Republic Hydrometeorological Service of Serbia
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11000 Belgrade
Republic of Serbia

MONTHLY BULLETIN FOR SERBIA

JANUARY 2024

Belgrade, the 5th of February 2024

Division for Climate Monitoring and Climate Forecast
Department of National Center for Climate Change, Climate Model Development and Disaster Risk Assessment
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AIR TEMPERATURE

Mean monthly air temperature

Mean January air temperature ranged from 0,3ºC in Pozega to 4,0ºC in Belgrade, and on the mountains from -3,8ºC at Kopaonik to -0,3ºC at Zlatibor (*Figure 1).*

Departure of the mean monthly air temperature from the normal[1] for the 1991–2020 base period ranged from +0,7ºC at Kopaonik to +2,4ºC in Cuprija and Leskovac (*Figure 2*).

Mean January air temperature, based on the percentile method[2], was in the categories of warm in most of the country, and normal in Sremska Mitrovica, Valjevo, Zlatibor and Kopaonik *(Figure 3).*

[1] Term ***normal*** refers to ***climatological standard normal***, that is, the average value of a particular climate element, calculated for the period from January 1, 1991 to December 31, 2020

[2] **n**th percentile of a variable refers to the value of the observed variable below which there is n percent of data previously arranged in an ascending order

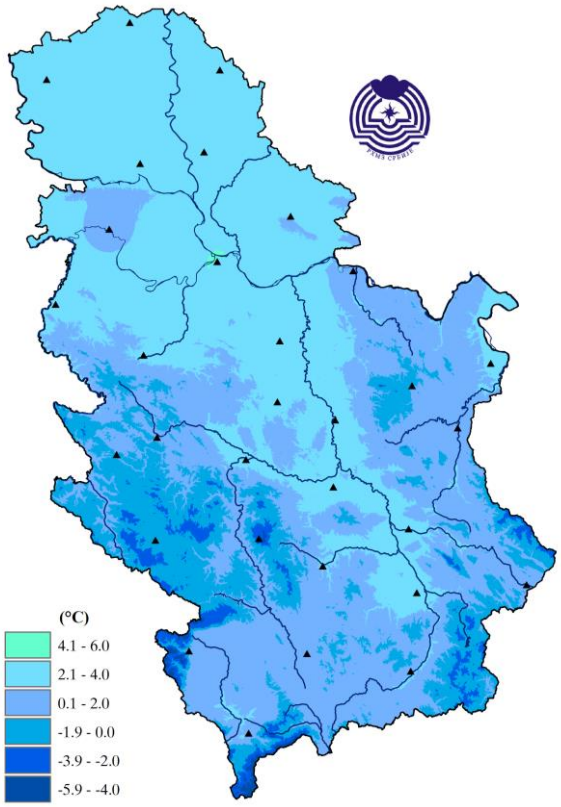


Figure 1. Spatial distribution of mean monthly air temperature (ºC)

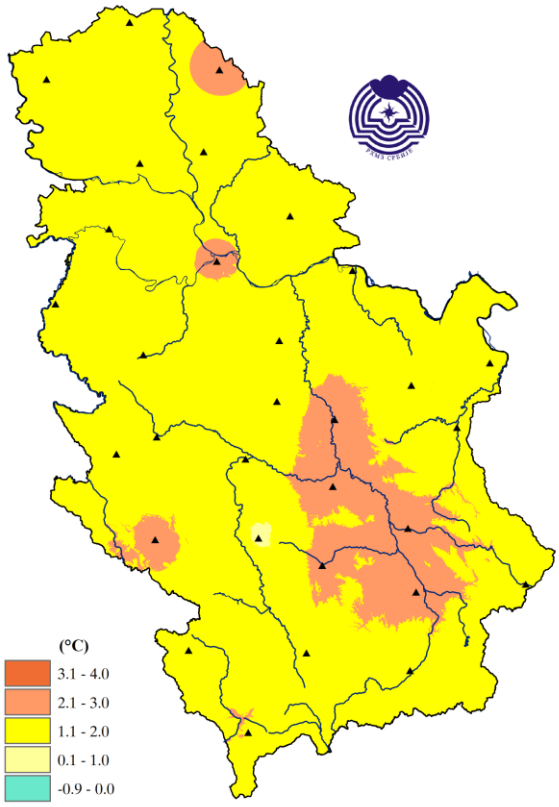


Figure 2. Spatial distribution of mean monthly air temperature anomaly (ºC)

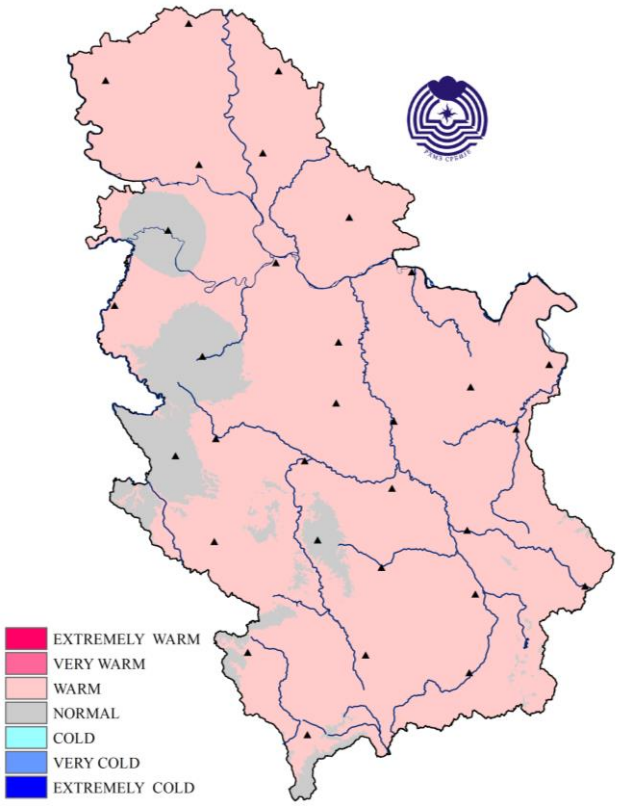


Figure 3. Spatial distribution of the mean monthly air temperature using percentile method

January 2024 ranks as the 12th warmest for Serbia in the period from 1951 *(Figure 4)*.

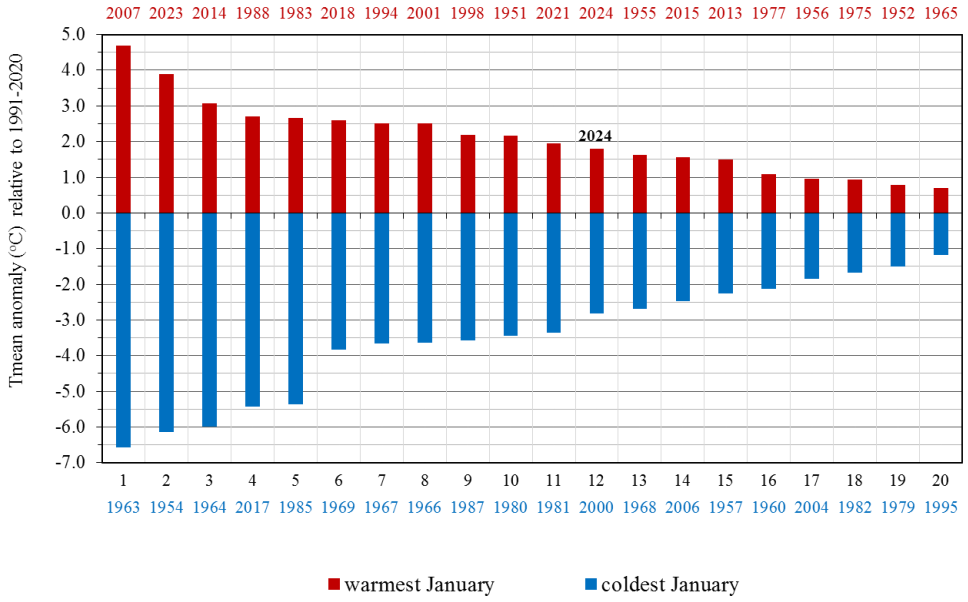


Figure 4. Rank of the warmest and coldest January in Serbia

Mean daily air temperature in Belgrade, based on the percentile method, was in the extremely warm category during most of the first decade and middle of the month. In the middle of the last decade, it was in the very warm category, whilst at the beginning of the second decade it was in the very cold category (*Figure 5*). Daily course of the mean daily air temperature and the accompanying percentiles for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje are given in the Appendix.

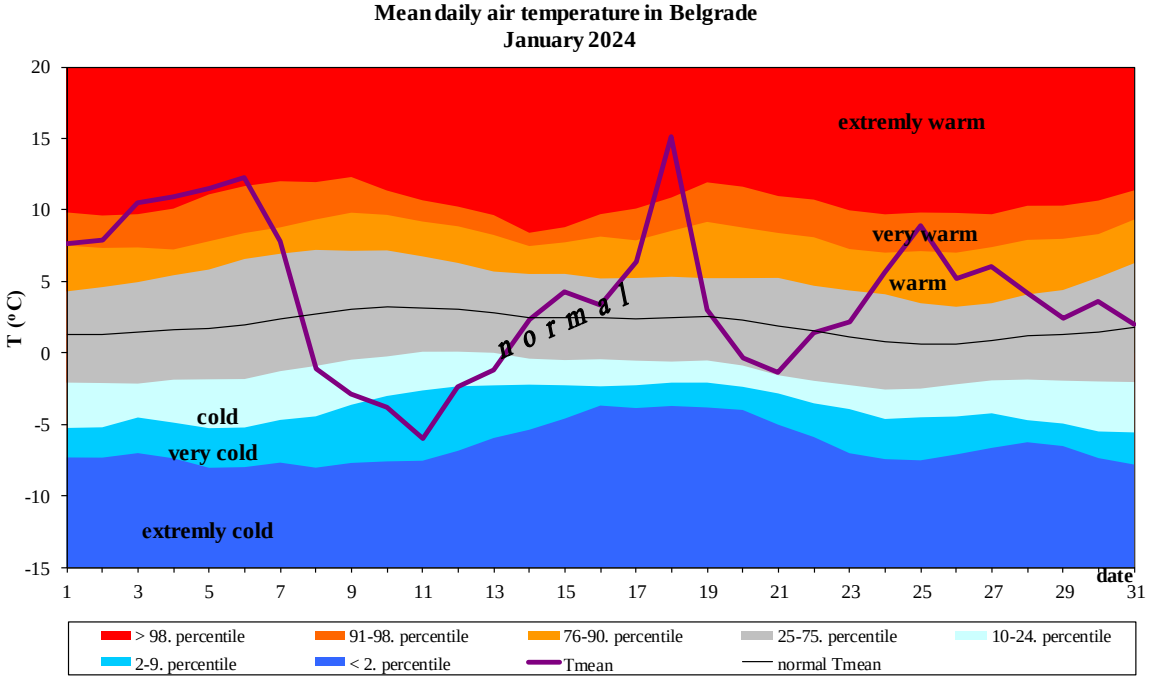


Figure 5. Daily course of the mean daily air temperature and accompanying percentiles for Belgrade

Maximum air temperature

Mean maximum January air temperature ranged from 6,1ºC in Pozega to 8,3ºC in Loznica, while Belgrade observed air temperature of 8,2°C. On the mountains, mean maximum January air temperature ranged from -0,2ºC at Kopaonik to 4,3ºC in Sjenica.

Based on the percentile method, mean maximum monthly air temperature was in the warm category in most of the country, very warm on Palic, Negotin and Pozega, and normal category at Zlatibor and Kopaonik.

In Serbia, the highest maximum daily air temperature of 21,5ºC was measured in Loznica on January 18, while Belgrade observed air temperatura of 18,9ºC.

The highest number of ice days[3] was registered at Kopaonik, total of 15 days, Crni Vrh observed 11 days, Zlatibor recorded 7 days, Banatski Karlovac, Veliko Gradiste, Pozega recorded 5 days, elsewhere it was 2 to 5 days below January average.

Heat wave[4] that was recorded in most of the country on 24 and 25 December continued throughout January. The heat wave with longest duration was recorded in Zrenjanin lasting from 24 December to 6 January, total of 14 days. Heat wave on Palic was recorded from 2 to 6 January (*Table 1*).

Table 1. Heat waves in Serbia

HEAT WAVES IN SERBIA - JANUARY 2024.

(relative to the 1991-2020 base period)

JANUARY

station/day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
PALIC		VW	VW	EW	VW	EW																									
SOMBOR																															
KIKINDA	VW	VW	EW	EW	VW	EW																									
ZRENJANIN	VW	VW	VW	EW	VW	VW																									
NOVI SAD	VW	VW	VW	EW																											
SR.MITROVICA	VW	VW	VW	EW	VW																										
BEOGRAD	EW	VW																													
LOZNICA	EW	VW	VW	VW																											
VALJEVO	EW	VW	VW	VW	VW																										
V.GRADISTE	VW	VW																													
SM.PALANKA	EW	VW																													
KRAGUJEVAC	EW	VW																													
KRALJEVO																															
POZEGA																															
ZLATIBOR																															
CUPRIJA																															
KRUSEVAC	EW	VW	VW																												
NEGOTIN	VW	EW	EW	VW	EW																										
ZAJECAR																															
CRNI VRH	EW																														
KOPAONIK																															
SJENICA	EW	VW	VW	VW																											
NIS																															
VRANJE																															
DIMITROVGRAD																															
LESKOVAC																															
KURSUMLIJA	VW																														
B.KARLOVAC	VW	VW	VW	VW	VW																										

[3] Ice day is defined as the day with maximum air temperature lower than 0°C

[4] Heat wave is, according to the percentile method, is a period during which maximum daily air temperature is in the very warm and extremely warm categories for 5 consecutive days or longer

Figure 6 shows daily course of the maximum daily air temperature and the accompanying percentiles for Belgrade in January 2024 and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje are given in the Appendix.

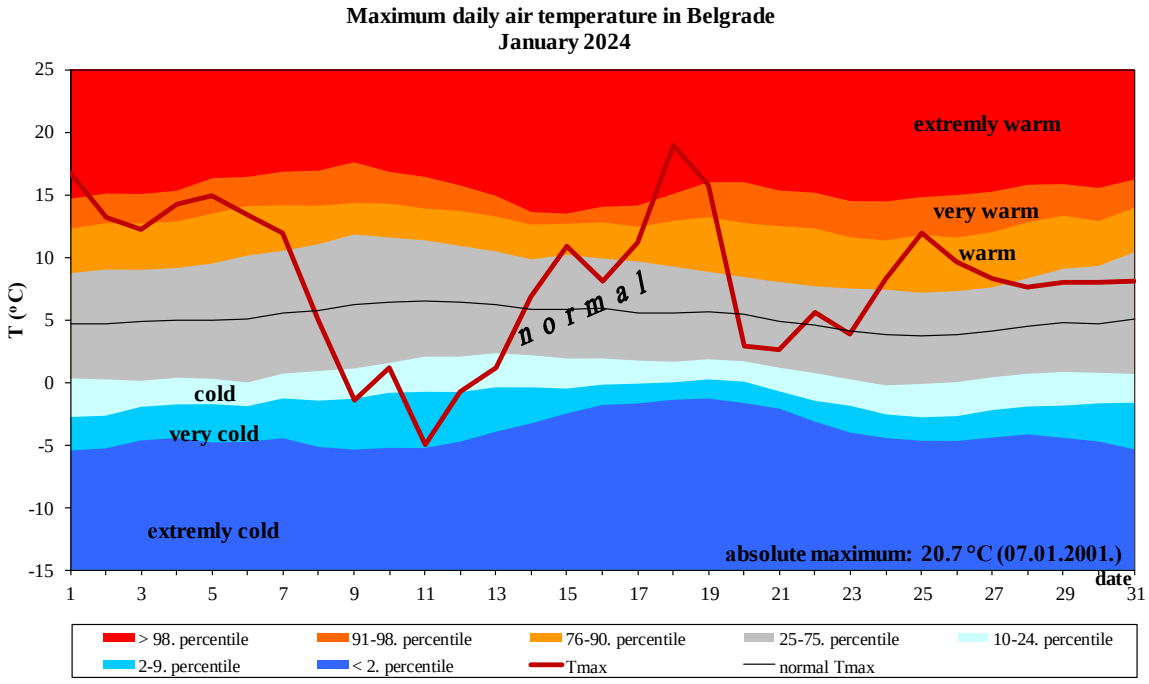


Figure 6. Daily course of the maximum daily air temperature and accompanying percentiles for Belgrade

Minimum air temperature

Mean minimum air temperature in January ranged from -3,9ºC in Pozega to 0,9ºC in Belgrade. On the mountains, mean minimum air temperature ranged from -6,8ºC at Kopaonik to -3,3ºC at Zlatibor.

Based on the percentile method, mean minimum monthly air temperature was in the categories of warm and normal.

The lowest minimum daily air temperature of -20,0ºC was measured in Sjenica on January 22. In the lowland, the lowest daily air temperature of -15,0ºC was measured in Sremska Mitrovica on January 10. On January 11, Belgrade observed the lowest montly air temperature of -7,1ºC.

Number of frost days[5], ranged from 13 in Belgrade to 25 u Pozega. In the upland, their number ranged from 23 frost days at Zlatibor to 29 days at Kopaonik. The recorded number of frost days was 4 days below the January average in most of the country.

Days with severe frost[6] were recorded in most of the country. Most days with severe frost were recorded at Kopaonik, total of 9 days, whereas in the lowland, 4 days was registered in Sremska Mitrovica.

Cold wave [7] was recorded in Sremska Mitrovica in the period from January 9 to 14.

[5] Frost day is defined as the day with minimum air temperature lower than 0°C
[6] Day with severe frost is defined as the day with the minimum air temperature -10°C and below

Na slici 7 prikazana je ocena minimalne i maksimalne temperature vazduha u Srbiji za januar prema raspodeli tercila u odnosu na referentni period 1991-2020. It can be noted that the mean minimum air temperature was slightly above the upper tercile threshold and the mean maximum air temperature was slightly above the upper tercile threshold.

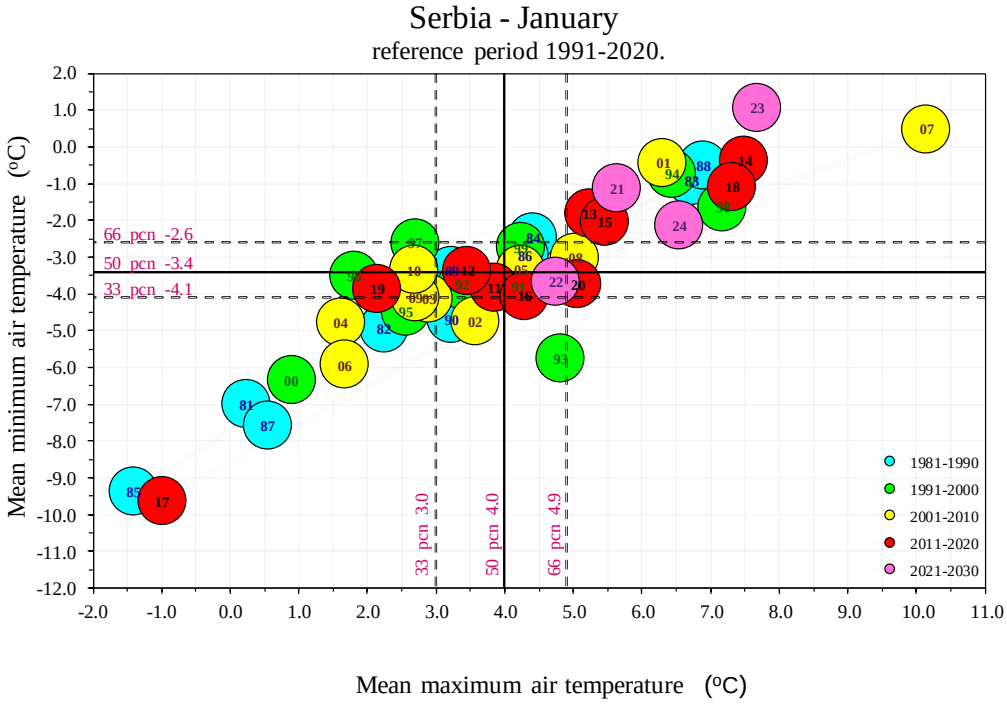


Figure 7. Assessment of minimum and maximum air temperature for Serbia with the accompanying terciles in relation to the 1991-2020 base period

Figure 8 shows daily course of the minimum daily air temperature and the accompanying percentiles for Belgrade in January 2024, and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje are given in the Appendix.

[7] Cold wave is, according to the percentile method, is a period during which minimum daily air temperature is in the very cold and extremely cold categories for 5 consecutive days or longer

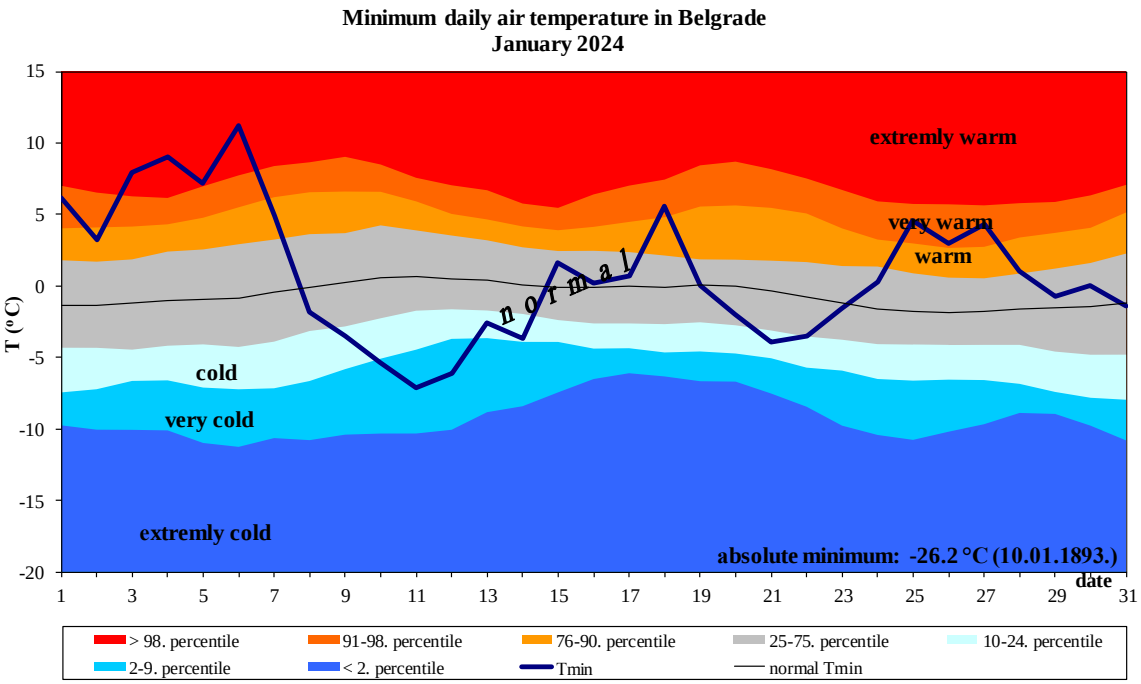


Figure 8. Daily course of the minimum daily air temperature and accompanying percentiles for Belgrade

PRECIPITATION

January precipitation sums ranged from 23,0 mm on Palic to 80,3 mm at Zlatibor, whilst Belgrade observed 41,5 mm of precipitation (*Figure 9*).

Precipitation totals compared to the normal for the 1991-2020 base period ranged from 58% in Leskovac to 197% in Sremska Mitrovica (Figure 10).

Based on the percentile method, precipitation sums were in the following categories: normal in most of the country, dry in Loznica and Negotin, rainy in Valjevo, Smederevska Palanka, Pozega and Vranje, and very rainy Sremska Mitrovica (*Figure 11).*

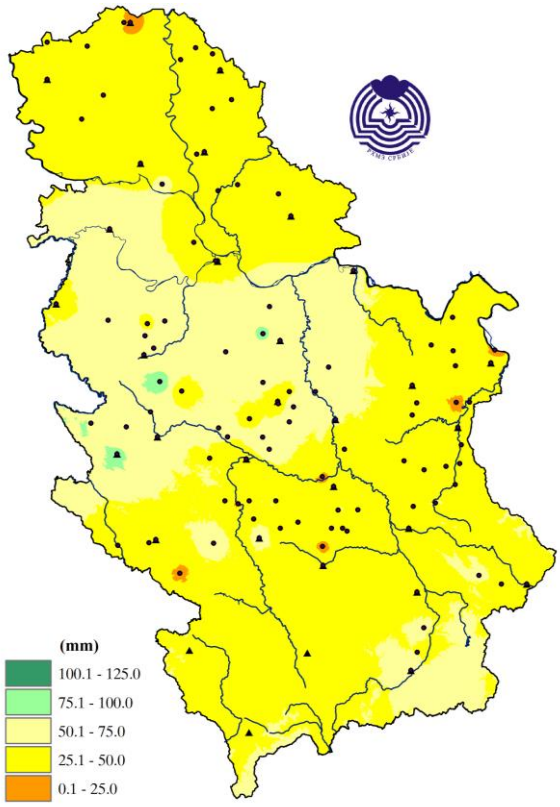


Figure 9. Spatial distribution of the monthly precipitation sums (mm) according to data from 28 major meteorological, 20 climatological and 63 rain gauge stations

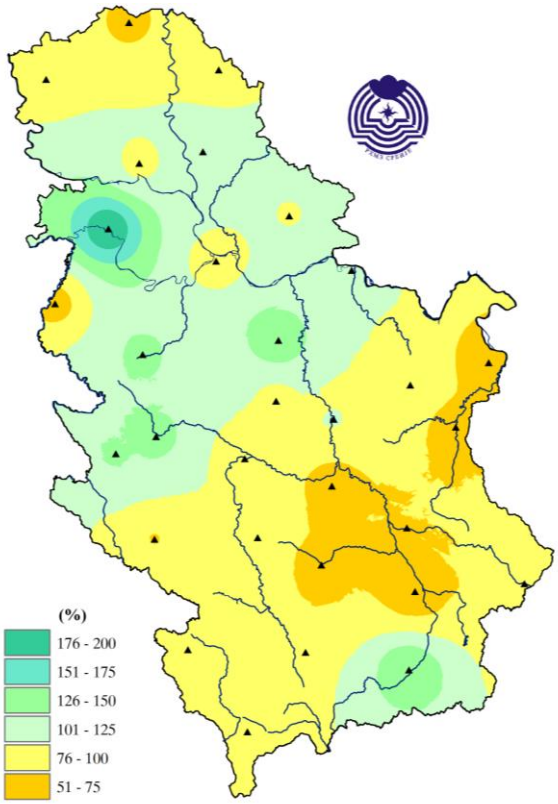


Figure 10. Spatial distribution of the monthly precipitation sums in the percentages of normal for the 1991–2020 base period

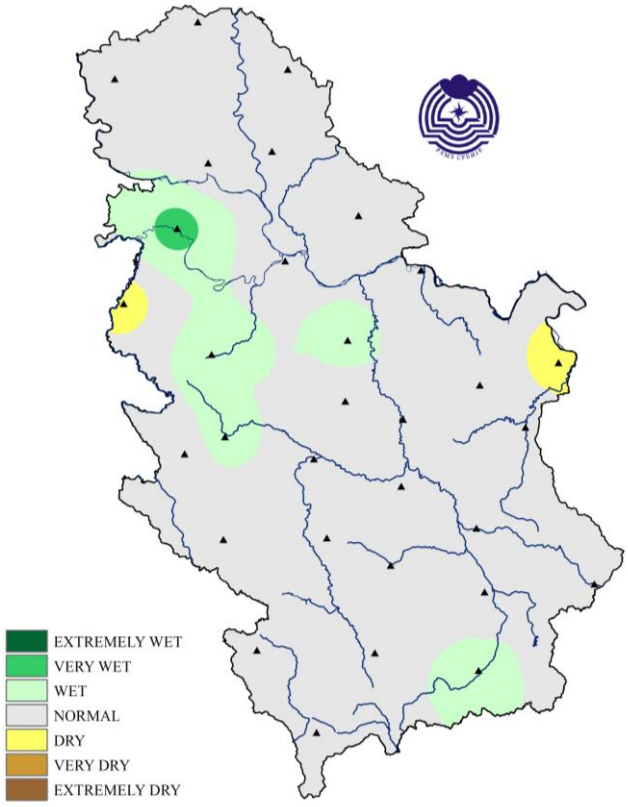


Figure 11. Monthly precipitation sums according to the percentile method

January 2024 was **the 8th wettest** for Sremska Mitrovica since the record-keeping at this MMS began (*Figure 12*).

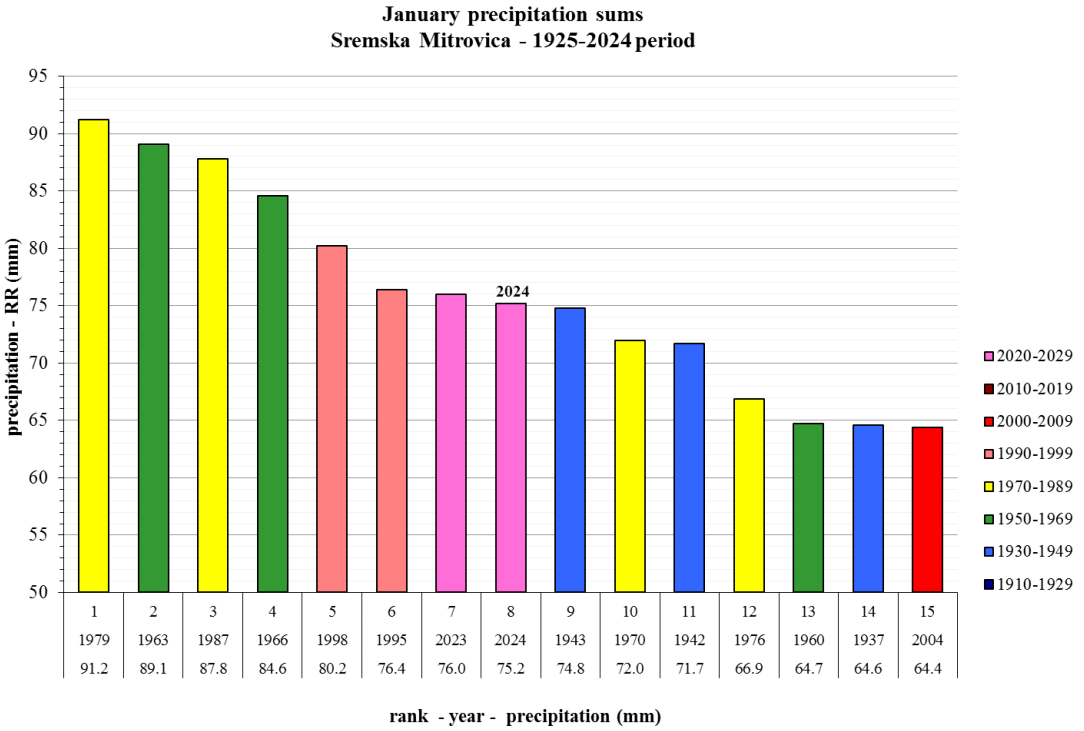


Figure 12. Rank of the highest precipitation in Sremska Mitrovica

The highest daily precipitation sum of 35,8 mm was measured at Zlatibor on January 8. On January 20, Belgrade measured the highest daily precipitation sum of 9,7 mm.

On January 8, Kraljevo recorded precipitation sum of 35,4 mm **thereby breaking the previous January record** of 34,2 mm set on January 1, 1980.

Number of days with precipitation in January ranged from 8 to 20 *(Figure 13).* The recorded number of days with precipitation was around January average in most of the country *(Figure 14*).

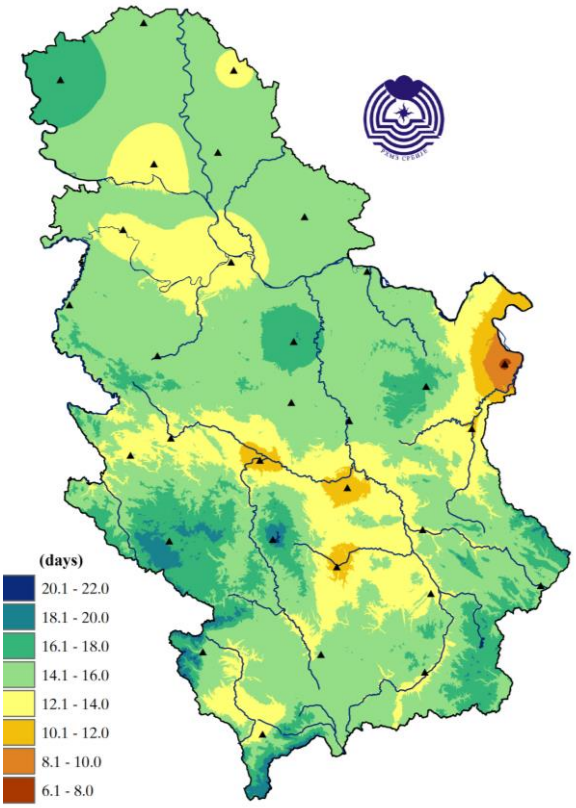


Figure 13. Spatial distribution of number of days with precipitation

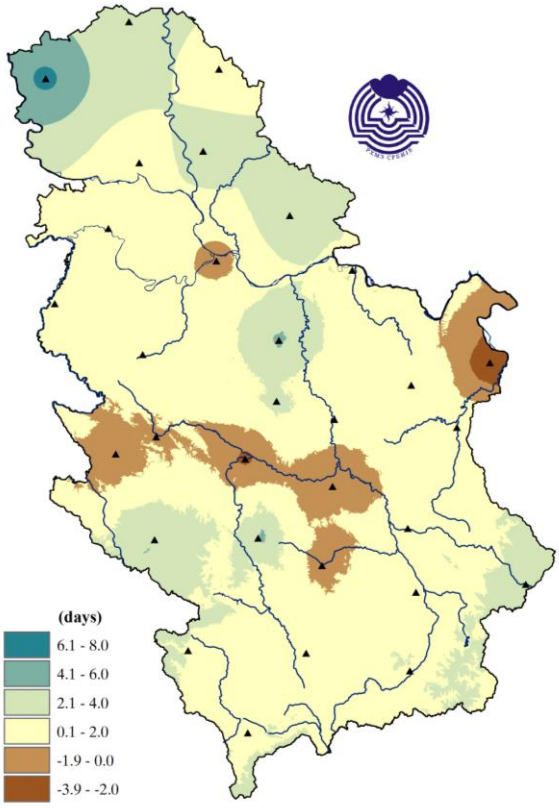


Figure 14. Spatial distribution of deviation of number of days with precipitation

Snow cover was recorded in entire Serbia. The highest snow depth of 34 cm was measured at Kopaonik on January 28, whereas in the lowland snow cover of 25 cm was measured in Valjevo on January 20.

The highest number of days with snow cover was registered at Kopaonik, total of 31 day, whereas in the lowland, the highest number of days, total of 15 days was recorded in Valjevo. The recorded number of days with snow cover was 3 to 9 days below the January average in most of the country.

Figure 15 shows assessment of the air temperature and precipitation sums for Serbia for January based on the tercile distribution relative to the 1991-2020 base period. It can be noted that January 2024 was marked by air temperature above the upper tercile threshold and precipitation sums within the average.

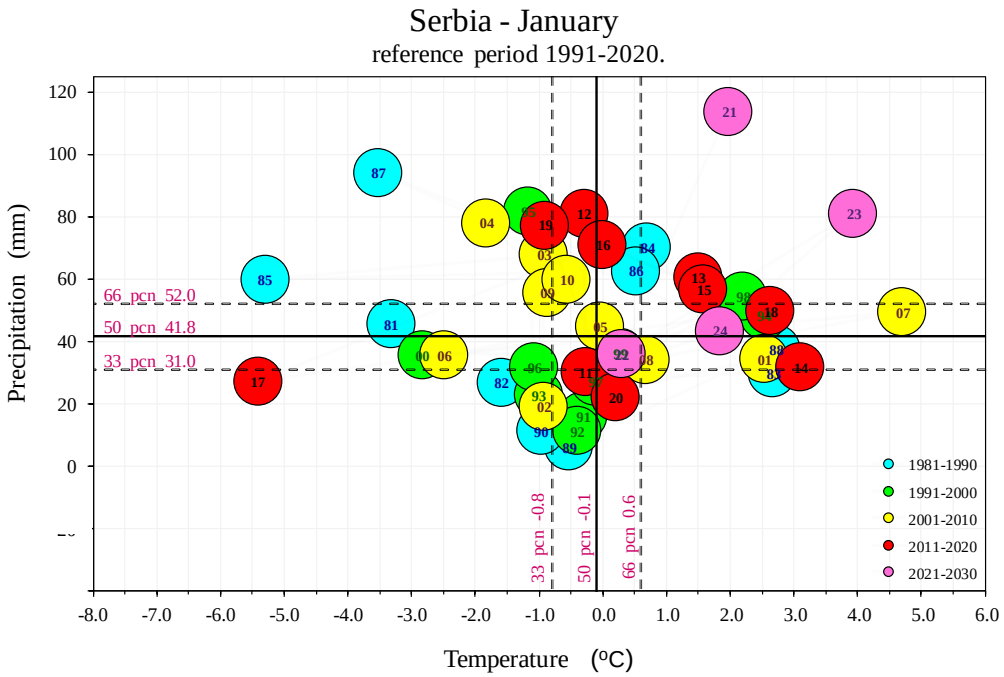


Figure 15. Assessment of air temperature and precipitation for Serbia with the accompanying terciles in relation to the 1991-2020 base period

Figure 16 show daily and cumulative precipitations sums with averaged normal 1991-2020 for January in Belgrade, and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje precipitation sums are given in Appendix.

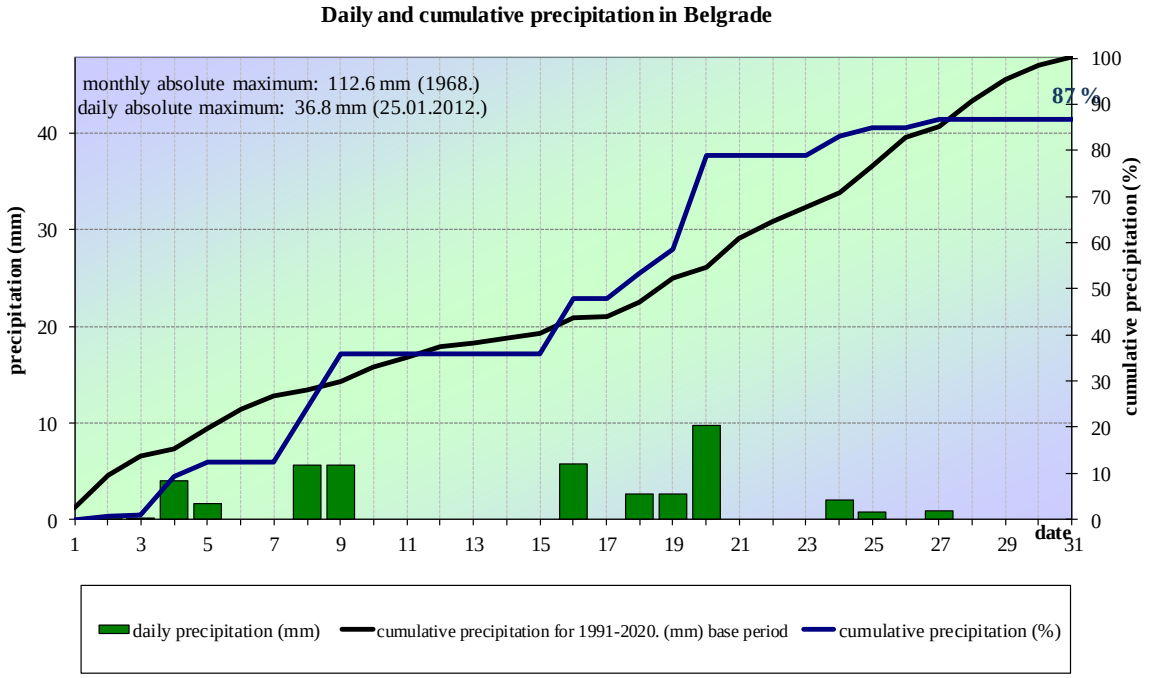


Figure 16. Daily and cumulative precipitation in Belgrade

CLOUD COVER, BRIGHT AND CLOUDY DAYS

Mean January cloud cover in Serbia was slightly below the average, ranging from 5/10 to 7/10. Figures 17, 18 and 19 show the average daily cloud cover in January for Belgrade, Leskovac and Sremska Mitrovica.

Bright days[8] ranged from 2 in Leskoviac to 8 in Sremska Mitrovica. Belgrade observed 6 bright days. The observed number of bright days was 2 to 5 days above the January average in the northern and parts of central and western Serbia.

The lowest number of cloudy days[9] was recorded in Sremska Mitrovica, total of 7 days, whereas the highest number of cloudy days, total of 17 days, was registered in Leskovac and Kopaonik. Number of cloudy days was 3 to 5 days below the January average in most of the country.

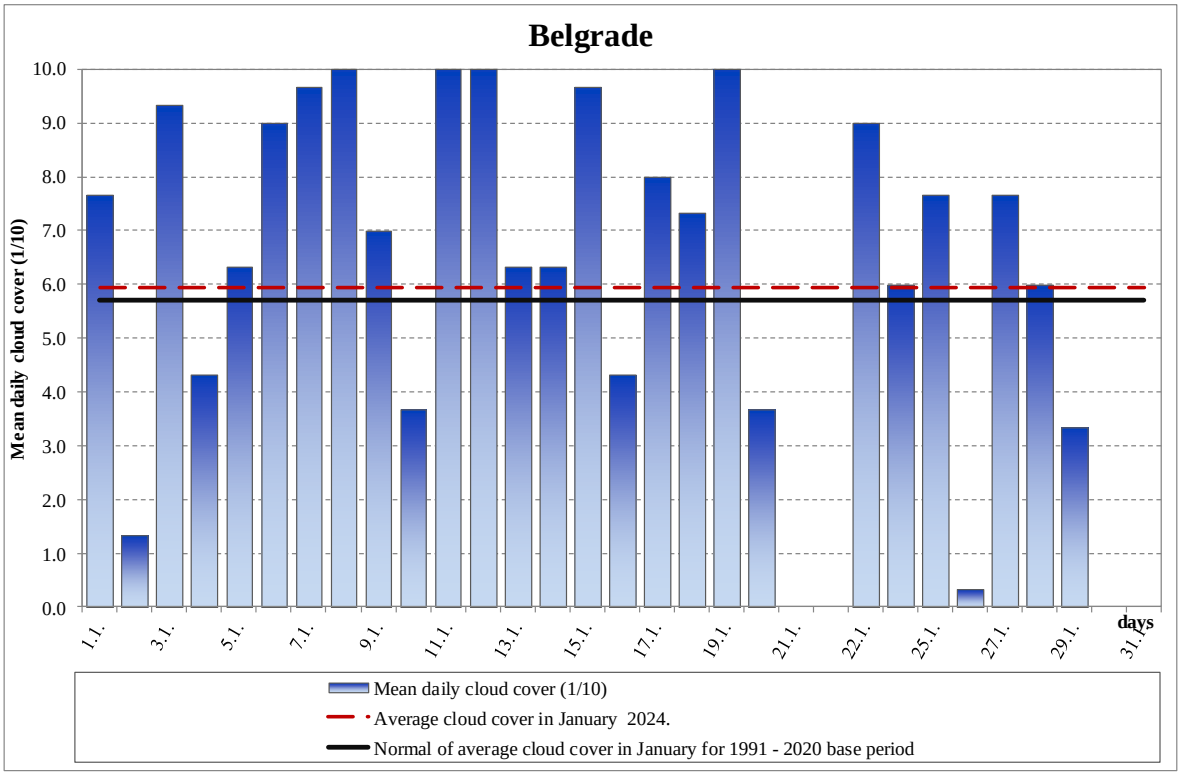


Figure 17. Mean daily cloud cover in Belgrade

[8] Bright day refers to a day with cloud cover less than 2/10
[9] Cloudy day refers to a day with cloud cover over 8/10

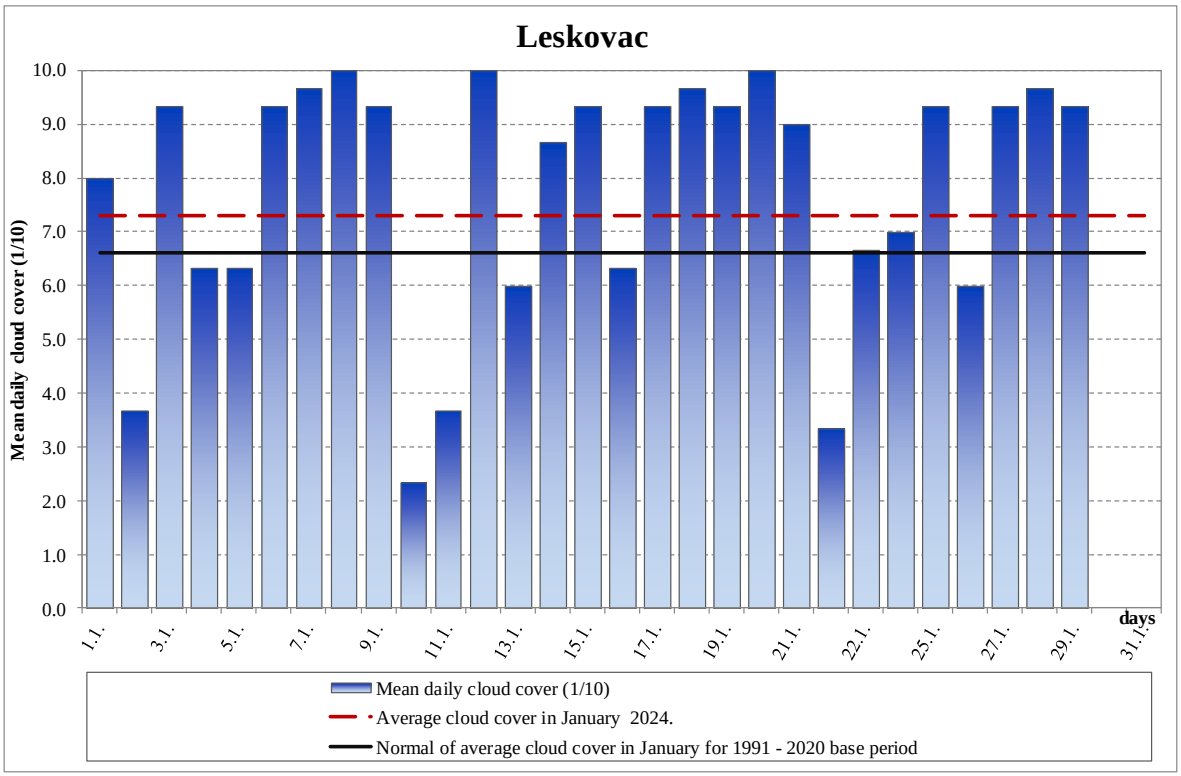


Figure 18. Mean daily cloud cover in Leskovac

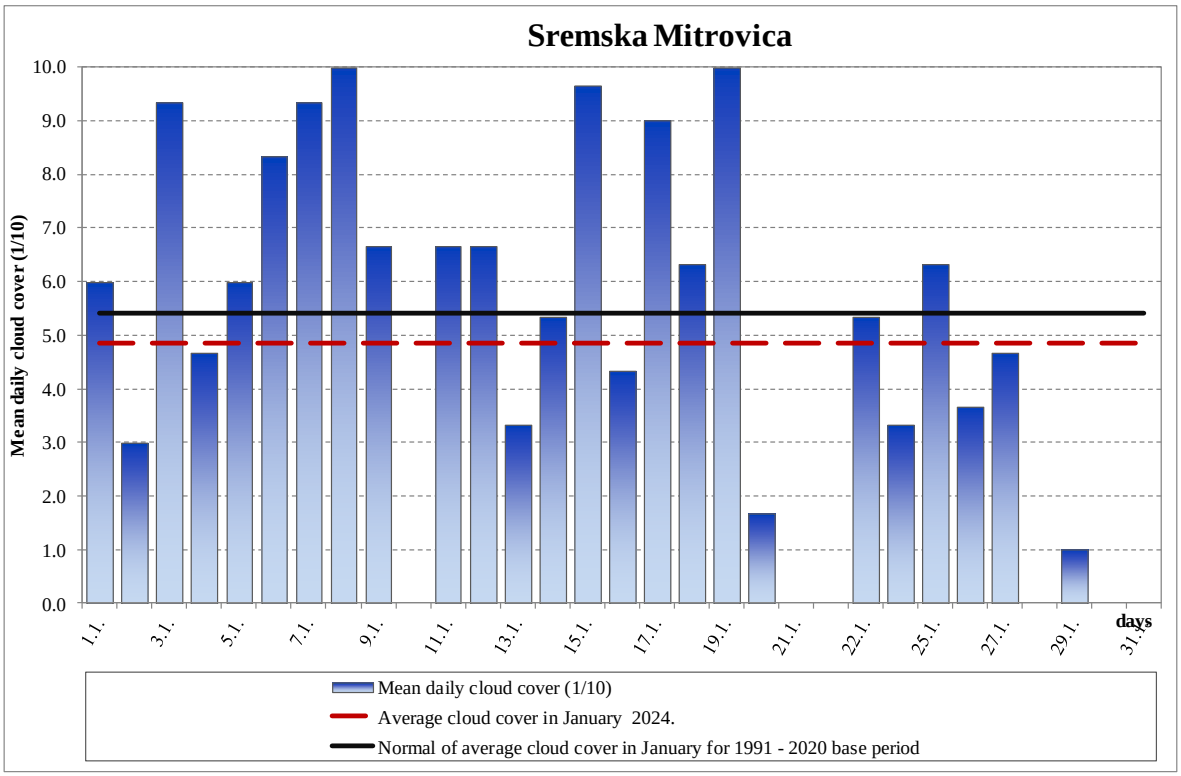


Figure 19. Mean daily cloud cover in Sremska Mitrovica

SUNSHINE DURATION (INSOLATION)

Sunshine duration in January ranged from 61,4 hours in Leskovac to 109,2 hours in Kikinda (*Figure 20*).

January insolation ranged from 78% at Kopaonik to 170% in Pozega relative to the normal for the 1991-2020 base period (*Figure 21*).

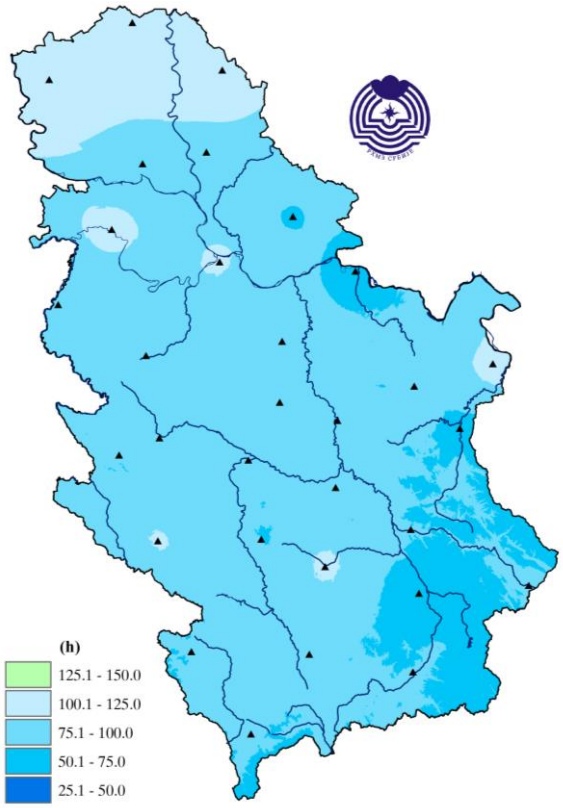


Figure 20. Insolation, expressed in hours

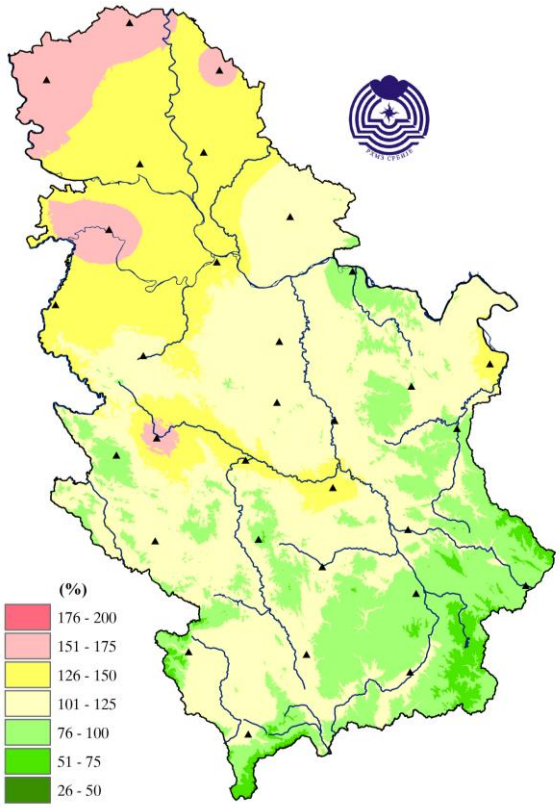


Figure 21. Insolation expressed in the percentages of normal

*** Note:** Climate analysis of meteorological elements was done based on the preliminary data obtained from 28 main meteorological stations

OVERVIEW OF THE SYNOPTIC SITUATION*

At the end of the first decade, a developed low pressure from the western Mediterranean, accompanying atmospheric fronts and their transfer across our country towards the east and southeast, and a cold air mass from the north and northeast; snow and several very cold days. Then, there was a shift in the influence of low pressures from the western Mediterranean, the North Sea, and the East European Plain; frequent changes, alternating periods of warmer and colder weather, occasionally with precipitation, rain, and snow mostly in the upland.

Period at the beginning of the month was marked by warm weather mostly without precipitation. Shallow disturbances occasionally took place in the zonal upper air circulation followed by development of the low pressure in the north and northwest of the continent with the trajectory of the center heading from the North towards the Baltic Sea along with influence of the atmospheric fronts periphery within the mentioned low pressure affected our territory.

Period at the end of the decade was characterized by transfer of the low pressure center across the Adriatic Sea and the Balkans towards the east and southeast, considerably cooler weather and change of the air mass, snow in the lowland. Until the middle of the month, period of cold weather remained with several ice days and the maximum air temperature below zero degrees owing to the advection and influence of a cold air mass within a developed and deep depression with the center in the north and northeast of the continent.

As of the middle of the month until the end of the second decade, considerably warmer weather prevailed compared to the previous days with occasional rain. Strengthening of the ridge from the North Africa and western Mediterranean, rise in geopotential and predominantly zonal upper air circulation across the central and southern Europe, warmer and wet air mass.

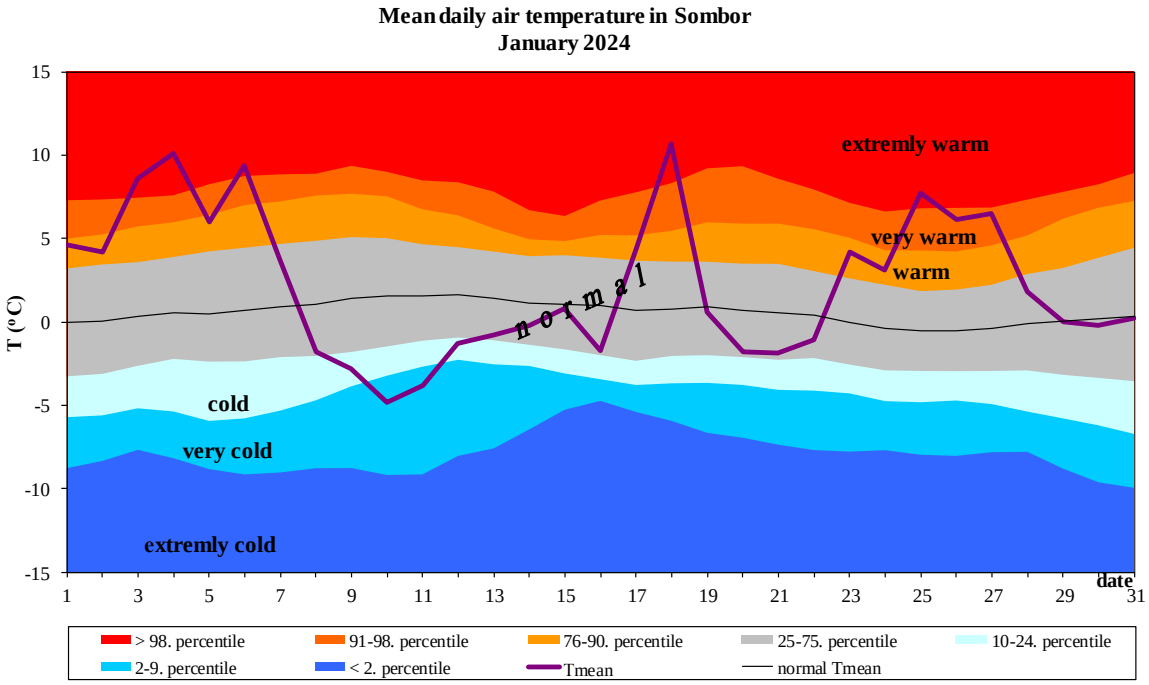
The third decade was marked by more frequent changes, several day period of warmer and colder weather and mixed precipitation, occasional rain and snow mostly on the mountains. Development and influence of the low pressure at first from the west Mediterranean, then from the northeast of the continent.

At the end of the month considerably warmer. Establishment of the ridge with the axis extending from the Azores Island to the east Europe, Ukraine and the Black Sea as well as surface anticyclone with stable air mass.

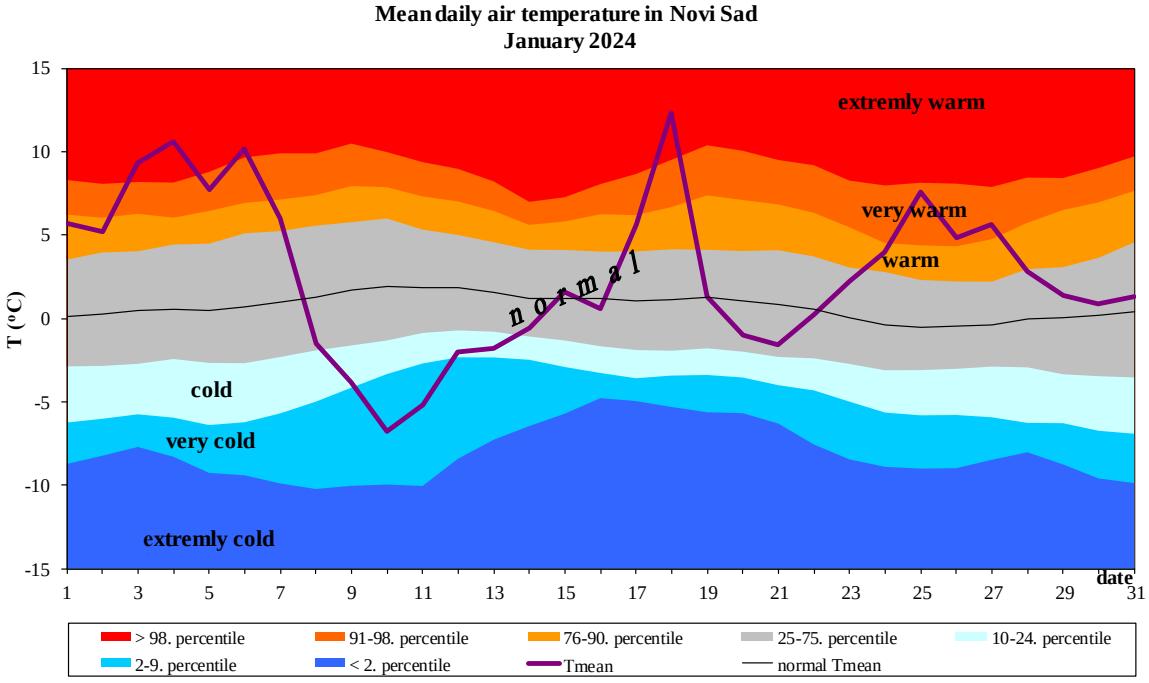
* National Center for Hydrometeorlogical Early Warning System

APPENDIX

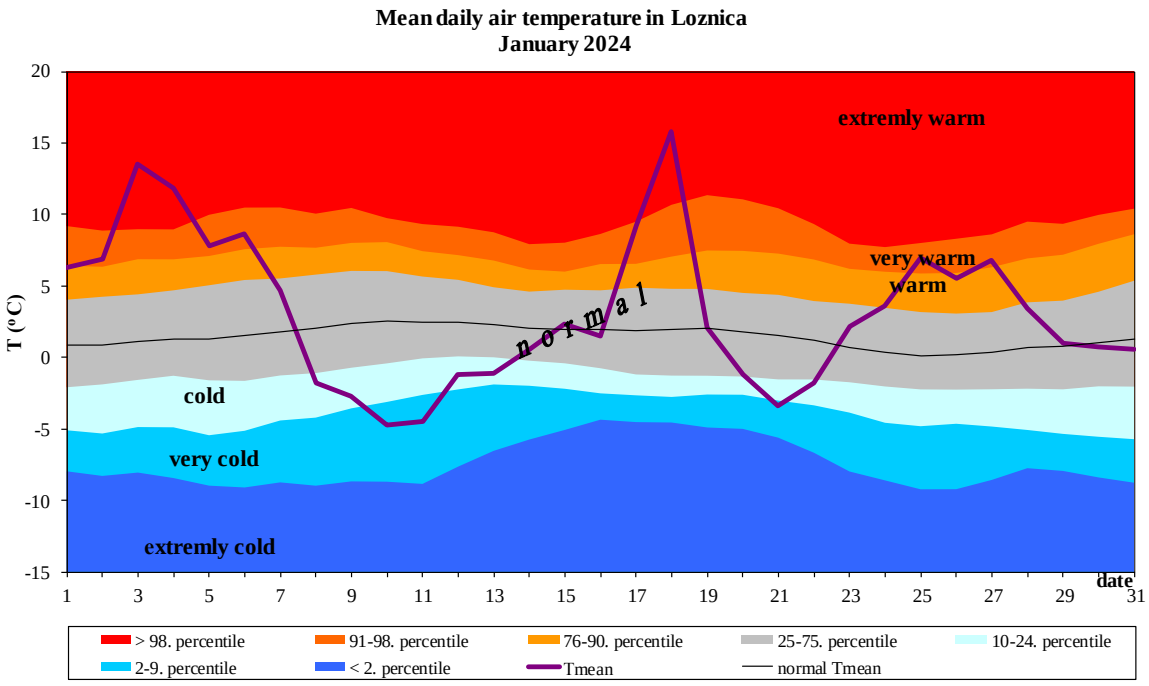
Mean air temperature



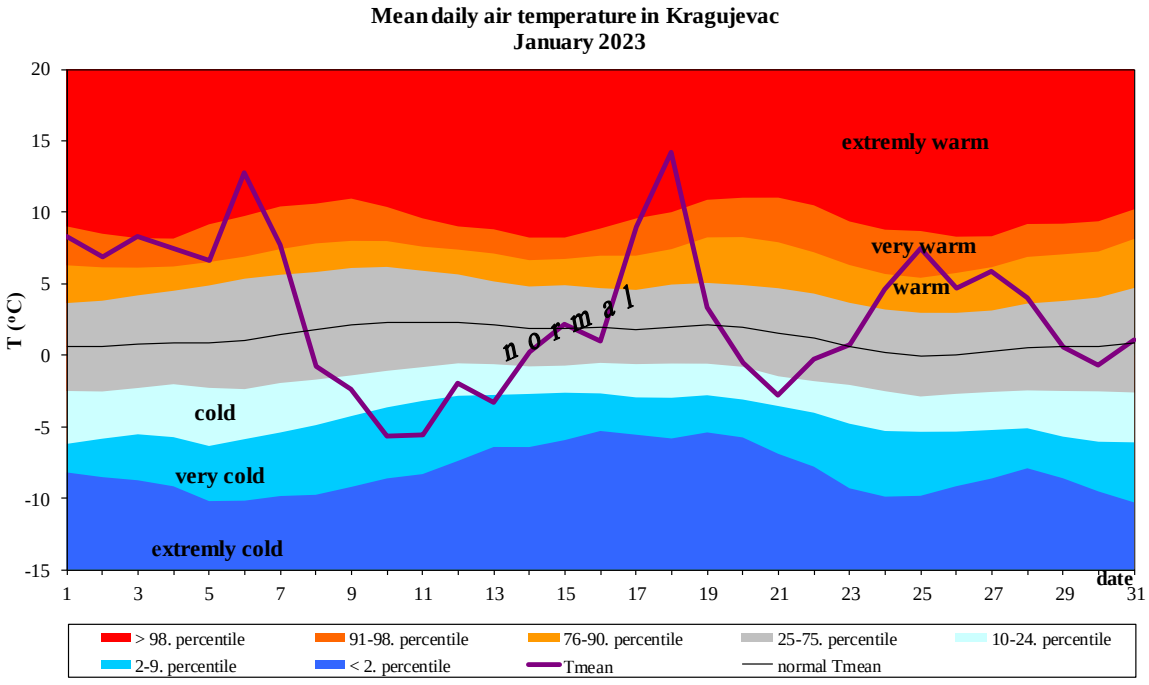
Appendix 1. Daily course of the mean daily air temperature and accompanying percentile for Sombor



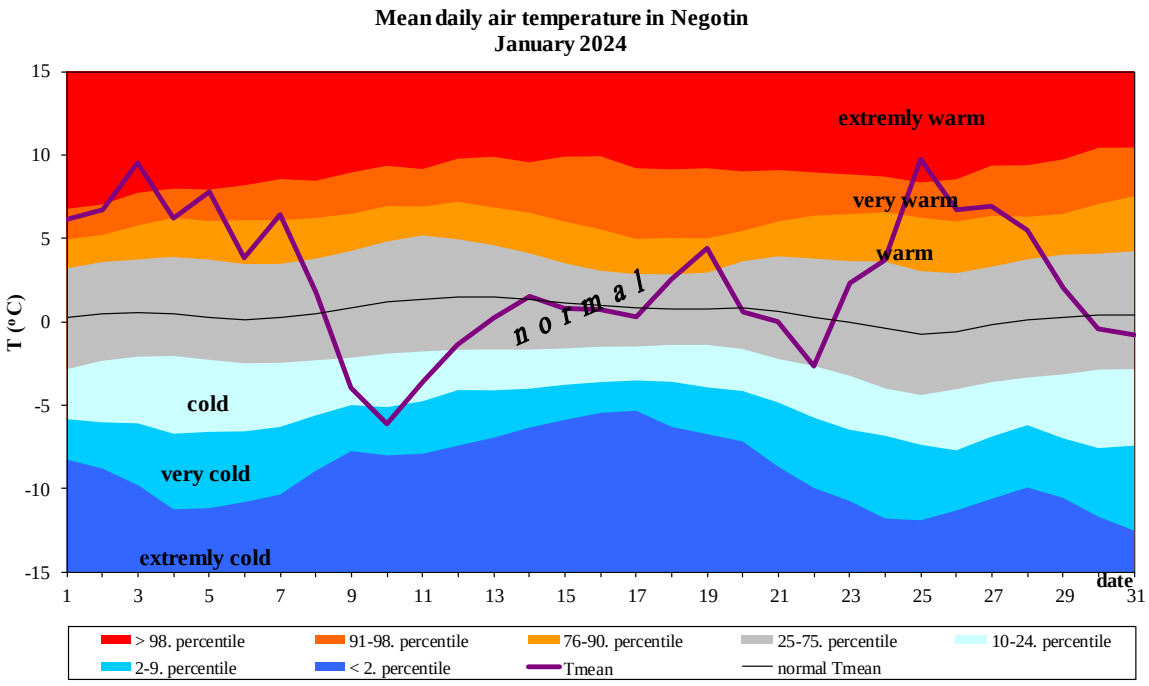
Appendix 2. Daily course of the mean daily air temperature and accompanying percentile for Novi Sad



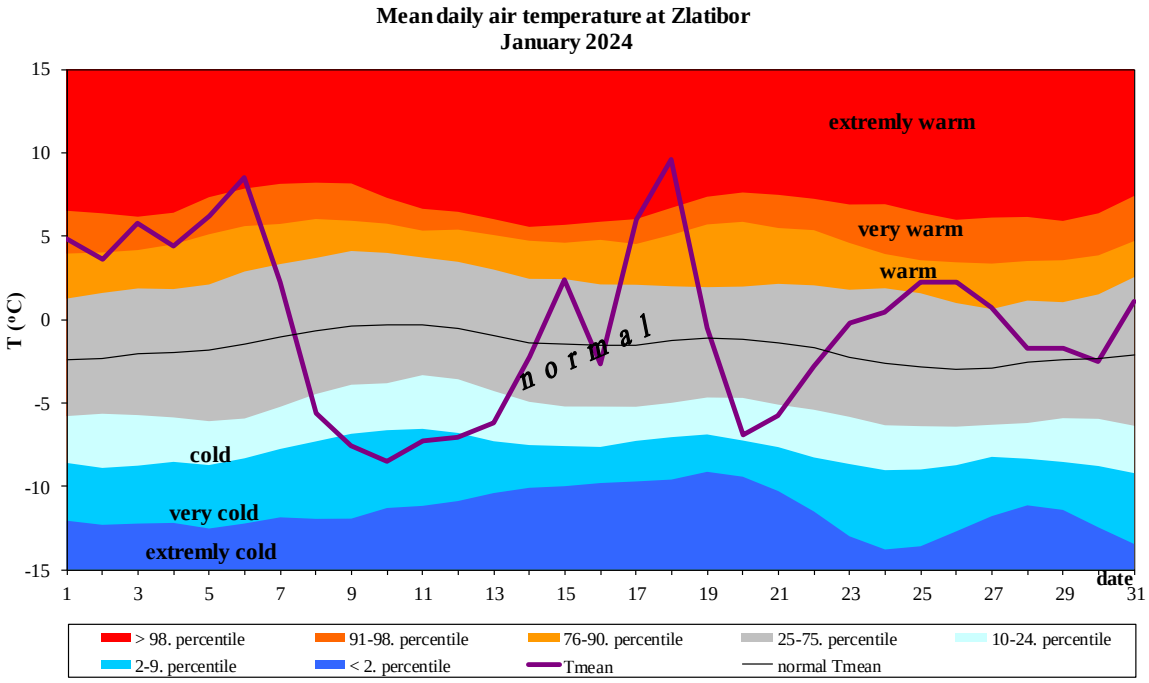
Appendix 3. Daily course of the mean daily air temperature and accompanying percentile for Loznica



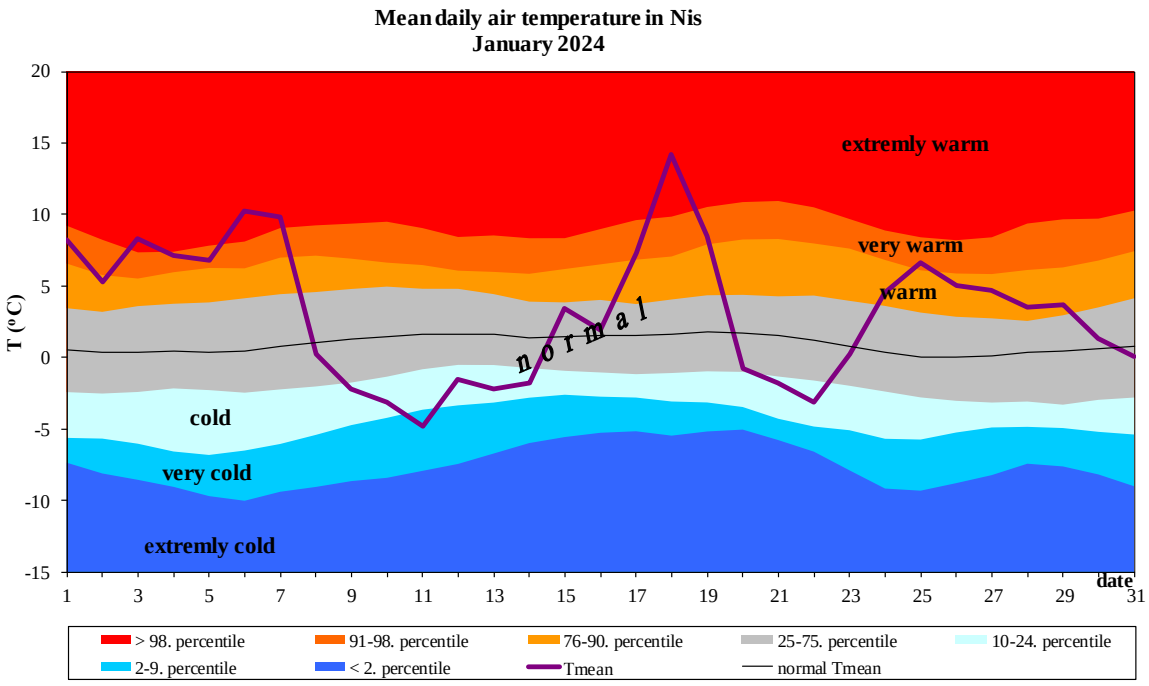
Appendix 4. Daily course of the mean daily air temperature and accompanying percentile for Kragujevac



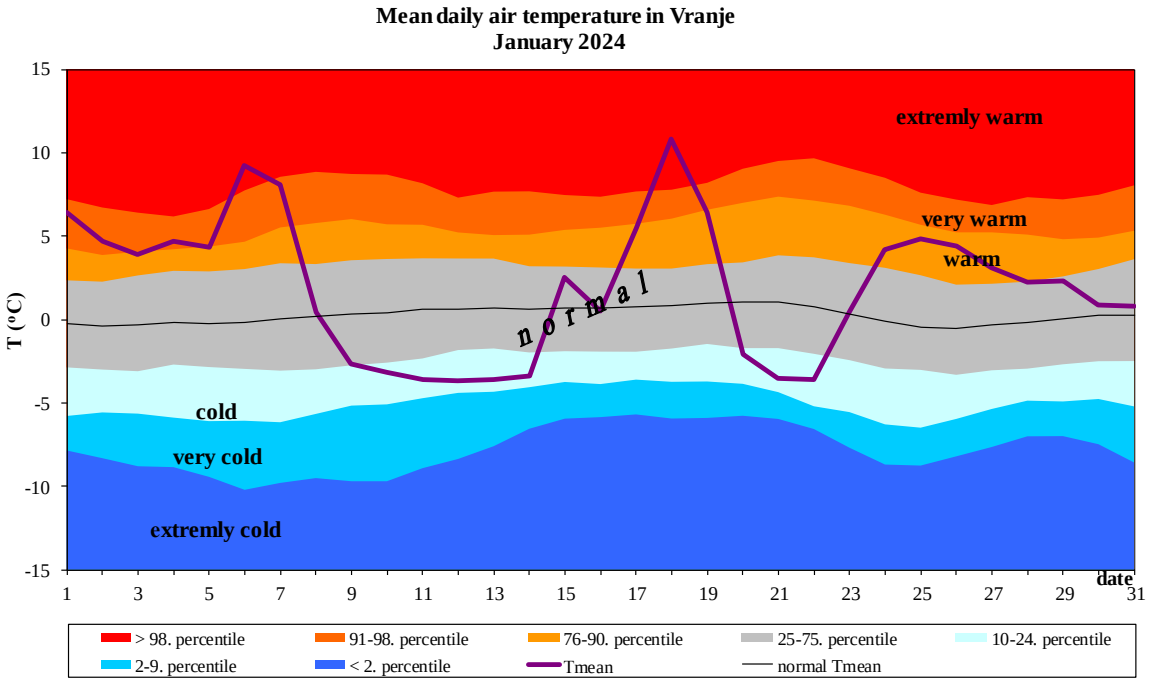
Appendix 5. Daily course of the mean daily air temperature and accompanying percentile for Negotin



Appendix 6. Daily course of the mean daily air temperature and accompanying percentile on Zlatiboru

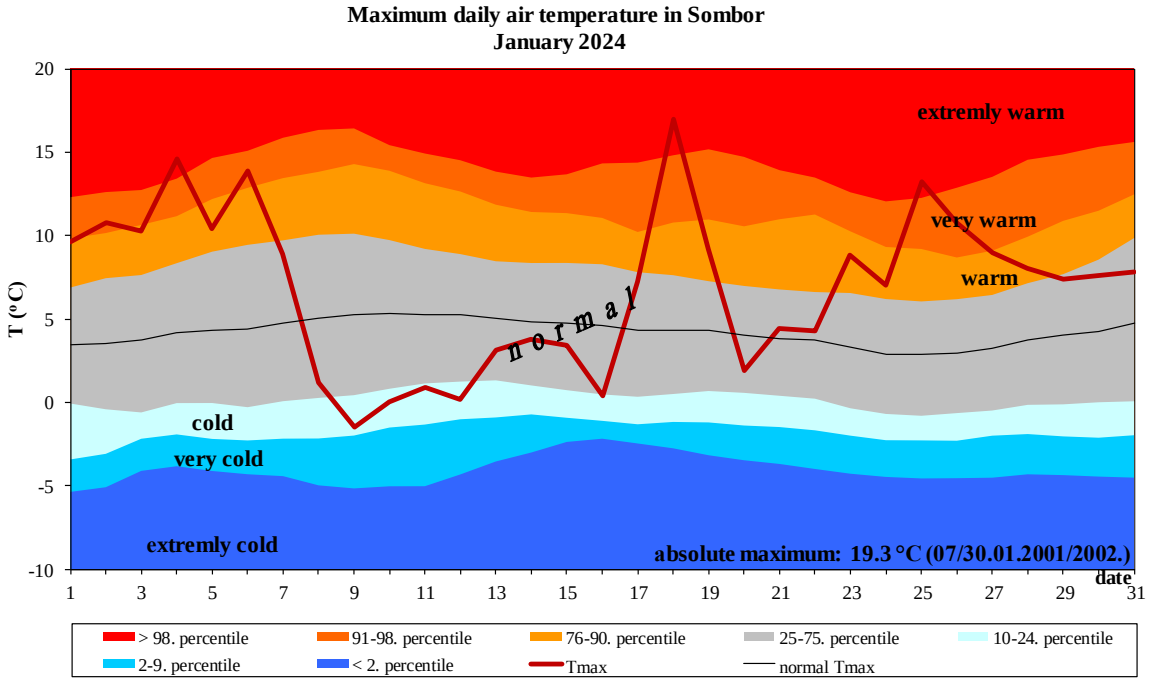


Appendix 7. Daily course of the mean daily air temperature and accompanying percentile for Nis

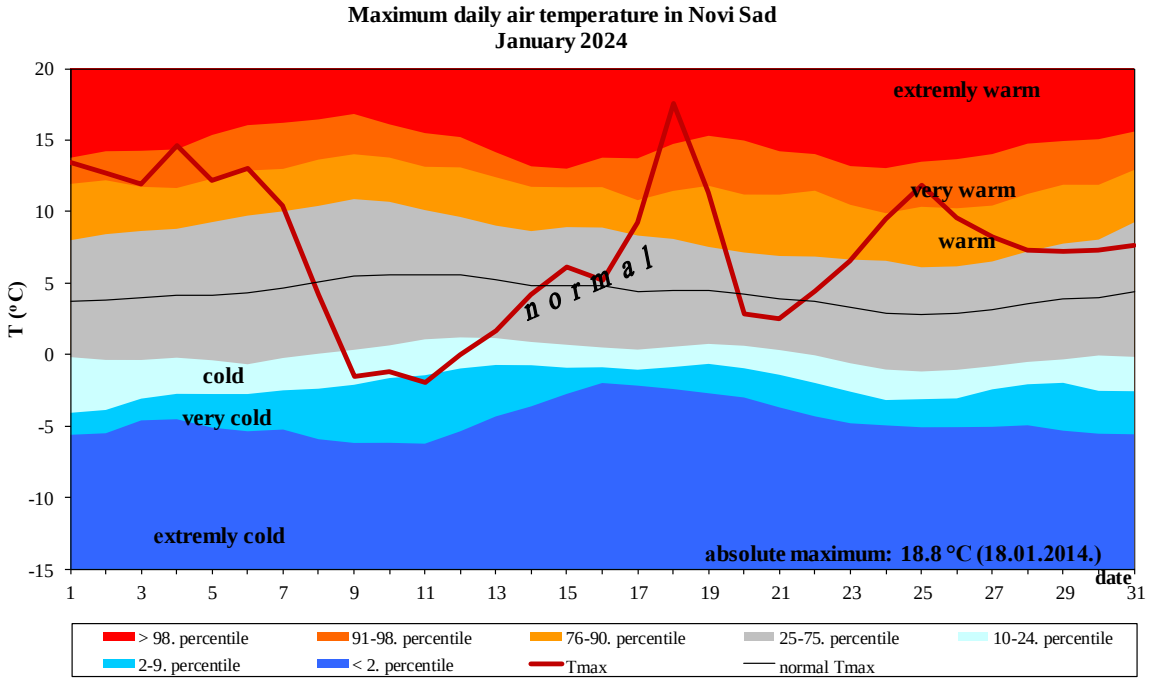


Appendix 8. Daily course of the mean daily air temperature and accompanying percentile for Vranje

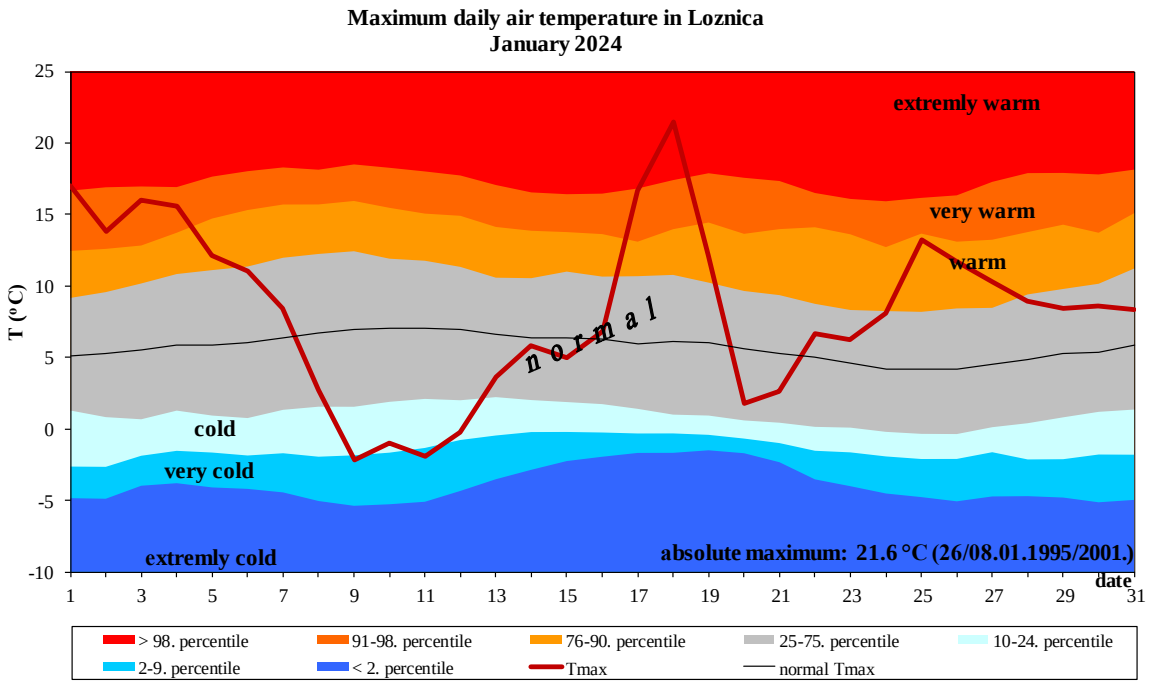
Maximum air temperature



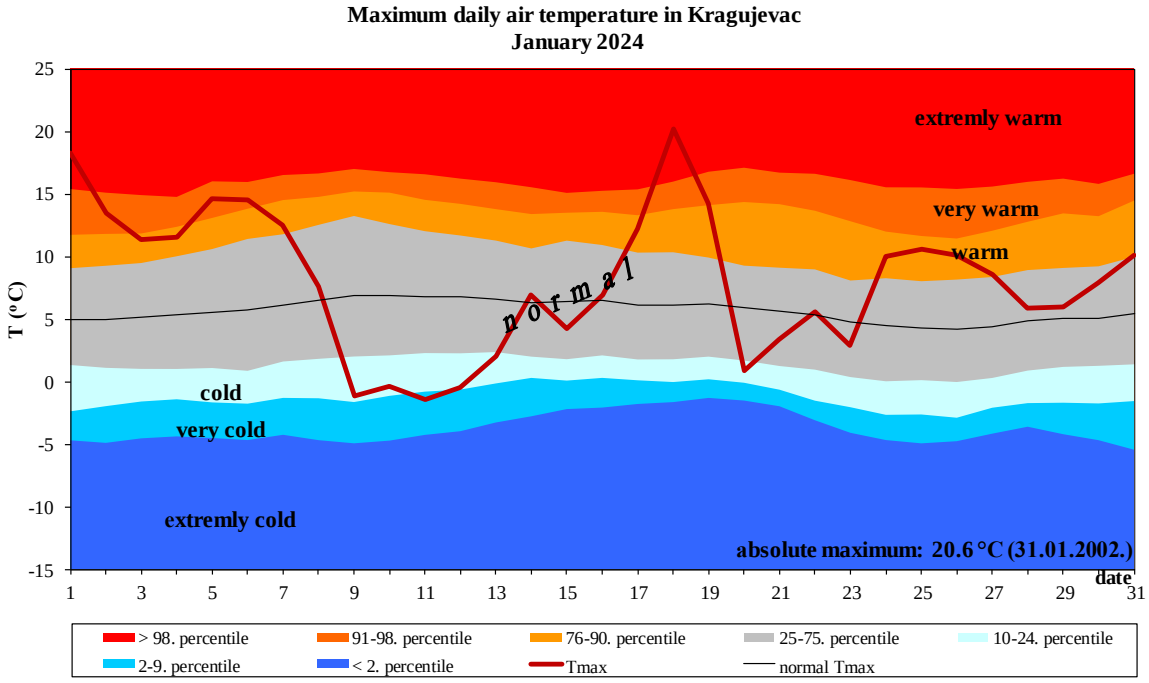
Appendix 9. Daily course of the maximum daily air temeperature and the accompanying percentile for Sombor



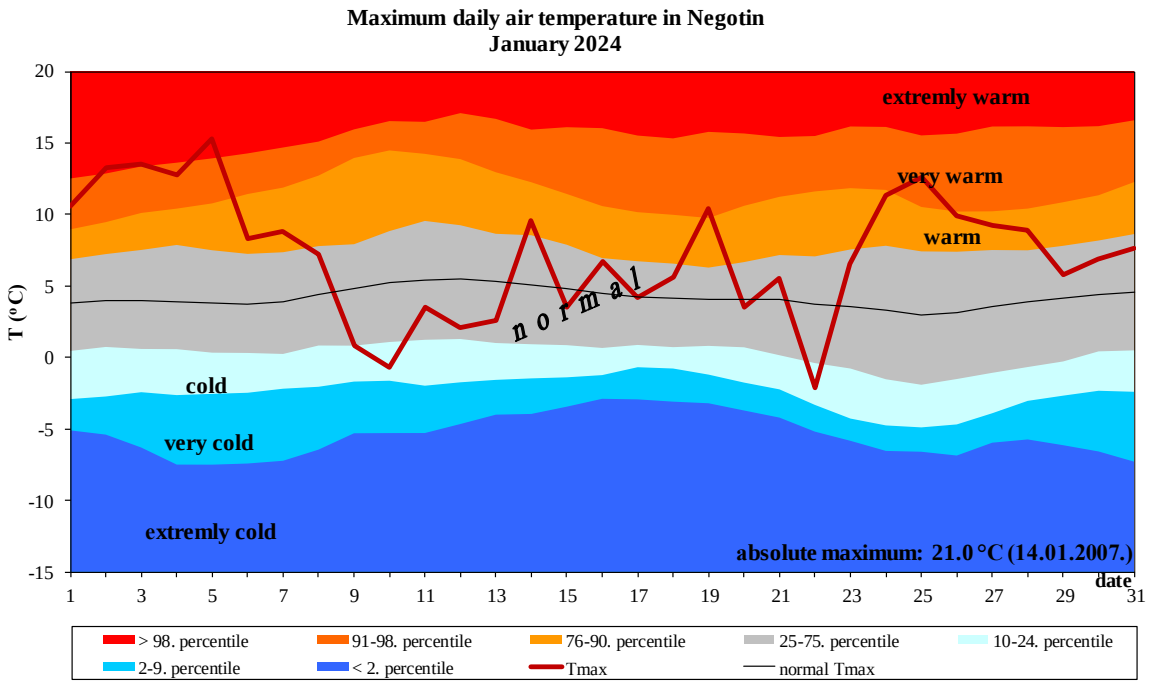
Appendix 10. Daily course of the maximum daily air temeperature and the accompanying percentile for Novi Sad



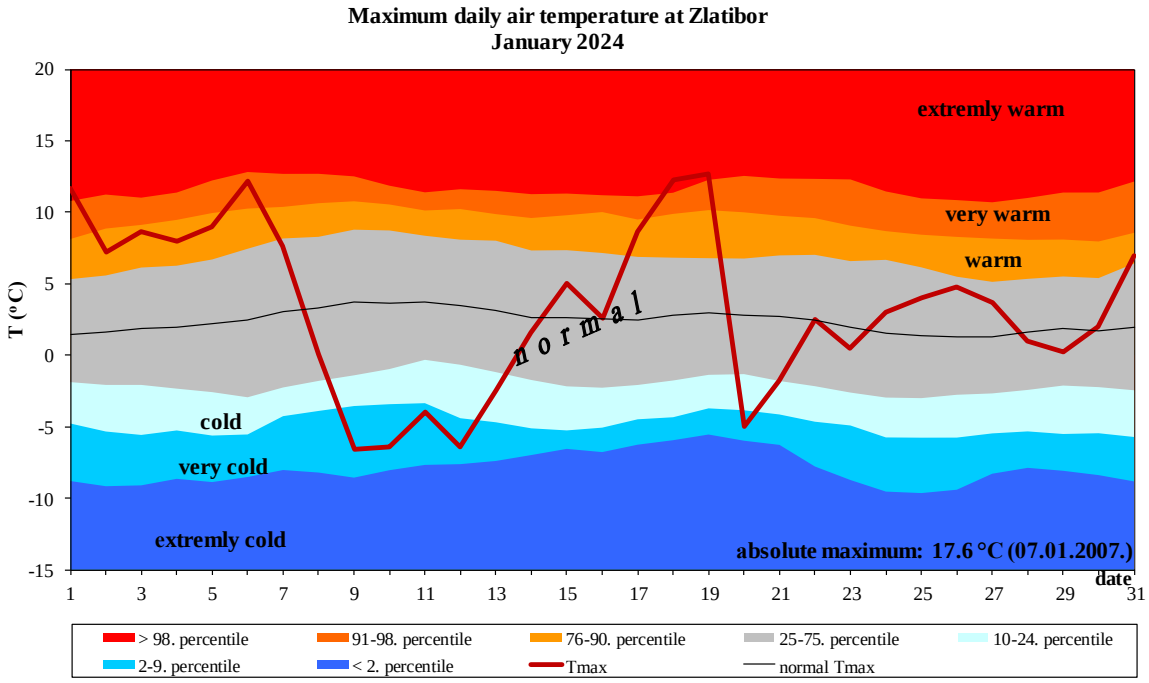
Appendix 11. Daily course of the maximum daily air temeperature and the accompanying percentile for Loznica



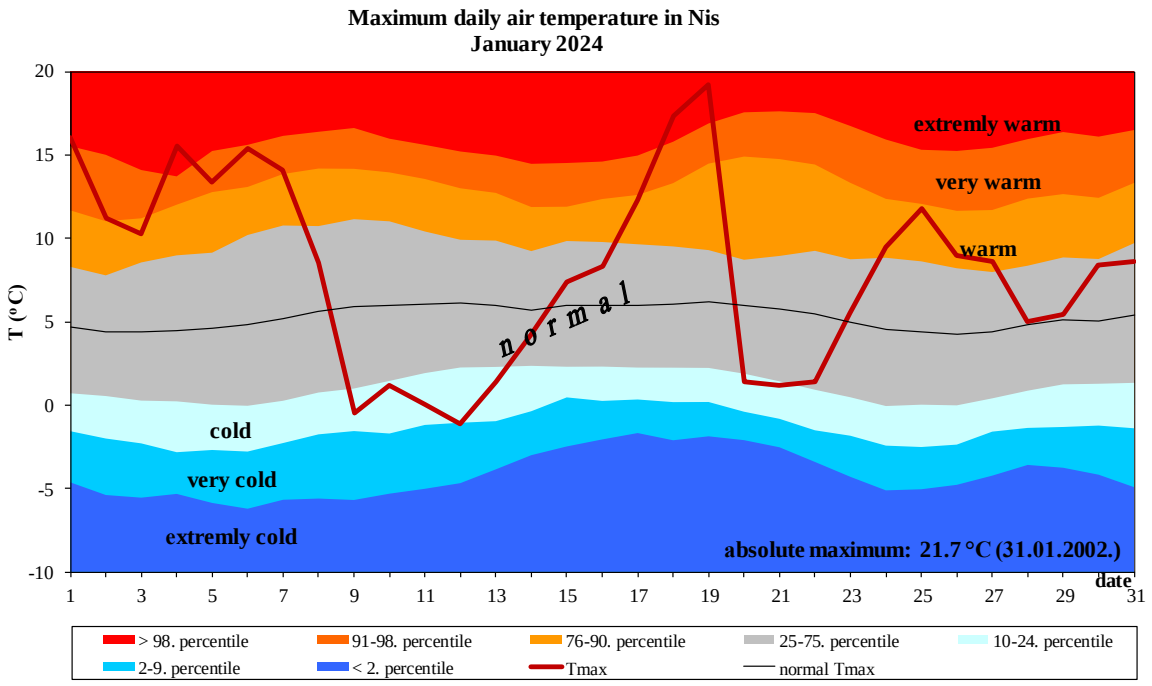
Appendix 12. Daily course of the maximum daily air temeperature and the accompanying percentile for Kragujevac



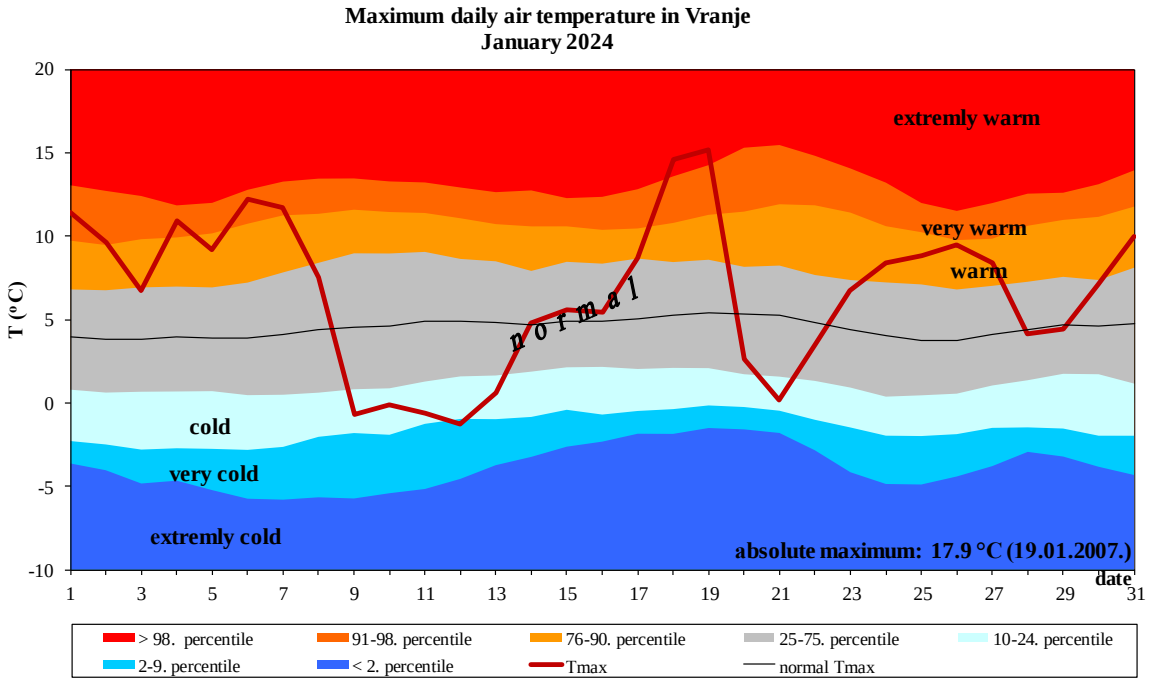
Appendix 13. Daily course of the maximum daily air temeperature and the accompanying percentile for Negotin



Appendix 14. Daily course of the maximum daily air temeperature and the accompanying percentile on Zlatibor

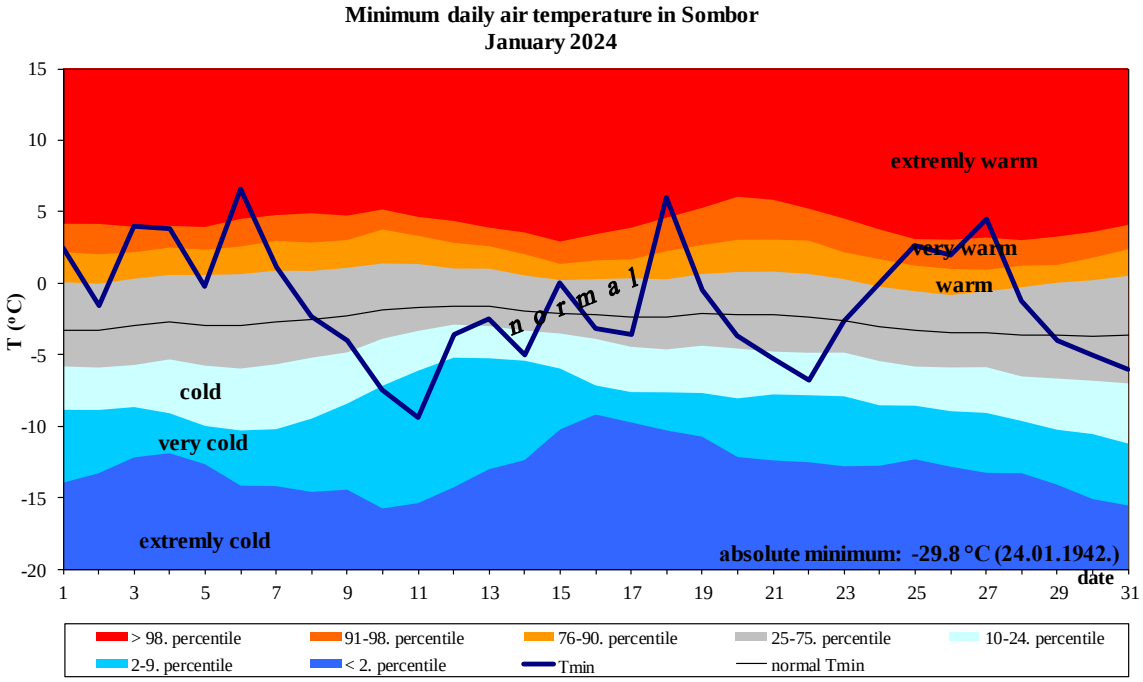


Appendix 15. Daily course of the maximum daily air temeperature and the accompanying percentile for Nis

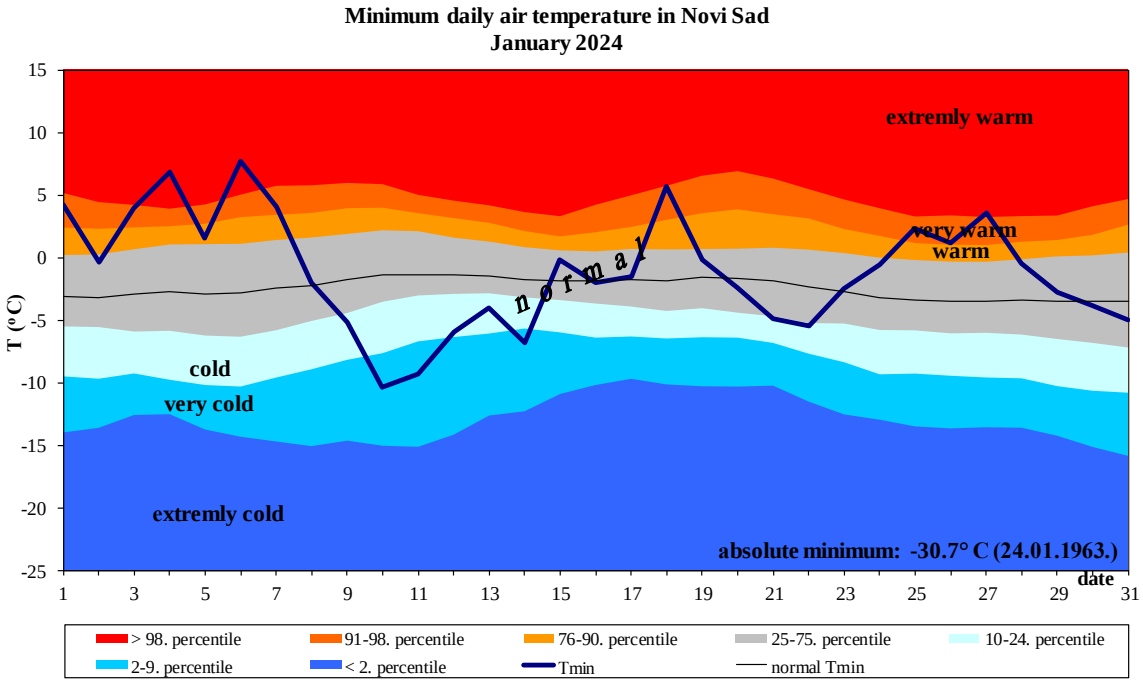


Appendix 16. Daily course of the maximum daily air temeperature and the accompanying percentile for Vranje

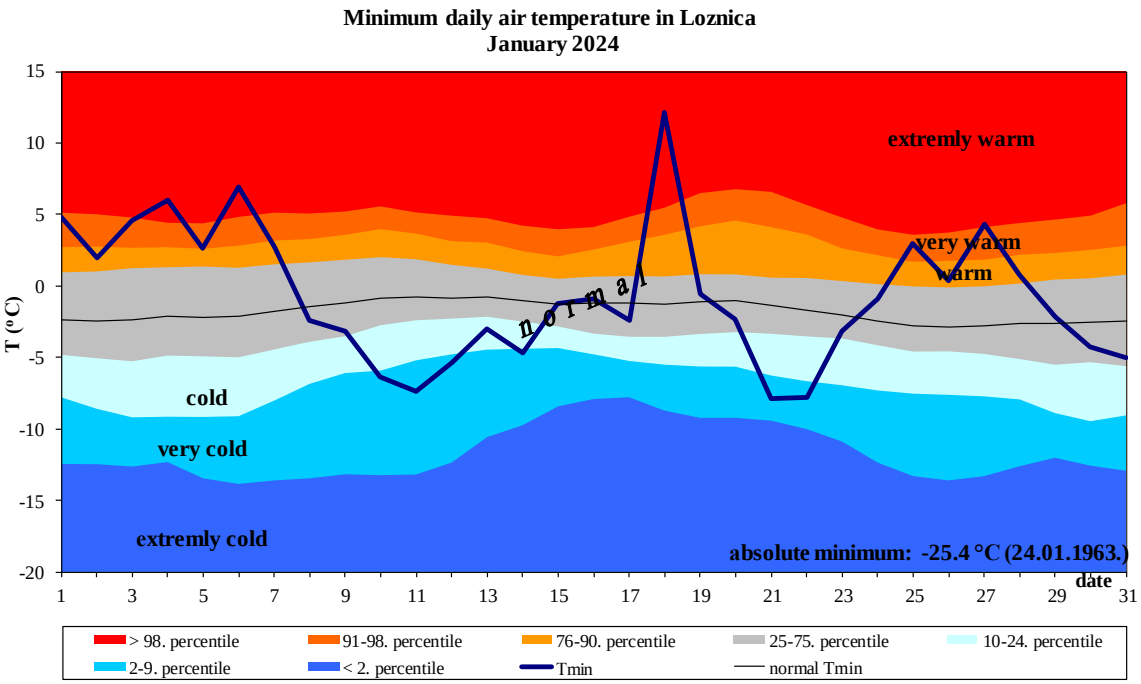
Minimum air temperature



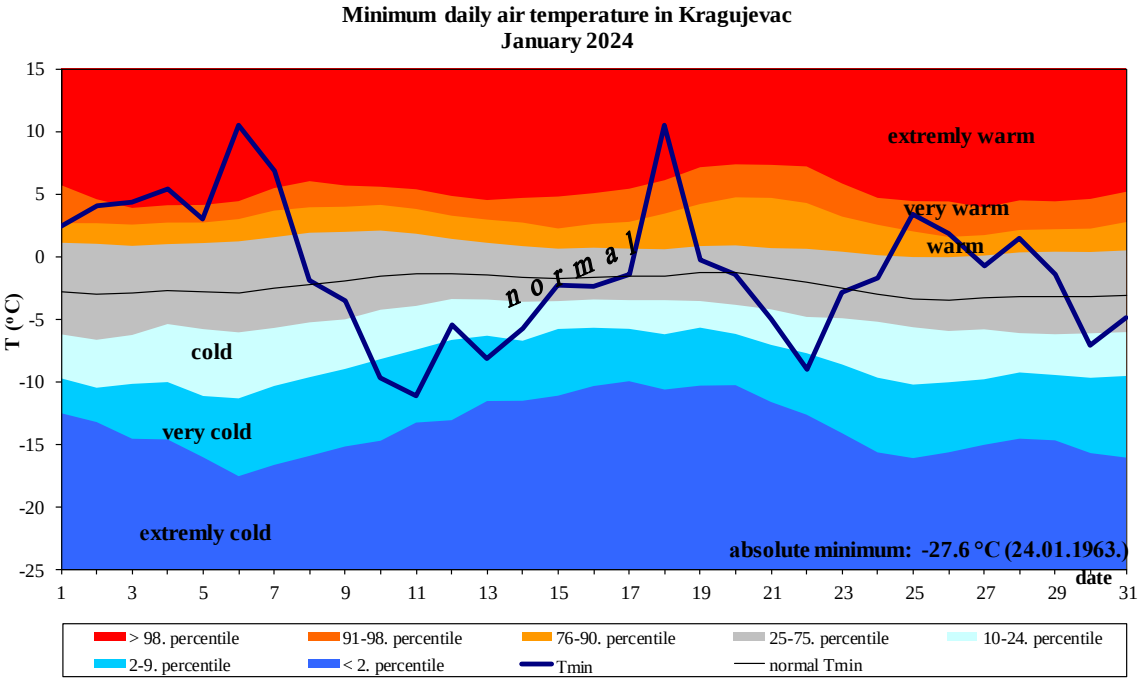
Appendix 17. Daily course of the minimum daily air temperature and the accompanying percentile for Sombor



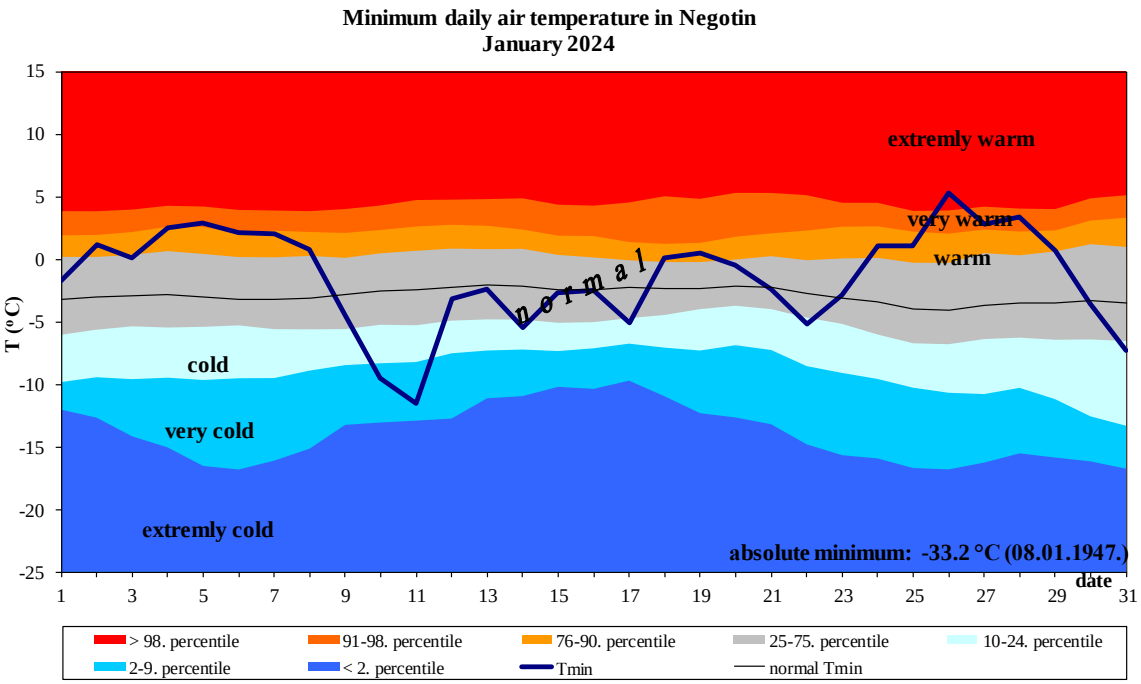
Appendix 18. Daily course of the minimum daily air temperature and the accompanying percentile for Novi Sad



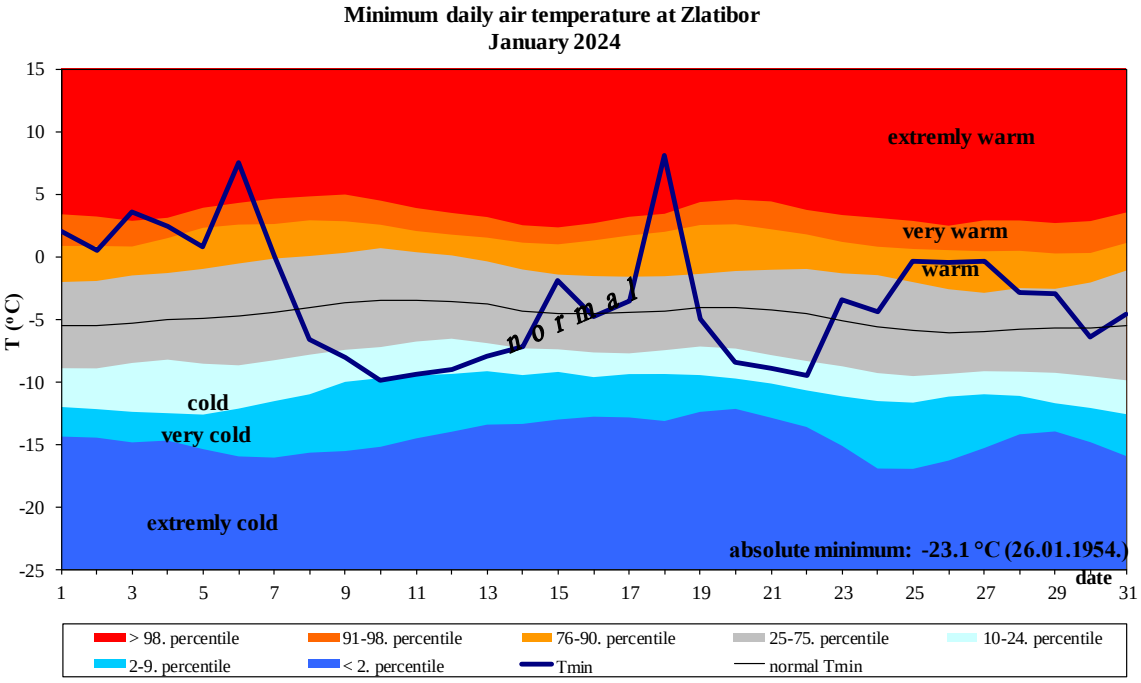
Appendix 19. Daily course of the minimum daily air temperature and the accompanying percentile for Loznica



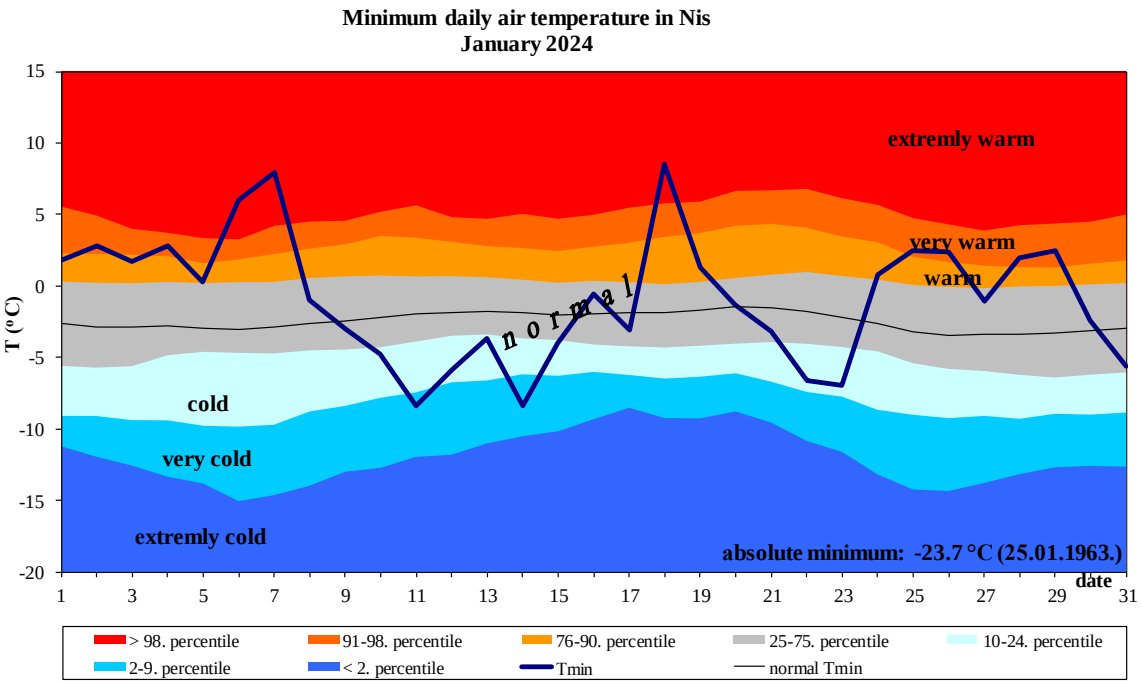
Appendix 20. Daily course of the minimum daily air temperature and the accompanying percentile for Kragujevac



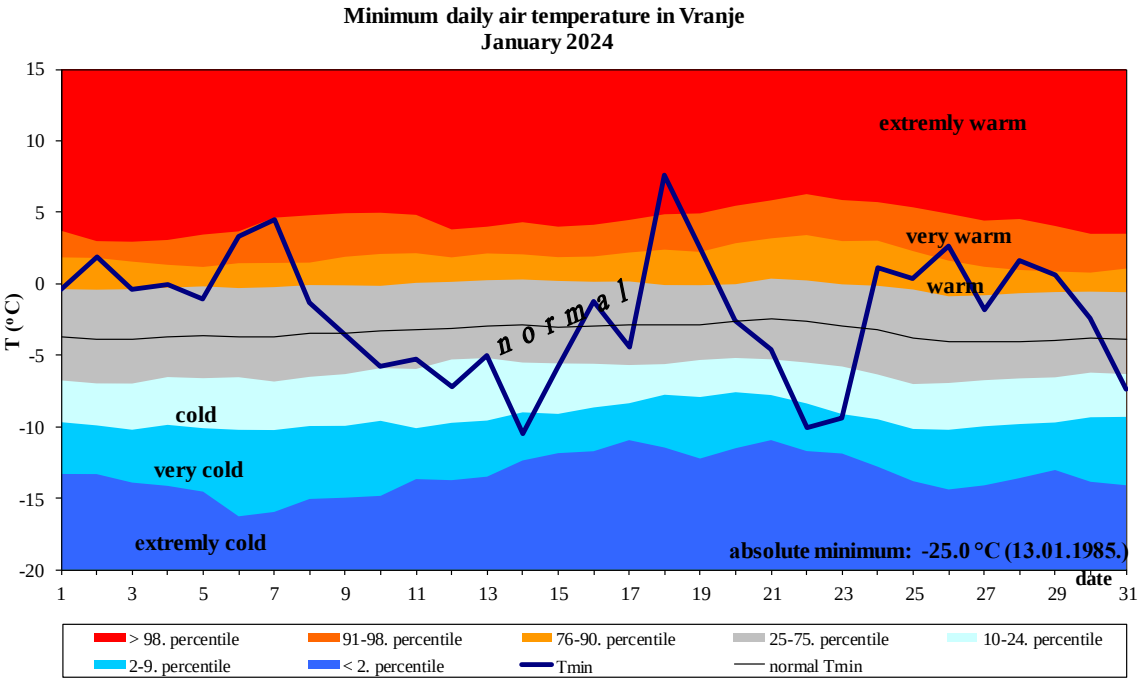
Appendix 21. Daily course of the minimum daily air temperature and the accompanying percentile for Negotin



Appendix 22. Daily course of the minimum daily air temperature and the accompanying percentile on Zlatibor

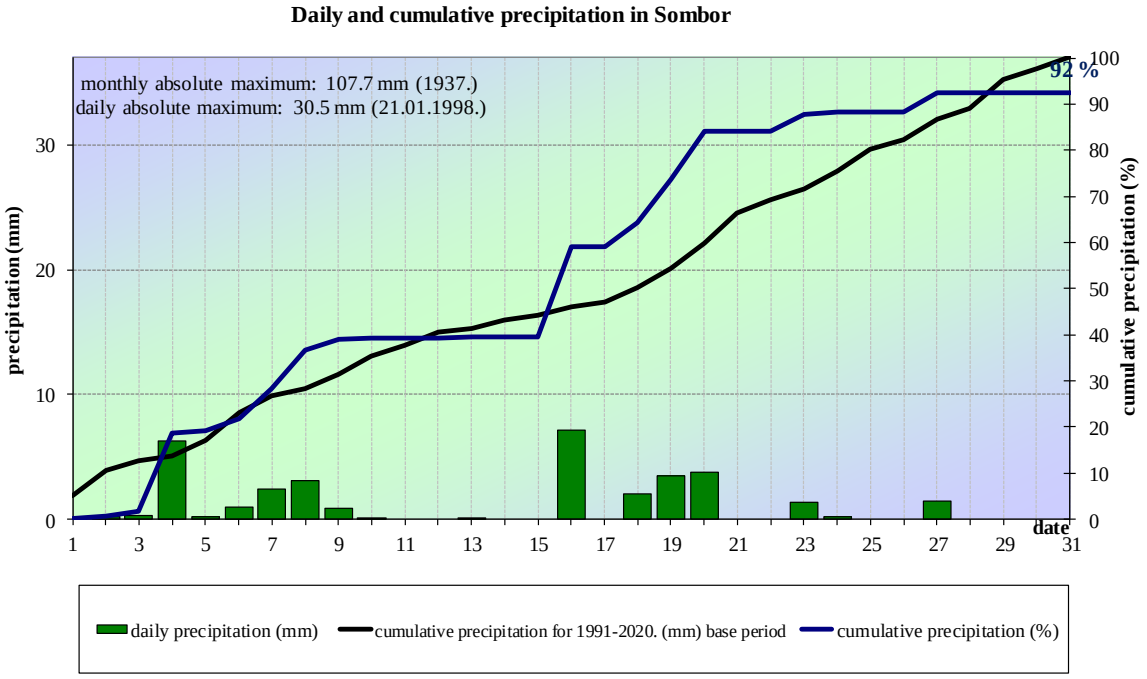


Appendix 23. Daily course of the minimum daily air temperature and the accompanying percentile for Nis

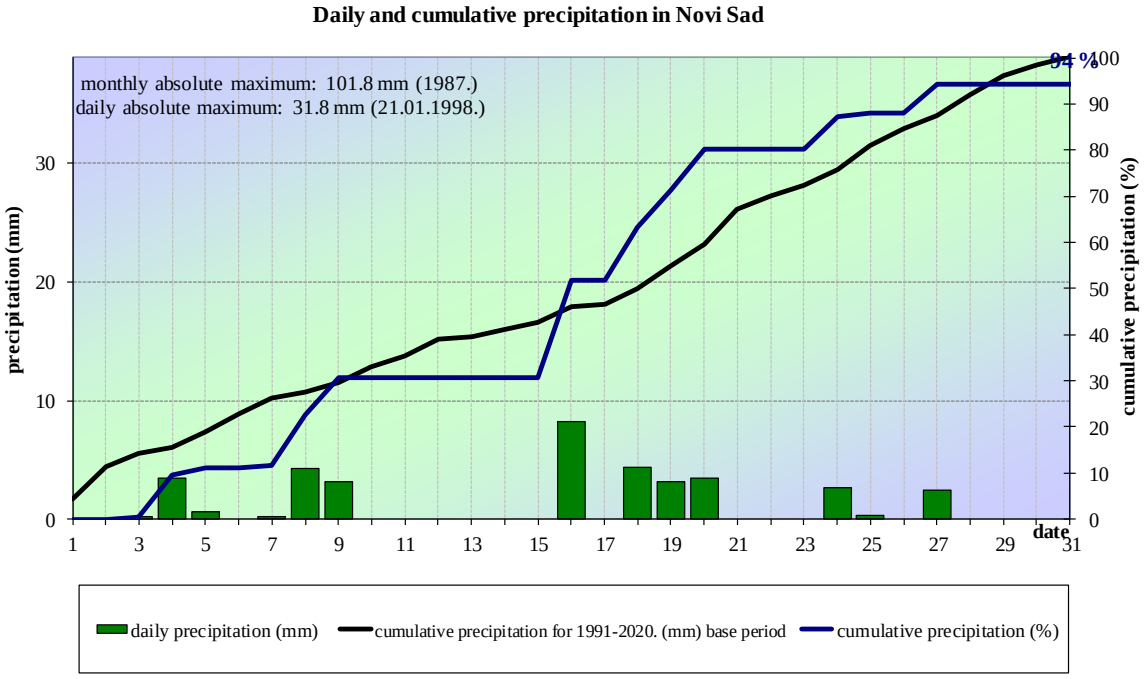


Appendix 24. Daily course of the minimum daily air temperature and the accompanying percentile for Vranje

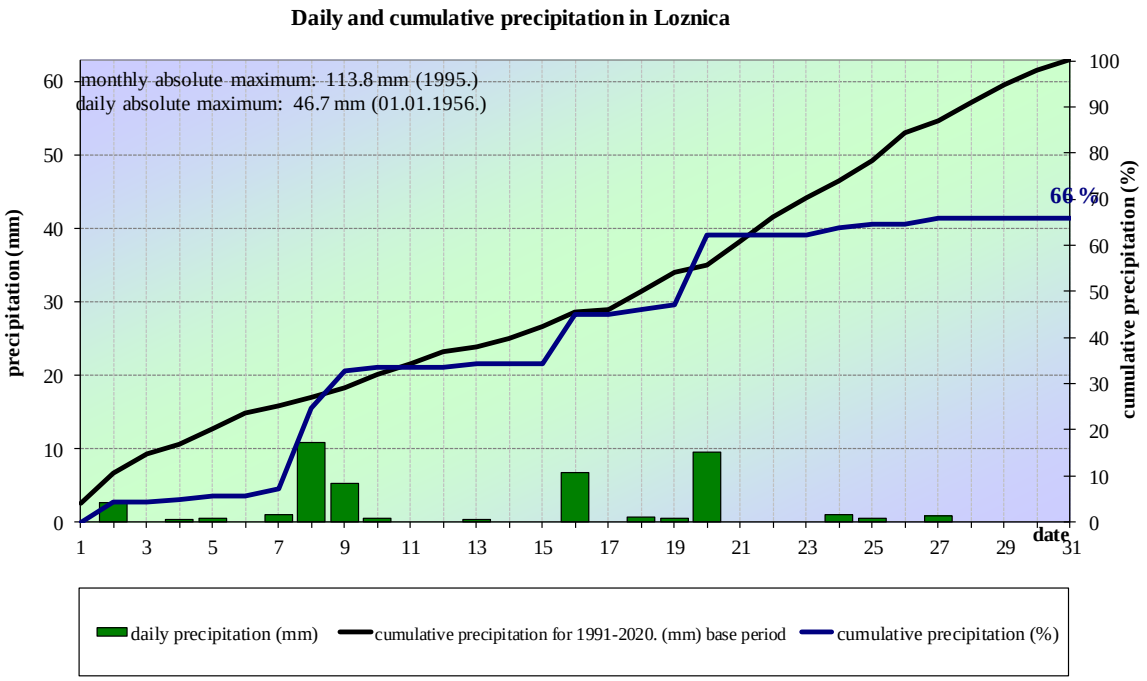
Precipitation



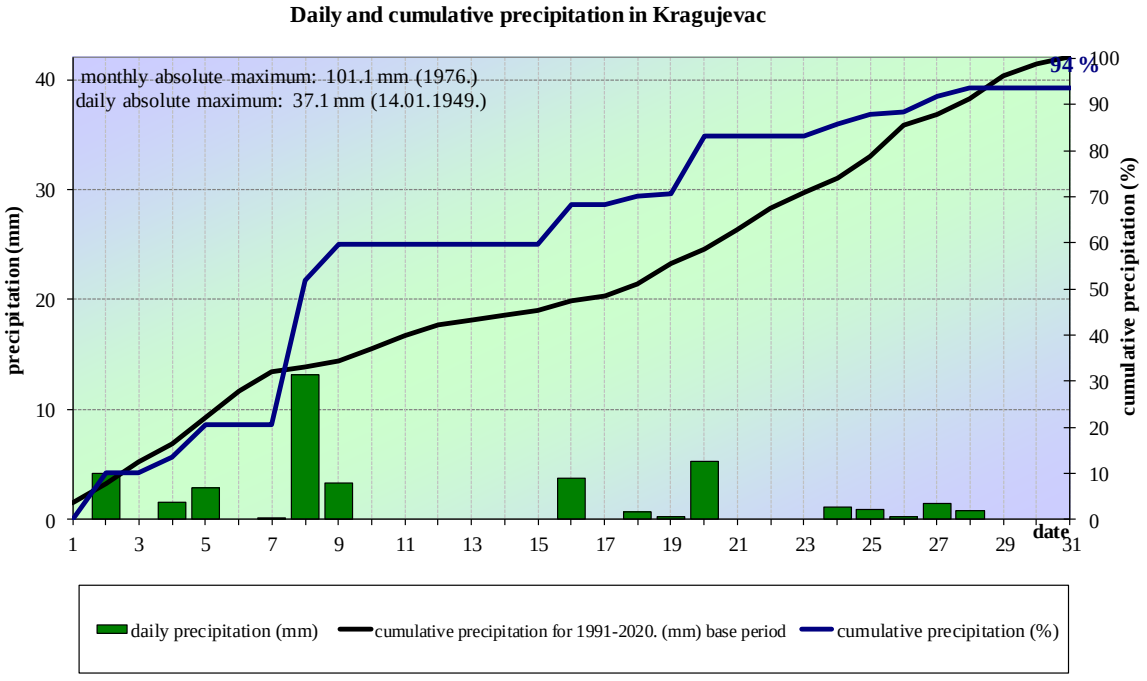
Appendix 25. Daily and cumulative precipitation sums for Sombor



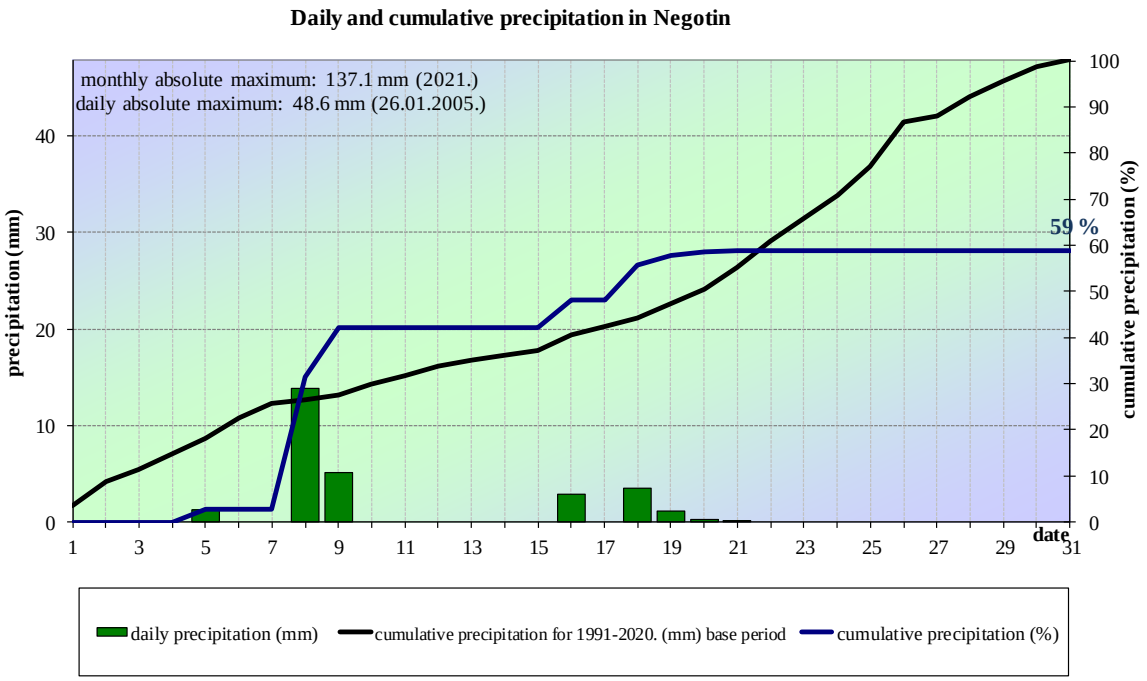
Appendix 26. Daily and cumulative precipitation sums for Novi Sad



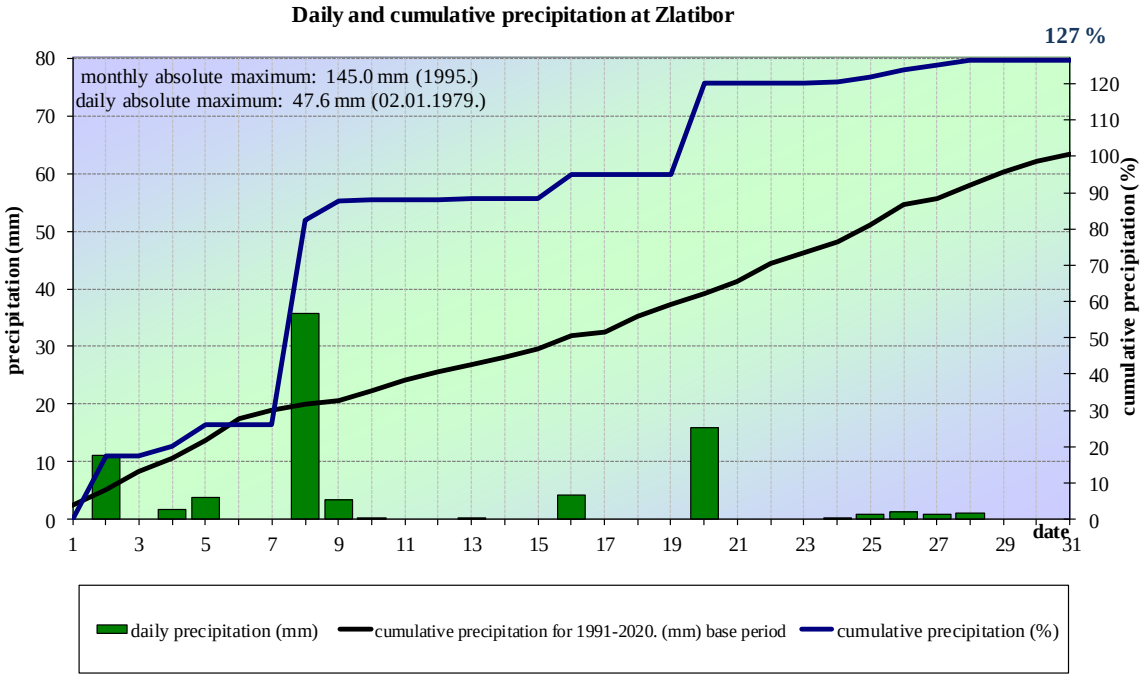
Appendix 27. Daily and cumulative precipitation sums for Loznica



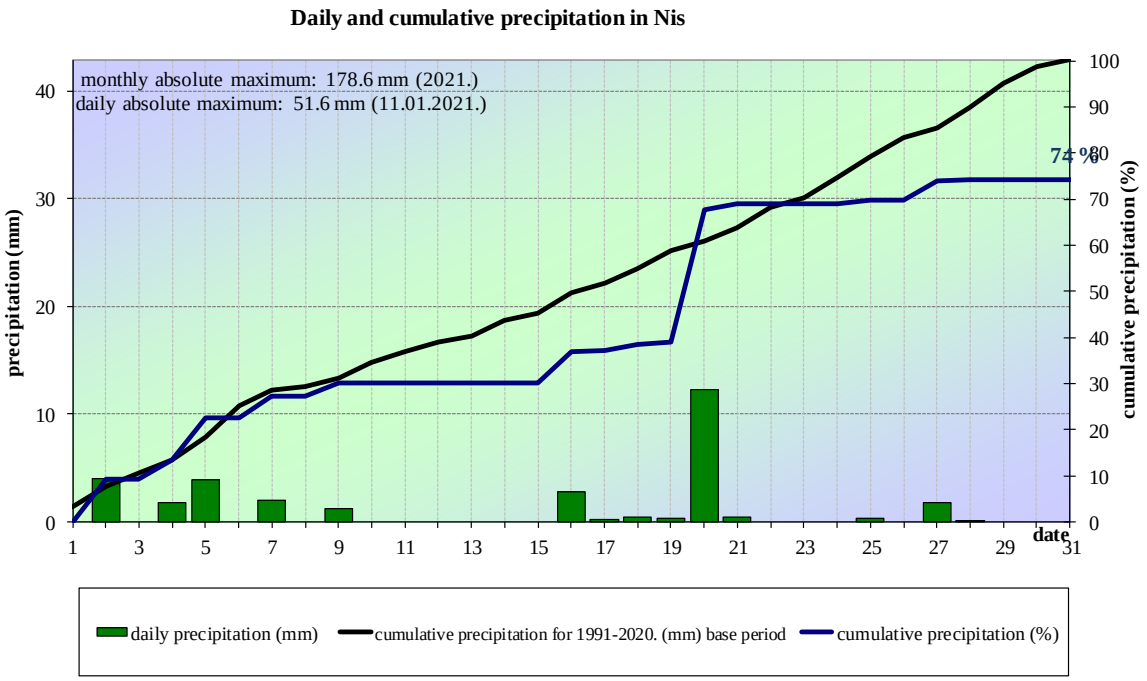
Appendix 28. Daily and cumulative precipitation sums for Kragujevac



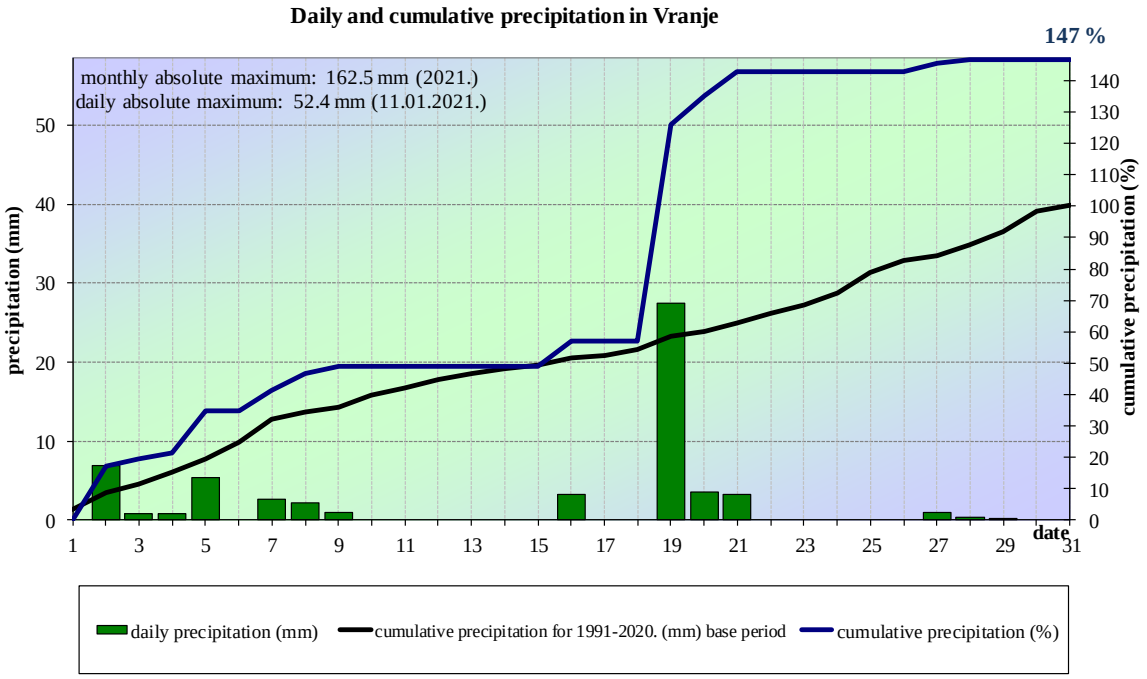
Appendix 29. Daily and cumulative precipitation sums for Negotin



Appendix 30. Daily and cumulative precipitation sums on Zlatibor



Appendix 31. Daily and cumulative precipitation sums for Nis



Appendix 32. Daily and cumulative precipitation sums for Vranje