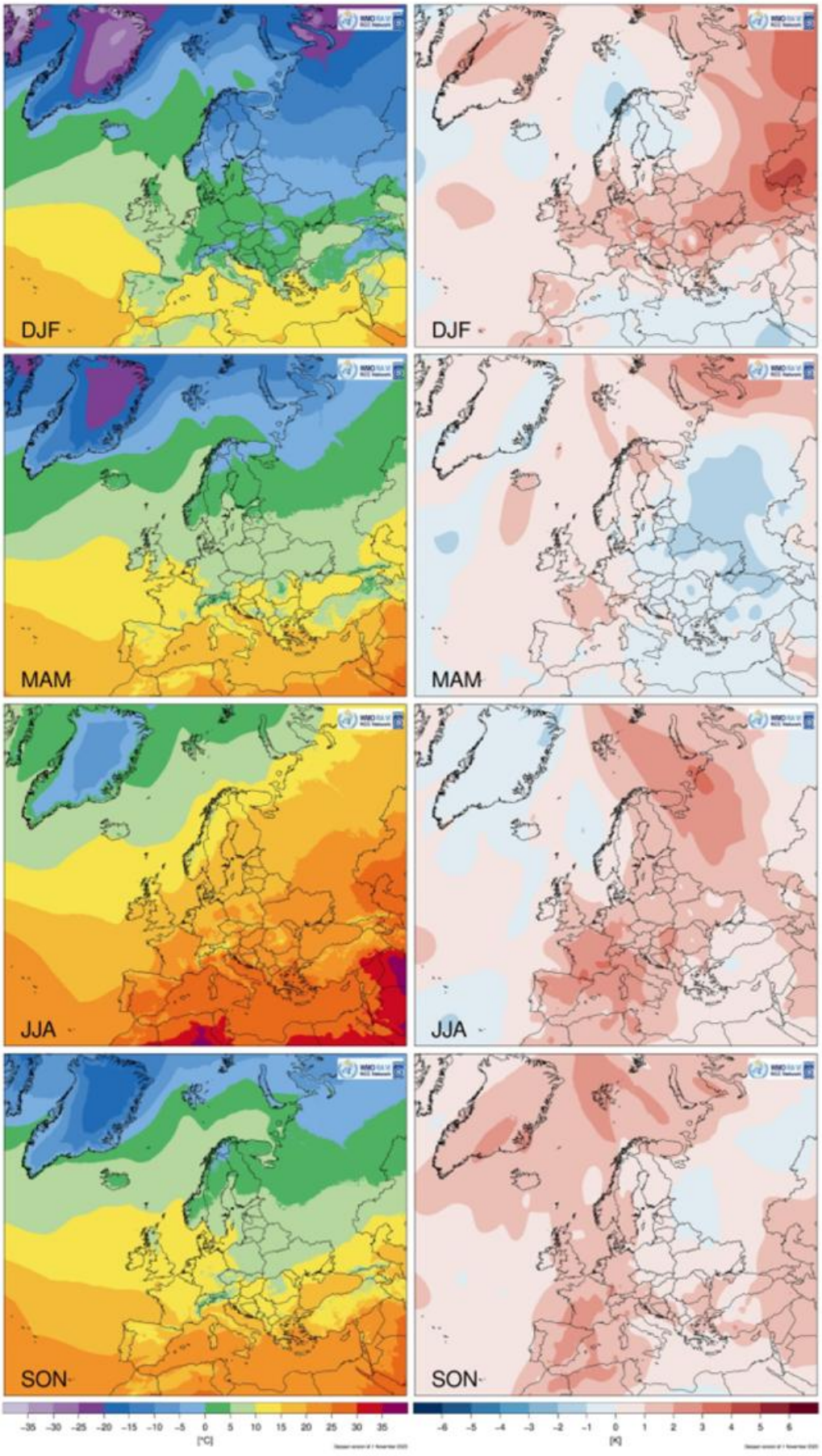

Figure 3-3: *Seasonal mean temperature in °C (left) and anomalies in K relative to 1991-2020 (right) for winter (DJF), spring (MAM), summer (JJA) and autumn (SON) 2020. Winter values relate to December 2019 – February 2022. Source: RCC-CM website.*

3.1.4. Monthly survey

In most months and subregions, it was warmer than normal as can be seen from **Table 3-4Table 3-5.** The largest positive anomaly occurred in February in Eastern Europe with +4.6 °C. March saw in several sub-regions colder-than-normal temperatures with largest anomalies occurring over Türkiye and the South Caucasus (−3.6 °C) and the Middle East (−2.9 °C).

Table 3-4: Monthly area average temperature anomalies in °C for each subregion in the year 2022 (reference period: 1991-2020; definitions of the subregions see Figure 1-1: Definitions of the eight subregions used in this bulletin.).

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Central Europe	+1.8	+3.0	+0.3	-1.6	+1.0	+2.2	+0.8	+2.1	-0.8	+2.8	+1.0	+0.5
Central Mediterranean Region	+0.4	+1.6	-1.6	-0.2	+1.5	+2.2	+1.7	+1.0	+0.4	+1.5	+1.5	+2.9
Eastern Europe	+1.4	+4.6	-0.6	-0.1	-1.9	+1.3	+0.6	+3.2	-1.0	+1.6	+0.8	+0.8
Iberian Peninsula	0.0	+1.5	-0.4	-0.7	+2.5	+1.6	+2.7	+1.7	+0.7	+3.0	+1.8	+2.7
Middle East	-0.3	+1.5	-2.9	+2.7	+0.3	+0.8	+0.4	+0.8	+1.3	+1.3	+1.2	+2.2
Nordic and Baltic Region	+1.4	+1.4	+2.0	-0.5	0.0	+1.6	+0.1	+1.3	-0.6	+1.7	+1.5	-1.7
Türkiye and South Caucasus	-0.4	+1.8	-3.5	+2.0	-0.7	+0.6	-0.2	+1.4	+1.0	+0.8	+2.0	+2.7
Western Europe	+0.0	+1.9	+1.0	+0.2	+2.0	+1.6	+1.9	+2.3	+0.5	+2.9	+1.8	0.0

Table 3-5: Rank statistics, monthly average temperature and anomalies (in °C) from several countries of the RA VI for individual months 2022 including countries with rankings among the top 5 (ranks 1–5) since start of the time series.

Country	Rank	Value (°C)	Anomaly (°C)	Reference period	Start of time series
		January			
Cyprus	4 (coolest)	8.9	-1.1	1981-2010	-
Portugal	5 (warmest)	-	-0.8	1971-2000	1931
		February			
Germany	5 (warmest)	4.5	+3.0	1991-2020	1881
Netherlands	4 (warmest)	6.8	+2.9	1991-2020	1901
		March			
Cyprus	1 (coolest)	9.1	-3.1	1991-2020	-
Greece	3 (coolest)	9.1	-2.2	1981-2010	1960
Israel	3 (coolest)	12.0	-3.4	1991-2020	1950
North Macedonia	4 (coolest)	3.5	-2.6	1981-2010	1981
Türkiye	2 (coolest)	4.1	-3.7	1991-2020	1971
		April			
Armenia	5 (warmest)	7.7	+2.9	1961-1990	1934
Cyprus	4 (warmest)	17.7	+1.8	1981-2010	-
Israel	3 (warmest)	21.3	+2.2	1991-2020	1950
		May			
Bosnia Herzegovina	3 (warmest)	16.8	+1.9	1991-2020	1950
Croatia	3 (warmest)	18.6	+1.9	1191-2020	1961
France	1 (warmest)	17.8	+2.4	1991-2020	1900

Country	Rank	Value (°C)	Anomaly (°C)	Reference period	Start of time series
Ireland	3 (warmest)	12.6	+1.3	1991-2020	1900
Italy	2 (warmest)	17.6	+1.9	1991-2020	1961
Monaco	1 (warmest)	19.9	+2.1	1991-2020	1969
Portugal	1 (warmest)	-	+3.4	1971-2000	1931
Slovenia	3 (warmest)	15.7	+1.9	1991-2020	1961
Spain	2 (warmest)	-	+3.0	1981-2010	1961
Switzerland	2 (warmest)	11.5	+2.6	1991-2020	1864
United Kingdom	5 (warmest)	11.8	+1.2	1991-2020	1884
		June			
Austria	5 (warmest)	-	+2.3	1991-2020	1767
Bosnia Herzegovina	1 (warmest)	22.0	+3.1	1991-2020	1950
Croatia	2 (warmest)	23.7	+2.9	1991-2020	1961
Czechia	4 (warmest)	18.7	+2.2	1991-2020	1961
France	3 (warmest)	21.2	+2.3	1991-2020	1900
Greece	4 (warmest)	25.9	+1.4	1981-2010	1960
Hungary	3 (warmest)	22.1	+2.3	1991-2020	1901
Italy	2 (warmest)	23.0	+3.0	1991-2020	1961
Monaco	2 (warmest)	24.0	+2.6	1991-2020	1969
North Macedonia	5 (warmest)	21.3	+1.5	1981-2010	1981
Poland	4 (warmest)	18.6	+1.8	1991-2020	1951
Romania	4 (warmest)	20.4	+1.6	1991-2020	1961
Serbia	4 (warmest)	21.7	+1.9	1991-2020	1951
Slovakia	3 (warmest)	20.0	+2.3	1991-2020	1951
Slovenia	3 (warmest)	20.4	+2.8	1991-2020	1961
Spain	4 (warmest)	-	+2.0	1981-2010	1961
Switzerland	2 (warmest)	15.4	+2.7	1991-2020	1864
		July			
Bosnia Herzegovina	5 (warmest)	22.6	+1.8	1991-2020	1950
Croatia	3 (warmest)	24.7	+1.8	1991-2020	1961
France	3 (warmest)	23.2	+2.1	1991-2020	1900
Hungary	5 (warmest)	23.1	+1.6	1991-2020	1901
Italy	2 (warmest)	24.8	+2.3	1991-2020	1961
Monaco	1 (warmest)	27.2	+3.4	1919-2020	1969
Portugal	1 (warmest)	-	+3.0	1971-2000	1931
Romania	5 (warmest)	22.1	+1.6	1991-2020	1961
Serbia	5 (warmest)	23.1	+1.5	1991-2020	1951
Slovenia	5 (warmest)	21.4	+2.0	1991-2020	1961
Spain	1 (warmest)	-	+2.7	1981-2010	1961
Switzerland	4 (warmest)	17.0	+2.4	1991-2020	1864
		August			
Armenia	4 (warmest)	19.5	+3.0	1961-1990	1934
Belgium	1 (warmest)	21.4	+3.0	1991-2020	1833
Belarus	1 (warmest)	20.8	+2.8	1991-2020	-
Czechia	5 (warmest)	19.1	+1.2	1991-2020	1961
Estonia	2 (warmest)	19.5	+2.8	1991-2020	1961
France	2 (warmest)	23.7	+2.7	1991-2020	1900

Country	Rank	Value (°C)	Anomaly (°C)	Reference period	Start of time series
Germany	2 (warmest)	20.2	+2.3	1991-2020	1881
Hungary	2 (warmest)	23.2	+2.0	1991-2020	1901
Latvia	2 (warmest)	19.8	+2.9	1991-2020	1924
Lithuania	1 (warmest)	20.4	+2.8	1991-2020	1961
Luxembourg	3 (warmest)	20.9	+3.1	1991-2020	1838
Monaco	3 (warmest)	26.7	+1.9	1991-2020	1969
Netherlands	3 (warmest)	20.0	+2.1	1991-2020	1901
Poland	3 (warmest)	20.5	+2.1	1991-2020	1951
Romania	2 (warmest)	21.9	+1.6	1991-2020	1961
Slovakia	4 (warmest)	20.9	+2.0	1991-2020	1951
Spain	2 (warmest)	-	+2.0	1981-2010	1961
Switzerland	3 (warmest)	16.1	+1.8	1991-2020	1864
United Kingdom	5 (warmest)	16.7	+1.5	1991-2020	1884
September					
-	-	-	-	-	-
October					
Austria	1 (warmest)	-	+2.8	1991-2020	1767
Belgium	1 (warmest)	11.3	+3.1	1991-2020	1833
Belarus	4 (warmest)	8.9	+2.1	1991-2020	1945
Bosnia Herzegovina	2 (warmest)	13.0	+1.9	1991-2020	1950
Croatia	1 (warmest)	15.9	+2.4	1991-2020	1961
Czechia	4 (warmest)	10.7	+2.5	1991-2020	1961
Denmark	4 (warmest)	11.7	+2.5	1981-2010	1874
France	1 (warmest)	17.2	+3.5	1991-2020	1900
Germany	1 (warmest)	12.5	+3.2	1991-2020	1881
Italy	2 (warmest)	16.7	+2.2	1991-2020	1961
Lithuania	5 (warmest)	9.8	+2.5	1991-2020	1961
Luxembourg	5 (warmest)	12.5	+2.5	1991-2020	1838
Monaco	3 (warmest)	20.1	+1.9	1991-2020	1969
Poland	4 (warmest)	11.2	+2.5	1991-2020	1951
Portugal	5 (warmest)	-	+2.4	1971-2000	1931
Romania	5 (warmest)	11.3	+1.4	1991-2020	1961
Slovakia	5 (warmest)	10.6	+1.9	1991-2020	1951
Slovenia	1 (warmest)	12.9	+3.1	1991-2020	1961
Spain	1 (warmest)	-	+3.6	1981-2010	1961
Sweden	5 (warmest)	7.3	+2.3	1991-2020	1860
Switzerland	1 (warmest)	10.4	+3.8	1991-2020	1864
November					
Denmark	4 (warmest)	7.5	+2.4	1981-2010	1874
Iceland	1 (warmest)	-	+3.1	1991-2020	1874
Ireland	5 (warmest)	9.3	+1.4	1991-2020	1900
Monaco	3 (warmest)	15.8	+1.5	1991-2020	1969
North Macedonia	5 (warmest)	8.8	+2.7	1981-2010	1981
Spain	3 (warmest)	-	+1.9	1981-2010	1961
United Kingdom	3 (warmest)	8.2	+1.7	1991-2020	1884
December					

Country	Rank	Value (°C)	Anomaly (°C)	Reference period	Start of time series
Bosnia Herzegovina	1 (warmest)	5.2	+3.7	1991-2020	1950
Bulgaria	4 (warmest)	-	+3.1	1991-2020	1930
Croatia	1 (warmest)	7.7	+2.8	1991-2020	1961
Cyprus	2 (warmest)	14.3	+2.6	1981-2010	-
Greece	2 (warmest)	12.7	+2.6	1981-2010	1960
Italy	1 (warmest)	7.8	+2.2	1991-2020	1961
Moldova	5 (warmest)	1.7	+1.9	1991-2020	1866
North Macedonia	2 (warmest)	5.7	+3.8	1081-2010	1981
Portugal	1 (warmest)	-	+2.8	1971-2000	1971
Romania	3 (warmest)	2.4	+0.6	1991-2020	1961
Serbia	2 (warmest)	4.7	+3.5	1991-2020	1951
Slovenia	5 (warmest)	2.8	+2.1	1991-2020	1961
Spain	1 (warmest)	-	+2.9	1981-2010	1961

Warm spells were seen in all seasons, affecting different subregions of the RA VI Region. These are reflected in the large positive monthly temperature anomalies, and are discussed in more detail in the section 4 on Extreme and high impact events. August and October 2022 were the warmest on record for the RA VI land areas (without Greenland) and June the third warmest. In many countries these months ranked among the top five warmest on record. (see **Table 3-5**).

Notable negative anomalies occurred in southern and eastern Europe in March, in central and northeastern Europe in April, in eastern Europe in May and September, and in northwestern Europe in December (see **Table 3-5**). Türkiye and Cyprus reported anomalies larger than −3°C marking their second coolest and coolest March on record respectively. December was particularly cold in Iceland, which saw temperatures largely 3 °C to 4 °C below normal making it the eight coldest December nationwide since the beginning of the measurements in 1900 and the coldest December since 1973. The cold spells contributing to these anomalies are discussed in more detail in section 4 on Extreme and high impact events.

The large-scale circulation patterns associated with these monthly temperature anomalies are discussed in the section 2 on Major circulation patterns.

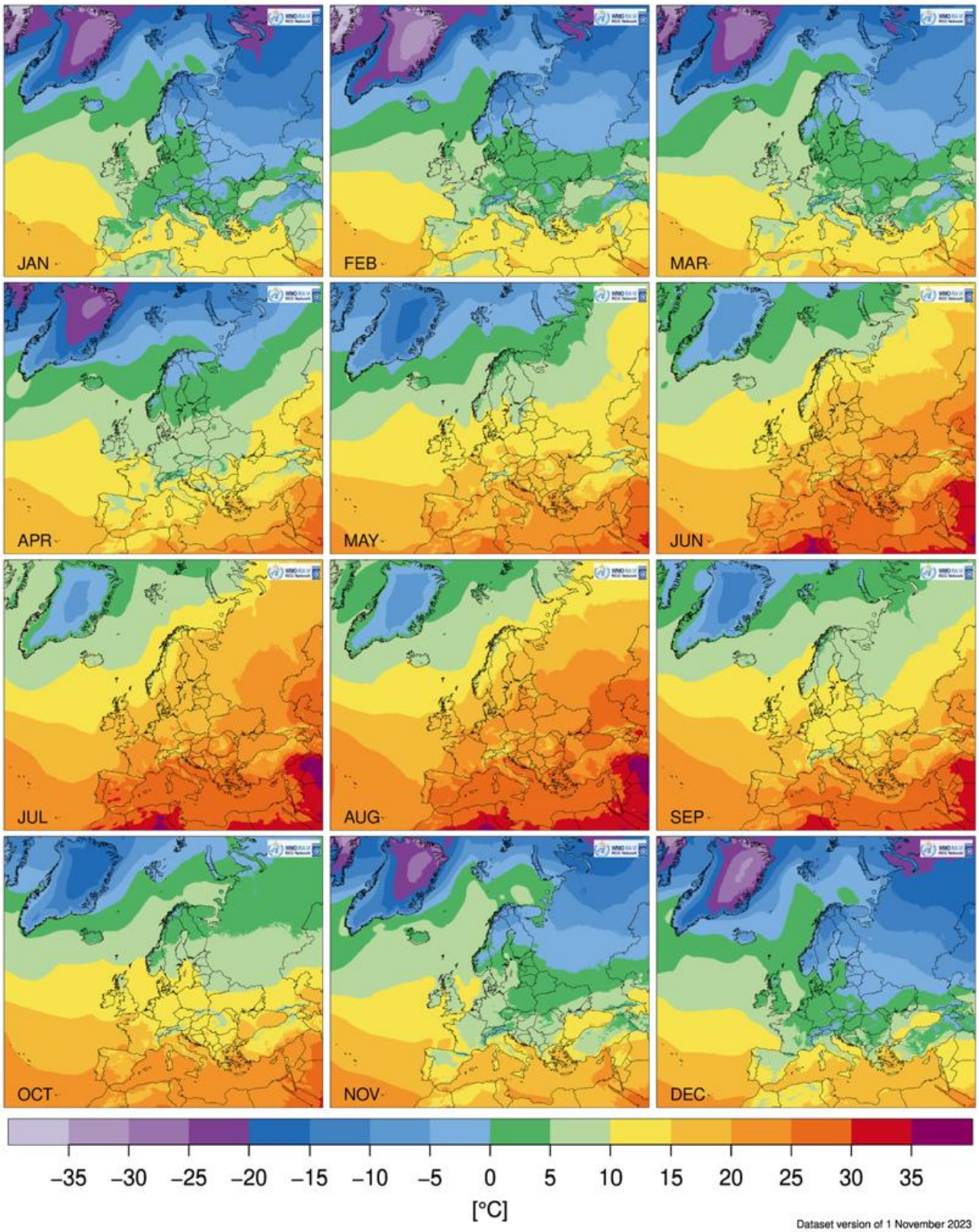

Figure 3-4: *Monthly mean temperature in °C for each month of the year 2022. Source: RCC-CM website.*

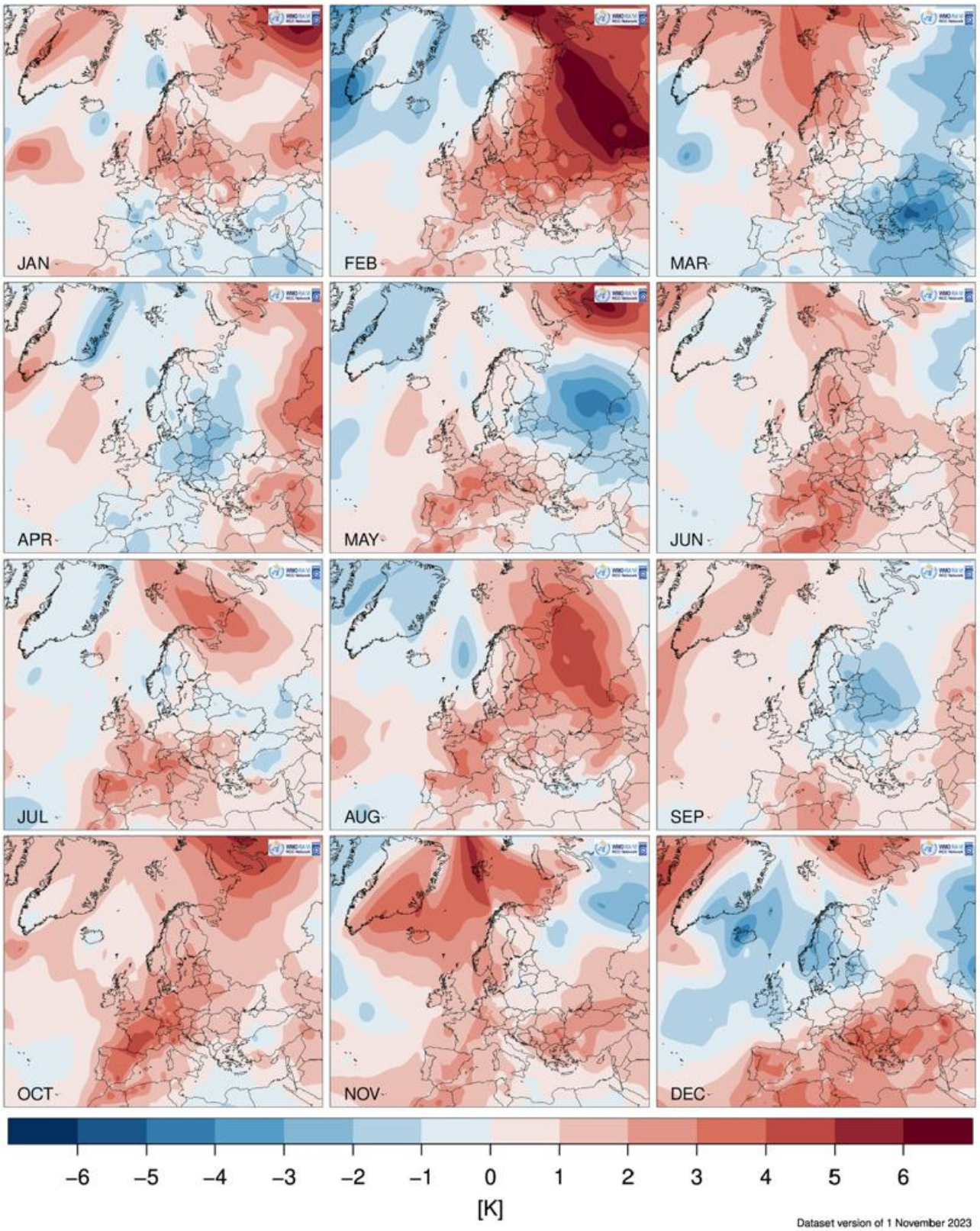

Figure 3-5: *Monthly anomalies of temperature in °C relative to 1991-2020 for each month of the year 2022. Source: RCC-CM website.*

3.2. Precipitation

3.2.1. Annual survey

For the RA VI land areas as a whole, precipitation in 2022 was around -30 to +30 mm of the norm. For large parts of Iberian Peninsula, France, Germany Switzerland, Italy and especially southern Scandinavia, the year was characterized by below-normal conditions. Drier-than-normal conditions with deficits as low as 20% to 60% were also recorded in regions to the west of the Black Sea as well as Estonia and the Middle East. Only in parts of Eastern Europe (for example Belarus, Russia, Azerbaijan, Armenia and Ukraine as well as in northern parts of Norway above-normal precipitation was registered, mostly up to 125% of normal, some parts even up to 167% of normal.

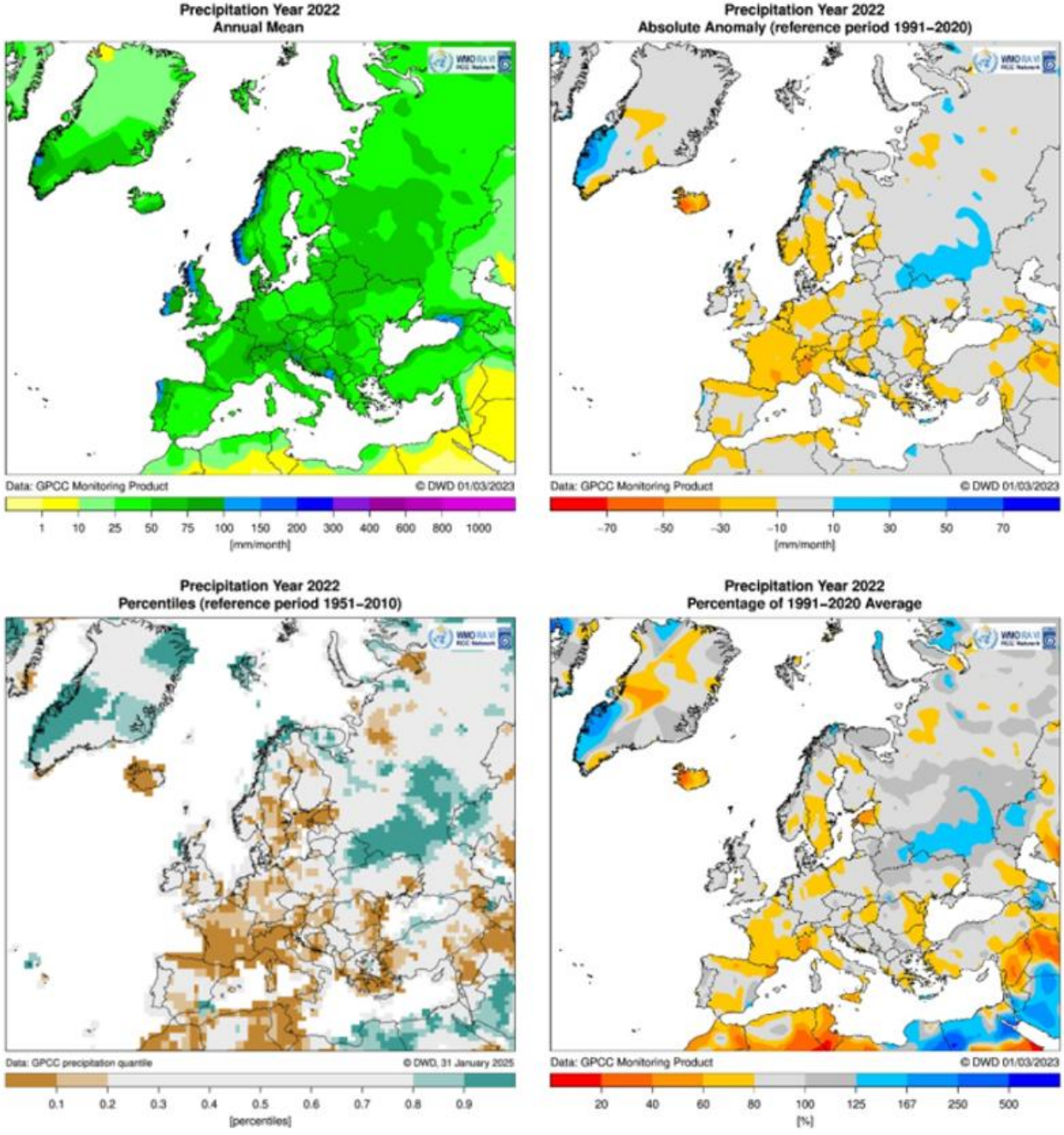

Figure 3-6: *Annual total precipitation (left, top), precipitation anomalies in mm per month relative to 1991–2020 (right, top) and percentiles relative to 1951-2010 (left, bottom) as well as percentage of precipitation in % (right, bottom) relative 1991-2020 for the year 2022. Source: RCC-CM website.*

In 2022, the average annual precipitation varied between the regions from around 80% of normal precipitation in the Western Europe to 107% in Eastern Europe (see **Table 3-7**). Eastern Europe was the only RA VI Region which was wetter conditions than normal. All the other regions were drier than normal in 2022. Many countries ranked in the top five of the wettest or driest years since start of the time series (see Fehler! Verweisquelle konnte nicht gefunden werden.).

Across **Central Europe,** precipitation for the year was below the norm (84% of normal precipitation).

Western Europa had lower anomalies than central Europe with 81% of the norm. France in particular had very dry conditions receiving only 76% of normal precipitation, making 2022 the second driest year on record.

The subregion **Nordic and Baltic countries** showed also negative anomalies with 89% of normal precipitation. Estonia reported 132.33 mm less than normal ranking 2022 the seventh driest year on record. All Baltic States, however, experienced drier than normal conditions.

The **Iberian Peninsula** saw slightly lower than normal precipitation (89% of normal). Spain recorded 84% of normal precipitation (w.r.t. 1981-2010) making the year 2022 the sixth driest since 1961.

The **Central Mediterranean Region** received also lower than normal precipitation amounts. Several countries recorded negative precipitation anomalies (see **Table 3-10**) and reported one of their driest years on record. 2022 ranked driest for Italy and Montenegro), forth driest for Monaco and fifth driest for Greece.

The **Middle East** was the subregion with the lowest anomalies of precipitation. Less than 80% of normal amounts fell in the year 2022. Syria was the driest country of the subregion with 64% of normal precipitation.

Eastern Europe as a whole saw the largest positive anomaly with 106% of normal. Largest deficits were observed in the areas around the Black Sea and in southern European Russia. While Rumania (84%) and Moldavia (79%) had less precipitation than normal, Belarus, Ukraine and western Kazakhstan experienced wetter-than-normal conditions.

The subregion **Türkiye and the south Caucasus** saw also drier-than-normal conditions on average (91%). While some areas, particularly in Türkiye, received as little as 60% to 80% of their normal precipitation, parts of the South Caucasus region, experienced wetter-than-normal conditions. Türkiye and Armenia received 88% and 75% normal respectively marking their fourth driest year on record.

Table 3-6: Rank statistics and anomalies of annual precipitation anomalies in 2022 as reported by the National Meteorological and Hydrological Services (NMHSs).

Country	Rank (driest/ wettest)	Annual Anomaly [mm][1]	Reference period	Start of time series
RA VI land areas	-	93%	1991-2020	1901
Albania	-	-	-	-
Armenia	4 (driest)	-147.2	1960-1991	1934
Austria	11 (driest)	+115.0	1991-2020	1858
Azerbaijan	-	-	-	-
Belarus	-	-	-	-
Belgium	40 (driest)	-135.7	1991-2020	1833
Bosnia and Herzegovina	8 (driest)	-208.0	1991-2020	1950
Bulgaria	-	-	-	-
Croatia	7 (driest)	-170.3	1991-2020	1961
Cyprus	57 (driest)	-48.0	1961-1990	1902
Czechia	-	-	1991-2020	1961
Denmark	66 (wettest)	-51.8	1981-2010	1874
Estonia	7 (driest)	-132.3	1981-2010	1961
Finland	-	-	-	-
France	2 (driest)	-225.4	1991-2020	1959
Germany	24 (driest)	-119.8	1991-2020	1881
Georgia	-	-	-	-
Greece	5 (driest)	-110.0	1981-2010	1960
Hungary	17 (driest)	-119.4	1991-2020	1901
Iceland	-	-	-	-
Ireland	30 (wettest)	-9.8	1991-2020	1941
Israel	30 (wettest)	+13.0	1991-2020	1950
Italy	1 (driest)	-212.0	1991-2020	1961
Jordan	-	-	-	-
Kazakhstan	-	-	-	-
Lavtia	39 (wettest)	0.0	1991-2020	1924
Lebanon	-	-	-	-
Lithuania	31 (wettest)	-20.9	1991-2020	1961
Luxembourg	49 (driest)	-122.4	1991-2020	1854
Malta	-	-	-	-
Moldova	2 (driest)	-218.0	1991-2020	1899
Monaco	4 (driest)	-318.4	1991-2020	1969
Montenegro	-	-41.0	1991-2020	1949
Netherlands	53 (wettest)	-33.8	1991-2020	1906
North Macedonia	12 (driest)	-58.8	1981-2010	1981
Norway	17 (wettest)	+53.7	1991-2020	1900
Poland	14 (driest)	-76.9	1991-2020	1951
Portugal	-	-	-	-

[1] By default, anomalies are given in mm unless otherwise specified.

Country	Rank (driest/ wettest)	Annual Anomaly [mm][1]	Reference period	Start of time series
Romania	10 (driest)	-121.7	1991-2020	1961
Russia	-	-	-	-
Serbia	27 (driest)	-49.4	1991-2020	1951
Slovakia	6 (driest)	-143.5	1991-2020	1961
Slovenia	7 (driest)	-231.3	1991-2020	1961
Spain	6 (driest)	-102.1	1981-2010	1961
Sweden	74 (driest)	-85.0	1991-2020	1880
Switzerland	10 (driest)	-289.2	1991-2020	1864
Syria	-	-	-	-
Türkiye	4 (driest)	-12.1%	1991-2020	1991
Ukraine	43 (wettest)	-7.0	1991-2020	1891
United Kingdom	78 (wettest)	-70.9	1991-2020	1836

3.2.2. Seasonal survey

In 2022, drier-than-normal conditions dominated on an annual basis across the RA VI Region with all sub-regions receiving less precipitation than normal except for Eastern Europe. Spring and Summer were particularly dry, the fourth and second driest on record. For many countries these two seasons ranked among the top five driest on record (see **Table 3-8**). Wetter-than-normal conditions occurred in Eastern Europe in winter and autumn, over the Iberian Peninsula and Türkiye and the South Caucasus in summer as well as over the Middle East in summer and autumn. In case of the Middle East region, it has to be kept in mind that the high relative anomalies in summer correspond to very small absolute numbers.

Table 3-7: *Seasonal and annual average of precipitation anomalies over land areas in % for each subregion in the year 2022 (reference period: 1991-2020; definitions of the subregions see Figure 1-1: Definitions of the eight subregions used in this bulletin.)*

Region	Year	Winter	Spring	Summer	Autumn
Central Europe	84	102	66	74	92
Central Mediterranean Region	84	98	70	107	88
Eastern Europe	103	118	99	84	119
Iberian Peninsula	85	43	112	56	74
Middle East	74	61	60	247	117
Nordic and Baltic Region	86	89	77	91	78
Türkiye and South Caucasus	91	102	95	116	75
Western Europe	81	86	67	68	102
RA VI land (without Greenland)	93	100	87	86	100

In **winter 2021/2022**, the southwestern parts of the RA VI Region were extremely dry while the eastern parts saw mostly wetter-than-normal conditions, except for the Middle East where also dry

conditions prevailed. The Iberian Peninsula saw on average less than half of normal precipitation amounts. For Portugal, it was the fifth driest winter since 1931, with January and February receiving only 20% to 40% of normal precipitation. Eastern Europe, in contrast, had the largest positive anomaly among the subregions with 120% of normal. Locally, over 150–200% of normal precipitation amounts fell, particularly in the mountains (Caucasus, Carpathians) and along the coasts at the Black Sea.

Spring was drier than normal across most of the RA VI Region, with large areas receiving only 60% to 80% of normal precipitation as high-pressure patterns over the continent prevailed (see **Figure 3-7**). Eight countries recorded one of the top five driest springs since the beginning of the measurements in 2022. Above-normal precipitation, in contrast, was observed across most of Belarus, European Russia, West-Kazakhstan as well as most of the Iberian Peninsula, ending its winter drought. For Norway spring 2022 ranked the fifth wettest springs since start of measurements in 1900.

The dry conditions continued in **summer** over large parts of the RA VI Region as anticyclonic conditions dominated over much of the continent. Most parts received only between 50% and 90% of normal precipitation. However, eastern Mediterranean cyclones contributed to above-normal precipitation across the southern Balkans, Greece, western Türkiye, and large areas of the Middle East. (see **Figure 3-7**). The Iberian Peninsula was driest on average receiving only around half of normal precipitation amounts. The large anomalies in the Middle East are misleading as (due to the dry summer conditions) they only correspond to very small absolute amounts. For Armenia, Belarus, Croatia, Germany and Slovenia, the summer was among the top five of the driest summer since the respective starts of measurements (see **Table 3-8**).

Autumn was wetter than normal for Eastern Europe and the Middle East with around 120% of normal precipitation. The other subregions saw drier-than-normal or normal conditions. Poland, Finland, and the Baltic countries as well as Greece, western Türkiye, and southern Spain received between 60% to 80% of their normal precipitation and even lower in some localized areas. For Armenia, Estonia and Lithuania autumn 2022 was the fifth driest since the beginning of the measuring. Ukraine, Portugal, Latvia and Ireland, in contrast, had one of the top five wettest autumns.

Table 3-8: *Seasonal rank statistics for precipitation (2021/2022) as provided by the NMHSs including countries with rankings among the top 5 (ranks 1–5) since start of the time series.*

Country	Rank	Anomaly [mm][2]	Reference period
	winter		
Monaco	4 (driest)	-126.5	1991-2020
Portugal	5 (driest)	-238.8	1971-2000
	spring		
Bosnia Herzegovina	5 (driest)	-96.0	1991-2020
Croatia	5 (driest)	-73.6	1991-2020
Czechia	3 (wettest)	-46.2	1991-2020
France	3 (driest)	-91.2	1991-2020

[2] By default, anomalies are given in mm unless otherwise specified.

Country	Rank	Anomaly [mm][2]	Reference period
Italy	3 (driest)	-83.0	1991-2020
Moldavia	2 (driest)	-109.0	1991-2020
North Macedonia	1 (driest)	-54.2	1981-2010
Norway	5 (wettest)	+49.5	1991-2020
Poland	3 (driest)	-51.7	1991-2020
Slovakia	5 (driest)	-63.7	1991-2020
summer			
Armenia	2 (driest)	-61.2	1961-1990
Belarus	4 (driest)	-31.4	1991-2020
Croatia	2 (driest)	-95.3	1991-2020
Germany	5 (driest)	-97.6	1991-2020
Slovenia	2 (driest)	-150.1	1991-2020
autumn			
Armenia	5 (driest)	-48.2	1961-1990
Estonia	5 (driest)	-60.7	1991-2020
Ireland	1 (wettest)	+169.6	1991-2020
Latvia	2 (wettest)	+50.0	1991-2020
Lithuania	5 (driest)	-73.3	1991-2020
Portugal	5 (wettest)	+75.3	1971-2000
Ukraine	3 (wettest)	+58.0	1991-2020

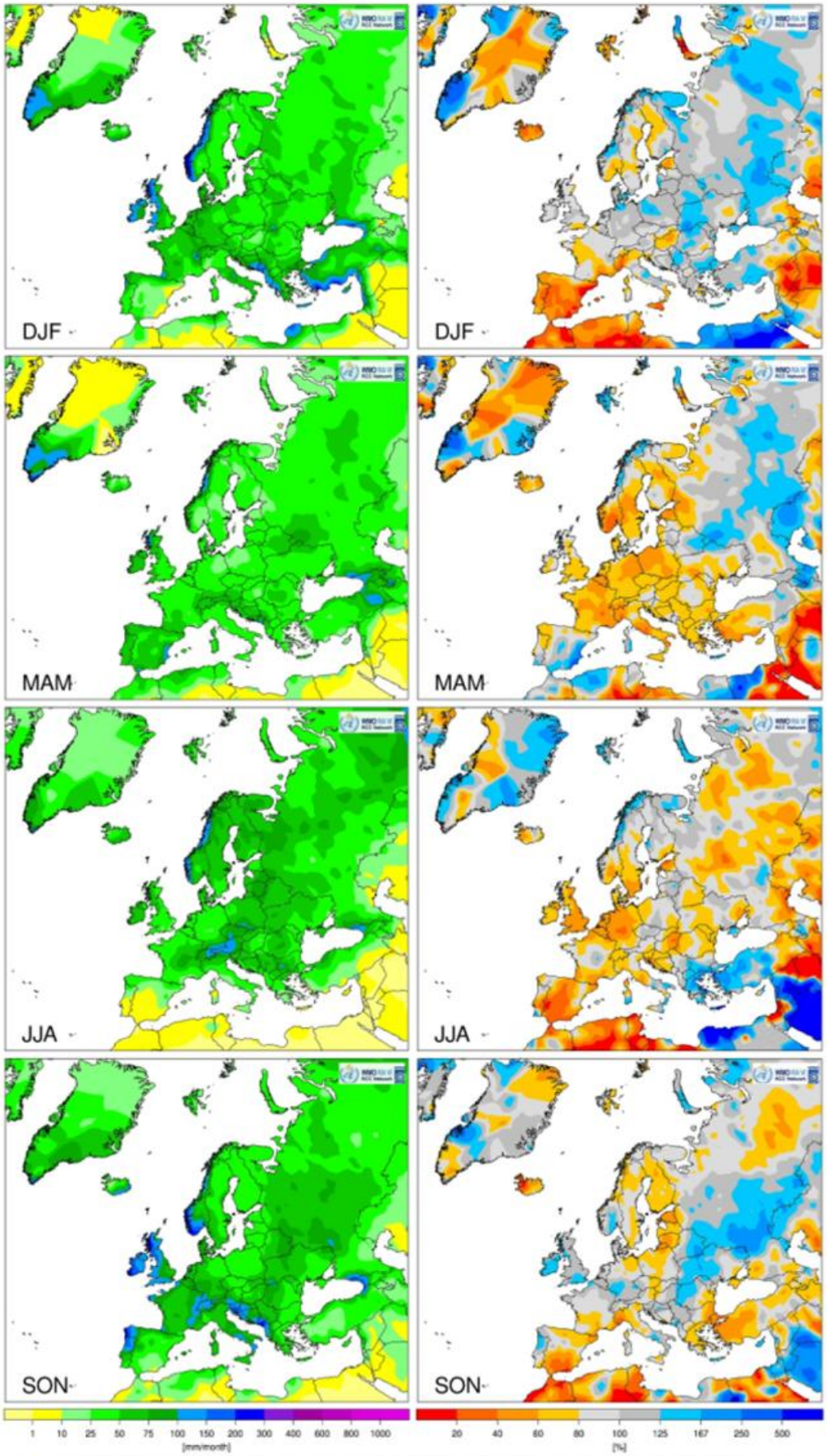

Figure 3-7: *Seasonal total precipitation in mm per month (left), and relative anomalies in % of the average for 1991-2020 (right) for winter (DJF), spring (MAM), summer (JJA) and autumn (SON) 2020. Winter values relate to December 2021 – February 2022. Source: RCC-CM website.*

3.2.3. Monthly survey

In 2022, drier-than-normal conditions dominated on an annual basis across the RA VI Region with all sub-regions receiving less precipitation than normal except for Eastern Europe. There were, however, differences among the regions and throughout the year.

The year started very dry over the Iberian Peninsula with January and February receiving only 20% to 40% of normal precipitation. Both months were among the five driest on record for Spain. France, Ireland, and the United Kingdom also received only around 50% of normal precipitation in January. Much-wetter-than normal conditions, in contrast, prevailed in February in an area stretching from the United Kingdom and Ireland to Finland with some parts seeing 1.5 to 2.5 times the normal precipitation amounts. Denmark and Latvia saw their second wettest February on record.

The month of March was particularly marked by drought over most parts of the RA VI Region in 2022 (see also 4.1). Most parts of Central Europe received less than 35% of normal precipitation. It was the second driest March for Poland and Austria, third driest for Hungary and fourth driest for Germany and Switzerland. March was also record dry in Denmark, and in southern Sweden, 50 stations had no measurable precipitation for the month. Estonia recorded only 4 mm (13% of normal), its lowest March total since 1961. Lithuania was also record dry for the month.

July was exceptionally dry across Western and Southern Europe (see 4.1). The Netherlands and France reported only 25% of normal precipitation, making it the second-driest July in history for France. Belgium and Luxembourg received less than 20% of normal, making it the second driest and driest July on record, respectively. Ireland and the United Kingdom received around 50% of normal precipitation in both July and August.

September was much wetter than normal over parts of Central and Eastern Europe and the Central Mediterranean Region. Central Italy and much of the Balkans received locally around 150–200% of normal. Slovenia and Ukraine saw their third wettest September on record, Croatia, Romania and Hungary reported their fifth wettest September on record.

In October, extremely dry conditions prevailed over the Central Mediterranean Region with less than 20% of normal precipitation in Italy and over the Balkan Peninsula. Several countries saw one of their driest October months on record: Bosnia and Herzegovina, third driest; Croatia and Serbia, fourth driest; Italy, fifth driest. In contrast, wetter-than-normal conditions prevailed in parts of Eastern and Western Europe. In Ireland, October ranked wettest on record.

December 2022 was a wet month for much of the Iberian Peninsula seeing locally more than 250% of normal precipitation.

The individual drought and heavy rain events causing the previously highlighted positive and negative precipitation anomalies are discussed in more detail in section 4 on Extreme and high-impact events. The large-scale circulation patterns associated with the monthly precipitation anomalies are discussed in the section 2 on Major circulation patterns.

Table 3-9: Monthly area average precipitation anomalies in % for each subregion in the year 2022 (reference period: 1991-2020; definitions of the subregions see Figure 1-1: Definitions of the eight subregions used in this bulletin.).

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Central Europe	88	131	29	111	64	83	63	80	140	63	68	112
Central Mediterranean Region	68	80	61	83	65	89	73	161	112	36	112	103
Eastern Europe	125	101	66	133	98	75	112	67	139	105	109	119
Iberian Peninsula	27	25	187	111	40	51	53	73	82	61	84	159
Middle East	89	44	82	18	52	172	103	229	29	41	169	62
Nordic and Baltic Region	99	123	52	90	87	82	100	91	79	85	70	83
Türkiye and South Caucasus	124	88	134	55	99	143	66	105	73	66	77	63
Western Europe	62	97	65	75	64	116	32	59	110	85	111	88

Table 3-10: Rank statistics, monthly average precipitation (mm) and anomalies (mm) from several countries of the RA VI for the individual months in 2022, only including countries with rankings among the top 5 (ranks 1–5) since start of the time series.

Country	Rank	Value [mm]	Anomaly [mm]	Reference period	Start of time series
		January			
Norway	4 (wettest)	207.0	+63.3	1991-2020	1900
Spain	5 (driest)	16.0	-45.5	1981-2010	1961
		February			
Armenia	4 (driest)	14.8	-26.2	1961-1990	1934
Denmark	2 (wettest)	121.7	+74.1	1981-2010	1874
Latvia	2 (wettest)	70.5	-20.0	1991-2020	1924
Lithuania	3 (wettest)	70.0	+27.0	1991-2020	1961
Netherlands	4 (wettest)	133.2	+70.1	1991-2020	1906
Portugal	3 (driest)	-	-	1971-2000	1931
Spain	3 (driest)	-	-	1981-2010	1961
Sweden	4 (wettest)	62.0	+23.3	1991-2020	1880
		March			
Armenia	2 (wettest)	90.7	+38.7	1961-1990	1934
Austria	5 (driest)	-	-	1991-2020	1858
Belgium	1 (driest)	2.2	-57.1	1991-2020	1833
Belarus	1 (driest)	6.4	-28.0	1991-2020	1945
Croatia	3 (driest)	15.9	-20.7	1991-2020	1961
Czechia	3 (driest)	16.0	-29.7	1991-2020	1961
Denmark	1 (driest)	4.2	-47.4	1981-2010	1874
Estonia	1-2 (driest)	4.4	-29.4	1991-2020	-

Country	Rank	Value [mm]	Anomaly [mm]	Reference period	Start of time series
Germany	4 (driest)	15.0	-42.0	1991-2020	1881
Latvia	2 (driest)	5.2	-0.8	1991-2020	1924
Lithuania	1 (driest)	2.0	-38.0	1991-2020	1961
Moldova	1 (driest)	4.0	-28.0	1991-2020	1899
Netherlands	5 (driest)	14.2	-43.6	1991-2020	1906
Poland	2 (driest)	9.6	-28.2	1991-2020	1951
Romania	5 (driest)	14.1	-26. 9	1991-2020	1961
Slovenia	3 (driest)	9.8	-78.9	1991-2020	1961
Sweden	4 (driest)	10.0	-27.0	1991-2020	1880
Switzerland	4 (driest)	18.5	-68.4	1991-2020	1864
April					
Armenia	3 (driest)	31.8	-39.2	1961-1990	1934
Belarus	1 (wettest)	86.0	+222.0	1991-2020	1945
Bosnia Herzegovina	5 (driest)	20.0	-69.0	1991-2020	1950
Cyprus	1 (driest)	0.0	-29.9	1981-2010	-
Israel	3 (driest)	0.1	-19.0	1991-2020	1950
May					
France	1 (driest)	29.7	-50.8	1991-2020	1959
Moldova	3 (driest)	12.0	-56.0	1991-2020	1899
Monaco	2 (driest)	6.3	-38.0	1991-2020	1969
Slovakia	4 (driest)	36.3	-42.4	1991-2020	1961
June					
Croatia	4 (driest)	44.3	-30.8	1991-2020	1961
Lithuania	5 (wettest)	98.0	+30.4	1991-2020	1961
Romania	3 (driest)	52.3	-0.38	1991-2020	1961
July					
Armenia	4 (driest)	9.3	-34.7	1961-1990	-
Belgium	2 (driest)	5.2	-71.7	1991-2020	1833
Cyprus	1 (driest)	0.0	-2.6	1981-2010	-
France	1 (driest)	9.8	-51.9	1991-2020	1959
Luxembourg	2 (driest)	6.5	-63.7	1991-2020	1854
Monaco	4 (driest)	0.3	-16.4	1991-2020	1969
Netherlands	4 (driest)	15.8	-69.4	1991-2020	1906
Portugal	4 (driest)	-	-	1971-2000	1931
Slovenia	4 (driest)	72.9	-52.5	1991-2020	1961
August					
Greece	3 (wettest)	28.8	+19.1	1981-2010	1960

Country	Rank	Value [mm]	Anomaly [mm]	Reference period	Start of time series
North Macedonia	5 (wettest)	66.1	+28.3	1981-2010	1981
Portugal	4 (driest)	-	+0.2	1971-2000	1931
		September			
Croatia	5 (wettest)	191.0	+80.2	1991-2020	1961
Portugal	4 (wettest)	-	-	1971-2000	1931
Romania	5 (wettest)	96.5	+38.0	1991-2020	1961
Serbia	5 (wettest)	104.9	+44.6	1991-2020	1951
Slovenia	3 (wettest)	317.5	+155.5	1991-2020	1961
Ukraine	3 (wettest)	106.0	+48	1991-2020	1891
		October			
Bosnia Herzegovina	3 (driest)	15.0	-1.0	1991-2020	1950
Croatia	4 (driest)	25.5	-84.8	1991-2020	1961
Cyprus	5 (wettest)	98.1	+65.4	1981-2010	-
Ireland	1 (wettest)	220.4	+92.0	1991-2020	1941
Italy	5 (driest)	37.0	-66.0	1991-2020	1961
Serbia	4 (driest)	11.3	-48.2	1991-2020	1951
		November			
Poland	3 (driest)	18.9	-20.8	1991-2020	1951
Slovakia	4 (driest)	25.5	-29.8	1991-2020	1961
		December			
Türkiye	5 (driest)	36.3	-39.4	1990-2020	1991

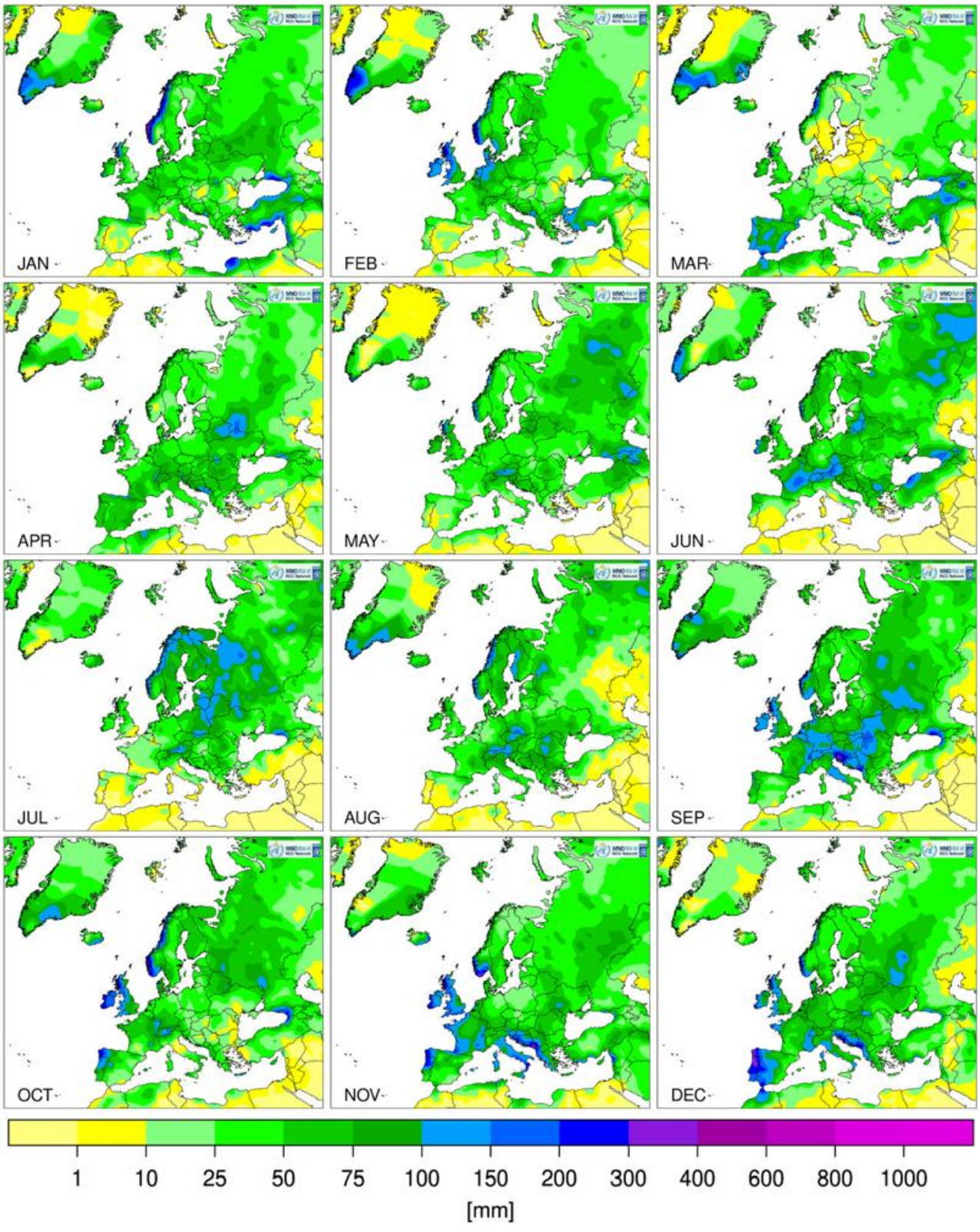

Figure 3-8: *Monthly mean precipitation in mm/month for each month of the year 2022. Source: RCC-CM website.*

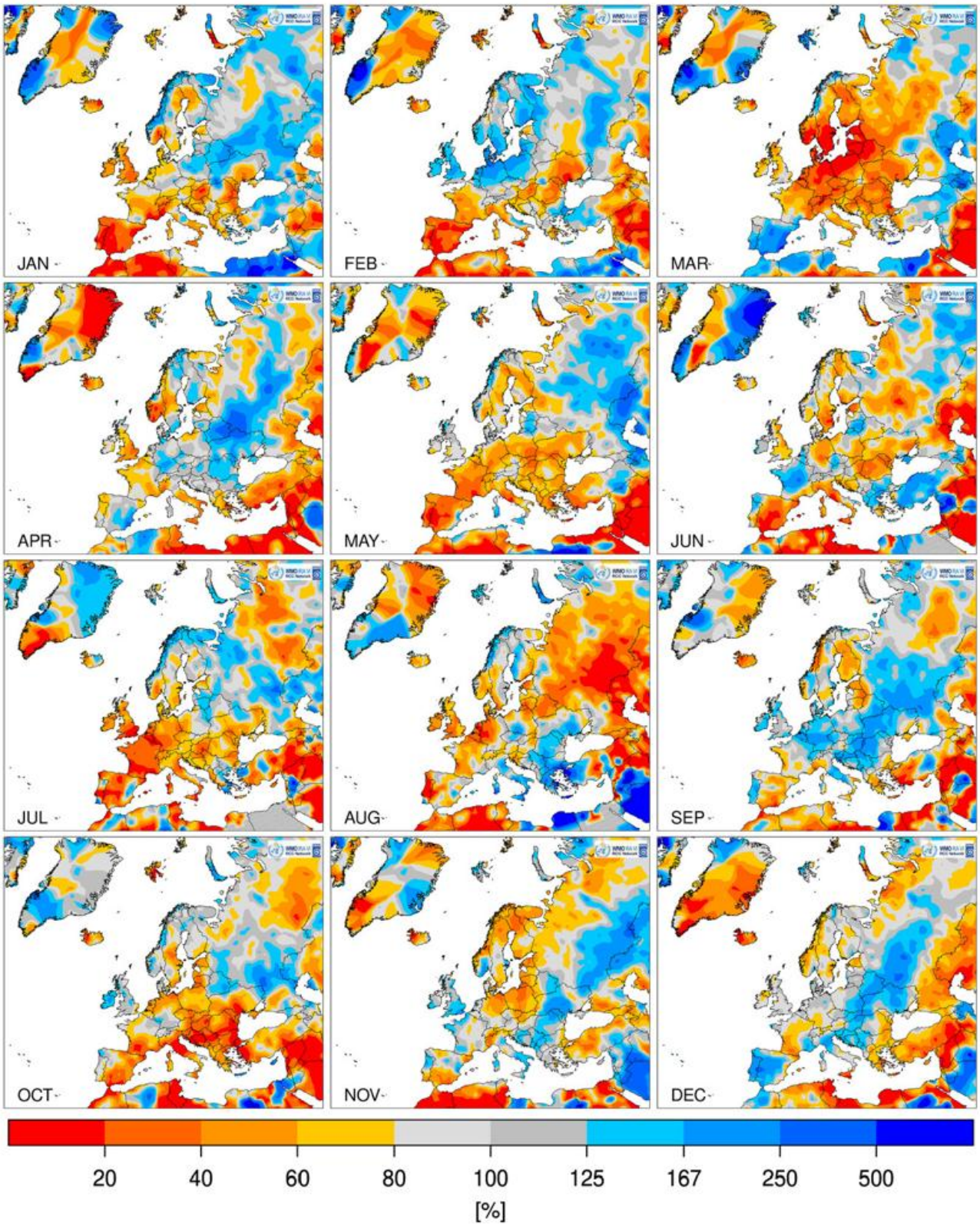

Figure 3-9: *Monthly precipitation anomalies in % of the average for 1991-2020 for each month of the year 2022. Source: RCC-CM website.*[3]

[3] The RCC monthly precipitation anomaly maps for March, April, June and July show deficits for Estonia which turned out to not correctly represent the anomalies reported by the NMHS of Estonia (indicating above normal precipitation amounts). The issue is likely related to incorrect decoded real-time data used for the grid generation. As a result, these grid point values may deviate considerably from actual precipitation totals.

3.3. Sunshine duration

3.3.1. Annual survey

Sunshine totals in 2022 were mostly above average across the RA VI land areas. All subregions saw on average positive anomalies, Central and Western Europe had the largest absolute surpluses in with around 250 hours respectively, while Eastern Europe, the Middle East and the Iberian Peninsula had the lowest with anomalies ranging between 20 and 30 hours. Negative anomalies occurred only over Portugal, eastern Spain, parts of Türkiye, Ukraine and European Russia. Largest positive anomalies, between +200 and +500 hours, occurred over Central, Western and parts of the Central Mediterranean Region (**Figure 3-10**). Annual and seasonal average anomalies of sunshine duration are shown in **Table 3-11.**

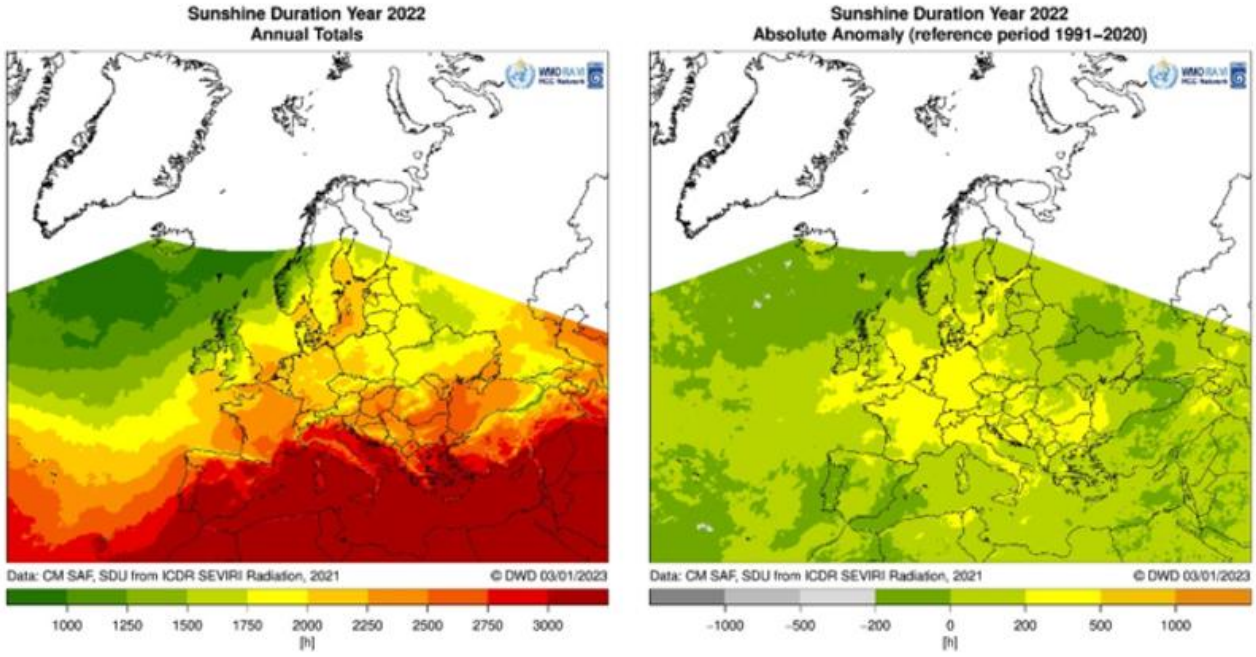

Figure 3-10: Annual sum of sunshine duration in hours (left) and absolute anomalies in hours (right) relative to 1991–2020 for the year 2022. Source: RCC-CM website.

In **Western Europe,** the sunshine totals were above normal with an overall anomaly of +255 hours. It was the sunniest year since 1983 for the subregion as a whole. Especially spring and summer were very sunny. With an average of 2233 hours of sunshine, 2022 was the sunniest year since observations began in the Netherlands. By October, the old record had already been reached.

Central Europe saw 250 hours more sunshine than normal. Spring and summer were very sunny. Germany saw its sunniest year with 2024 hours of sunshine, 480 hours more than normal (1961-1990).

The anomalies of the **Central Mediterranean Region** were also positive across the region with an average of +228 hours.

Over **Eastern Europe** anomalies in sunshine duration mostly varied between −200 and +200 hours, resulting in an average close to normal (+29 hours). Largest positive anomalies occurred over Romania while largest deficits were registered over parts of the Ukraine and European Russia.

The **Iberian Peninsula** was divided in a sunnier central part and a less sunny coastal part with anomaly values ranging from −200 to +200 hours. For the whole region, the sunshine total was close to normal (+20 hours).

The **Middle East** saw an average sunshine total close to normal.

Over the parts of **Nordic and Baltic countries** covered (see maps) sunshine totals were above normal, mainly due to an above normal sunny spring season.

In **Türkiye and South Caucasus,** the sunshine the average sunshine total was above normal, although regionally there were areas receiving below-normal sunshine, especially over Türkiye.

3.3.2. Seasonal survey

The sunshine duration in the year 2022 was mostly above normal with largest absolute anomalies around +250 hours in the Central and Western Europe (see *Fehler! Verweisquelle konnte nicht gefunden werden.*).

Table 3-11: *Seasonal and annual average of sunshine duration anomalies over land areas in hours for each subregion in the year 2022 (reference period: 1991–2020; definitions of the subregions see Figure 1-1: Definitions of the eight subregions used in this bulletin.).*

Region	Year	Winter	Spring	Summer	Autumn
Central Europe	+250	+12	+117	+113	+5
Central Mediterranean Region	+228	+58	+90	+30	+46
Eastern Europe+	+29	+2	+28	+29	-41
Iberian Peninsula	+20	+89	-45	+22	-12
Middle East	+23	+15	+10	+3	-7
Nordic and Baltic Region[Fehler! Textmarke nicht definiert.]	+74	+7	+73	+12	-18
Türkiye and South Caucasus	+56	+6	+31	-10	+13
Western Europe	+255	+23	+96	+124	+9

In **winter 2021/2022**, largest anomalies occurred over the Iberian Peninsula, the Central Mediterranean Region and the South Caucasus with values up to 200 hours above normal. Most subregions saw mixed conditions resulting in average sunshine totals close to normal (see **Figure 3-11**).

Spring 2022 saw for most subregions the largest anomalies among the seasons. Exceptionally sunny conditions occurred over parts of Germany with above 200 hours more sunshine than normal. Also Western Europe, especially France and the Benelux States, recorded an significant surplus in sunshine duration (see **Table 3-11**). Over the Iberian Peninsula, in contrast, sunshine totals were below normal with −45 hours.

In **summer,** Central and Western Europe saw largest anomalies in sunshine duration with +113 and +124 hours respectively. Especially northeastern France and western parts of Germany had anomalies exceeding +200 hours in some parts. The other regions had anomalies lower than +30 hours, Türkiye and the South Caucasus had less sunshine hours than normal.

Autumn finished for many subregions with a deficit in sunshine hours. Largest negative anomalies occurred over Eastern Europe.

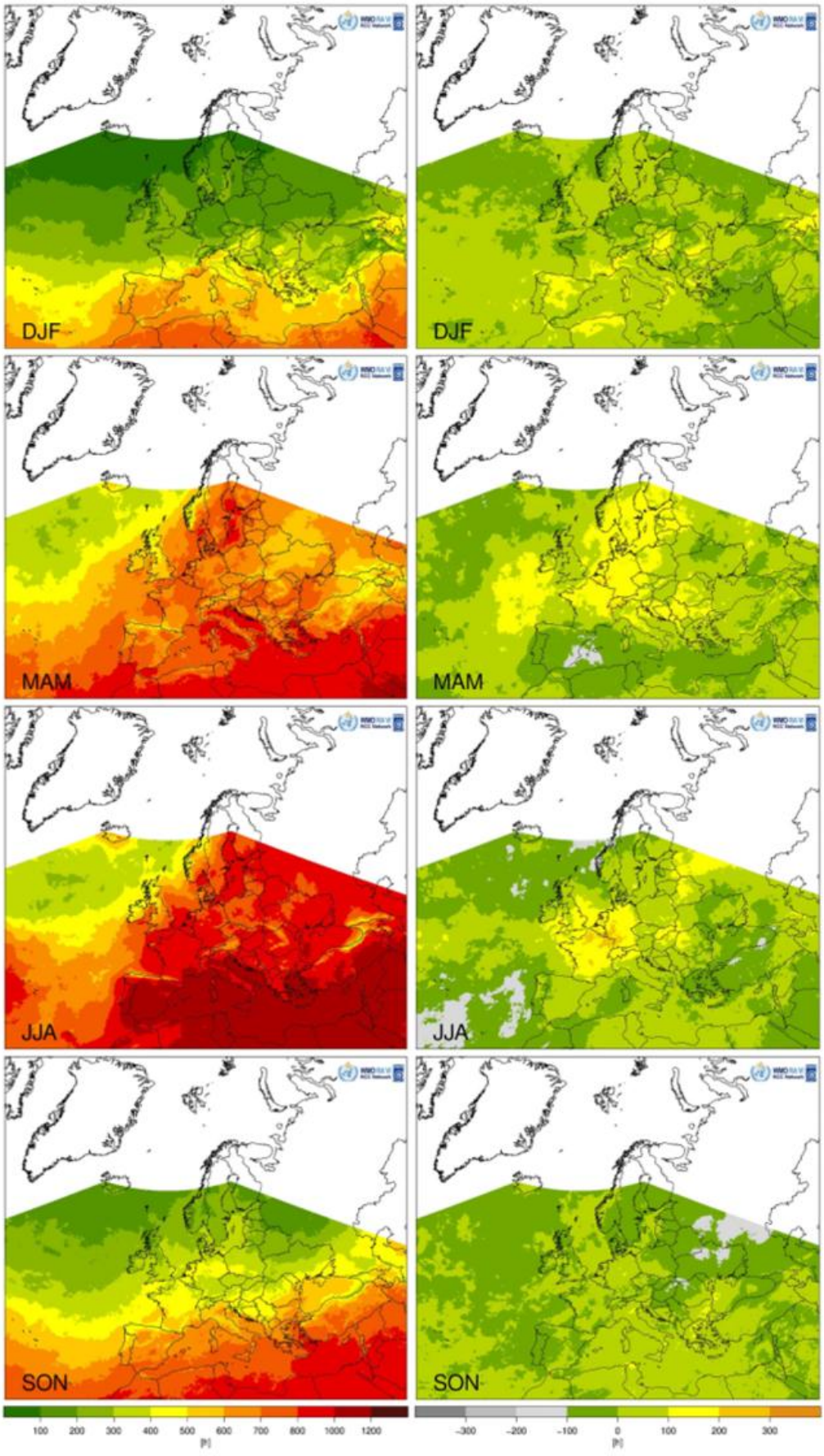

Figure 3-11: Seasonal sunshine duration in hours (left) and absolute anomalies in hours relative to 1991–2020 (right) for winter (DJF), spring (MAM), summer (JJA) and autumn (SON) 2022. Winter values relate to December 2021 – February 2022. Source: RCC-CM website.

3.3.3. Monthly survey

The positive anomaly of sunshine duration for 2022 mainly came from above-average sunshine hours between January and July. From August onwards, sunshine duration was generally closer to or below average. The above-normal monthly sunshine totals during the first half of 2022 also reflect the dry and sunny conditions that contributed to widespread drought conditions in large parts of Europe during spring and summer. The months with largest surpluses in sunshine duration, March and May, were also those which saw largest deficits in precipitation. Conversely, the below-average sunshine totals in September wet conditions in this month over large parts of the European continent. More details can be found in the 'Precipitation' section (see 3.2).

Table 3-12: Monthly area average sunshine duration anomalies in hours for each subregion in the year 2022 (reference period: 1991–2020; definitions of the subregions see Figure 1-1: Definitions of the eight subregions used in this bulletin.).

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Central Europe	+3	+20	+96	-12	+33	+63	+29	+22	-23	+24	+4	-9
Central Mediterranean Region	+37	+27	+28	+22	+41	+26	+33	-29	-7	+51	+2	-2
Eastern Europe	-3	+12	+32	-11	+6	+25	+3	+6	-33	-1	-8	+7
Iberian Peninsula	+61	+25	-92	+4	+43	+1	+17	+5	-4	-7	-1	-31
Middle East	-2	+15	-25	+22	+13	+1	+9	-7	+7	+7	-21	+4
Nordic and Baltic Region	+3	+8	+41	+32	0	+11	-11	+12	-5	-5	-8	-4
Türkiye and South Caucasus	-15	+12	-28	+44	+15	-26	+14	+1	+12	-1	+2	+27
Western Europe	+14	+17	+43	+17	+36	+24	+57	+43	-6	+11	+4	-4

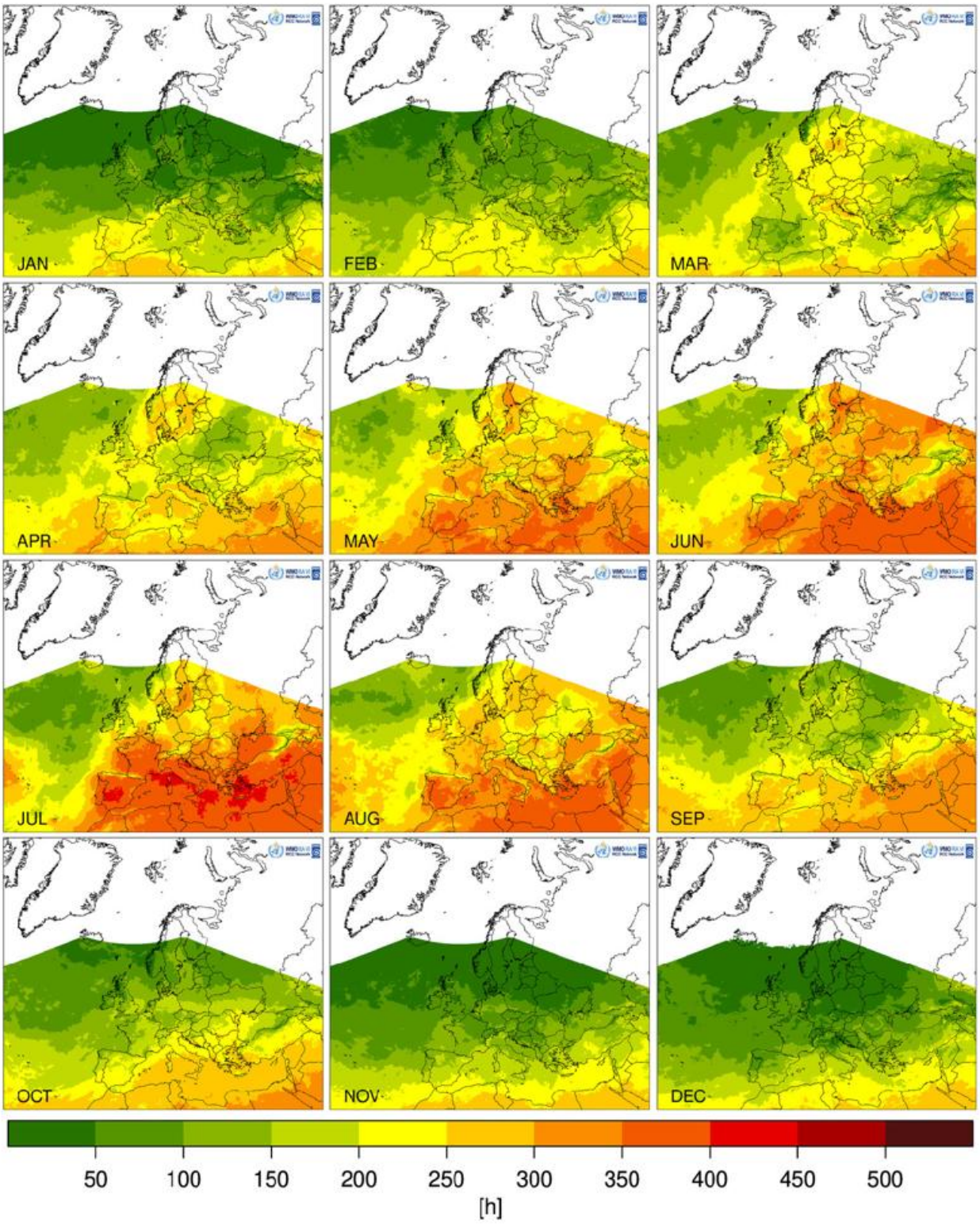

Figure 3-12: *Mean sunshine duration in hours for each month of the year 2022. Source: RCC-CM website.*

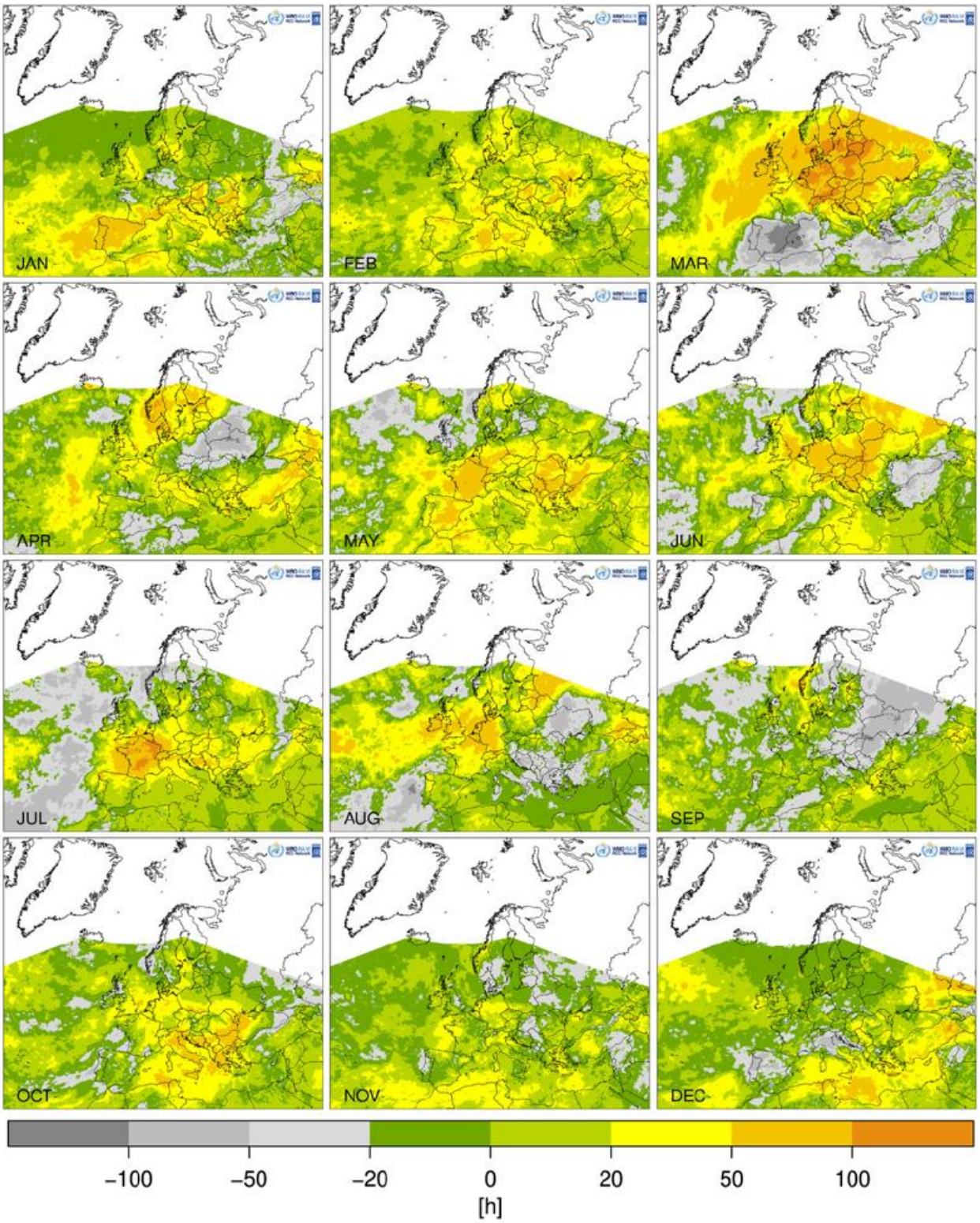

Figure 3-13: *Monthly anomalies of sunshine duration in hours relative to 1991–2020 for each month of the year 2022. Source: RCC-CM website.*

3.4. Snow cover

For most of the northern parts of the RA VI Region, the snow season of 2021-22 (September 2021 – August 2022) started in October 2021 (**Figure 3-14**). In November, snow appeared for the first time also in areas further south, including central European Russia, the Baltic countries and Belarus. It also appeared in eastern parts Central Europe, as well as in some parts of Western Europe and northern Spain. The last occurrence of snow in the lowlands of Central and Western Europe was in April 2022, when a cold spell hit these regions, bringing freezing temperatures and heavy snowfall.

Despite long duration of the snow period (due to the early start and late last occurrence of snow, see **Figure 3-15**) in some lowland areas of Central, Western and Southeastern Europe, these regions generally experienced fewer snow days than normal (w.r.t 1981–2010; GLOBAL SNOW LAB (Rutgers University, information available at https://climate.rutgers.edu/snowcover/). Northern parts of the RA VI Region - especially Scandinavia and Finland - in contrast, consistently experienced more snow days (w.r.t 1981–2010) throughout all months of the winter season. In the Swiss Alps, the winter of 2021/2022 began well, with an early snow accumulation in some areas (WMO, 2022). However, by the end of the season (November–April), snow amounts north of the Alpine ridge above 1500 meters reached only 70–90% of normal (compared to the 1991–2020 averages), with even lower amounts recorded at lower altitudes. South of the Alpine ridge, the snow situation was even more critical as higher temperatures and low precipitation led to record-low snow amounts at some stations. Even above 2000 meters, snow depths in the south were less than half the normal levels.

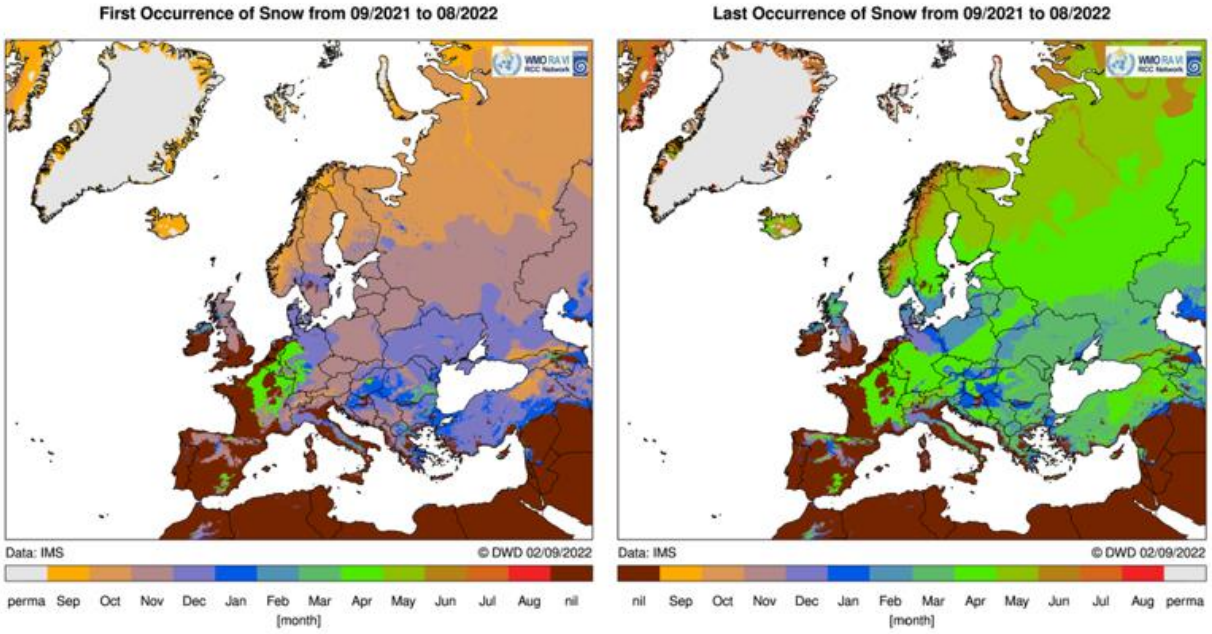

Figure 3-14: *First occurrence (left) and last occurrence of snow (right) during the snow season 2021/2022 from 09/2021 to 08/2022. Source: RCC-CM website.*

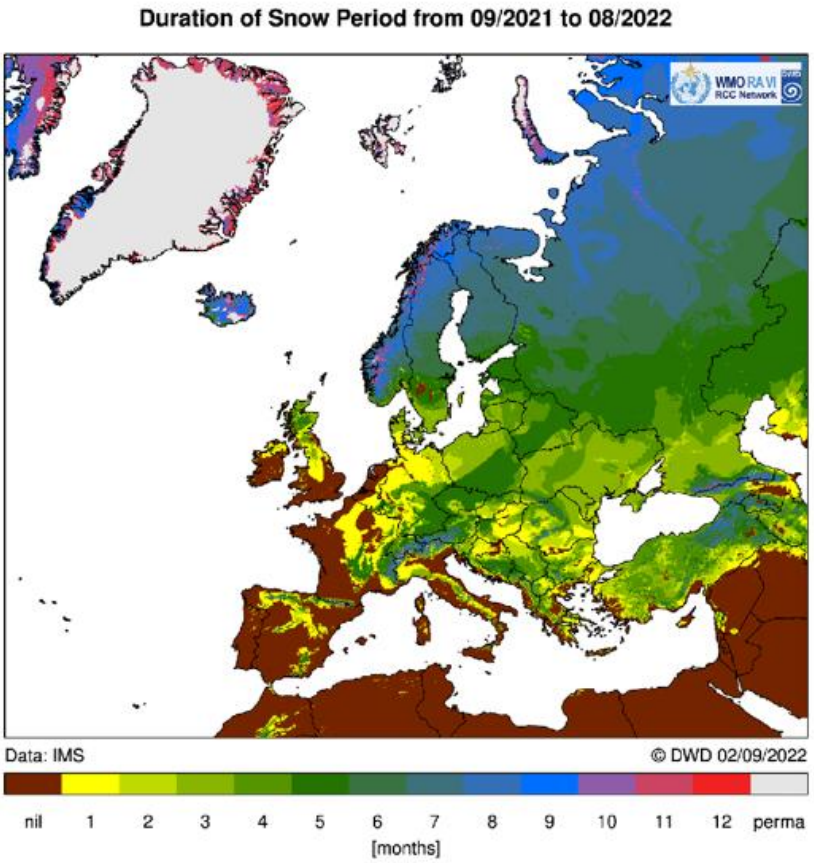

Figure 3-15: *Duration of snow cover in the snow season 2021/2022 from 09/2021 to 08/2022. Source: RCC-CM website.*

3.5. Selected climate indices for 2022

This section presents selected temperature and precipitation indices calculated based on the SYNOP-based GPCC (Global Precipitation Climatology Centre; GPCC Website) Product. Annual climate index maps are shown as well as anomaly maps. The following climate indices are considered:

1. **Precipitation Days**: count of days where RR (precipitation) ≥ 1 mm

Precipitation below 1 mm/day has no effect on vegetation because it normally evaporates on the same day and is locally affected.

2. **Number of Summer Days**: count of days where TX (daily maximum temperature) ≥ 25 °C

3. **Very Heavy Precipitation Days**: count of days where RR (precipitation) ≥ 20 mm

4. **Number of Tropical Nights**: count of days where TN (daily night temperature) ≥ 20 °C

The **number of summer days** was just in the northern parts of the RA VI Region around normal (reference period 1981-2010). Scandinavia and the north of the United Kingdom as well as Iceland recorded 0 to 25 summer days. The Mediterranean region and the western Balkan Peninsula had high positive anomalies. Particularly in France there were 40 to 60 days more summer days than normal across the whole country. In contrast, the number of summer days was lower than normal in Hungary and Latvia. Türkiye hat a regional variation of the summer days from +60 in the north to −20 days in the southern region.

For the **number of tropical nights**, anomalies were mostly between -10 and 10 days. In the Mediterranean countries Spain, Italy, Greece and south France the year 2022 had in some parts more than 50 tropical nights with anomalies exceeding +30 days. There was no country which had remarkable anomalies in the negative range.

In most parts of the RA VI Region, the number of **precipitation days** was with 100 to 145 days around normal. Large parts of southern European Russia, northeastern Ukraine and the Atlantic coast region of Scandinavia and Scotland had positive anomalies of the precipitation days (20 to 60 days more than normal).

Most **very heavy precipitation days** occurred over Portugal, the Atlantic Coast regions of the Scotland, Norway. The western coastal region of the Balkan Peninsula and eastern coast of the Black Sea had between 9 to more than 30 days of very heavy precipitation. Otherwise most parts had around 3 to 6 days of very heavy precipitation and in Central Europe the anomalies values were negative (−3 to −9 days). Especially Iceland had more than 15 days less very heavy rainfall then normal.

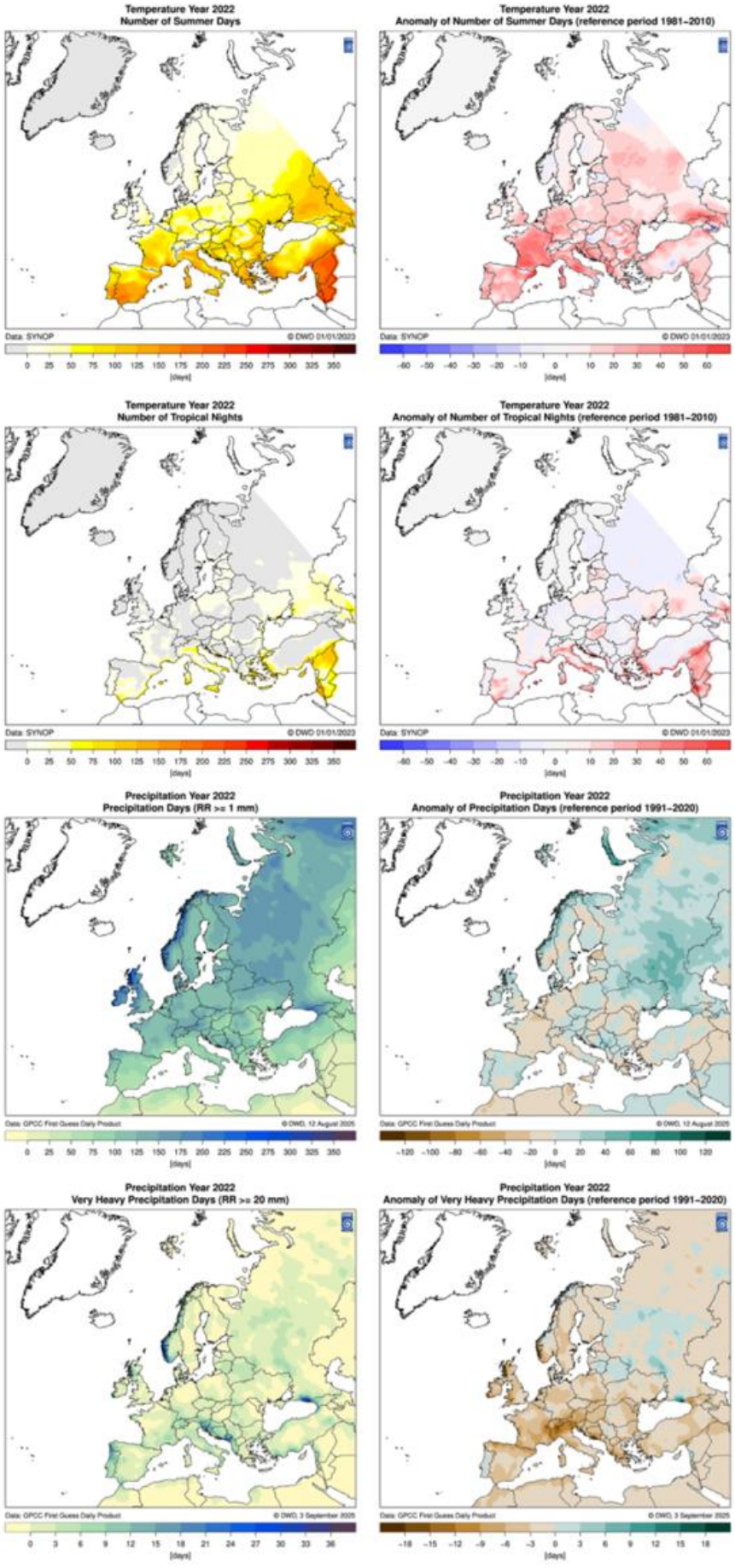

Figure 3-16: *Selected climate indices (left) and their anomalies (right) relative to 1991–2020 for the year 2022. Source: SYNOP and GPCC (DWD).*

4. Extreme and high-impact events

4.1. Droughts

4.1.1. March

The month of March 2022 was particularly marked by drought over large parts of the RA VI Region in. Particularly the countries neighbouring the Baltic Sea were affected and formed part of the areas experiencing extreme drought conditions in March according to the GPCC Drought Index (**Figure 4-1**).

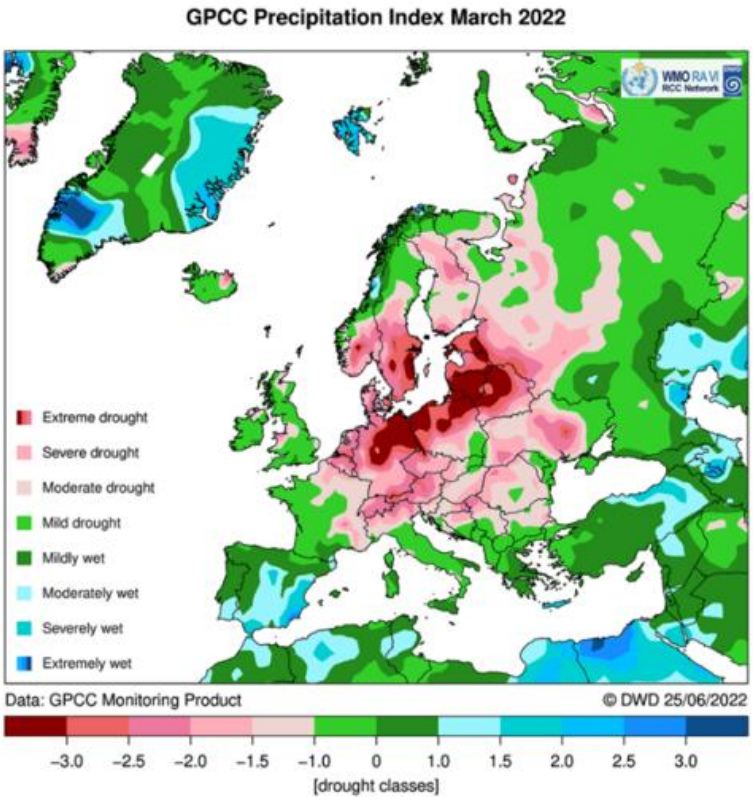

Figure 4-1: *Drought index for March 2022 in the RA VI Region. Source: Deutscher Wetterdienst - RCC Node-CM (WMO RA-VI).*

In Lithuania, the entire country received on average only 1.9 mm of precipitation. In some places the amount of 1.0 mm was not exceeded or there was no rain at all (see Figure 4-2). Neighbouring country Latvia also received only 14% of its monthly total precipitation, making March the driest month on record since 1924. In Germany, only 28% of normal precipitation fell and the month of March was the fourth driest March since 1981. All stations were drier than average - less than 10% of the average amount of precipitation fell from the island of Fehmarn and Mecklenburg-Western

Pomerania's coast to Lüneburg Heath and Lower Lusatia. In Sweden there were over 30 measuring stations in the south that did not measure any precipitation for the month.

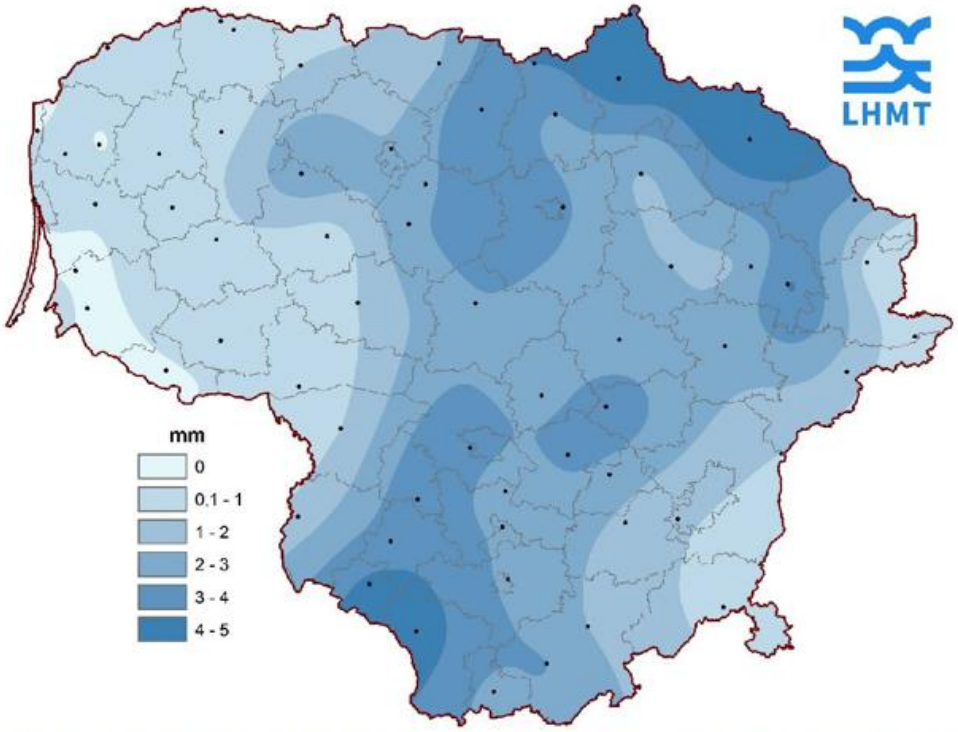

Figure 4-2:: *Monthly precipitation (mm) for March 2022 in Lithuania according. Source: Lithuanian Hydrometeorological Service.*

4.1.2. July

July was characterized by drought in Western and Southern Europe (**Figure 4-3**). Because of the scarce rainfall and several droughts, the Portuguese and Italian governments called on the citizens to limit their water use to a minimum. In northern Italy, this drought situation even affected the crop production and threatened the densely populated region with a serious drinking shortage, because of the unusually low levels of the country's largest river Po. Other rivers in that region were also concerned.

In France, the GPCC Drought Index was negative in July across the entire country. On 8 July 2022, 68 of the 96 departments were affected by water-use restrictions. From 17 July onwards, France set new records for soil drought every day (in a history that began in August 1958). In the Southeast, this extreme drought began even earlier: the daily record was broken every day from the beginning of July on in Corsica. In Spain, the water reserves decreased to 41.9% of its total capacity Until 26 July. In the south of the country (Guadalquivir), the water reserves even dropped to 25.6%. In the United Kingdom, areas southeast of a line from Lincolnshire to Cornwall saw less than a quarter of the normal July precipitation amounts (see **Figure 4-4**). In combination with the heat wave, which reached its peak around 18 and 19 July, there were many fires across large parts of England, particularly Greater London and the southeast.

In Germany, the grain harvest was significantly lower due to the drought, as were the sugar beet, maize and grape harvests later in the summer. Other consequences of the drought were low water levels even in large rivers (e.g. Rhine) and forest fires.

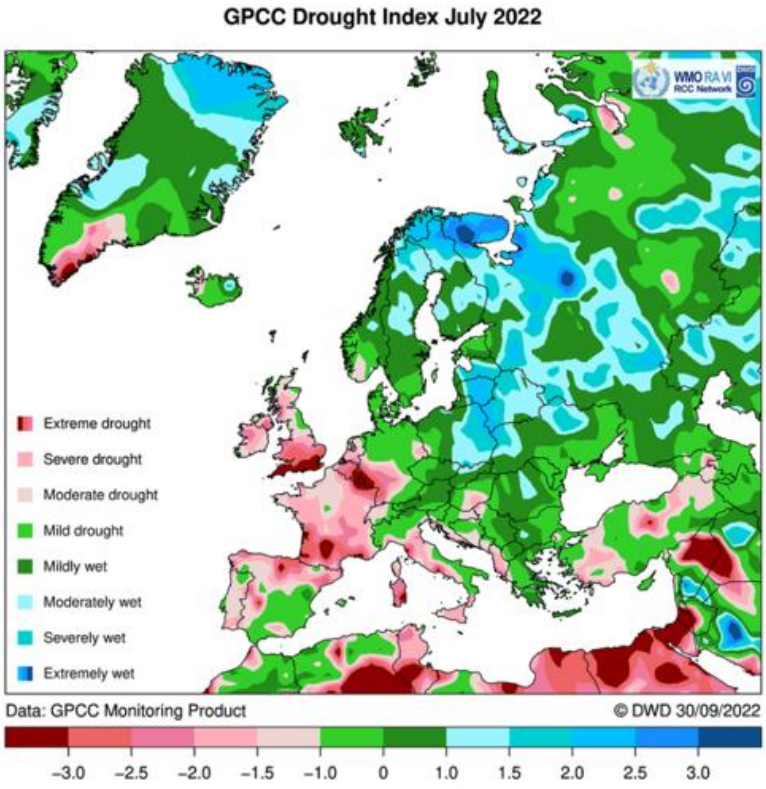

Figure 4-3: Drought index for July 2022 in the RA VI Region. Source: Deutscher Wetterdienst - RCC Node-CM (WMO RA-VI).

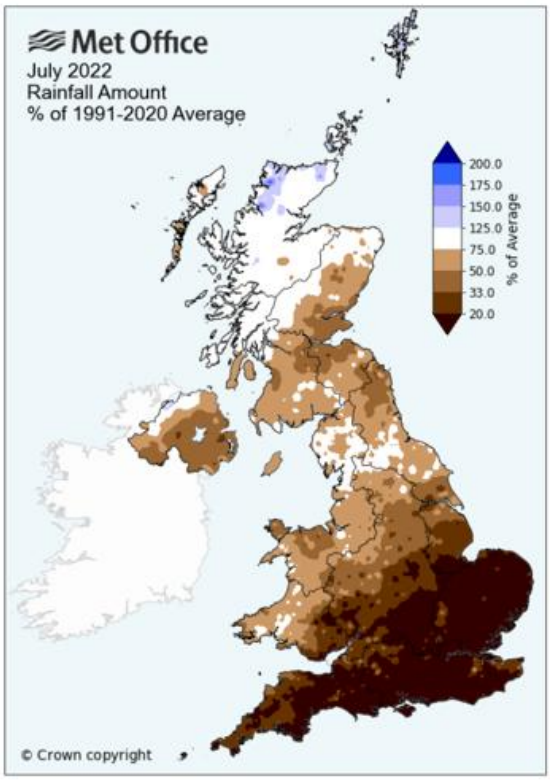

***Figure 4-4**: Monthly precipitation anomalies (%) for July 2022 in the United Kingdom according to the 1991-2020 climatology. Source: Met Office.*

4.2. Heatwaves and wildfires

4.2.1. February

In February, a warm spell affected almost the whole RA VI Region. The anomaly values were in a positive range from Eastern Europe to Portugal as well as over Scandinavia and the Central Mediterranean Region. The values of the anomalies increased from west to east and varied from +1 °C in Spain and Italy to over +6 °C in parts of Russia. Iceland and Greenland were the only two countries with negative anomalies.

For the eastern countries the unusually warmer temperatures of February 2022 caused snow melting. In Lithuania, the intensive snowmelt caused river levels to rise by around two metres in one day.

In Hungary, the national daily record for maximum temperatures was broken on 17 February 2022. The south-westerly wind behind the warm front warmed the air to 21.5 °C in Fertorákos. This record is almost +3 °C higher than the previous record in Sellye in 1998. The anomalies spread across the country can be seen in **Figure 4-5**.

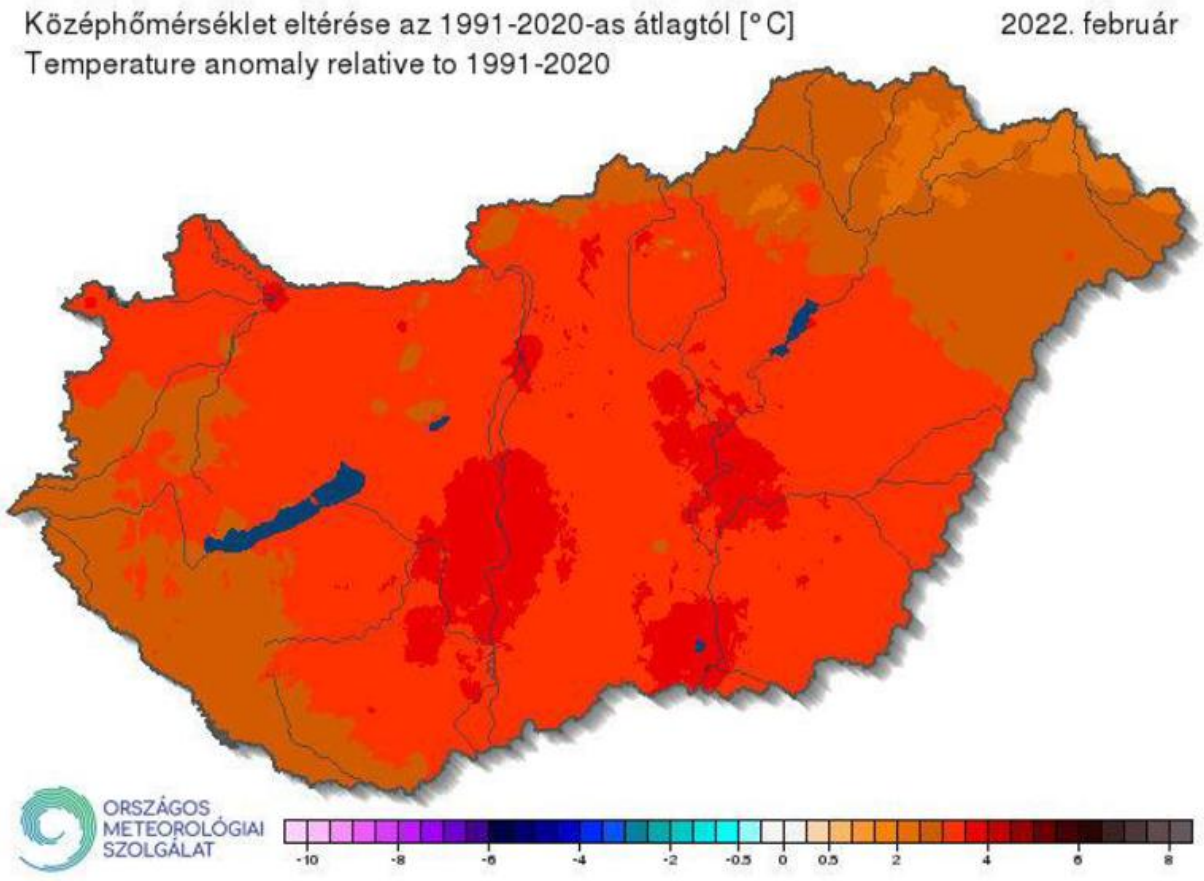

Figure 4-5: Mean temperature anomalies (°C) for February 2022 in Hungary according to the 1991-2020 climatology. Source: Meteorological Service of Hungary.

In Sweden, the largest temperature change within one hour in the month of February took place on 14 February, when the temperature rose by +19.8 °C from −29.3 °C to −9.5 °C between 05:00 and 06:00 local time.

4.2.2. March

March 2022 brought a warm spell, which was particularly noticeable in Northern and Central Europe. Between 20 and 27 March, this warm spell reached northern Europe where many records were

broken. Anomaly values up to +4 °C occurred in some parts of Norway and Sweden. In Norway, 14 new maximum temperature records were set in the western part of the country, as can be seen in **Figure 4-6**. Sweden recorded new March records up to above 16 °C at some stations, and also Finland noted a new March record at Uto in the Baltic Sea with 11.6 °C. In the Russian Republic of Karelia (northwestern part of Russia), new monthly records of highest temperatures were set on 21 March with temperatures exceeding 13 °C and the air temperature in the central and northern regions of European Russia exceeded the norm by 4–9 °C.

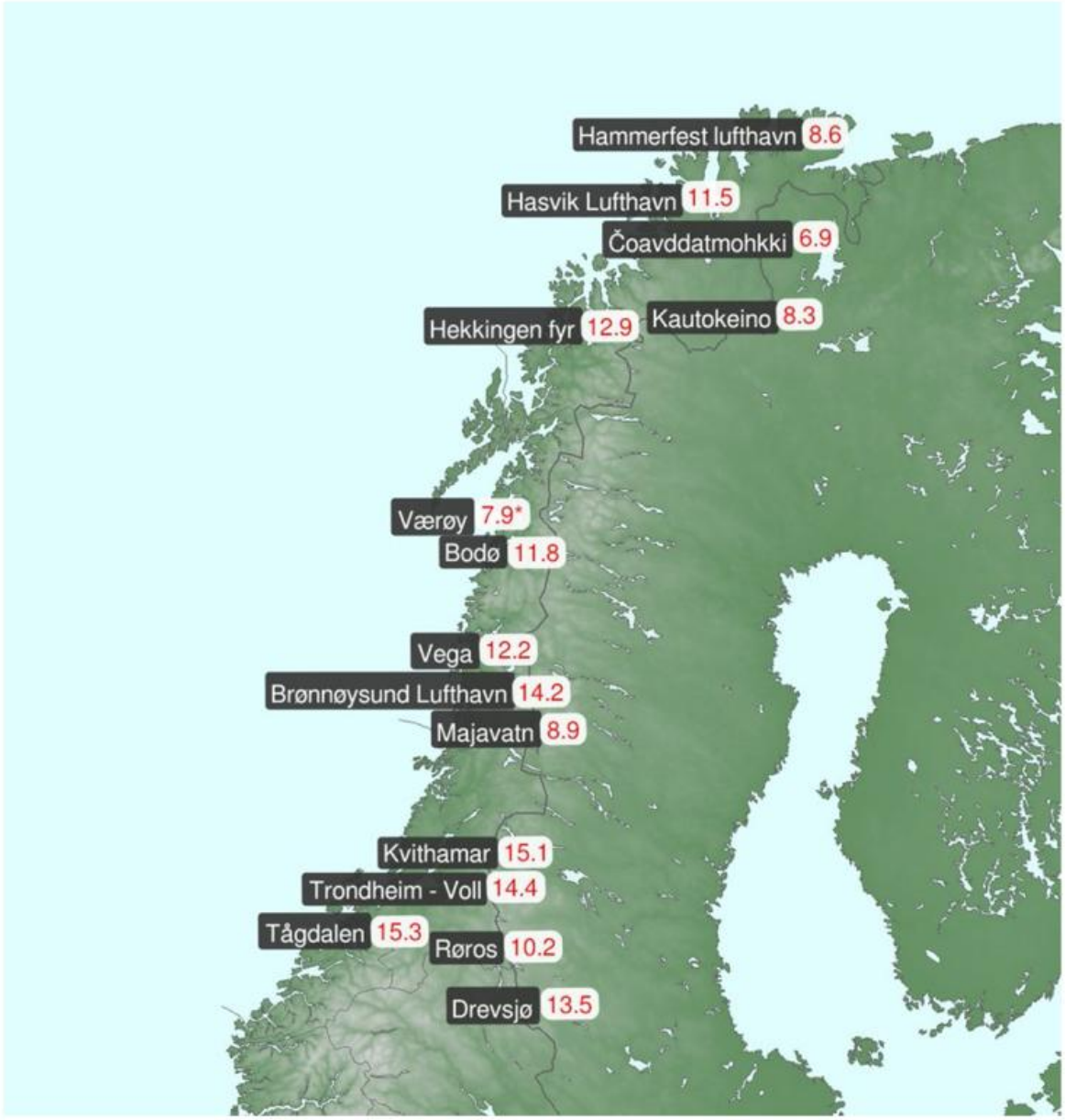

***Figure 4-6**: Heat records (°C) for March 2022 in Norway. Source: Meteorologisk institutt (MET Norway).*

4.2.3. Summer

4.2.3.1. Heatwaves

During the summer months of June, July and August, there were several heat waves in the RA VI Region, which had both a large geographical and temporal extent.

The June heat waves affected mostly the southern parts and Central Europe and at the end of the month northern and eastern parts of Europe. Between 9 and 17 June, a heat wave hit the Iberian Peninsula with daily maximum temperatures of 42.3 °C in Portugal (Pinhão) and 44.5 °C in Spain (Andujar). This heatwave was probably the second-largest heatwave in southwestern Europe since

at least 1950, after 2003, as it lasted a very long time and affected a large area. The south of France was hit by a heatwave from the 11 to 19 June. The heat wave set a new record for the earliest temperature of 40 °C in the year since 1947, measured on the 16 June in Hérault region. Through the weeks, the heat expanded till the Atlantic coast in the North and the highest temperatures was 42.9 °C in Biarritz (southern Atlantic coast).

In July, the heat continued over the southwestern, central and southeastern parts of the RA VI Region. The first heat wave developed across southwestern parts of Europe. Daily maximum temperatures exceeded 40 °C in several countries. Anomalies of +3 °C occurred for example in Portugal and southern France. The heat also spread to the east. In Slovakia, the all-time temperature record was broken with 38.6 °C on 21 July, a new monthly record was reached in Slovenia (39.4 °C) on 23 July, and the second hottest day since 1881 occurred in Zagreb in Croatia (39.1 °C). The southeast was also affected by several heat waves, which lasted for a long time and brought high temperatures and tropical nights to many countries of the Middle East.

August was also characterized by three huge heat waves in many parts of the RA VI Region. The first wave hit southern, western and central parts between the 1 and 6 August. More than half of France mainland saw temperatures higher than 35 °C during that episode. The second wave (8-19 August) affected not only southwestern and western parts of Europe but also the Nordic and Baltic Countries. In Sweden, Finland and Norway several tropical nights were recorded.

4.2.3.2. Forest Fires

Wildfires occurred in the RA VI Region between June and September. The southern subregions were particularly affected, such as the Central Mediterranean Region and the Iberian Peninsula as well as parts of Central Europe. A description of selected forest fires follows.

In June 2022, forest fires occurred over large parts of Europe and the RA VI Region. The fires had their focus on southern countries and appeared all over the month in different regions. In Spain and France, the heat wave, combined with the almost permanent drought, repeatedly led to forest fires. Out across northern Spain, among others, in Navarra Province, in Zamora Province, in Zaragoza Province and in the Provinces of Lleida and Tarragona, a series of wildfires broke out on 16 June. The largest area affected was in Provinces of Lleida, where around 2 700 hectares of land burned down, of which 2 560 hectares were forest vegetation. In the southwestern France (Nouvelle-Aquitaine Region), forest fires occurred on 19 June which extended to the southeast and caused evacuations and widespread damage. About 1 900 hectares were burned.

Southern Europe was especially affected by forest fires in July. In north-eastern Greece wildfires broke out and caused evacuations. Between 22 and 24 July, there were about 250 forest fires in Greece. In Southern France, between July 12 and 18, an area of 21 000 hectares was affected in the department of Gironde and almost 43 000 people had to be evacuated. The largest forest fire in the history of Slovenia broke out on 15 July in the municipality of Miren-Kostanjevica (north western Slovenia), spread over the Karst ridge and was only brought under control on 24 July. Slovenia activated the EU Civil Protection Mechanism (UCPM) and other neighbouring countries helped to extinguish the fire. Around 1 000 firefighters were involved in the operations. The power supply line between Divaca and Regipulje had to be switched off on 20 July, and was restored on 21 July.

In August, the dry weather caused a higher-than-normal (in terms of number, extension, duration and intensity) forest fire activity in various countries. Large forest fires occurred in various parts of France, even in those, where fires do not occur very often (e.g. Jura, Brittany, Pays-de-la-Loire). Nearly 50 000 hectares of vegetation were lost in smoke in mid-August, something that had not been seen for many years. Portugal experienced outstandingly extended and long wildfires for 15 days on 6-21 August. An area of about 17 000 hectares was burned, more than 1 500 people were affected

in the burned area. The most affected areas include Castelo Branco district (central Portugal), where 10 firefighters were injured during operations, and Guarda district (north-eastern Portugal), where a wildfire in Gouveia municipality caused five injuries.

Large wildfires took place in early September especially in France, Germany and in Türkiye. On 3 September, a fire broke out in the National Park in the Harz Mountains in central Germany, in the state of Saxony-Anhalt, causing the displacement of hundreds of tourists from the area. The fire affected an estimated area of at least 60 hectares and, due to the drought and the presence of dry wood and underbrush in the area, it was spreading rapidly. A forest fire broke out in Gülnar District (Mersin Province, southern Türkiye) on 7 September that resulted in casualties and damage. At least 31 people were affected by the fires and 1 025 people were displaced across the districts of Gülnar and Silifke. A total of 29 helicopters, 11 aircrafts, and 138 water tanks had been deployed to battle the fire.

4.2.4. October

The month of October was extremely warm nearly all over the RA VI Region. The anomaly values ranged from 0-5 °C above the norm and were particularly high over western Europe and the Iberian Peninsula. In the western Mediterranean, the water temperature was up to 5 °C above average, which warmed the air additionally.

The heat first appeared in Western and Central Europe (Iberian Peninsula, France, Germany, Switzerland and Austria) until it spread to the Balkans during the third decade of October. The maximum temperatures were in Serbia and Albania up to 29.0 °C, North Macedonia 28.5 °C, Montenegro 28.3 °C, Bosnia and Herzegovina 28.0 °C on 24 October. In Slovenia 28.2 °C, Croatia 28.5 °C on 30 October and Greece 31.8 °C on 23 October.

Another warm spell was observed in the Türkiye and South Caucasus Region at the beginning of the month. In Yerevan (Armenia, 854 m a.s.l.) the hottest October day since 1945 was recorded with 33.2 °C on 5 October. In Cyprus the hottest October day since the beginning of the measurement was recorded on 2 October (41.2 °C in Alonoudi).

4.3. Cold spells and snow

4.3.1. February

A large amount of fresh snow was recorded in the Northern Alps at the beginning of February. In Arosa (Switzerland), 103 cm of snow accumulated within three days and in Seefeld in Tyrol (Austria) even 93 cm within 24 hours. At least 9 people died in Austria after more than 100 avalanches struck the country in just three days between 5 and 7 February.

4.3.2. March

In March, a cold wave affected the southeast of the RA VI Region. At the end of the second week, especially the Balkans, Greece and Türkiye saw an exceptionally cold morning on 12 March 2022. A new cold record for March was reached in Montenegro with −30.1 °C at Kosanica.

The city of Istanbul was hit by a snowstorm on 12-13 March and the storm Filippos brought low temperature and snowfall to parts of Greece and Cyprus. In Türkiye, March temperature were below the seasonal normal almost in the whole country as can be seen from **Figure 4-7**, marking the second coldest March on record (since 1971).

It was also cold in the Caucasus region with temperature anomalies between −3 °C and −6 °C during two weeks. It snowed during several days in Georgia and for the first time, snowfall in Tbilisi did not stop for more than a week in a row.

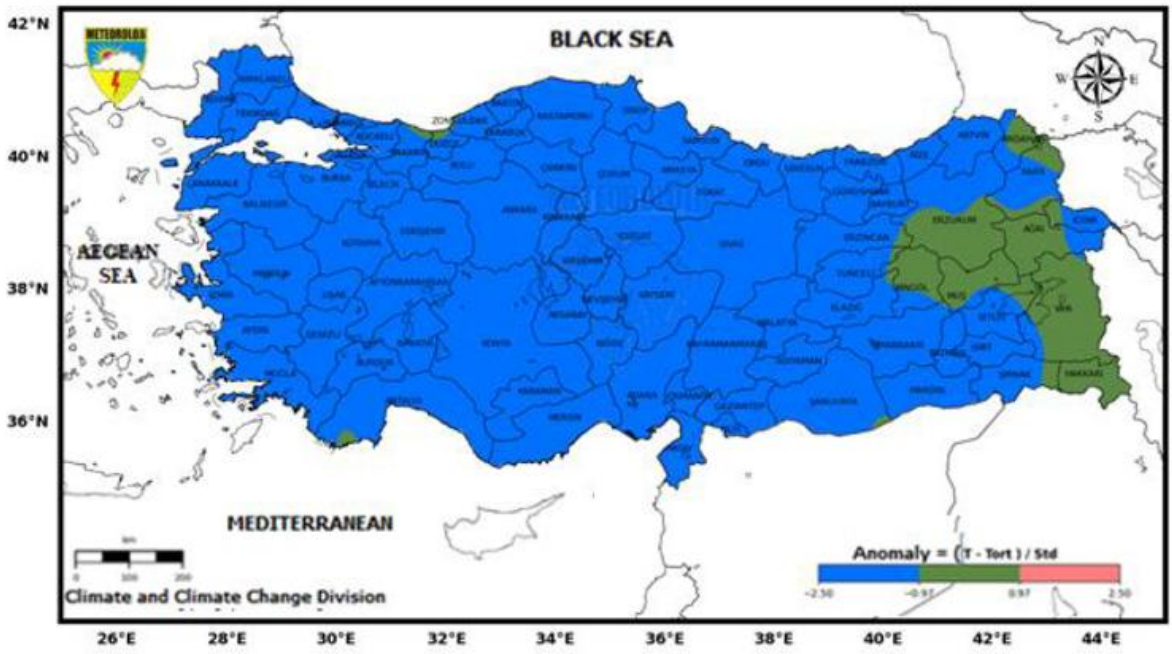

Figure 4-7: Spatial distribution of mean temperature anomaly relative to the seasonal normal in Türkiye in March 2022 according to the 1991-2020 climatology. Source: Meteorological Service of Türkiye.

4.3.3. September

Mid-September 2022, a flow of Arctic air into Northern and Central Europe led to a short, but notable cold spell. Parts of Europe experienced their first snowfall of the season at the weekend on 17-18 September when temperatures decreased significantly. The anomalies reached up to −3 °C in the Baltic countries and parts of eastern Europe.

In Estonia, the first September decade was particularly cool with an average air temperature of 10.0 °C. Latvia also recorded a cold start of the month: the first decade was the second coldest since 1961 with an average temperature of +9.9 °C, which is 4.1 °C below the norm. **Figure 4-8** shows that the average air temperature in Latvia was below normal in the whole country.

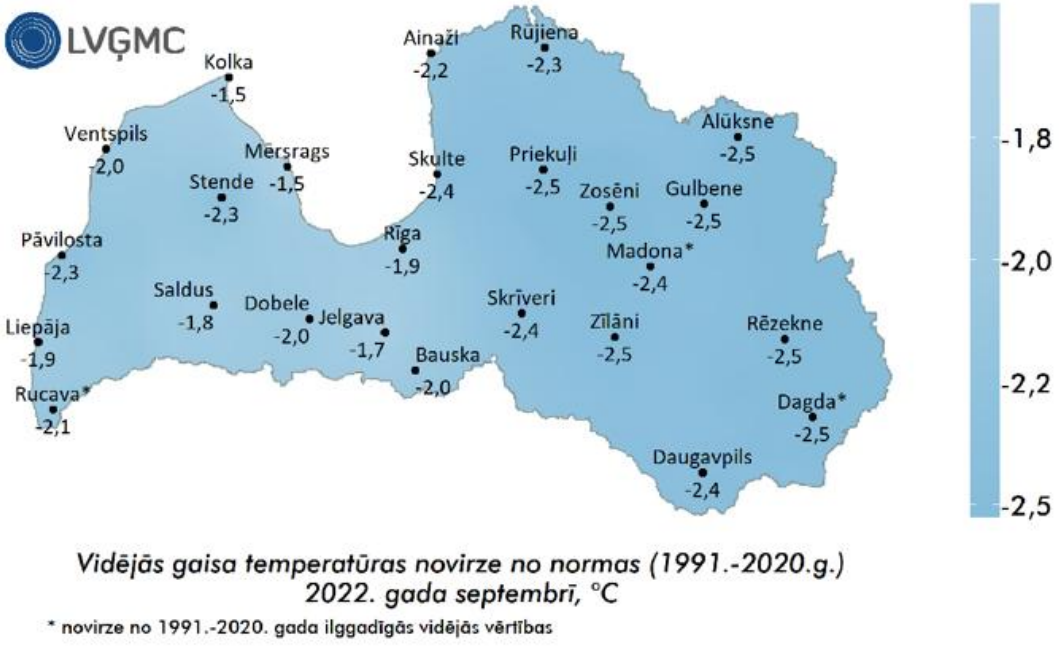

Figure 4-8: Mean temperature anomalies (°C) for September 2022 in Latvia according to the 1991-2020 climatology. Source: Latvian Environment, Geology and Meteorology Centre.

In eastern Lithuania, the active plant vegetation season ended on 10 September due to temperatures dropping below 10.0 °C. This season was therefore a total of 19 days shorter than normal. September brought Belarus average air temperatures of 2.3 °C below the norm. Especially the first decade was significantly colder than normal, with temperature anomalies of −4 °C.

4.3.4. December

In December multiple cold waves affected the north of the RA VI Region and brought temperature anomaly up to −5 °C.

Around 5 December, a cold wave affected Northern, Western and Central Europe. In southern Norway, daily minimum temperatures down to −25 °C were measured in the night to 5 December and −11.1 °C in Denmark on 8 December. Ireland recorded ice days mainly during 9-13 December. Both the United Kingdom and Ireland measured the lowest maximum temperature since 2010 on 12 December (United Kingdom −9.3 °C, Ireland −3.1 °C, excluding mountain stations). Generally, this was one of the most significant spells of low winter temperatures to affect the United Kingdom since the exceptional December of 2010. In France, Germany, Poland and Czechia temperature minima's around −15 °C or lower were recorded in places within the days of 13–16 December, even in lower altitudes.

It was unusually cold in Reykjavík. The average temperature in December was -3.9 degrees, which is 4.7 degrees below the average from 1991 to 2020. December has not been this cold in Reykjavík for over 100 years, but December 1916 was as cold as December 2022 (see **Figure 4-9**).

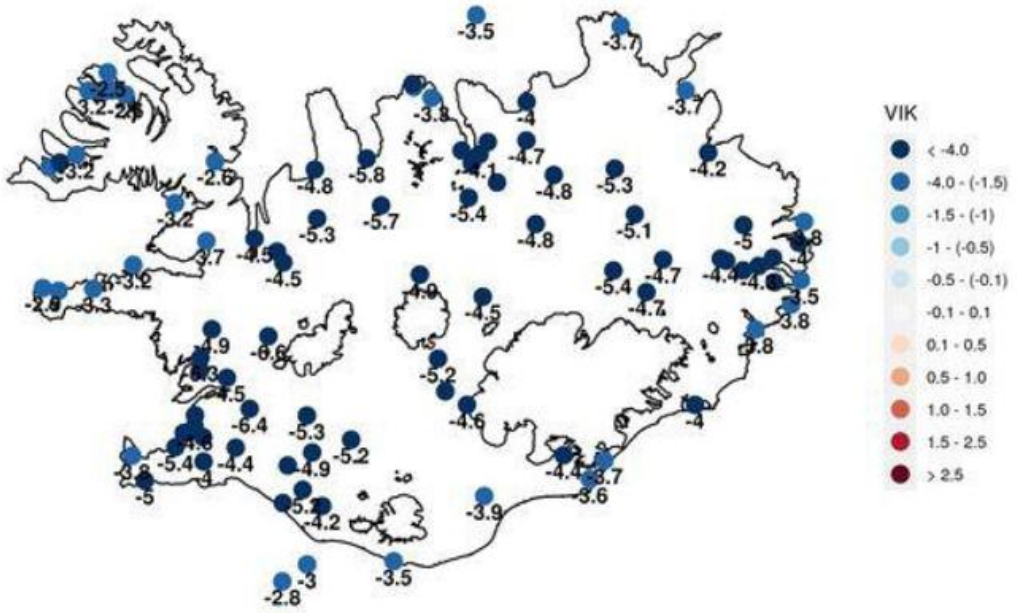

***Figure 4-9**: Mean temperature anomalies (°C) for December 2022 in Iceland relative to the average of the last then years. Source: Icelandic Met Office.*

4.4. Storms and heavy rain events

4.4.1. January

In the second week of January 2022, intense but spatially limited heavy rain events occurred in central Scandinavia. The storm Gyda moved over central parts of Norway (see **Figure 4-10**) and Sweden and caused heavy rainfalls: Several measuring stations in Trøndelag and Møre og Romsdal recorded a new 24-hour record for January, e.g. 153.1 mm in Tomrefjord on 12-13 January. The station in Meråker received the precipitation normal for January in just 24 hours with 83.5 mm. In the

areas affected by the heavy rain events, there was still a risk of avalanche and flooding afterwards. In the night to 17 January 2022, a gust of 202 km/h was measured in Jolster-Kvamsfjellet (980 m a.s.l.).

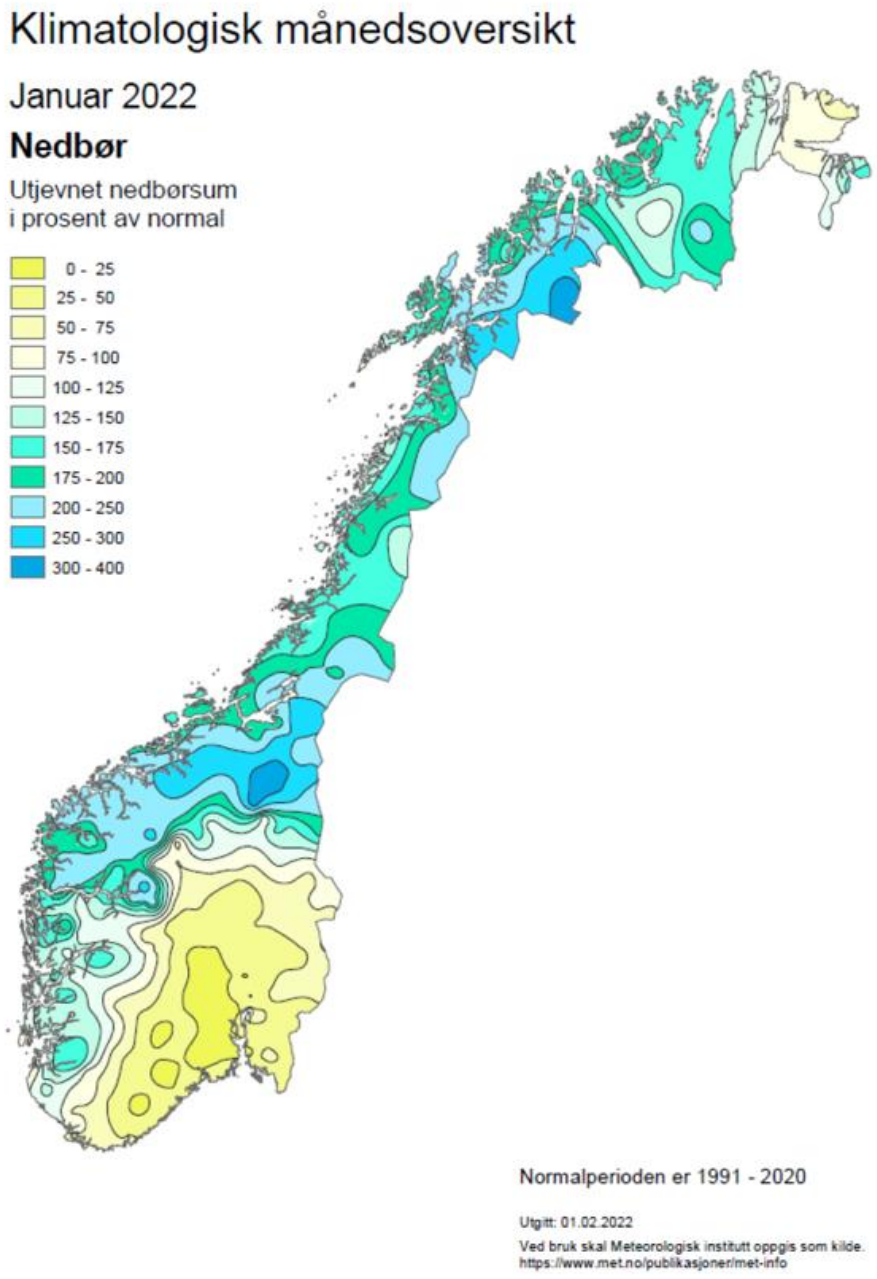

***Figure 4-10**: Monthly precipitation anomalies (%) for January 2022 in Norway according to the 1991-2020 climatology. Source: Meteorologisk institutt (MET Norway).*

4.4.2. September

Croatia and Slovenia were particularly affected by the heavy rain events in September. A new record was set with a total of 287.5 mm of rain falling in 24 hours in Rijeka in Croatia on 28 September 2022. The previous record of 262.1 mm dated back to 1981. The city recorded up to 140 mm of rain in just 2 hours, 95 mm in just one hour. The rain also caused flash floods and landslides that resulted in damage. One person died in flash floods in a central area of Rijeka. Precipitation data from Croatia for the month of September is shown in **Figure 4-11**.

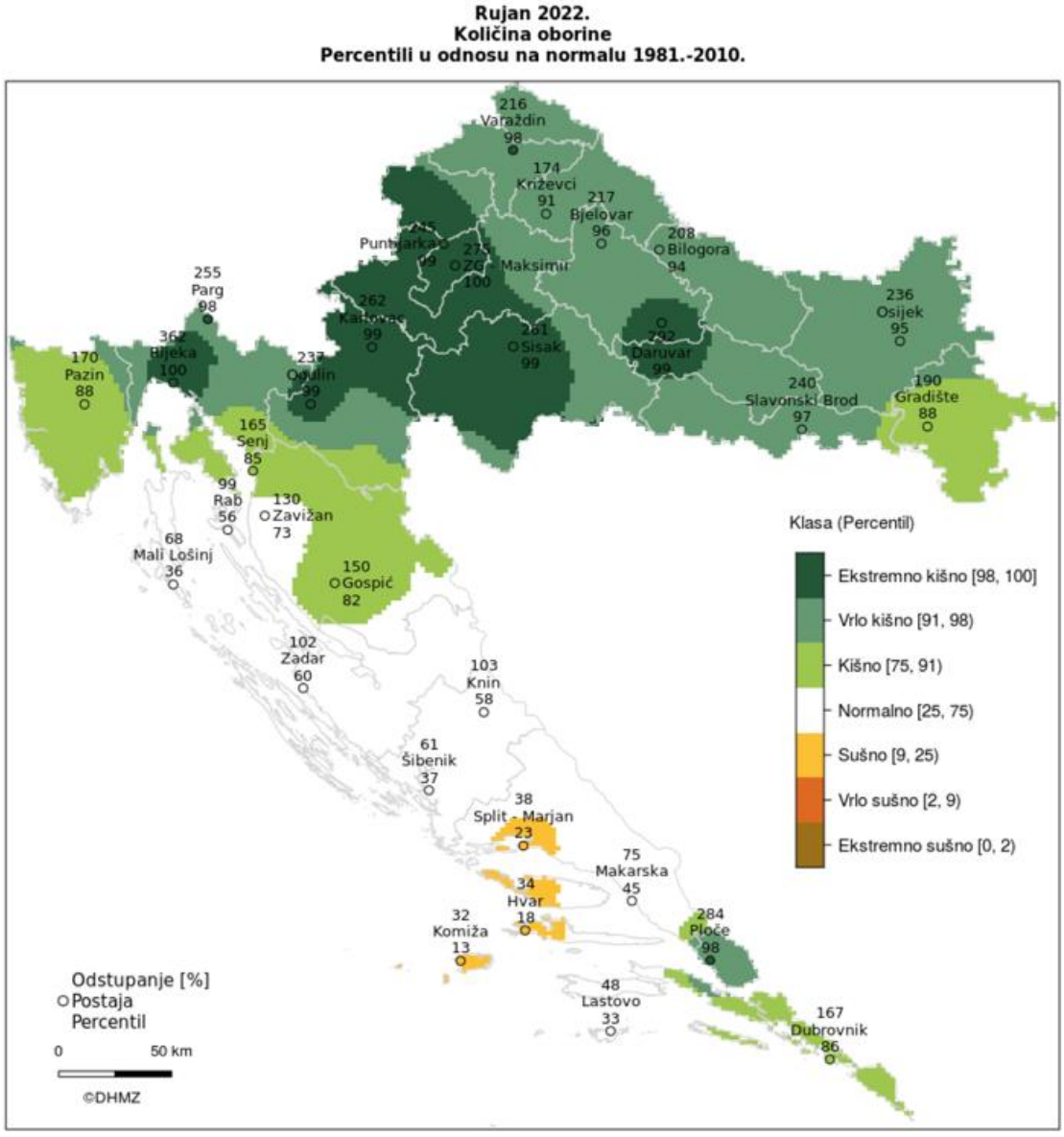

Figure 4-11: Precipitation in Croatia in September 2022 according to the 1981-2010 climatology. Source: Croatian Meteorological and Hydrological service.

Exceptional amounts of precipitation fell also at some stations across Slovenia. Sebreljski Vrh (970 m a.s.l.) recorded 258 mm in 24 hours on 15-16 September, Idrija (in the lowlands, coastal region) 250 mm. More than half of the monthly rainfall fell between 15 and 17 September, when flooding occurred mainly in central and south-eastern Slovenia.

4.4.3. December

Heavy rain events occurred particularly in early and mid-December 2022 in various parts of Southern Europe and the eastern Mediterranean (**Figure 4-12**).

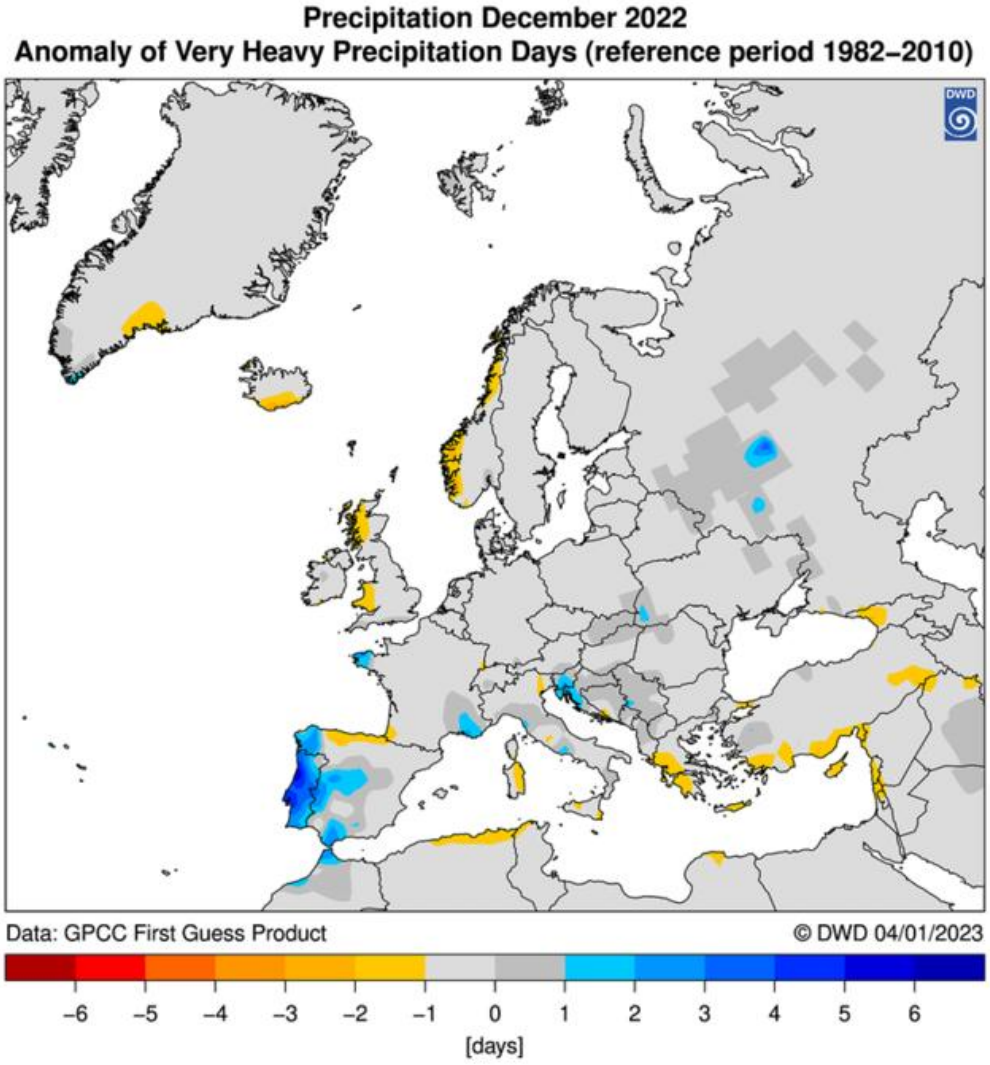

Figure 4-12: Anomaly of very heavy precipitation days for December 2022 in the RA VI Region. Source: Deutscher Wetterdienst.

Between December 4th and 7th, heavy storms and heavy rain were recorded on the Iberian Peninsula. In Spain, basements of houses, garages and commercial premises were flooded and one person was slightly injured. Flash floods and landslide events also occurred in Portugal in the Algarve Region. The maximum precipitation measured was around 110 mm in 24 hours. New local December records for 24-hour precipitation were registered at some stations, among them the Geophysical Institute of Lisbon with 83.3 mm on 7 December when heavy rainfall and strong winds associated with a thunderstorm line continued to hit Portugal in the Lisbon metropolitan area. Later Portugal was again affected by floddings in the night of 12-13 December due to the storm Efraín. The weather station at Tapada da Ajuda in Lisbon recorded 65.6 mm of rain in three hours. **Figure 4-13** underlines that also parts of western and central areas of Spain were affected, where flood damage was reported in Extremadura, Castilla-La Mancha, Andalucía and the Community of Madrid.

Over the entire week from 7 to 13 December, rainfall totals of 100 mm were exceeded in large regions of the eastern half and the centre of the Peninsula such as the northern half of Extremadura, the province of Cuenca and areas of Andalusia. The most outstanding amounts of more than

200 mm occurred in the province of Cáceres and in the Sierra de Gredos and more punctually in the Sierra de Grazalema with totals exceeding 300 mm

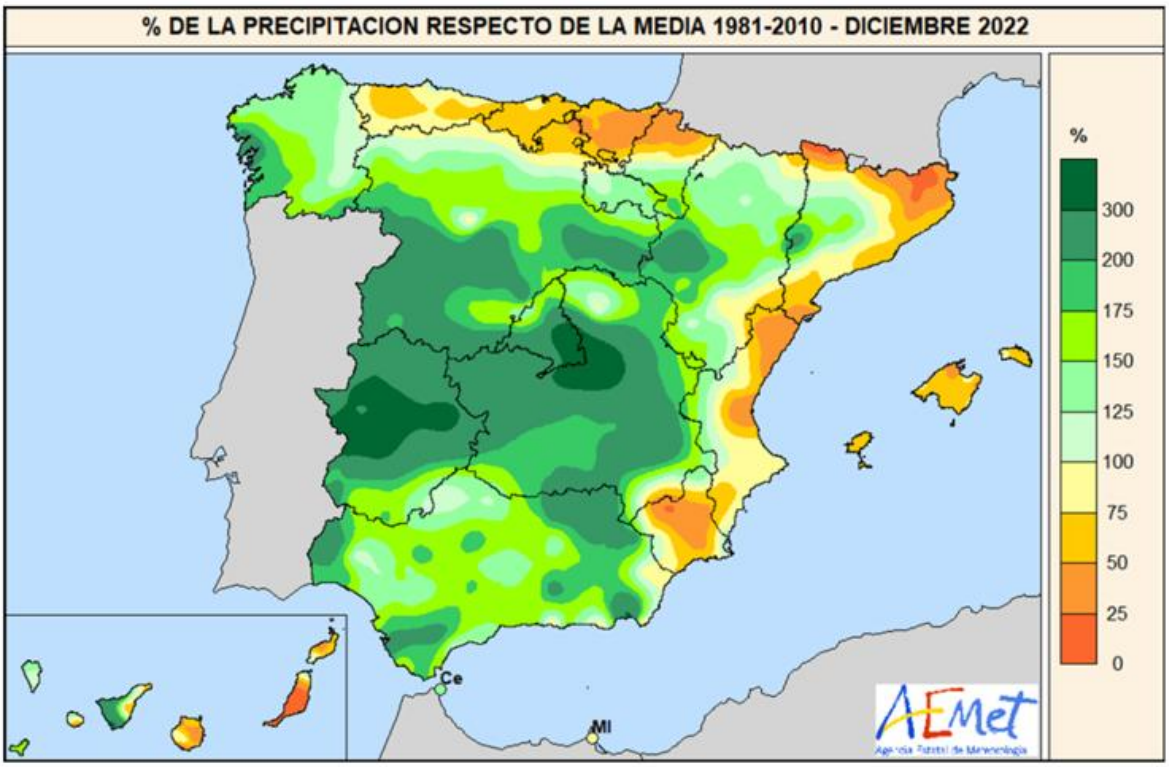

Figure 4-13: *Spatial distribution of mean precipitation anomaly in Spain in December 2022 according to the 1981-2010 climatology. Source: Agencia Estatal de Meteorogía.*

5. Annex: Monthly and annual tables

Table 5-1: *Statistical values of annual mean temperature and total precipitation and their deviations from the long term mean (1961–1990, CLIMAT Data) for the year 2022 for several stations of the RA VI Region.*

Station name	Country	Temp. (°C)		Precip. (mm)	
		mean	dev.	total	dev.
Jan Mayen	NOR	1	2.4	717	30
Svalbard	NOR	-2.3	4.1	209	26
Tromso	NOR	3.9	1.1	1282	309
Oslo	NOR	7.8	2.1	704	-65
Haparanda	SWE	3.1	2	530	-22
Stockholm	SWE	8.8	2.2	473	-67
Sodankyla	FIN	1.5	2.5	514	14
Aberdeen	GBR	9.7	1.8	814	31
London	GBR	12.9	2.4	572	-27
Dublin	IRL	10.5	1.2	768	57
Reykjavik	ISL	5.1	0.7	1065	267
Danmarkshavn	GRL	-11	1.3	158	26
Copenhagen	DNK	10.5	1.8	499	-137
De Bilt	NLD	11.6	2.2	820	15
Brussels	BEL	12.2	2.3	754	-64
Luxembourg	LUX	11.2	2.9	637	-238
Zurich	CHE	11.5	3	873	-213
Geneve	CHE	12.8	3.1	695	-259
Bordeaux	FRA	15.5	2.7	640	-283
Marseille	FRA	17.3	2.5	355	-191
La Coruna	ESP	15.9	1.8	902	-93
Madrid	ESP	17	2.6	450	-7
Menorca	ESP	18.5	1.9	665	67
Gibraltar	GIB	19.5	1.3	612	-164
Ponta Delgada/Acores	PRT	17.7	0.8	835	-158
Lisbon	PRT	17.9	1.1	737	-16
Berlin-Tempelhof	DEU	11.6	2.2	389	-195
Vienna	AUT	12.3	2.6	467	-140
Prague	CZE	10	2.1	604	78
Sliac	SVK	10.2	2.3	516	-170
Elbing	POL	8.4	0.8	700	10
Warsaw	POL	9.9	2.1	461	-58
Budapest	HUN	12.7	2.2	494	-24
Belgrade	SRB	14.4	2.6	640	-44
Ljubljana/Bezigrad	SVN	12.9	3.1	1257	-137
Split	HRV	18	2.2	530	-295
Sarajevo	BIH	11.7	2.2	671	-261
Bucharest	ROU	12.4	1.8	380	-215
Sofia	BGR	11.2	1.5	611	48
Pisa	ITA	16.3	2.2	631	-278
Luqa	MLT	19.9	1.3	369	-185
Thessaloniki Airp.	GRC	17.3	1.7	386	-74
Heraklion	GRC	19.2	0.5	490	-11
Murmansk	RUS	2.5	2.6	583	105
Tallinn	EST	7.1	2	516	-151
Liepaja	LVA	8.6	1.8	688	-2
Kaunas	LTU	8.2	1.9	591	-39
Vilnius	LTU	7.6	1.6	727	44
Minsk	BLR	7.3	1.5	730	53
Moscow	RUS	7	2	713	25
Chisinau	MDA	11.7	2.1	442	-105
Simferopol	UKR	12	1.4	641	136
Astrakhan	RUS	12	2	247	27
Tbilisi	GEO	14.6	1.6	406	-92
Yerevan	ARM	13.5	2	203	-74
Samsun	TUR	15.5	1.2	855	164
Istanbul	TUR	16	1.9	510	-187
Ankara	TUR	13.2	1.6	348	-59
Van	TUR	11	2.4	322	-56
Antalya	TUR	20.1	1.7	655	-411
Larnaka	CYP	20.7	1.7	337	8
Uralsk	KAZ	7.5	2.1	312	-12
Tel Aviv	ISR	21.2	1.7	594	27
Eilat	ISR	25.8	1.3	39	8
Mafraq	JOR	18.2	1.7	96	-64
L. Palmas/Gran Can.	ESP	21.7	1.2	207	90
Princess Juliana Airp.	SMA	27.4	0.6	862	-145
Le Lamentin	MTQ	26.7	0.5	1970	-62

Table 5.2: *Statistical values of monthly mean temperature and total precipitation and their deviations from the long term mean (1961–1990, CLIMAT Data) for the year 2022 for several stations of the RA VI Region.*

Station name	Country	January				February				March			
		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)	
		mean	dev.	total	dev.	mean	dev.	total	dev.	mean	dev.	total	dev.
Jan Mayen	NOR	-3.5	2.2	52	-9	-3.8	2.3	20	-33	-1.3	4.8	77	22
Svalbard	NOR	-10.2	5.2	10	-4	-12.6	3.1	7	-12	-7.9	6.8	32	11
Tromso	NOR	-2.6	1.4	205	124	-4.6	-0.9	54	-32	0.8	3	170	106
Oslo	NOR	-0.2	4.1	24	-25	0.3	4.3	68	32	2.8	3	3	-43
Haparanda	SWE	-8	4.1	22	-22	-8.6	2.7	72	40	-3	3.8	19	-16
Stockholm	SWE	0.5	3.3	46	7	0.9	3.9	46	19	4.1	4	<1	-26
Sodankyla	FIN	-11.6	3.5	17	-14	-11.1	2.5	36	11	-3.9	4.6	8	-17
Aberdeen	GBR	5.1	2.4	21	-60	5	2.1	50	-1	6	1.5	43	-15
London	GBR	5.7	1.5	17	-35	7.8	3.3	50	15	9.1	2.6	31	-16
Dublin	IRL	5.3	0.4	21	-48	6.7	2.1	99	48	7.6	1.6	40	-14
Reykjavik	ISL	1.2	1.7	142	66	-1.3	-1.7	114	42	2.5	2	210	128
Danmarkshavn	GRL	-20	3.1	17	6	-25.2	-0.9	4	-7	-20.4	3	26	9
Copenhagen	DNK	4.1	3.6	50	-1	4.2	3.7	108	77	4.7	2.1	3	-39
De Bilt	NLD	5.3	3.1	57	-9	6.8	4.3	133	84	7.3	2.3	14	-49
Brussels	BEL	4.2	1.6	68	1	6.6	3.1	95	42	8.7	3.2	3	-69
Luxembourg	LUX	1.9	1.9	69	-2	4.5	3.4	72	10	6.9	2.9	25	-45
Zurich	CHE	1.7	2.2	40	-27	4.5	3.6	54	-16	7.2	3	27	-42
Geneve	CHE	2	1.2	28	-52	5.1	2.8	49	-32	7.4	2.3	18	-61
Bordeaux	FRA	5.3	-0.5	40	-60	9.2	2.1	49	-37	11.4	2.6	35	-41
Marseille	FRA	5.8	-0.9	<1	-47	10.3	2.4	27	-27	12	1.8	6	-38
La Coruna	ESP	11.4	1.2	54	-77	11.9	1.4	44	-60	12.8	1.5	105	19
Madrid	ESP	7.1	1	12	-34	10.1	2.6	9	-35	10	0	82	49
Menorca	ESP	9.5	-1	12	-54	10.9	0.2	13	-44	12.5	0.9	48	-7
Gibraltar	GIB	14.3	0.9	23	-98	15.1	1.3	9	-91	14.9	-0.1	205	130
Ponta Delgada/Acores	PRT	15.1	1.3	119	1	14.5	1.1	24	-66	14.9	1	46	-50
Lisbon	PRT	12	0.6	5	-105	13.8	1.5	8	-103	13.8	0.1	98	29
Berlin-Tempelhof	DEU	3.8	4	30	-13	5.3	4.5	55	21	5.9	1.7	1	-36
Vienna	AUT	3.2	4.2	35	-3	6	5	23	-19	5.9	0.9	16	-25
Prague	CZE	1.6	4	20	-3	3.8	4.6	15	-8	4.2	1.2	15	-13
Sliac	SVK	-0.6	3.3	19	-25	2.6	3.7	45	1	3.5	0.5	26	-16
Elbing	POL	0.7	3.1	72	25	1.9	4.1	73	48	2.8	0.7	0	-35
Warsaw	POL	1	4.3	39	17	3.4	5.4	39	18	3.6	1.6	2	-26
Budapest	HUN	1.9	3.5	3	-29	5.3	4.2	9	-23	6.3	0.7	16	-13
Belgrade	SRB	2.3	1.9	46	-3	7	4.3	22	-22	6.9	-0.3	10	-40
Ljubljana/Bezigrad	SVN	0.8	1.9	32	-50	5.1	3.7	53	-27	6.6	1.2	7	-91
Split	HRV	8.6	1.2	7	-76	10	1.9	48	-20	10.3	-0.1	7	-68
Sarajevo	BIH	-0.7	0.2	47	-24	4	2.5	39	-28	4.3	-0.8	10	-60
Bucharest	ROU	1.2	3.6	6	-34	3.3	3.4	6	-30	4	-0.8	17	-21
Sofia	BGR	0.2	1.8	23	-4	2.9	2.4	52	19	2.7	-1.9	19	-19
Pisa	ITA	6.9	0.8	49	-26	8.3	1.2	40	-31	9.2	-0.3	49	-27
Luqa	MLT	11.7	-0.5	77	-12	12.6	0.2	5	-56	12.4	-1	24	-17
Thessaloniki Airp.	GRC	6	1	23	-14	8.5	1.8	24	-16	8.1	-1.5	54	8
Heraklion	GRC	11.1	-0.9	91	-1	12.6	0.4	77	0	11.4	-2.2	116	59
Murmansk	RUS	-8	3.7	53	20	-7.6	3.6	45	23	-2.9	3.9	39	19
Tallinn	EST	-1.6	3.9	80	35	-0.4	5.3	57	28	1	3.2	4	-25
Liepaja	LVA	1.9	4.9	102	56	2.2	5.2	115	84	2	2.2	2	-34
Kaunas	LTU	0	5.2	69	30	1.3	5.6	74	43	1.8	2.2	4	-31
Vilnius	LTU	-1.3	4.8	63	22	0.4	5.2	47	9	1.4	2	1	-38
Minsk	BLR	-2.1	4.8	83	43	0	5.8	53	19	0.4	1.8	7	-35
Moscow	RUS	-5.4	3.9	70	25	-0.9	6.8	41	4	-0.7	1.5	16	-18
Chisinau	MDA	0.3	3.6	12	-28	3.6	5.3	6	-32	3.7	0.8	16	-19
Simferopol	UKR	0.9	1.2	57	15	4.1	3.8	61	28	1.4	-2.2	28	-9
Astrakhan	RUS	-0.9	4.5	37	24	2.4	7.3	5	-5	1.6	0.3	62	48
Tbilisi	GEO	3.3	1.6	2	-17	6.5	3.6	0	-26	4.7	-2.2	136	106
Yerevan	ARM	-2.2	1	15	-6	4	5	7	-17	3.4	-1.7	48	16
Samsun	TUR	7	0.1	174	113	9.3	2.1	59	9	6.3	-1.7	122	66
Istanbul	TUR	6.2	0.6	79	-20	7.7	1.8	131	64	5.9	-1.6	55	-7
Ankara	TUR	0.9	0.9	40	-1	4	2.3	30	-6	2.4	-3.6	46	10
Van	TUR	-3	1.4	70	36	0	3.8	20	-13	1	0.1	53	11
Antalya	TUR	9.9	0	218	-21	12.6	2.3	135	-61	11.1	-1.6	54	-49
Larnaka	CYP	11.7	-0.1	106	41	13.3	1.1	25	-32	11.5	-2	35	-14
Uralsk	KAZ	-8.9	4	31	6	-4.2	8.3	10	-8	-5	0	60	40
Tel Aviv	ISR	12	-0.3	253	104	13.7	0.8	89	-9	13.7	-1.2	63	1
Eilat	ISR	14.5	-0.6	9	4	17	0.2	5	0	18.3	-1.5	0	-4
Mafraq	JOR	7.7	0.5	39	5	10.1	1.4	11	-20	9.3	-2.2	13	-16
L. Palmas/Gran Can.	ESP	18.2	0.7	18	1	19.2	1.6	10	-12	18.6	0.2	7	-3
Princess Juliana Airp.	SMA	26.1	0.9	30	-32	25.7	0.5	71	27	26.1	0.6	51	7
Le Lamentin	MTQ	25	0.1	59	-62	25.4	0.6	66	-23	25.9	0.7	106	18

Table 5.2: continued

Station name	Country	April				May				June			
		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)	
		mean	dev.	total	dev.	mean	dev.	total	dev.	mean	dev.	total	dev.
Jan Mayen	NOR	-1.9	2	66	26	0.9	1.6	28	-12	3.9	1.9	47	12
Svalbard	NOR	-9.7	2	7	-5	-1.7	2	2	-4	6	3.8	14	4
Tromso	NOR	1	0.3	65	5	6	1.1	98	50	11	1.7	22	-31
Oslo	NOR	6.4	1.8	10	-32	11.4	0.6	51	-1	16.7	1.5	89	24
Haparanda	SWE	0.3	0.8	33	4	7.3	1.2	24	-7	14.8	2	33	-8
Stockholm	SWE	5.6	1	30	0	11.5	0.8	44	14	18.1	2.5	60	15
Sodankyla	FIN	0.1	2.2	38	14	6.7	1.7	42	7	14	2.4	50	-6
Aberdeen	GBR	7.3	1	68	15	11.5	2.5	54	-5	14.1	2	21	-32
London	GBR	10.9	2	16	-29	15.1	2.6	34	-17	17.6	1.9	26	-25
Dublin	IRL	8.2	0.7	47	-3	12.4	2.3	60	3	14	0.9	78	25
Reykjavik	ISL	5.1	2.2	72	14	7.7	1.4	44	0	9.6	0.6	66	16
Danmarkshavn	GRL	-18.1	-0.8	0	-10	-6.1	0.5	0	-4	0.8	0.1	24	19
Copenhagen	DNK	7.6	1	36	-6	12.9	0.9	49	6	16.9	0.8	32	-22
De Bilt	NLD	9.3	1.3	61	9	14	1.7	71	10	17.1	1.9	92	24
Brussels	BEL	10.2	1.4	77	20	15.2	2.3	69	-2	17.8	2.1	89	10
Luxembourg	LUX	8.7	1.2	34	-27	15.4	3.6	30	-51	18.3	3.4	46	-36
Zurich	CHE	9.2	1.4	85	-2	16	3.9	73	-30	19.5	4.3	127	3
Geneve	CHE	10.3	1.5	54	-11	17.6	4.6	12	-65	21.2	4.7	64	-25
Bordeaux	FRA	12.7	1.4	65	-7	19	4.4	19	-58	21.5	3.7	100	44
Marseille	FRA	14.4	1.2	16	-32	20.7	3.6	10	-32	26.1	5.2	5	-23
La Coruna	ESP	13.2	1.1	40	-43	17	2.9	27	-51	18.2	1.8	50	1
Madrid	ESP	12.8	0.6	63	9	20.6	4.6	6	-35	24.7	4	<1	-26
Menorca	ESP	14.1	0.8	23	-27	19.8	3	17	-20	24.7	3.9	<1	-14
Gibraltar	GIB	16.7	0.5	73	13	20.4	1.9	3	-32	23.2	2.1	0	-11
Ponta Delgada/Acores	PRT	15.5	1.1	67	-5	16.5	0.6	122	59	18.4	0.3	41	2
Lisbon	PRT	15.1	0	52	-12	20.4	3	5	-34	20.5	0.3	7	-14
Berlin-Tempelhof	DEU	8.8	0.2	29	-12	15.9	2	31	-25	20.7	3.3	22	-53
Vienna	AUT	9.8	-0.1	37	-14	17.6	3	53	-8	21.8	3.9	83	9
Prague	CZE	7.1	-0.6	40	2	15	2.3	35	-42	19.2	3.3	179	106
Sliac	SVK	7.6	-0.9	42	-5	15.1	1.4	30	-34	20.7	4.1	16	-69
Elbing	POL	5.7	-1.1	18	-24	11	-1.9	66	25	16.7	1.3	79	-15
Warsaw	POL	7.2	-0.6	47	15	14.2	0.8	40	-19	19.8	3.2	33	-39
Budapest	HUN	10.1	-1	66	28	18.2	2.2	26	-29	22.9	3.8	65	2
Belgrade	SRB	12.2	-0.2	80	21	20.1	2.9	32	-39	24.3	4.2	43	-47
Ljubljana/Bezigrad	SVN	10.4	0.5	113	3	18.1	3.5	51	-71	23.4	5.6	36	-119
Split	HRV	14	0.1	58	-8	21.7	3.3	8	-48	27.4	5.2	8	-43
Sarajevo	BIH	9.6	0.2	83	9	16.8	2.7	35	-47	22.3	5.4	30	-61
Bucharest	ROU	10.9	-0.4	76	30	17.3	0.6	52	-18	22.1	1.9	33	-44
Sofia	BGR	10.3	0.4	58	8	16	1.7	46	-27	19.9	2.2	160	88
Pisa	ITA	11.8	-0.7	60	-19	18.1	1.8	29	-30	24.5	4.7	27	-17
Luqa	MLT	15.8	0.3	2	-21	20.5	1.4	17	10	27	4	0	-3
Thessaloniki Airp.	GRC	15.2	1	22	-14	21.6	2.1	10	-34	26.7	2.5	62	30
Heraklion	GRC	17.4	0.8	<1	-30	20.7	0.4	1	-14	25.6	1.3	<1	-3
Murmansk	RUS	-0.3	1.6	16	-5	4.8	1	27	-5	11.6	2.2	66	13
Tallinn	EST	3.4	0	36	0	9.5	-0.2	40	3	16.9	2.4	26	-27
Liepaja	LVA	5.8	1.2	42	7	9.5	-0.8	27	-13	16.5	2.2	40	-6
Kaunas	LTU	6.2	0.4	38	-4	11	-1.4	69	14	17.7	1.9	78	9
Vilnius	LTU	5.5	-0.2	51	5	10.8	-1.7	92	30	17.8	2	129	52
Minsk	BLR	4.8	-1.2	119	77	10.8	-2.1	87	25	18.3	2.2	50	-33
Moscow	RUS	5.8	0	78	38	10.7	-2.2	67	9	18.8	2.2	46	-30
Chisinau	MDA	10.6	0.4	73	31	16.8	0.7	21	-30	22.3	2.9	6	-69
Simferopol	UKR	11	0.8	66	33	14.2	-1	51	7	20.7	1.6	141	88
Astrakhan	RUS	13.9	2.8	13	-5	16.5	-1.8	32	8	24.6	1.7	2	-20
Tbilisi	GEO	14.7	1.9	27	-24	16.6	-0.8	67	-11	23.7	2.5	83	7
Yerevan	ARM	14.3	2.7	12	-25	15.5	-0.8	48	5	23.6	3	13	-8
Samsun	TUR	12.3	0.9	41	-21	15.1	-0.4	41	-8	21.5	1.5	81	36
Istanbul	TUR	14.1	2.1	30	-19	17.5	1	21	-10	21.6	0.5	22	1
Ankara	TUR	14.2	3	3	-45	16.7	1.1	13	-42	20.9	1.3	108	71
Van	TUR	10.2	2.9	13	-41	12	-0.8	56	6	20.5	2.9	7	-14
Antalya	TUR	18.1	2	12	-34	22.1	1.8	10	-18	26	1	18	10
Larnaka	CYP	19.3	2.4	<1	-11	22.7	2.3	1	-6	26	2	8	7
Uralsk	KAZ	11.6	3.9	22	3	12.4	-3.7	39	18	21.1	0.9	5	-32
Tel Aviv	ISR	20.6	2.4	0	-23	22.8	1.7	<1	-3	26.1	2.1	0	0
Eilat	ISR	27.2	2.8	0	-3	29.4	1.2	0	-1	32.9	2	0	0
Mafraq	JOR	20.2	4.4	<1	-10	21.3	1.5	0	-3	24.4	1.7	0	0
L. Palmas/Gran Can.	ESP	19.6	0.9	3	-3	21.6	1.7	<1	-2	22.7	1.3	<1	<1
Princess Juliana Airp.	SMA	26.3	0.2	18	-49	27.5	0.5	30	-66	28.5	0.7	13	-50
Le Lamentin	MTQ	26.3	0.4	49	-47	27.4	0.6	67	-56	27.9	0.6	210	40

Table 5.2: continued

Station name	Country	July				August				September			
		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)	
		mean	dev.	total	dev.	mean	dev.	total	dev.	mean	dev.	total	dev.
Jan Mayen	NOR	6.1	1.9	91	44	6.8	1.9	65	4	5.6	2.8	95	13
Svalbard	NOR	9.3	3.3	5	-8	6.9	2.1	42	17	3.2	2.7	27	4
Tromso	NOR	13	1.3	161	89	11.9	1	151	69	8.1	1.3	33	-61
Oslo	NOR	17.5	1.1	68	-16	17.3	2.1	76	-14	12	1.2	64	-26
Haparanda	SWE	16.7	1.2	70	20	15.1	1.8	52	-11	8.3	0.4	32	-31
Stockholm	SWE	18.4	1.2	48	-24	19.8	3.6	46	-20	12.2	1	41	-14
Sodankyla	FIN	16.2	2.1	105	40	14.5	3.3	49	-14	6.9	1	24	-31
Aberdeen	GBR	16.3	2.5	45	-15	15.8	2.2	37	-38	13.1	1.4	111	43
London	GBR	21.4	3.6	8	-38	21.5	4.1	54	3	16	1	86	35
Dublin	IRL	16.8	1.6	40	-9	16.3	1.5	19	-45	13.1	0.5	119	60
Reykjavik	ISL	10.6	0	73	21	10.2	-0.1	55	-7	9.3	1.9	98	32
Danmarkshavn	GRL	3.5	-0.2	20	6	2.1	-0.3	1	-13	-1.1	3.1	14	3
Copenhagen	DNK	18.3	1.1	25	-44	19.8	2.8	36	-27	14.2	0.6	57	-5
De Bilt	NLD	18.6	1.8	16	-59	20	3.3	45	-26	14.6	0.6	108	41
Brussels	BEL	19.6	2.1	13	-62	21.4	4.1	18	-45	15	0.5	113	54
Luxembourg	LUX	20.6	3.7	7	-61	21.5	5.1	21	-51	13.8	0.4	78	8
Zurich	CHE	21.3	3.7	45	-72	20.4	3.7	75	-58	14.3	0.5	113	21
Geneve	CHE	23.6	4.5	5	-62	22.3	4.1	48	-31	15.9	1	120	39
Bordeaux	FRA	24.1	3.9	3	-44	24.7	4.8	26	-28	19.4	1.5	39	-35
Marseille	FRA	27.6	3.8	0	-14	26.7	3.5	52	23	21.6	1.3	62	15
La Coruna	ESP	20.3	1.9	2	-23	20.2	1.4	7	-22	19.6	1.5	62	0
Madrid	ESP	29.6	5.2	10	-3	27.8	3.9	5	-4	21.5	1	44	14
Menorca	ESP	26.5	2.3	<1	-4	27.9	3.4	65	39	25.9	3.7	113	59
Gibraltar	GIB	24.7	1	<1	<1	25.5	1.3	0	-6	23.4	0.6	3	-12
Ponta Delgada/Acores	PRT	20.9	0.6	5	-25	22.3	0.9	27	-18	22.2	1.3	54	-40
Lisbon	PRT	24.8	2.4	0	-5	22.3	-0.5	0	-6	21.5	-0.2	20	-6
Berlin-Tempelhof	DEU	20.6	1.8	33	-19	22	3.6	59	-2	14.2	-0.4	47	2
Vienna	AUT	22.7	3	26	-37	22.7	3.8	42	-16	15.5	0.4	72	27
Prague	CZE	19.2	1.7	77	11	20	3	76	6	13	-0.3	44	4
Sliac	SVK	21.4	3.2	44	-15	21.6	4.3	82	13	13.6	0.2	97	41
Elbing	POL	17	0.2	99	5	20.4	3.7	75	-6	11.5	-1.2	110	40
Warsaw	POL	19.5	1.6	96	29	22	4.7	30	-33	12.5	-0.7	44	1
Budapest	HUN	24.6	3.7	22	-30	24.6	4.3	57	6	16	-0.4	94	54
Belgrade	SRB	25.6	3.9	64	-2	24.9	3.6	91	39	18.1	0.4	98	47
Ljubljana/Bezigrad	SVN	24.4	4.5	87	-35	23	3.9	54	-91	16	0.5	469	339
Split	HRV	28.7	3.3	4	-24	27.5	2.3	42	-8	21.8	0.4	28	-33
Sarajevo	BIH	22.4	3.5	42	-38	20.8	2.3	102	31	15.3	0.2	86	16
Bucharest	ROU	24.8	2.8	25	-39	24.8	3.6	31	-27	17	0.1	53	11
Sofia	BGR	22	2	59	3	21.4	2	41	-11	15.9	0.1	64	25
Pisa	ITA	26.7	3.9	<1	-23	26.1	3.6	31	-29	21.9	2.4	32	-57
Luqa	MLT	28.6	2.7	<1	<1	28.2	1.9	7	0	26.1	2	60	20
Thessaloniki Airp.	GRC	28.6	2.1	37	11	27.8	2	31	10	22.7	0.9	52	26
Heraklion	GRC	26.8	0.7	<1	<1	27	1.1	<1	<1	24.5	1	1	-19
Murmansk	RUS	15.9	3.1	78	18	14.8	3.8	60	-5	7.5	0.8	90	38
Tallinn	EST	18	1.7	63	-16	19.9	4.6	12	-72	10.2	-0.6	47	-35
Liepaja	LVA	18.1	1.7	90	16	20.4	4	64	-16	11.7	-1.2	41	-37
Kaunas	LTU	18	1.1	101	21	20.8	4.4	39	-39	11.1	-0.8	26	-30
Vilnius	LTU	17.7	0.8	113	35	20.6	4.3	56	-16	10.3	-1.3	41	-24
Minsk	BLR	17.9	0.6	91	3	20.5	4	12	-60	10.2	-1.5	44	-16
Moscow	RUS	20.7	2.6	99	7	21.9	5.5	4	-70	10.1	-0.8	81	17
Chisinau	MDA	23.7	2.8	83	14	23.7	3.2	81	36	16.1	-0.1	35	-13
Simferopol	UKR	22.8	1.4	35	-20	24.4	3.4	63	22	17.8	1.2	34	-3
Astrakhan	RUS	25.2	-0.1	11	-12	27.4	4.1	<1	-19	19.7	2.4	33	7
Tbilisi	GEO	25.7	1.3	11	-34	27.2	3.5	0	-48	22.3	2.7	13	-23
Yerevan	ARM	26.4	1.8	0	-10	27.6	3.7	0	-7	23	3.2	23	13
Samsun	TUR	23.5	0.8	3	-26	26	3.3	35	2	21.6	2	116	66
Istanbul	TUR	25.2	2	20	1	26.8	3.8	65	39	22.9	3.2	20	-21
Ankara	TUR	23.2	0.3	26	12	26.1	3.5	29	17	20.5	2.2	4	-15
Van	TUR	23.3	1.4	<1	-4	24.4	3.2	0	-4	19.9	3.1	<1	-10
Antalya	TUR	30.3	2.2	<1	-3	28.2	0.5	<1	<1	26.3	1.8	0	-11
Larnaka	CYP	29	2.4	<1	<1	28.5	1.9	0	0	27.1	2.5	19	19
Uralsk	KAZ	23.2	0.7	15	-23	24.3	3.9	1	-24	15.6	1.5	32	5
Tel Aviv	ISR	27.8	2.1	0	0	28.6	2.5	0	0	27.4	2.6	0	0
Eilat	ISR	33.8	1.4	0	0	34.8	2.5	0	0	32.3	1.9	0	0
Mafraq	JOR	25.4	1.3	0	0	27.1	2.9	0	0	25.1	2.4	0	-1
L. Palmas/Gran Can.	ESP	24.8	1.5	<1	<1	24.6	0.5	<1	<1	24.2	0.4	153	145
Princess Juliana Airp.	SMA	28.6	0.6	64	-12	29.1	0.9	103	4	28.8	0.6	185	54
Le Lamentin	MTQ	27.7	0.5	215	11	27.7	0.5	269	17	27.6	0.6	256	20

Table 5.2: continued

Station name	Country	October				November				December			
		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)		Temp. (°C)		Precip. (mm)	
		mean	dev.	total	dev.	mean	dev.	total	dev.	mean	dev.	total	dev.
Jan Mayen	NOR	2.1	2	90	8	2.8	6.1	30	-36	-5.7	-0.5	56	-9
Svalbard	NOR	-1.9	3.6	8	-7	-1	9.5	37	24	-8.4	4.9	18	6
Tromso	NOR	4.1	1.2	193	68	0.1	0.9	46	-58	-2.4	0.6	84	-20
Oslo	NOR	8	1.6	82	-2	4.8	4.1	83	8	-3.6	-0.8	86	30
Haparanda	SWE	4.4	1.9	71	7	-2.2	1.9	28	-30	-7.5	2	74	32
Stockholm	SWE	10.1	2.6	27	-23	5.5	2.9	59	6	-1.4	-0.4	25	-21
Sodankyla	FIN	2	2.3	62	11	-5.5	1.9	16	-23	-10.2	2.9	67	36
Aberdeen	GBR	11	1.1	107	30	7.8	2.8	138	63	3	-0.5	119	46
London	GBR	14.4	2.7	81	23	10.5	3.3	124	69	5.1	0	45	-12
Dublin	IRL	12.2	2.1	101	34	8.9	2.2	52	-15	4	-1.6	92	19
Reykjavik	ISL	4.9	0.5	80	-6	5.1	4	77	5	-3.9	-3.7	34	-45
Danmarkshavn	GRL	-10.4	3.2	21	9	-16.8	3.1	25	15	-20.6	1.2	6	-7
Copenhagen	DNK	12.6	2.7	35	-24	8.2	2.7	13	-49	2.2	0	55	-3
De Bilt	NLD	13.1	2.6	38	-34	8.6	2.7	98	17	3.9	0.7	87	8
Brussels	BEL	14.4	3.5	32	-38	9.1	3	67	-9	4.2	0.7	110	34
Luxembourg	LUX	12.8	3.7	102	27	7.2	3.4	88	5	2.6	1.6	65	-15
Zurich	CHE	13.7	4.4	69	0	7.3	3.4	75	-7	2.7	2.1	90	17
Geneve	CHE	14.7	4.6	77	0	8.2	3.2	107	15	5.1	3.3	113	26
Bordeaux	FRA	18.6	4.6	58	-30	11.7	2.6	148	54	8.2	1.8	58	-41
Marseille	FRA	19.6	3.5	24	-54	13	2.3	89	31	9.5	2.2	63	7
La Coruna	ESP	18.2	2.5	150	46	14.9	2.3	162	46	13.2	2.3	199	71
Madrid	ESP	18.5	3.7	28	-17	11.3	1.9	45	-19	9.4	3	145	94
Menorca	ESP	20.7	2.2	182	98	16.2	1.8	148	71	13.7	1.9	43	-31
Gibraltar	GIB	21.1	1.6	2	-62	18.2	2.1	48	-93	16.5	2.4	245	99
Ponta Delgada/Acores	PRT	19.2	0.5	73	-26	17.6	1.1	86	-43	15.4	0.3	171	53
Lisbon	PRT	20.1	1.6	129	49	15.9	1.4	77	-37	14.8	3	336	228
Berlin-Tempelhof	DEU	13.2	3.2	23	-13	6.2	1.3	9	-40	2.1	0.7	50	-3
Vienna	AUT	13.1	3.2	16	-25	6.8	2.2	32	-18	2.4	1.5	32	-11
Prague	CZE	11.3	3	17	-13	4.4	1.6	43	11	0.9	1.5	43	17
Sliac	SVK	10.8	2.5	17	-33	5.3	2.3	18	-51	0.7	2.4	80	23
Elbing	POL	10.7	1.8	24	-29	3.4	0.1	19	-37	-1.1	-1.4	65	13
Warsaw	POL	11.2	2.9	28	-10	4.2	1	15	-27	0.6	1.5	48	16
Budapest	HUN	12.9	2	6	-28	6.7	1.9	55	3	2.4	2	75	35
Belgrade	SRB	15.4	3	13	-27	9.4	2.4	65	11	6.9	4.6	76	18
Ljubljana/Bezigrad	SVN	14.4	4	78	-37	7.9	3.3	82	-53	4.3	4.3	195	94
Split	HRV	19.9	3	9	-70	14.3	2.1	134	26	11.8	3.1	177	77
Sarajevo	BIH	13.2	2.9	10	-67	7.3	2	92	-2	5.2	4.9	95	10
Bucharest	ROU	11.9	1.1	9	-23	8.3	3.1	48	-1	2.9	2.7	24	-19
Sofia	BGR	12	1.6	11	-26	7.9	2.9	40	-7	3.7	3.2	38	-1
Pisa	ITA	18.1	2.8	2	-121	12.7	2.3	157	33	10.8	4	154	69
Luqa	MLT	21.7	1	19	-71	18.1	1.1	151	71	16.6	2.8	6	-106
Thessaloniki Airp.	GRC	17.5	1.4	4	-37	14.6	3.7	38	-20	10.6	3.9	29	-24
Heraklion	GRC	20.5	0.6	143	74	17.6	1	55	-4	15.6	1.8	4	-73
Murmansk	RUS	3.5	2.5	56	14	-2.1	3	19	-21	-7.3	2	34	-4
Tallinn	EST	8.8	2.5	32	-38	2.8	1.6	52	-16	-2.9	0	67	12
Liepaja	LVA	11.3	2.8	42	-32	3.9	0.2	23	-60	-0.7	-0.4	100	33
Kaunas	LTU	10.1	3	18	-27	2.9	1.1	31	-22	-2.4	0.1	44	-3
Vilnius	LTU	9	2.4	48	-5	2.3	1.1	25	-32	-3	-0.1	61	6
Minsk	BLR	8.5	2.2	63	14	1.8	1	53	1	-3.3	0.5	68	15
Moscow	RUS	7.2	2.2	62	4	-0.6	0.5	38	-20	-4.1	2	111	59
Chisinau	MDA	12.6	2.5	12	-15	5.8	1.4	69	30	1.7	2	28	-10
Simferopol	UKR	12.4	1.6	27	-5	8.8	2.5	34	-10	5.3	2.9	44	-10
Astrakhan	RUS	12.1	3	33	16	4.3	1	16	-3	-3.1	-1.2	2	-13
Tbilisi	GEO	16.2	2.7	44	6	10.4	2.3	6	-24	4	0.2	17	-4
Yerevan	ARM	15.5	2.7	14	-13	8.5	1.9	14	-8	2.4	1.9	9	-14
Samsun	TUR	17	1.4	57	-28	14.6	2.1	45	-44	12	2.8	81	-1
Istanbul	TUR	17.9	2.6	16	-55	14.6	3	29	-60	11.3	3.2	22	-100
Ankara	TUR	13.7	1.1	15	-12	10	2.9	10	-23	6.2	3.7	24	-25
Van	TUR	14	3.9	40	-8	6.8	2.8	47	3	2.8	3.9	15	-19
Antalya	TUR	23.1	3.5	30	-40	18.1	3.3	85	-49	15.2	3.8	92	-135
Larnaka	CYP	23.7	2.4	83	64	19	2.1	39	-5	16.2	2.8	20	-56
Uralsk	KAZ	8.1	3	26	-4	0	2.1	53	18	-7.8	0.6	18	-11
Tel Aviv	ISR	24.5	2.5	5	-21	20.2	2.2	85	17	16.7	2.9	98	-40
Eilat	ISR	28	1.4	4	1	22.9	1.8	12	8	18.9	2.7	9	3
Mafraq	JOR	21.6	2.5	4	-3	15.3	1.8	17	0	11.3	2.5	11	-17
L. Palmas/Gran Can.	ESP	23.4	0.9	<1	-10	22.5	2.1	<1	-21	20.8	2.5	13	-8
Princess Juliana Airp.	SMA	28.5	0.7	68	-41	27.4	0.5	191	61	26.4	0.6	38	-48
Le Lamentin	MTQ	27.5	0.8	283	13	26.9	0.6	297	73	25.6	0.2	93	-66

6. References to national reports

Note: Primary information sources are the annual reports of RA VI Members, which are kindly provided by RA VI NMHSs. The names of Members, which contributed to the 2020 edition of the Bulletin, are listed on page 3 above. Many contributions or additional information may as well be found on the web, see below.

Austria: Bundesanstalt für Geologie, GEophysik, Klimatologie und Meteorologie (**Geosphere Austria**), Vienna, Climate Reports

Belgium: The Royal Meteorological Institute of Belgium (**KMI**), Klimatologisch overzicht

Bosnia and Herzegovina: Federal Meteorological Institute (**METEOBIH**), Analiza-godina

Croatia: Meteorological and Hydrological Service (**DMHZ**) Annual reports

Denmark: Danish Meteorological Institute (**DMI**), Vejret i Danmark

Denmark: Danish Meteorological Institute (**DMI**), Storms in Denmark since 1891

Estonian Weather Service: Estonian Bulletin

Finnish Meteorological Institute (FMI) Press release archive

France: Météo-France, Toulouse Bilan climatiques

Germany: Deutscher Wetterdienst (**DWD**), Annual, Seasonal and Monthly Summary

Greece: Hellenic National Meteorological Service, Climatology extreme

Greece: National Observatory of Athens, Meteorological bulletin

Hungarian Meteorological Service (**OMSZ**), Climate retrospective

Icelandic Met Office: The weather in Iceland 2022-Climate summary

Ireland: The Irish Meteorological Service (**MET Éireann**), Weather Summary

Israel Meteorological Service (**IMS**): Weather summary in Israel

Italy: Institute for Environmental Protection and Research (**ISPRA**) - System for Climate Data Collection and Dissemination (SCIA), ISPRA SCIA Website; RAPPORTOCLIMA2021

Latvian Environment, Geology and Meteorology Centre Monthly bulletins

Lithuanian Hydrometeorological Service (**Lhmt**) Monthly Reviews

Luxembourg: MeteoLux, Bilans climatologiques annuels (Annual climate assessments)

Moldova: State Hydrometeorological Service (**SHS**), Caracterizarea conditiilor meteorologice si agrometeorologice din anul

Montenegro: Institute of Hydrometeorology and Seismology (IHMS) Annual reports

Netherlands: Royal Netherlands Meteorological Institute (**KNMI**), Jaaroverzicht van het weer in Nederland

Netherlands: Royal Netherlands Meteorological Institute (**KNMI**), Zware stormen in Nederland sinds 1910

Norway: Meteorologisk institutt (MET Norway), Klimatologisk månedsoversikt

Poland: Institute of Meteorology and Water Management (**IMGW**), CLIMATE OF POLAND 2022

Portugal: Instituto portuguesa do mar e da atmosfera (**ipma**), Bolletim Climatológico Anual

Romania: Administrația Națională de Meteorologie, Monitorizare climatica

Russia: Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) - Hydrometeorological Research Center of Russian Federation (Hydrometcenter of Russia): Climate information

Serbia: Republic Hydrometeorological Service of Serbia (**RHMZ**) Annual Bulletin for Serbia

Slovakia: Slovak Hydrometeorological institute (**SHMU** Slovenský hydrometeorologický ústav) Bulletin Meteorológia a Klimatológia

Slovenia: Slovenian Environment Agency (**ARSO,** Agencija Republike Slovenije za okolje): Mesečni bilten ARSO

Slovenia: Unusual events http://meteo.arso.gov.si/met/sl/climate/natural-hazards/

Spain: Agencia Estatal de Meteorología (**AEMET**), Resumen anual climatologico

Spain: Agencia Estatal de Meteorología (**AEMET**), Olas de calor en España desde 1975

Spain: Agencia Estatal de Meteorología (**AEMET**), Olas de frío en España desde 1975

Swedish Meteorological and Hydrological Institute (**SMHI)**, Året (year)

Swedish Meteorological and Hydrological Institute (**SMHI)**, Månadens väder

Switzerland: Federal Office of Meteorology and Climatology **MeteoSwiss**, Klimabulletin

Türkiye: Turkish State Meteorological Service (**TSMS**), Bulletin

United Kingdom: **Met Office** Climate summaries and UK Annual Climate Summary 2022 in RMetS

7. References

Bissolli, P., Ed., 2023: Europe and the Middle East [in "State of the Climate in 2022"]. *Bull. Amer. Meteor. Soc.*, **104** (9), S416–S434, https://doi.org/10.1175/2023BAMSStateoftheClimate.1.

Dunn, R. J. H., J. B. Miller, K. M. Willett, and N. Gobron, Eds., 2023: Global Climate [in "State of the Climate in 2022"]. *Bull. Amer. Meteor. Soc.*, **104** (9), S11–S145, https://doi.org/10.1175/BAMS-D-23-0090.1.

Menne, M.J., C.N. Williams, and B.E. Gleason, 2018: The Global Historical Climatology Network Monthly Temperature Dataset, Version 4. *J. Climate*, **31**, 9835-9854, https://doi.org/10.1175/JCLI-D-18-0094.1.

Schneider, U., P. Finger, A. Meyer-Christoffer, M. Ziese, A. Becker, 2018: Global Precipitation Analysis Products of the GPCC. Product description on open data server of Deutscher Wetterdienst (DWD), https://opendata.dwd.de/climate_environment/GPCC/PDF/GPCC_intro_products_v2018.pdf.

WMO, 2022: Global Cryosphere Watch snow assessment report 2021-2022. *Retrieved from* https://globalcryospherewatch.org/assessments/snow/2022/.

WMO, 2023a: State of the Climate in Europe 2022, WMO-No.1320.

WMO, 2023b: State of the Global Climate 2022, WMO-No. 1316.

Ziese, M., Schneider, U., Meyer-Christoffer, A., Schamm, K., Vido, J., Finger, P., Bissolli, P., Pietzsch, S., and Becker, A., 2014: The GPCC Drought Index – a new, combined and gridded global drought index, *Earth Syst. Sci. Data*, **6**, 285–295, https://doi.org/10.5194/essd-6-285-2014.

8. Abbreviations

Abbreviation	Meaning
AO	Arctic Oscillation (circulation indices)
BAMS	Bulletin of the American Meteorological Society
CLIMAT	Monthly climatological data provided by the NMHSs via GTS
DWD	Deutscher Wetterdienst (German Meteorological Service)
EA	East Atlantic Pattern (circulation indices)
EA/WR	East Atlantic/West Russia Pattern (circulation indices)
EMCC	Eastern Mediterranean Climate Centre
GHCN	Global Historical Climate Network
GPCC	Global Precipitation Climatology Centre located at the Deutscher Wetterdienst
GTS	Global Telecommunication System
KNMI	Koninklijk Nederlands Meteorologisch Instituut (Royal Netherlands Meteorological Institute)
m a.s.l.	Metre above sea level
NAO	North Atlantic Oscillation (circulation indices)
NMHS	National Meteorological and Hydrological Service
POL	Polar/Eurasia Pattern (circulation indices)
RCC	Regional Climate Centre
RCC-CM	Regional Climate Centre on Climate Monitoring
RR	daily total precipitation
RR1	count of days where RR ≥ 1 mm
SCA	Scandinavia Pattern (circulation indices)
SU	Number of summer days
SYNOP	Surface synoptic or weather observations provided by the NMHSs via GTS
TG	Daily mean temperature
TN	Daily minimum temperature
TX	Daily maximum temperature
WMO RA VI	WMO Regional Association VI (Europe and Middle East)
WMO	World Meteorological Organization