Republic Hydrometeorological Service of Serbia
Kneza Viseslava 66
11000 Belgrade
Republic of Serbia

MONTHLY BULLETIN FOR SERBIA

NOVEMBER 2024

Belgrade, the 5th of December 2024

Division for Climate Monitoring and Climate Forecast
Department of National Center for Climate Change, Climate Model Development and Disaster Risk Assessment
web: http://www.hidmet.gov.rs
mail: office@hidmet.gov.rs

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AIR TEMPERATURE

Mean monthly air temperature

Cold November in most of the country. November 2024 was 7th coldest for Banatski Karlovac in the period from 1985 to 2024 (*Figure 1).*

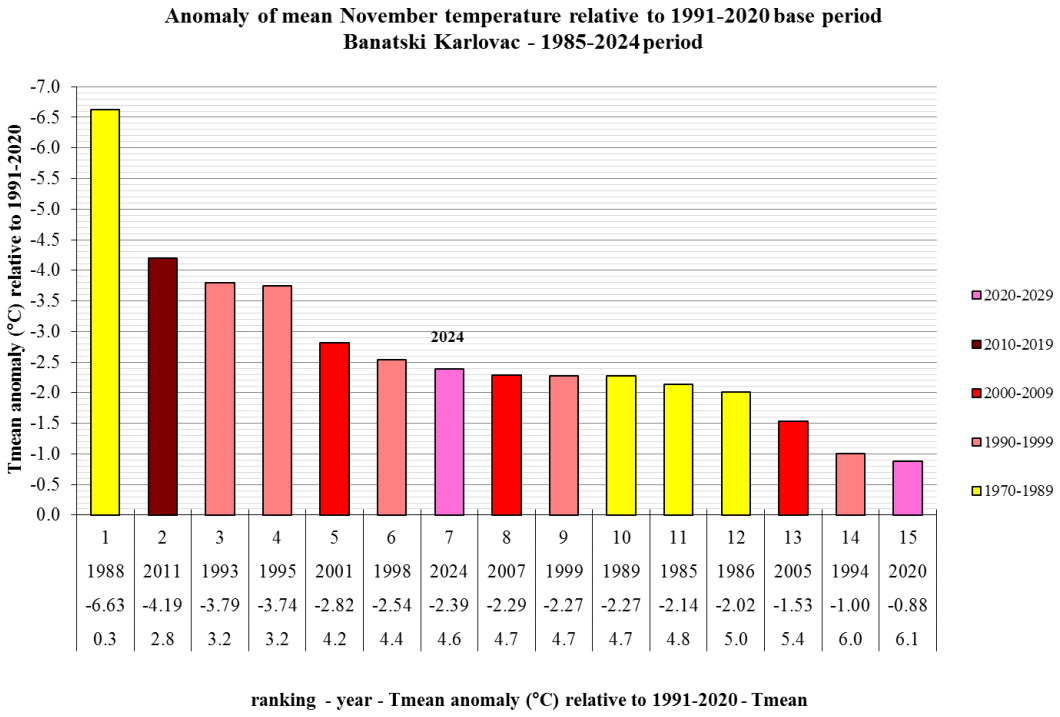


Figure 1. Rank of the coldest November in Banatski Karlovac

Mean air temperature in Serbia ranged from 3,3 ºC in Pozega to 6,6 ºC in Belgrade, and on the mountains from 0,1 ºC at Kopaonik to 2,4 ºC at Zlatibor (*Figure 2).*

Departure of the mean air temperature from the normal[1] for the 1991–2020 base period ranged from -2,5 ºC in Zrenjanin to -0,8 ºC in Negotin (*Figure 3*).

Mean air temperature, based on the percentile method[2], was in the cold category in most of the country, and normal in Loznica, Valjevo, Negotin, Zajecar, Crni Vrh and Kopaonik (*Figure 4).*

[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

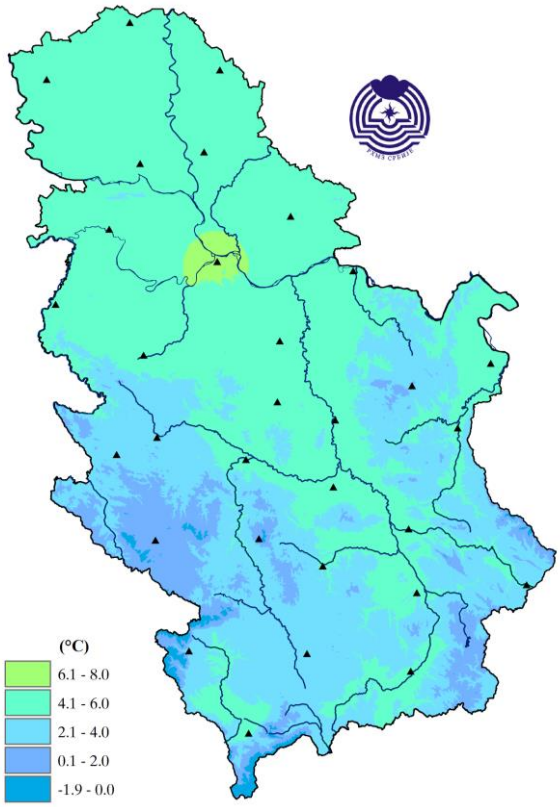


Figure 2. Spatial distribution of mean monthly air temperature (ºC)

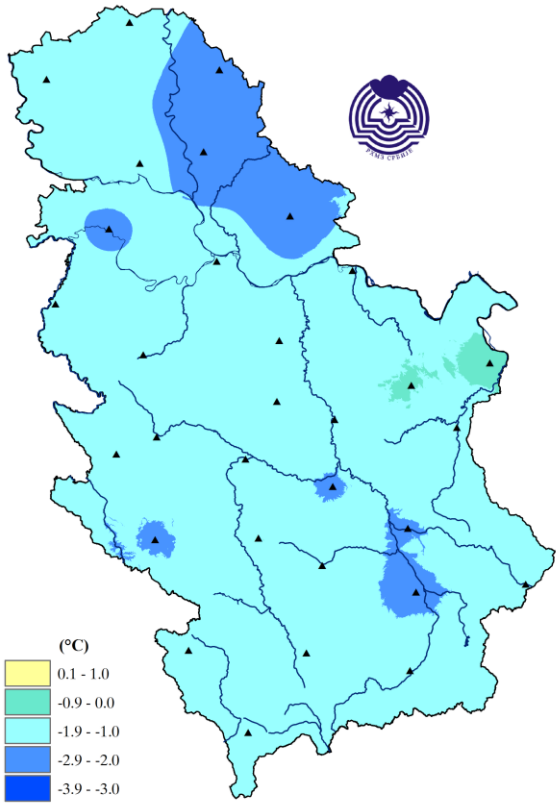


Figure 3. Spatial distribution of mean monthly air temperature anomaly (ºC)

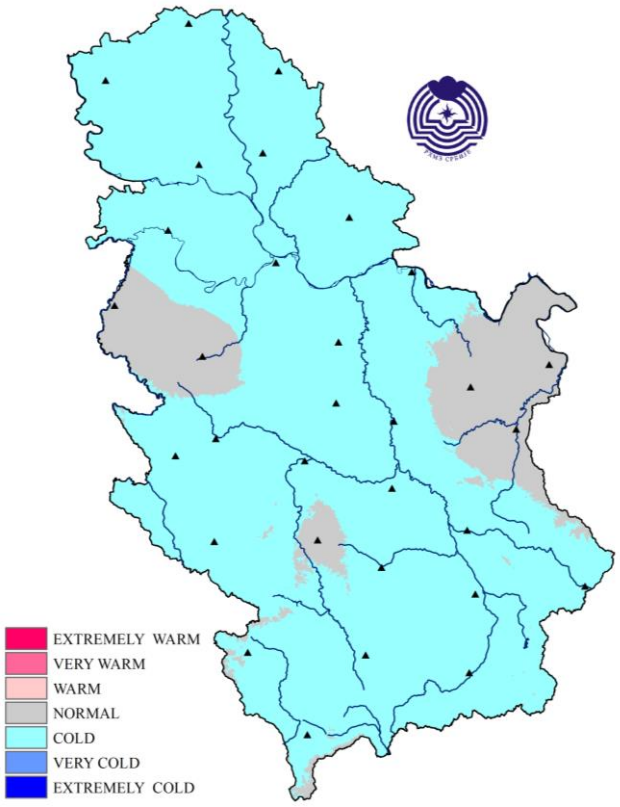


Figure 4. Spatial distribution of the mean monthly air temperature using percentile method

Mean daily air temperature in Belgrade, based on the percentile method, was in the categories of cold and very cold most of the second decade as well as in the middle of the third decade, while it was in the warm category at the end of the third decade (*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.

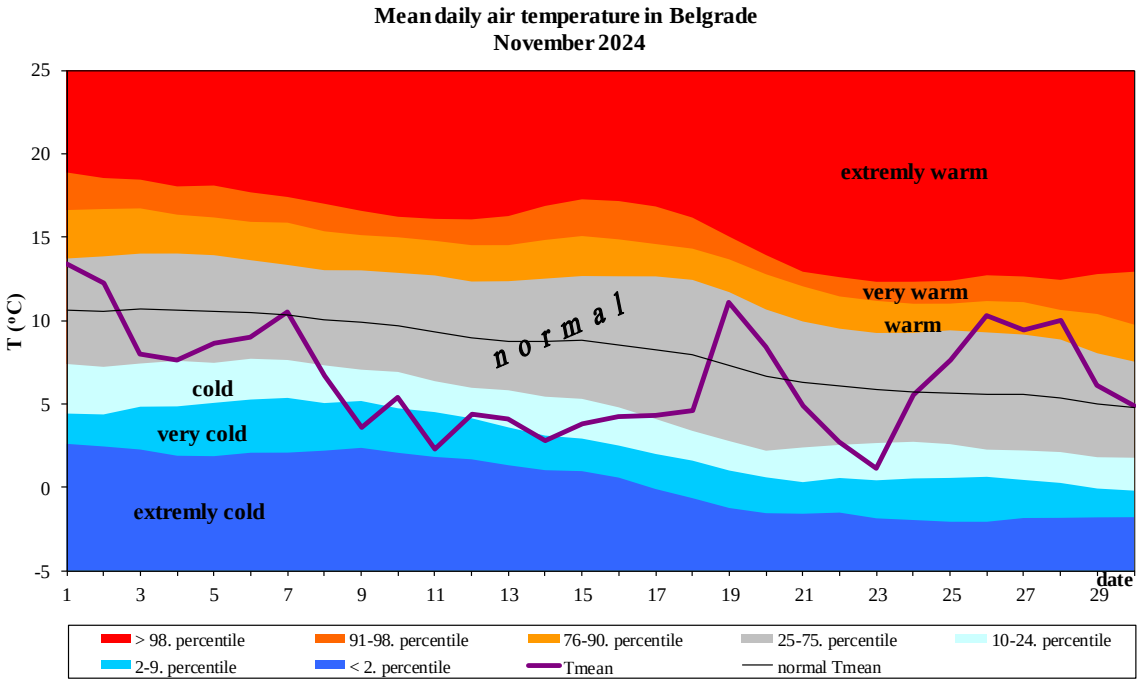


Figure 5. Daily course of the mean daily air temperature and accompanying percentiles for Belgrade

Maximum air temperature

Mean maximum air temperature in November ranged from 9,6 ºC in Kikinda and Palic to 11,9 ºC in Kragujevac and Cuprija, whereas Belgrade recorded 11,5 °C. On the mountain, mean maximum November air temperature ranged from 5,2 ºC at Kopaonik to 9,1 ºC in Sjenica.

Based on the percentile method, mean maximum monthly air temperature was in the normal category in most of the country, and cold category at Zlatibor.

The highest maximum daily air temperature of 23,0 ºC was measured in Zajecar on November 2. On November 1, Belgrade recorded air temperature of 19,7 ºC.

Ice days[3] were recorded on the mountains, ranging from 2 in Sjenica to 6 at Zlatibor.

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

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

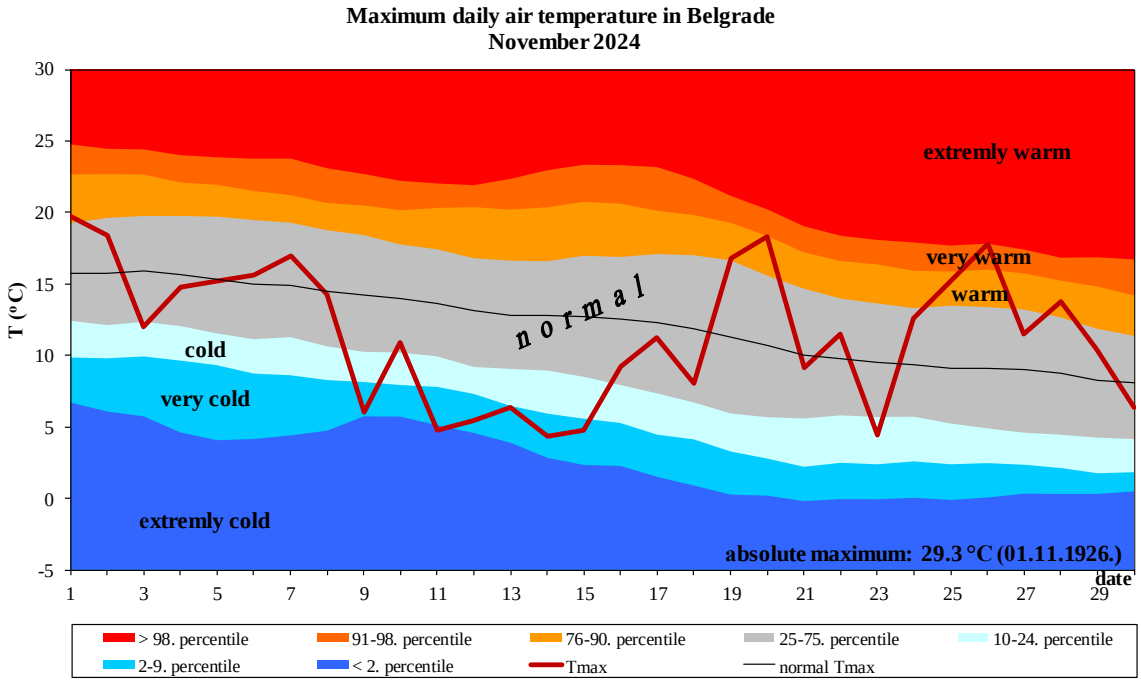


Figure 6. Daily course of the maximum daily air temperature and accompanying percentiles for Belgrade

Minimum air temperature

Mean minimum air temperature in November range from -1,0 ºC in Zajecar to 2,8 ºC in Belgrade. On the mountains, mean minimum air temperature ranged from -4,7 ºC in Sjenica to -0,7 ºC at Zlatibor.

Based on the percentile method, mean minimum monthly air temperature was in the categories of cold and very cold in most of the country, and normal category at Zlatibor and Crni Vrh.

The lowest minimum daily air temperature of -14,0 ºC was measured on November 24 in Sjenica. On the same day, in the lowland, the lowest daily air temperature of -9,5 ºC was recorded in Leskovac. On November 18 and 24, Belgrade recorded the lowest monthly air temperature of -1,0 ºC.

Number of frost days[4] ranged from 11 to 17 days, Belgrade observed 4 days while Loznica recorded 5 days. On the mountains, frost days ranged from 17 at Zlatibor to 27 in Sjenica. The recorded number of frost days was 3 to 7 days above the November average in most of the country.

Sjenica observed 3 days with severe frost[5], Kopaonik observed 2 days with severe frost.

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

Cold wave[6] was recorded at the majority of MMS in the period from 4 to 11 November and then from 22 to 26 November in Leskovac (*Table 1).*

Table 1. Cold waves in Serbia

COLD WAVES IN SERBIA - NOVEMBER 2024

(relative to the 1991-2020 base period)

NOVEMBER

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
PALIC																														
SOMBOR																														
KIKINDA				VC	VC	VC	VC	EC	EC																					
ZRENJANIN				VC	EC	VC	VC	EC	VC	VC	EC																			
NOVI SAD																														
SR.MITROVICA																														
BELGRADE																														
LOZNICA																														
VALJEVO																														
V.GRADISTE																														
SM.PALANKA				VC	VC	VC	EC	EC	VC																					
KRAGUJEVAC					VC	EC	EC	EC	EC																					
KRALJEVO						VC	EC	EC	EC	VC																				
POZEGA						VC	VC	VC	VC	VC																				
ZLATIBOR																														
CUPRIJA				VC	VC	VC	EC	EC	EC																					
KRUSEVAC						VC	VC	EC	EC	EC																				
NEGOTIN																														
ZAJECAR				VC	VC	EC	EC	EC	EC																					
CRNI VRH																														
KOPAONIK																														
SJENICA						VC	VC	VC	VC	EC																				
NIS						VC	VC	VC	EC	VC																				
VRANJE																														
DIMITROVGRAD																														
LESKOVAC						VC	VC	VC	EC	EC												VC	VC	EC	VC	VC				
KURSUMLIJA																														
B.KARLOVAC					VC	VC	VC	EC	VC	EC	VC																			

EC	EXTREMELY COLD
VC	VERY COLD

[6] 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 7 shows assessment of the minimum and maximum air temperature in Serbia for November based on the tercile distribution relative to the 1991-2020 base period. It can be noted that the mean minimum air temperature was below the lower tercile threshold and the mean maximum air temperature was at the lower tercile threshold.

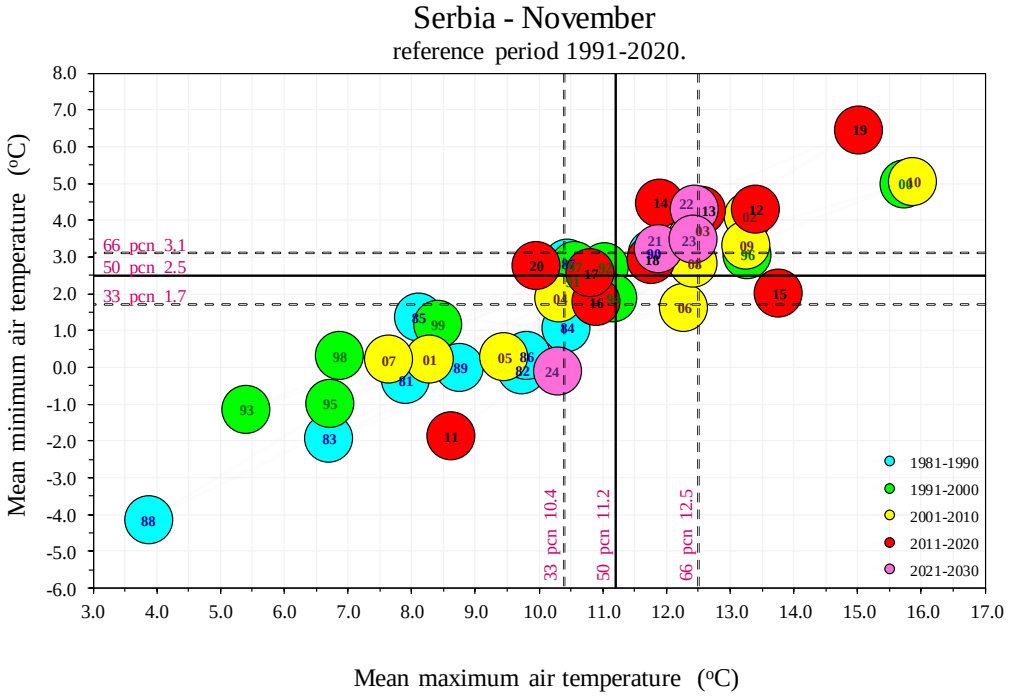


Figure 7. Assessment of minimum and maximum air temperature for Serbia with the accompanying terciles in relation to the 1991-2020 base period

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

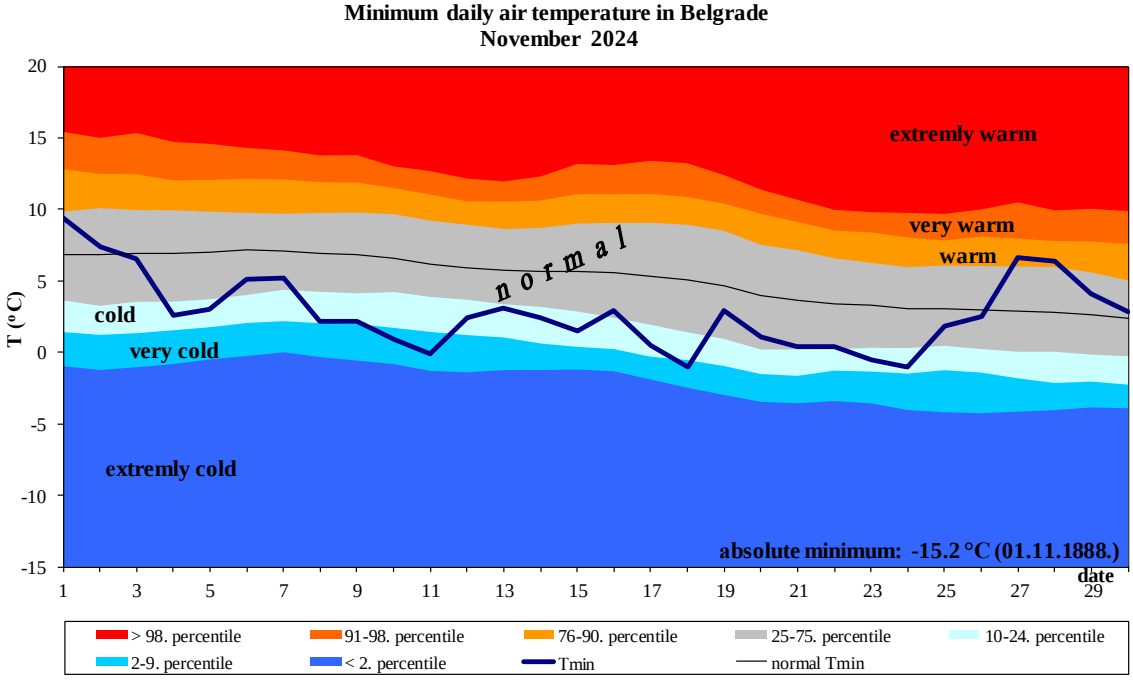


Figure 8. Daily course of the minimum daily air temperature and accompanying percentiles for Belgrade

PRECIPITATION

Averagely rainy November in most of Serbia. Precipitation sums ranged from 29,5 mm at Crni Vrh to 111,1 mm at Kopaonik, while Belgrade recorded 51,8 mm of precipitation (*Figure 9*).

Precipitation totals compared to the normal for the 1991-2020 base period ranged from 48% at Crni Vrh to 194% in Leskovac (*Figure 10).*

Based on the percentile method, precipitation sums were in the normal category in most of the country, rainy in Kraljevo, Kursumlija, Krusevac, Nis, Zajecar and Kopaonik, very rainy in Leskovac and dry at Crni Vrh *(Figure 11).*

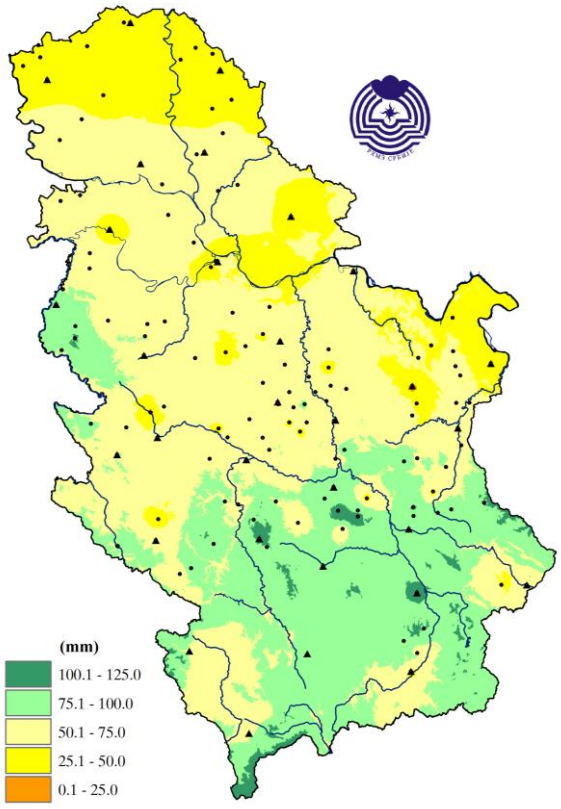


Figure 9. Spatial distribution of the monthly precipitation sums (mm) according to data from 28 major meteorological, 26 climatological and 84 rain gauge stations

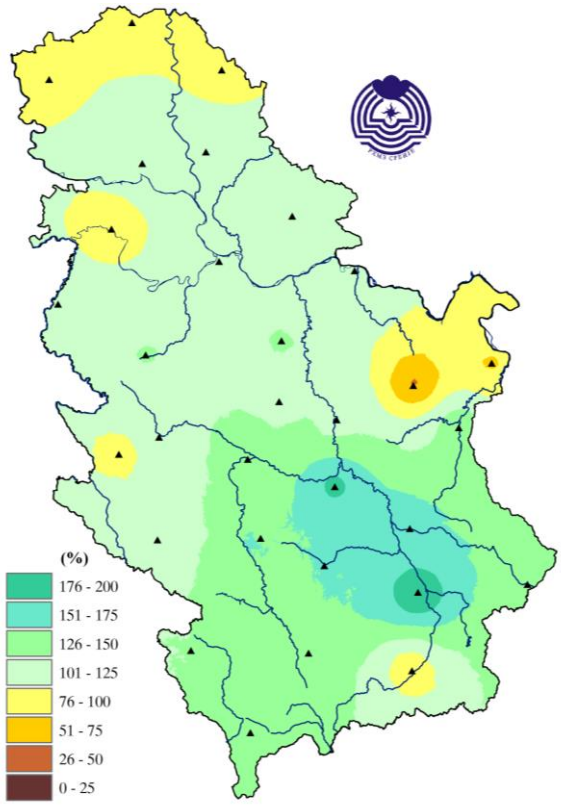


Figure 10. Spatial distribution of the monthly precipitation sums in the percentages of normal for the 1991–2020 base period

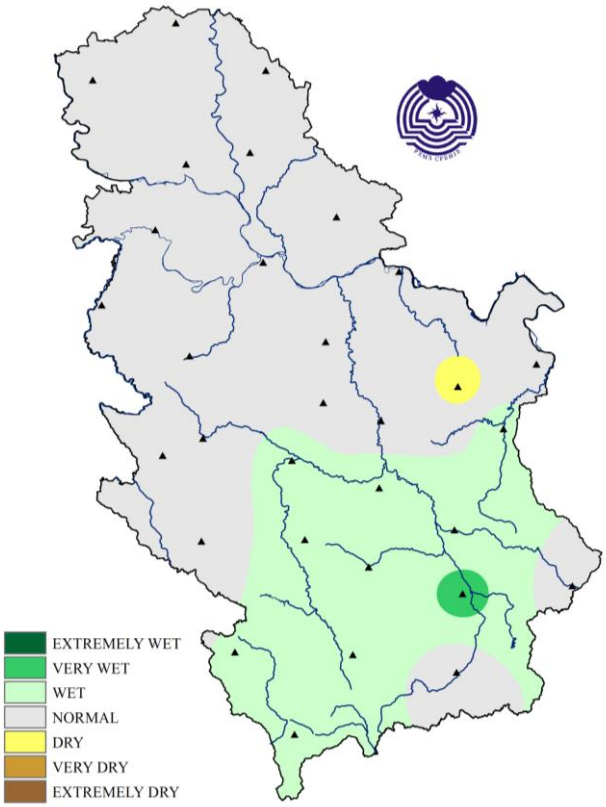


Figure 11. Monthly precipitation sums according to the percentile method

The highest daily precipitation sum of 55,3 mm was recorded at Kopaonik on November 21. On November 23, Belgrade recorded the highest daily precipitation sum of 20,5 mm.

Number of days with precipitation in November ranged from 7 on Palic, Kikinda, Banatski Karlovac, Loznica, Belgrade, Smederevska Palanka, Veliko Gradiste and Vranje to 13 at Crni Vrh (*Figure 12).* The recorded number of days with precipitation was 1 to 4 days below the November average in most of Serbia (*Figure 13*).

Snow cover was recorded in most of Serbia apart from Palic, Kikinda and Negotin. On November 21, the highest snow depth of 21 cm was measured at Kopaonik and Sjenica. In the lowland, the highest snow depth of 7cm was measured in Dimitrovgrad on the same day.

The highest number of days with snow cover was recorded at Kopaonik, total of 17 days, whereas in the lowland, the highest number of days, total of 7 was recorded in Leskovac. The recorded number of days with snow cover was around the November average at most places.

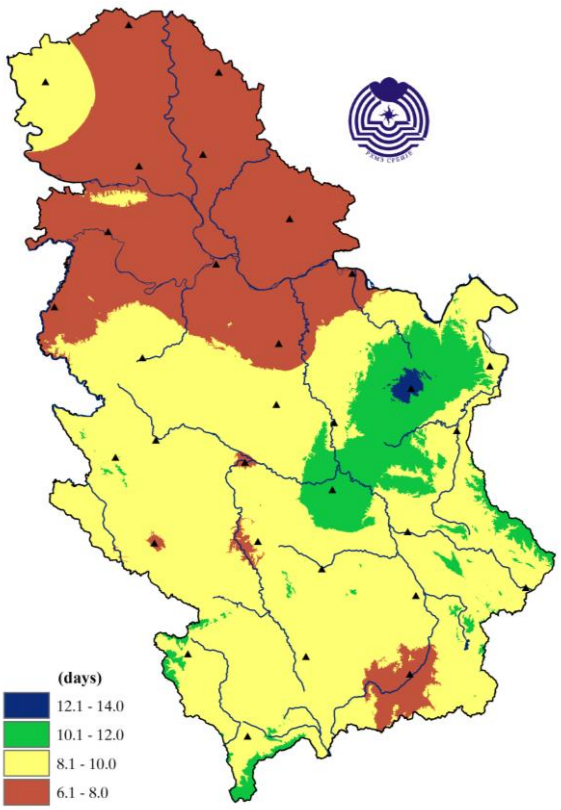


Figure 12. Spatial distribution of number of days with precipitation

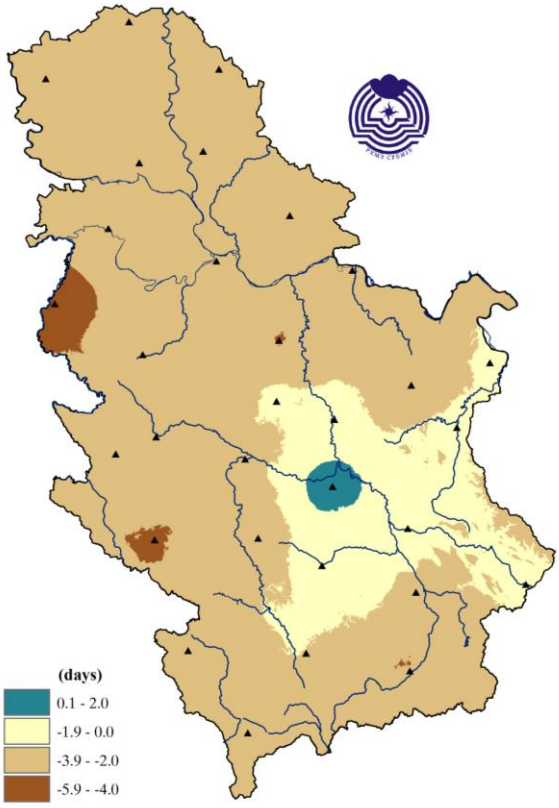


Figure 13. Spatial distribution of deviation of number of days with precipitation

Figure 14 shows assessment of air temperature and precipitation sums for Serbia for November based on the tercile distribution relative to the 1991 – 2020 base period. It can be noted that November 2024 was marked by air temperature below the lower tercile threshold and precipitation sums at the upper tercile threshold.

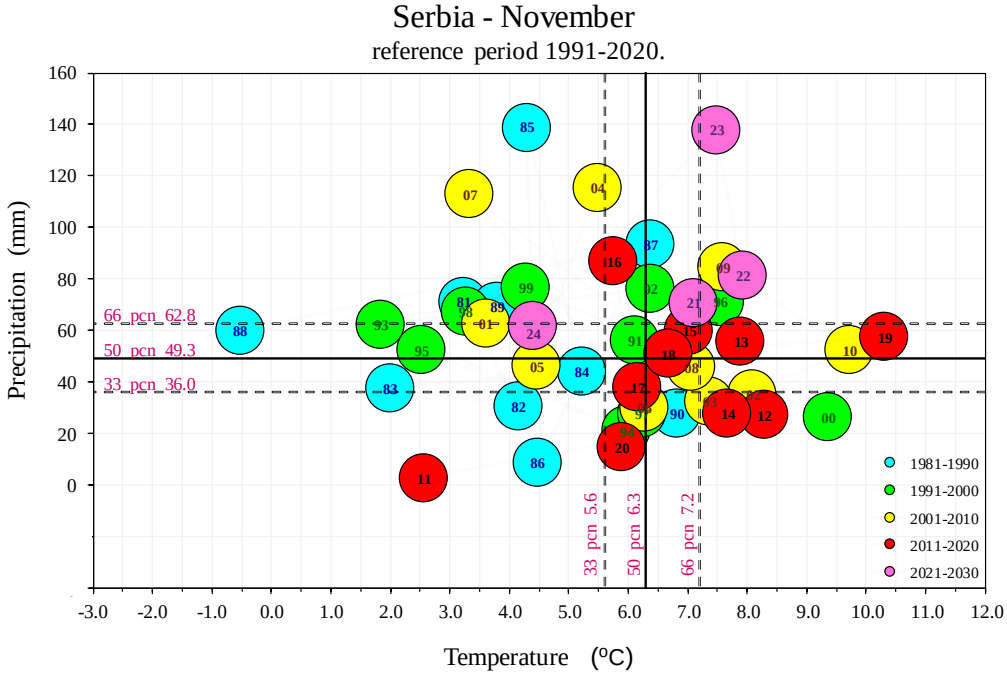


Figure 14. Assessment of air temperature and precipitation for Serbia with the accompanying terciles in relation to the 1991-2020 base period

Figure 15 show daily and cumulative precipitations sums with averaged normal 1991-2020 for November in Belgrade, and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje precipitation sums are given in Appendix.

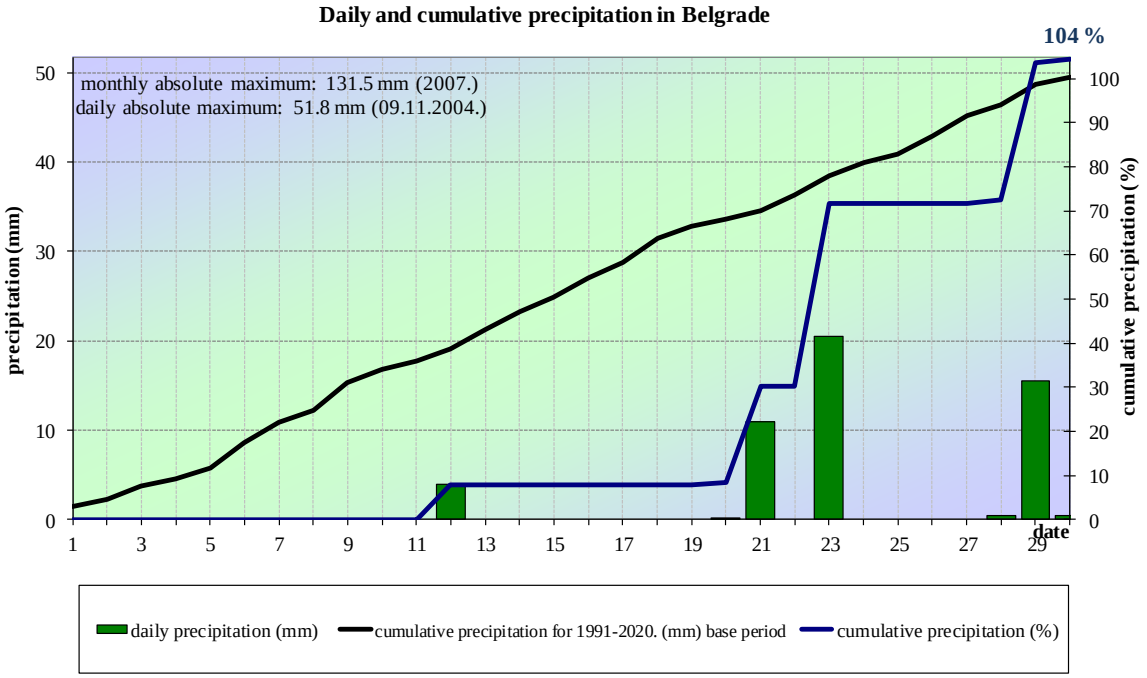


Figure 15. Daily and cumulative precipitation in Belgrade

CLOUD COVER, BRIGHT AND CLOUDY DAYS

Mean November cloud cover in Serbia was around the average, ranging from 5/10 to 7/10. Figures 16, 17 and 18 show average daily cloud cover in November for Belgrade, Pozega and Negotin.

Bright days [7] we're not recorded in Pozega while Leskovac recorded the highest number, total of 12. Belgrade recorded 7 bright days. The observed number of bright days was 4 days above the November average at most places.

Number of cloudy days[8] ranged from 7 at Kopaonik to 13 in Valjevo and Veliko Gradiste, while Belgrade obseved 10. Number of cloudy days was 2 days below November average in most of the country and 4 to 6 days below the November average in the east and Kopaonik.

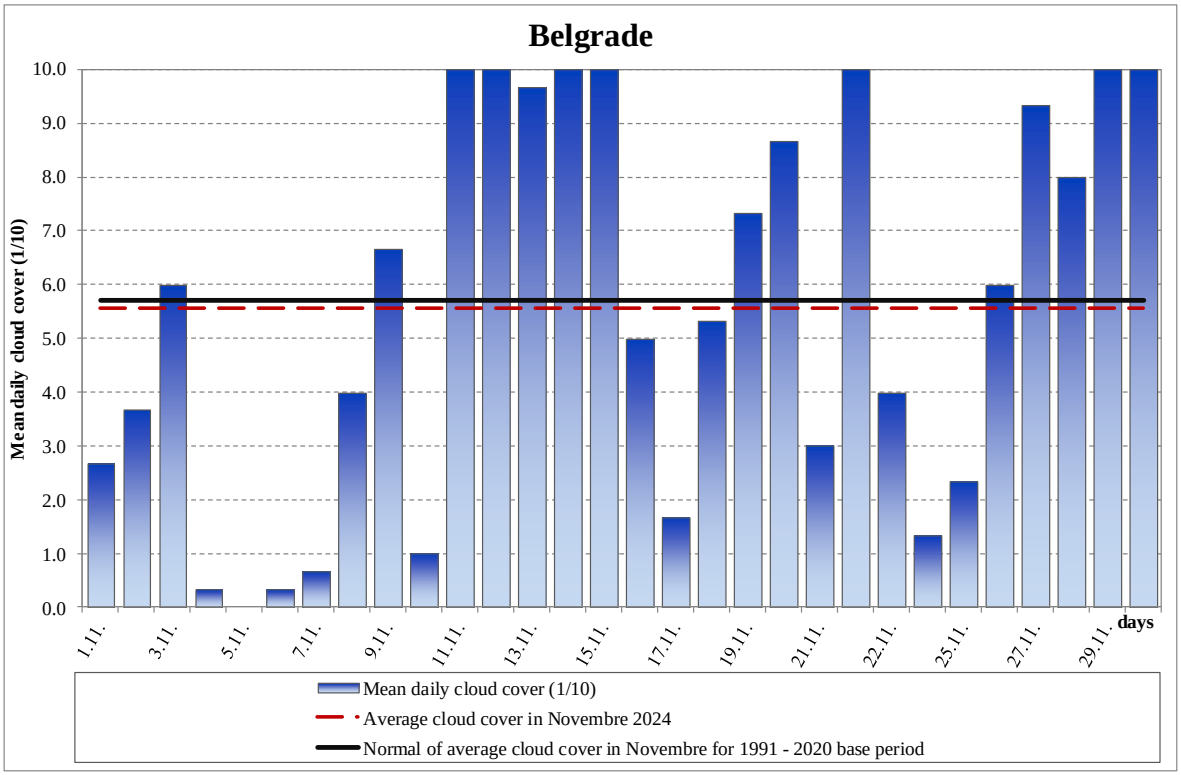


Figure 16. Mean daily cloud cover in Belgrade

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

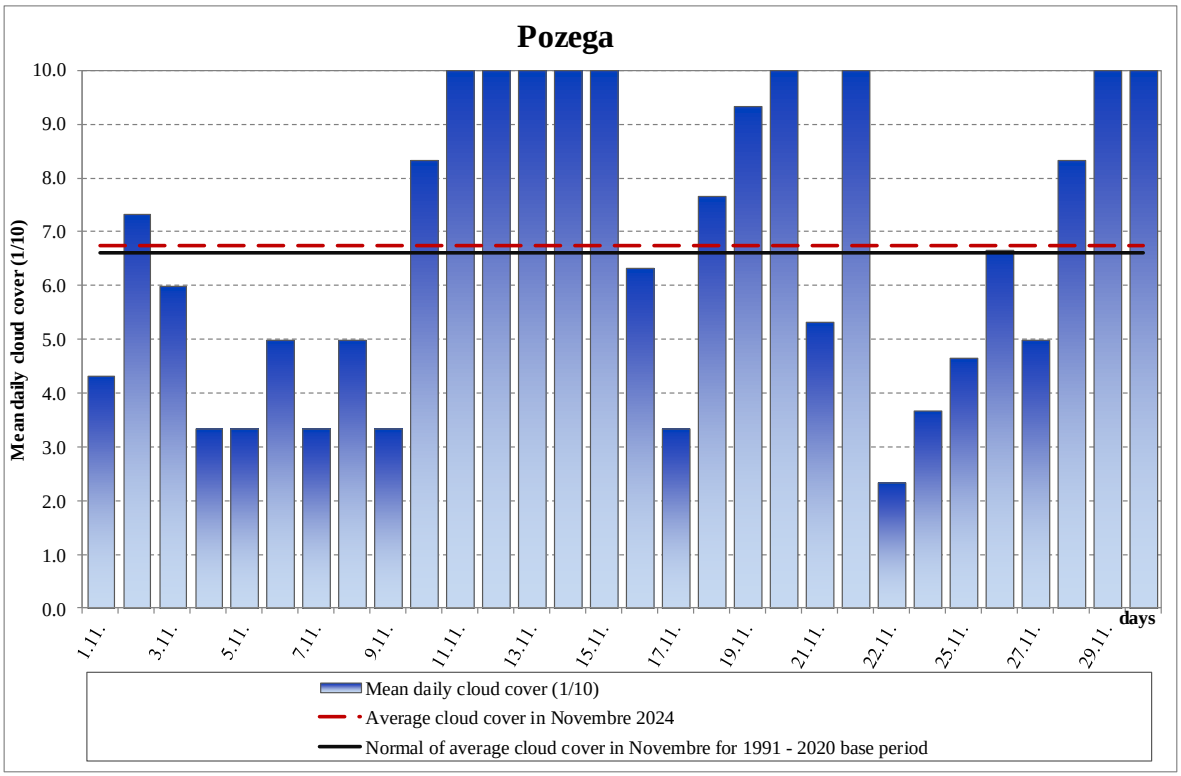


Figure 17. Mean daily cloud cover in Pozega

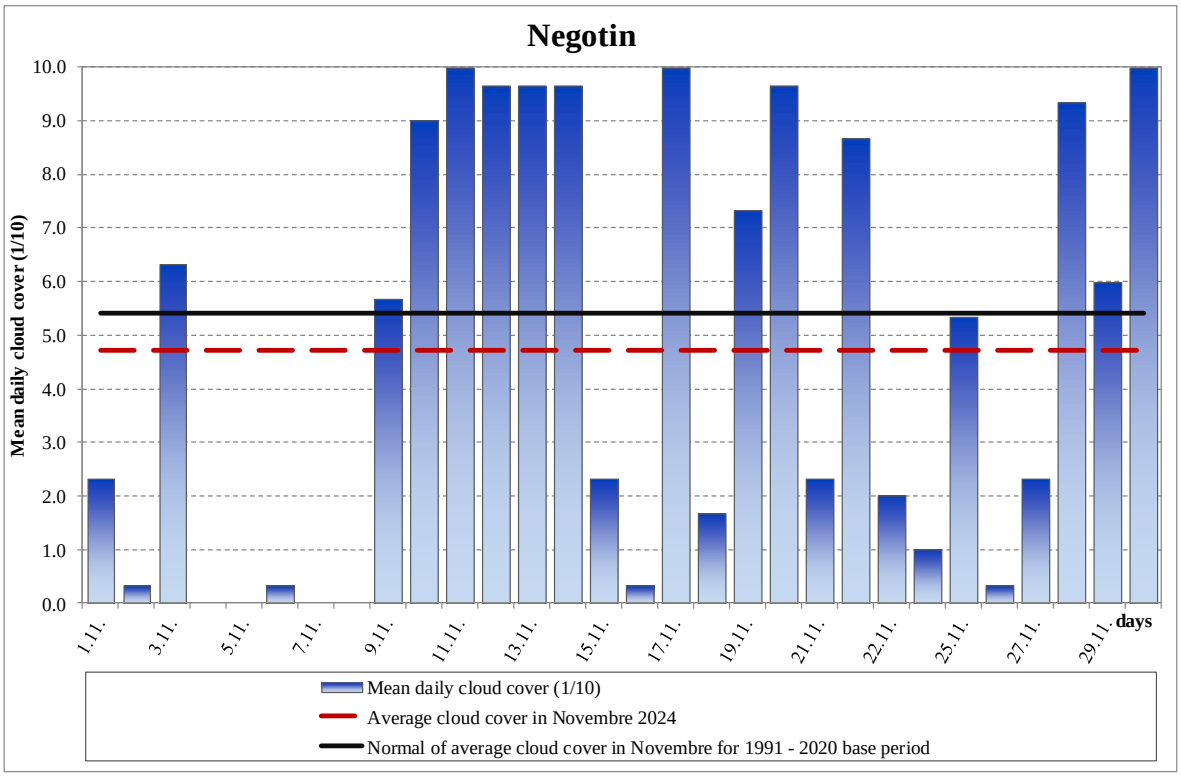


Figure 18. Mean daily cloud cover in Negotin

SUNSHINE DURATION (INSOLATION)

Sunshine duration in November ranged from 65,3 hours in Pozega to 156,1 hours at Kopaonik (*Figure 19*).

November insolation ranged 95% at Zlatibor to 187% in Negotin compared to the normal for the 1991-2020 base period (*Figure 20).*

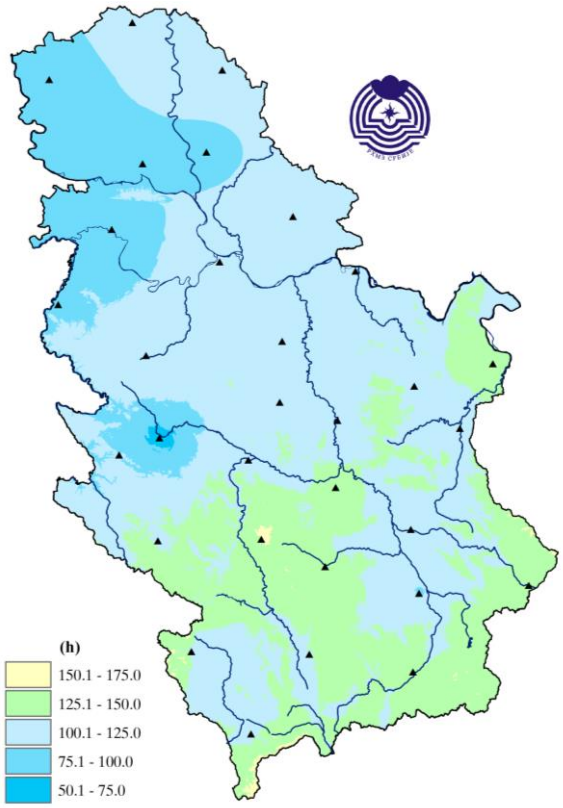


Figure 19. Insolation, expressed in hours

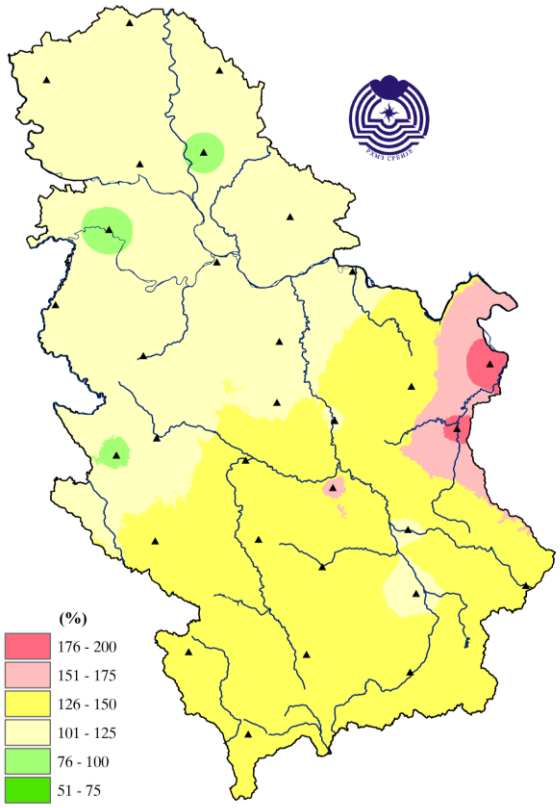


Figure 20. Insolation expressed in the percentages of normal

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

OVERVIEW OF THE SYNOPTIC SITUATION*

Periods of stable and dry weather due to the influence of a high-pressure system; from the middle of the month, several influences of low pressure and waves of cold and moist air, colder weather with rainfall, locally with snow, even in lower areas

During the first decade of November, the weather was stable and dry due to the influence of vast anticyclone prevailing over most of the continent.

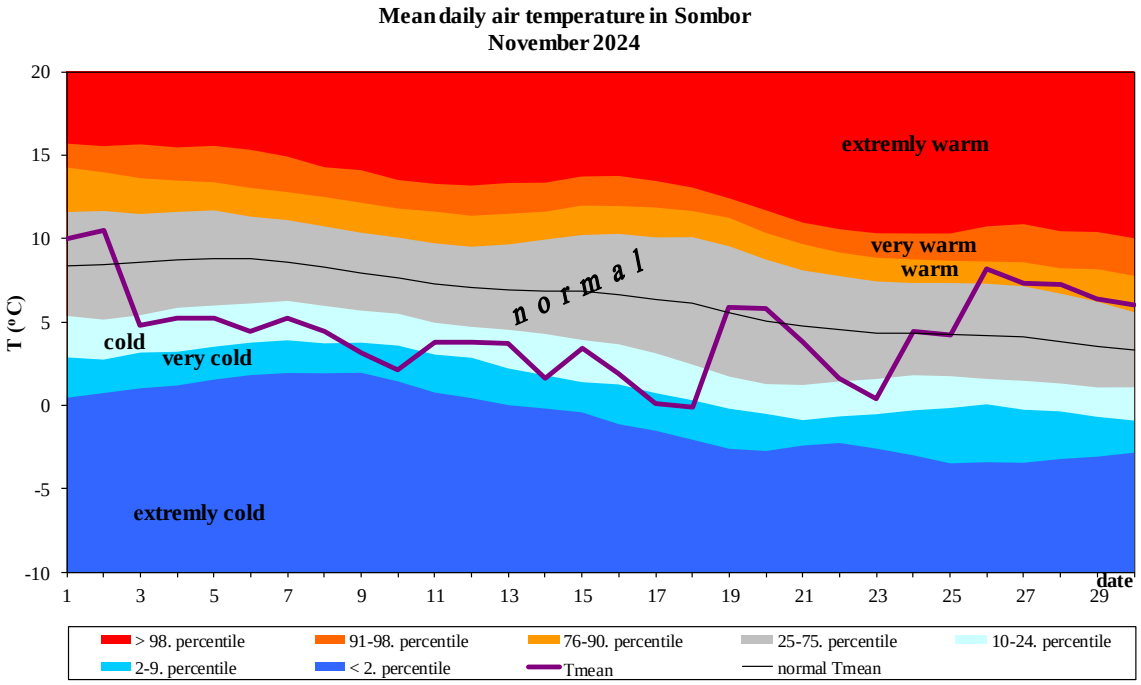
Period at the beginning of the second decade was marked by the influence of cold air from the east of the continent in the form of an upper-air depression, which moved from the area of Ukraine and the Black Sea toward the Adriatic Sea across our region. Changeably cloudy and colder weather, with occasional rain, more frequent in the east and south of the country. Then, in the middle of the decade, the passage of an upper-air trough from the northwest and further movement and weakening of the mentioned upper-air low pressure over the southern Balkans toward the east, followed by the establishment of an anticyclone. By the end of the decade, there was also a pronounced southwest upper-air circulation on the front side of a developed low pressure in the North Sea and northern Europe. The weather was stable, and by the end of the decade, it became slightly warmer.

Period at the beginning of the third decade was characterized by the passage of cold atmospheric fronts from the north and northwest, strong winds, rain, and showers, with occasional thunderstorms in the south. In a subsequent period, cooling followed, so even in the low-lying areas of western, central, and eastern Serbia, light snow was observed. Then, in the middle of the third decade, there was a period of settled weather until the end of the month, when a new change occurred, with cloudiness and rain and snow on the mountains, and locally in lower areas in the west and south, with a low snowformation due to the influence and transfer of a low pressure from the eastern Atlantic toward the east of the continent, passing through the central areas, while an upper-air low pressure was cut off and moved southeast across our region.

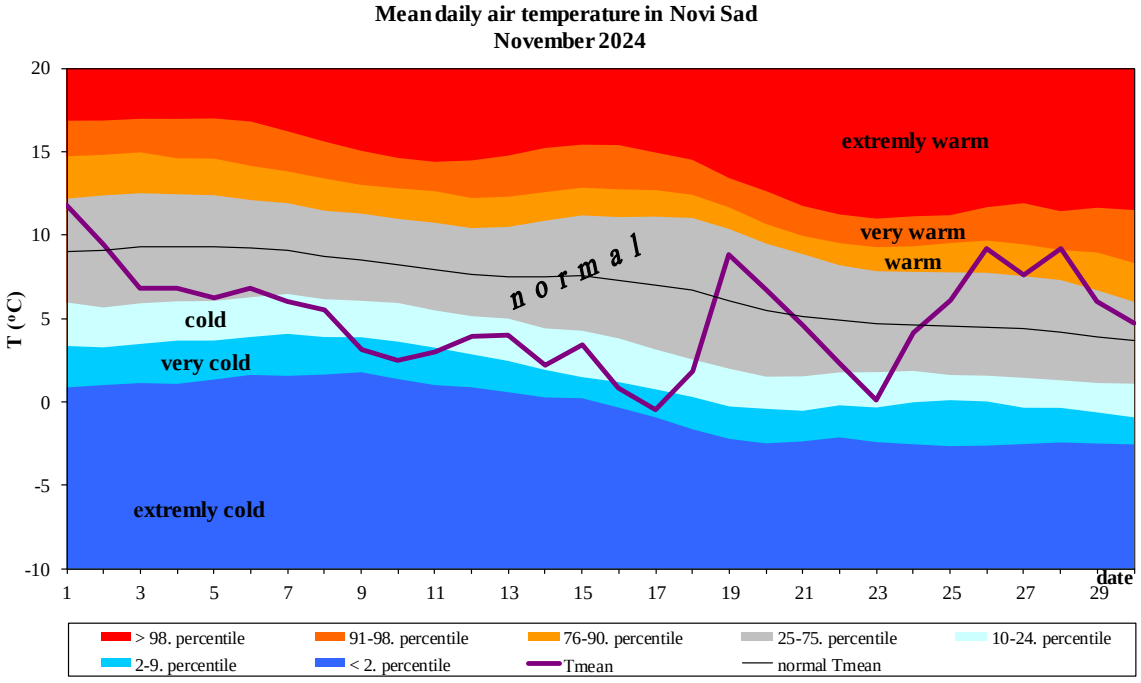
* National Center for Hydrometeorlogical Early Warning System

APPENDIX

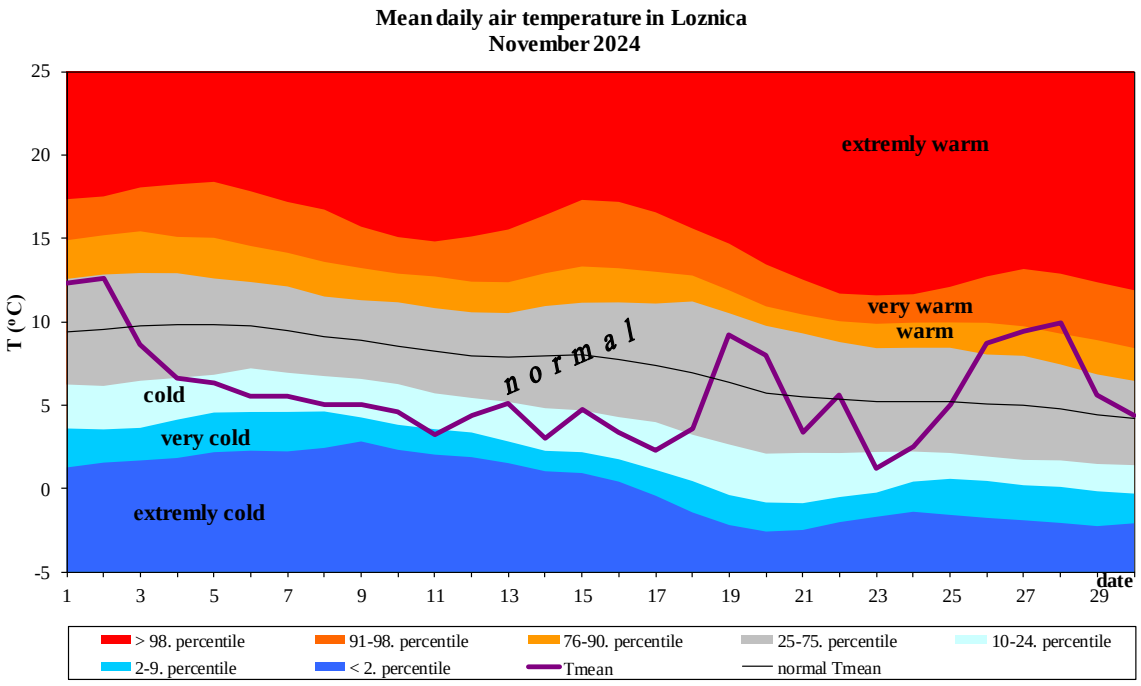
Mean air temperature



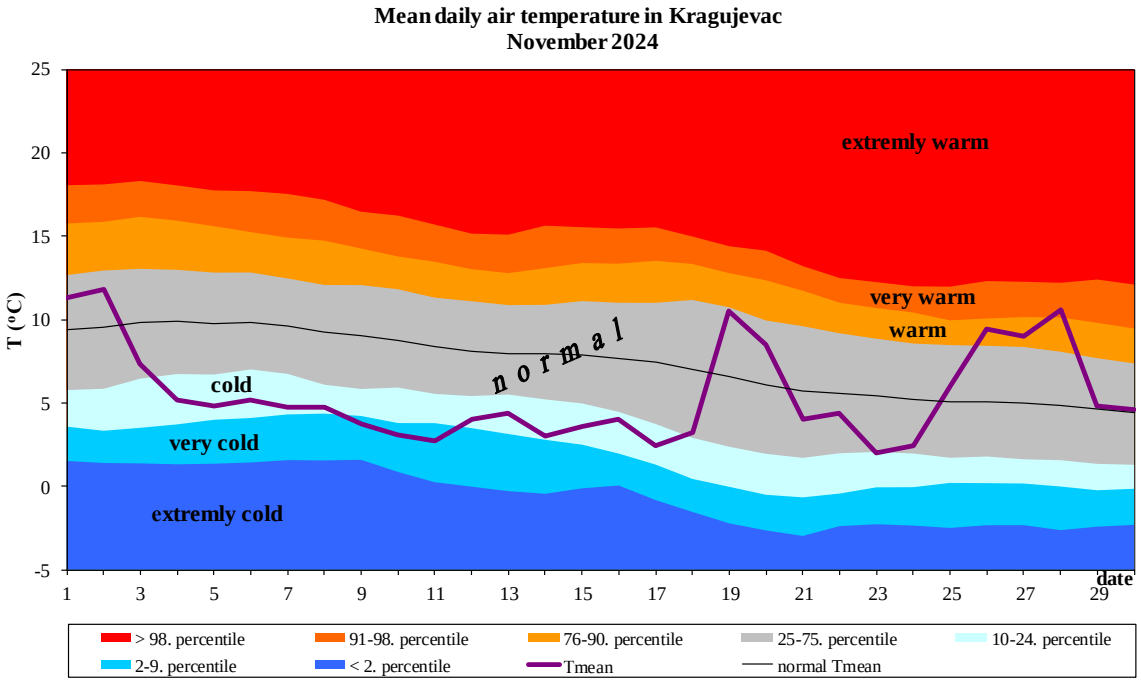
Appendix 1. Daily course of the mean daily air temperature and accompanying percentile for Sombor



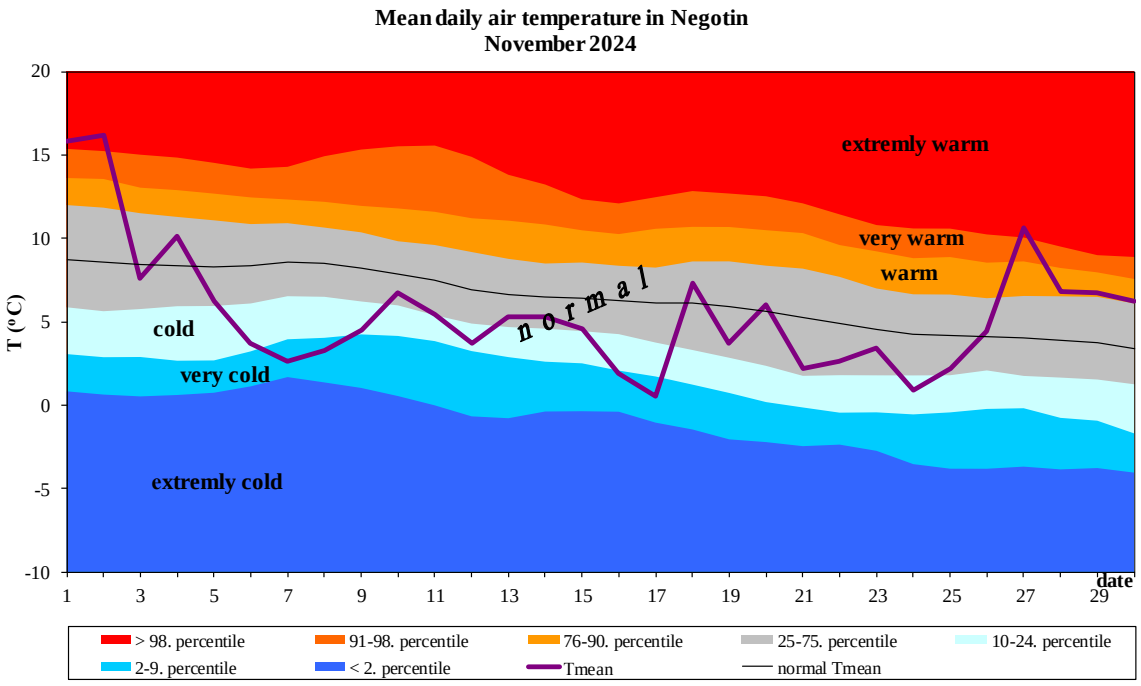
Appendix 2. Daily course of the mean daily air temperature and accompanying percentile for Novi Sad



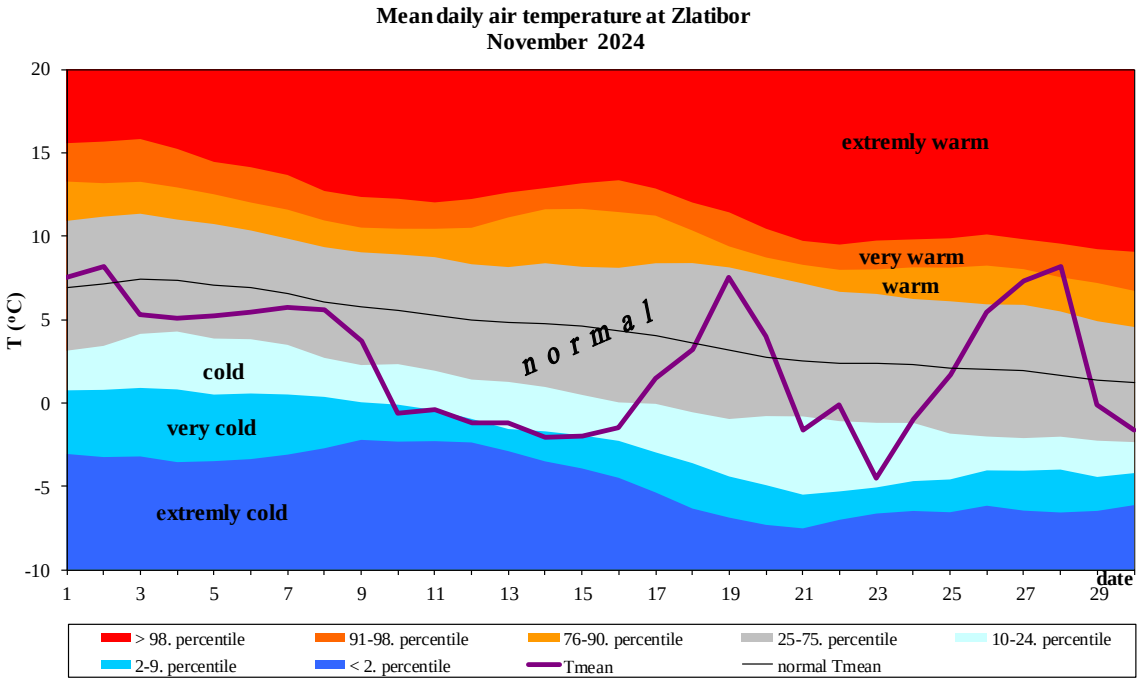
Appendix 3. Daily course of the mean daily air temperature and accompanying percentile for Loznica



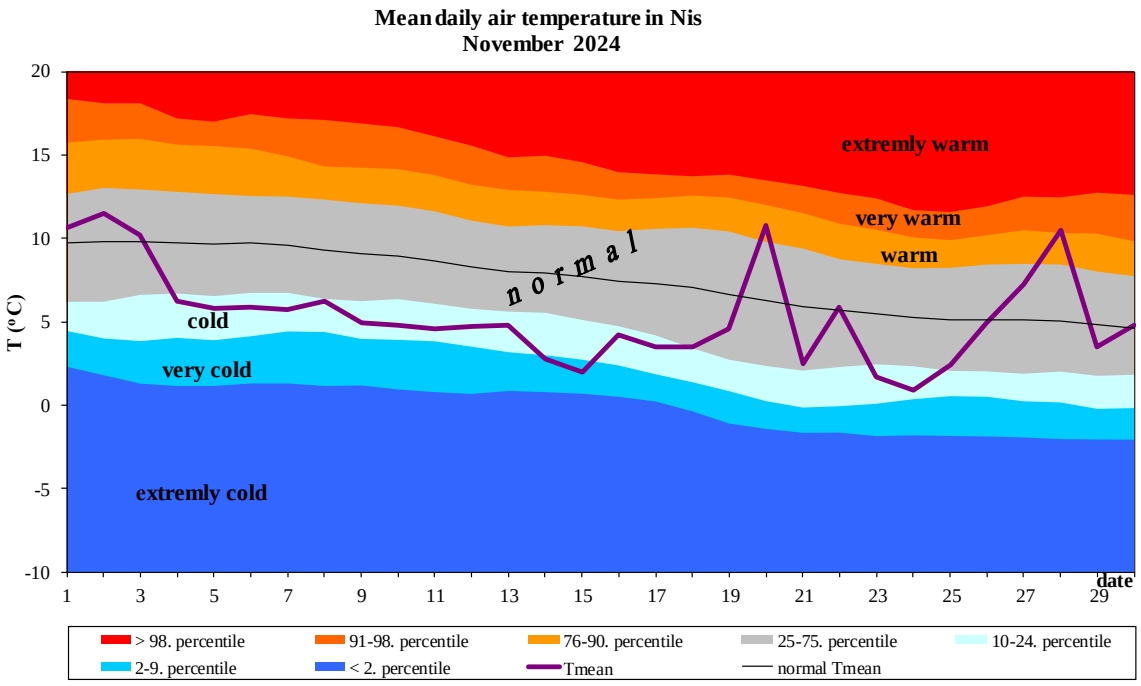
Appendix 4. Daily course of the mean daily air temperature and accompanying percentile for Kragujevac



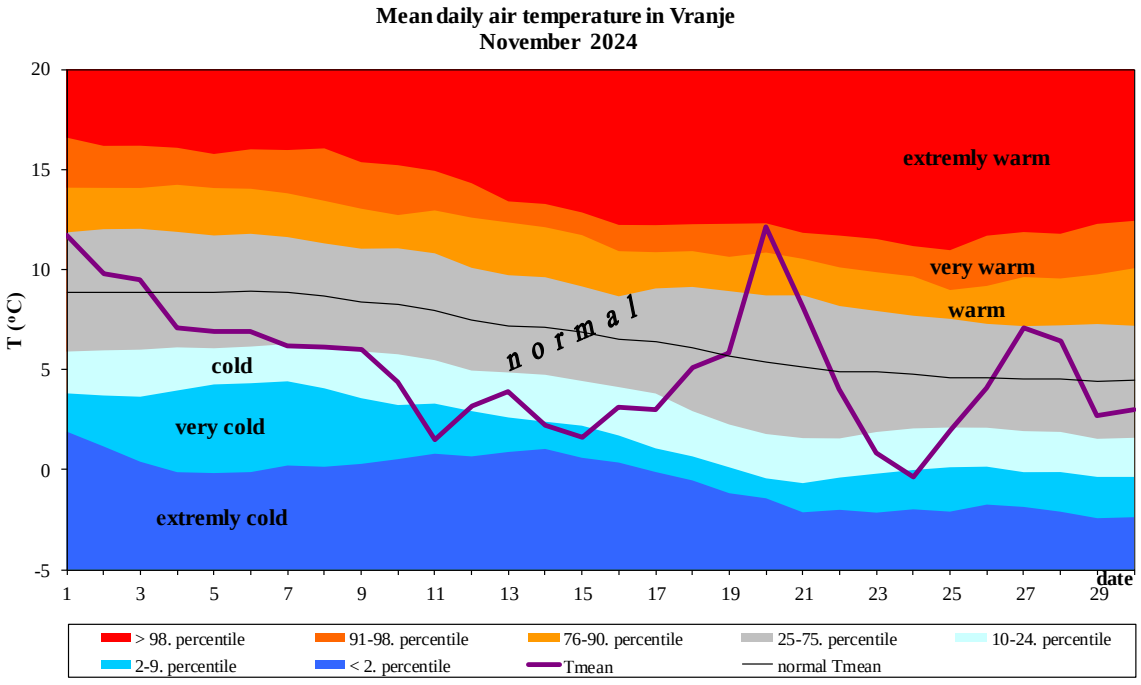
Appendix 5. Daily course of the mean daily air temperature and accompanying percentile for Negotin



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

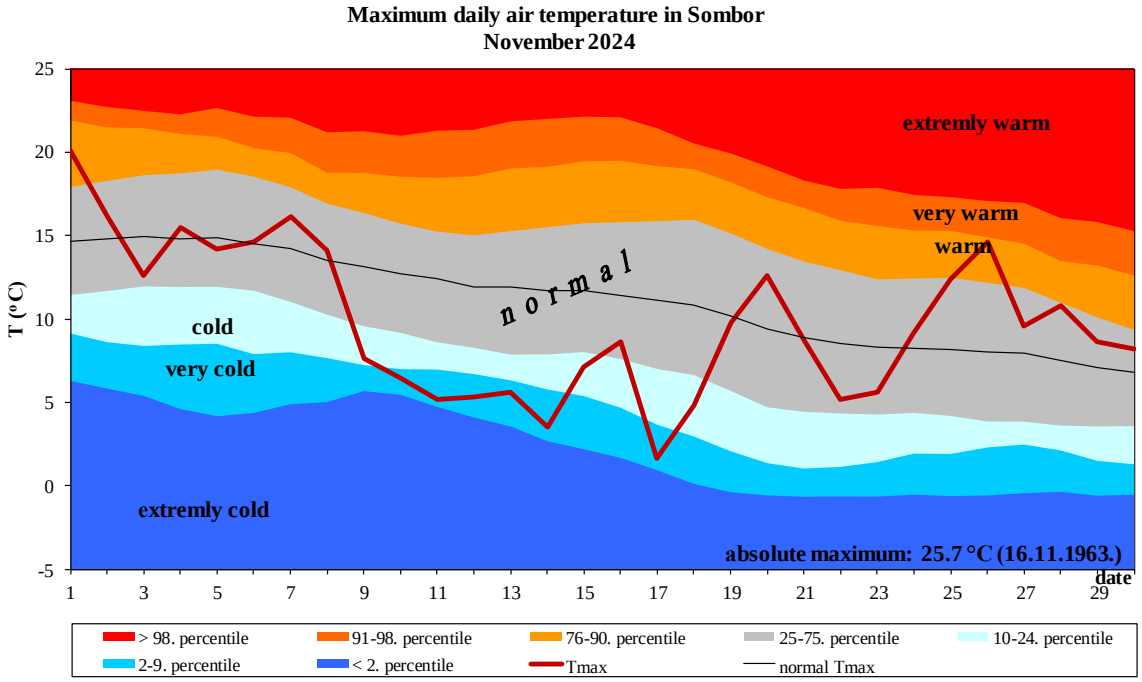


Appendix 7. Daily course of the mean daily air temperature and accompanying percentile for Nis

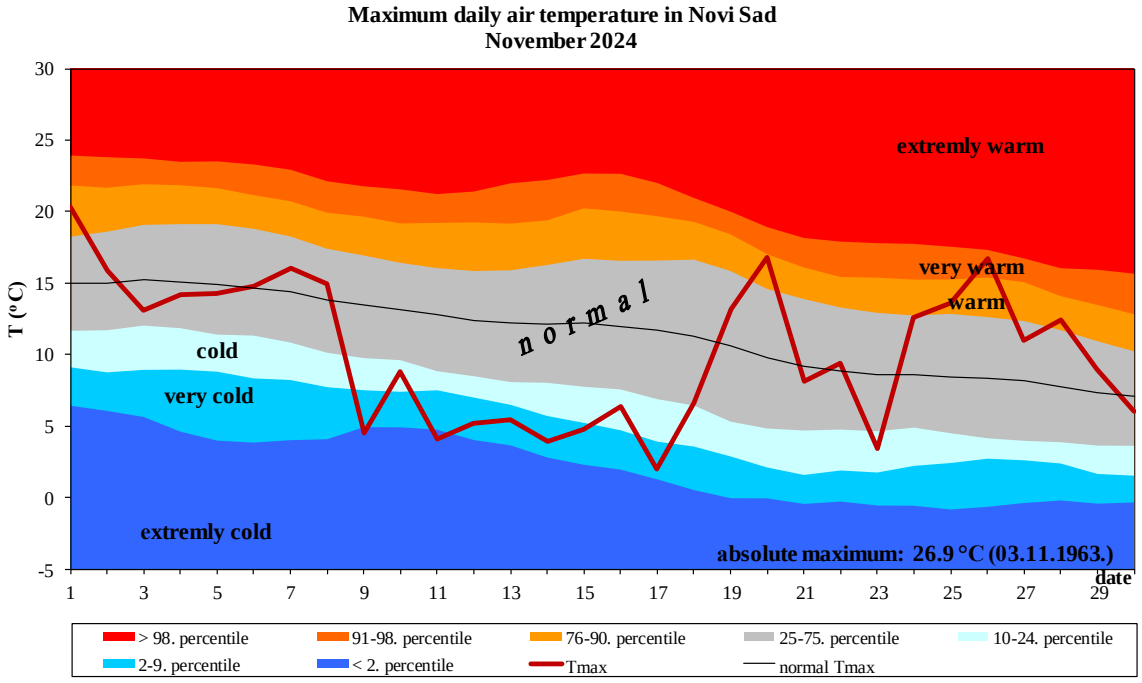


Appendix 8. Daily course of the mean daily air temperature and accompanying percentile for Vranje

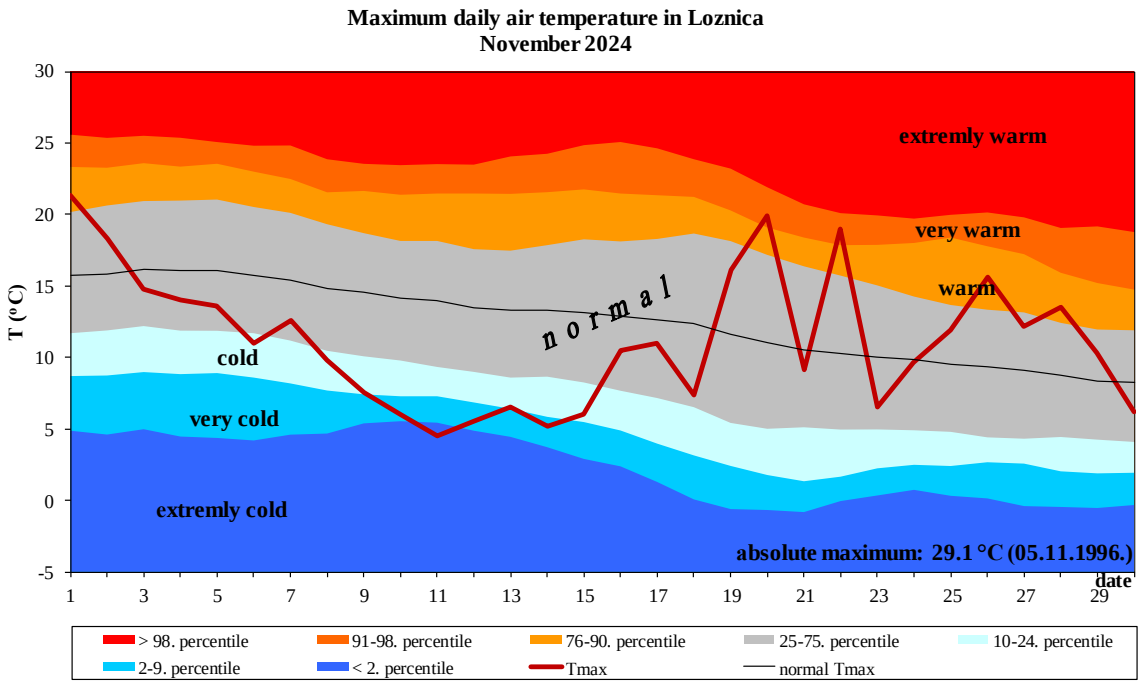
Maximum air temperature



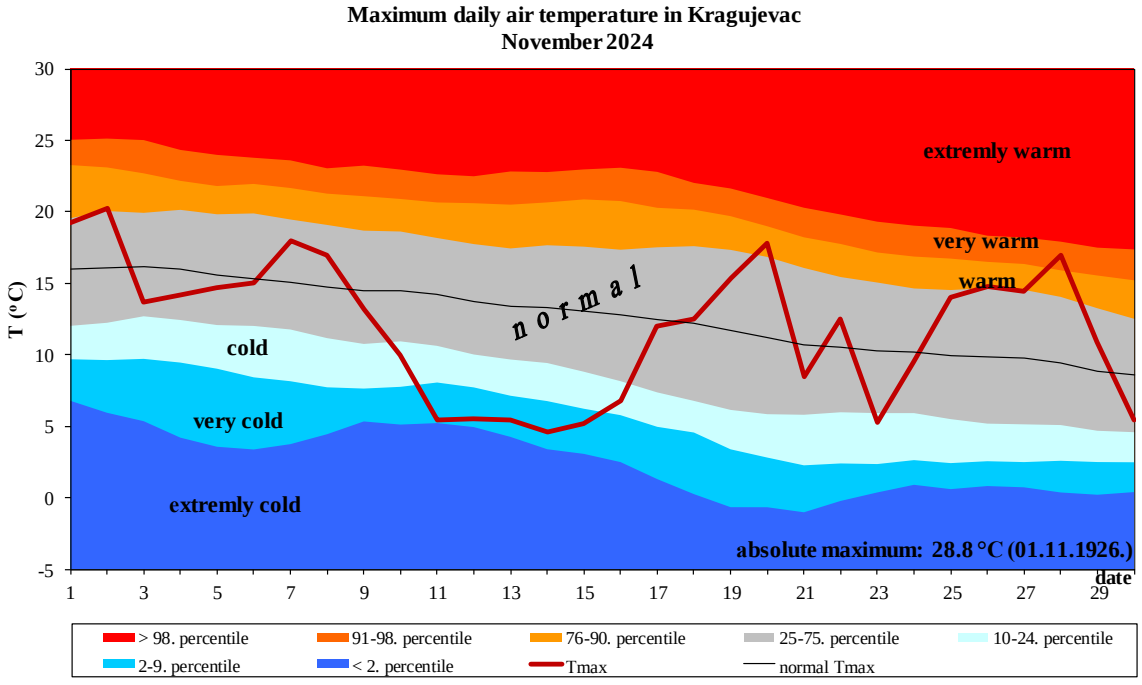
Appendix 9. Daily course of the maximum daily air temeperature and the accompanying percentile for Sombor



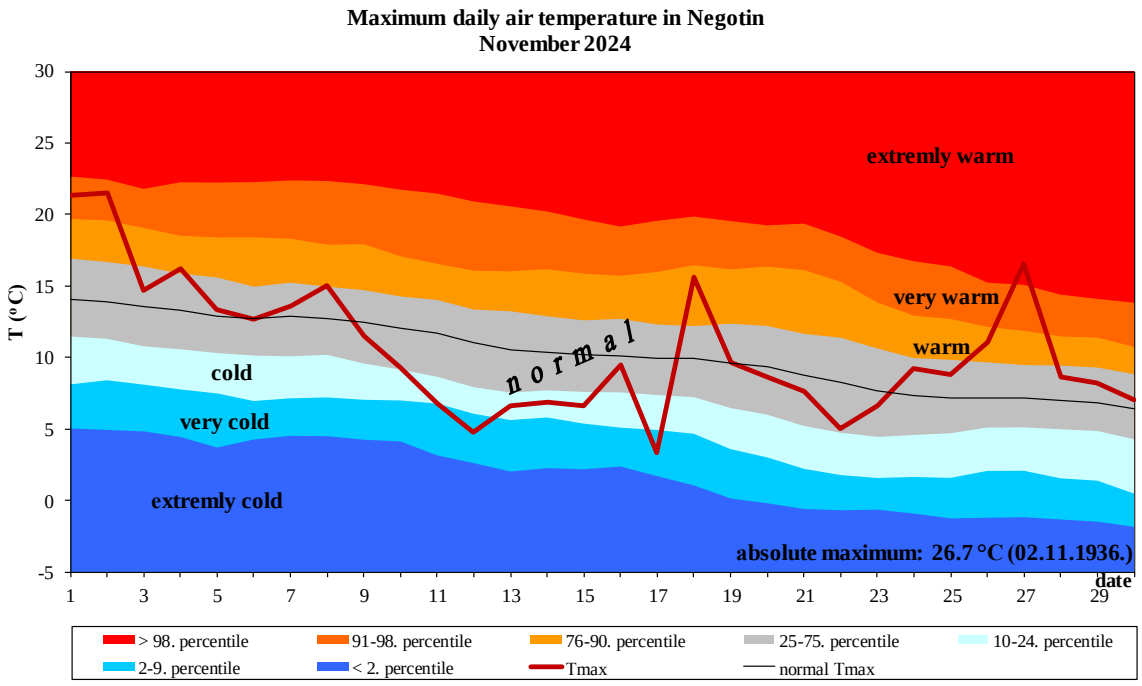
Appendix 10. Daily course of the maximum daily air temeperature and the accompanying percentile for Novi Sad



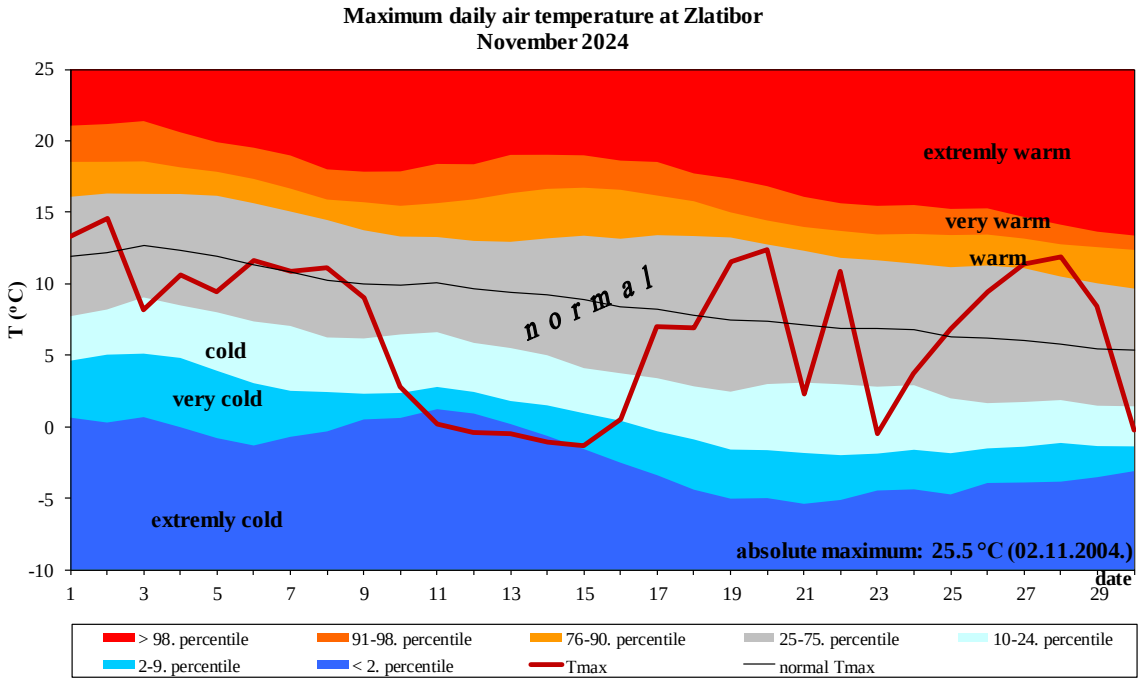
Appendix 11. Daily course of the maximum daily air temeperature and the accompanying percentile for Loznica



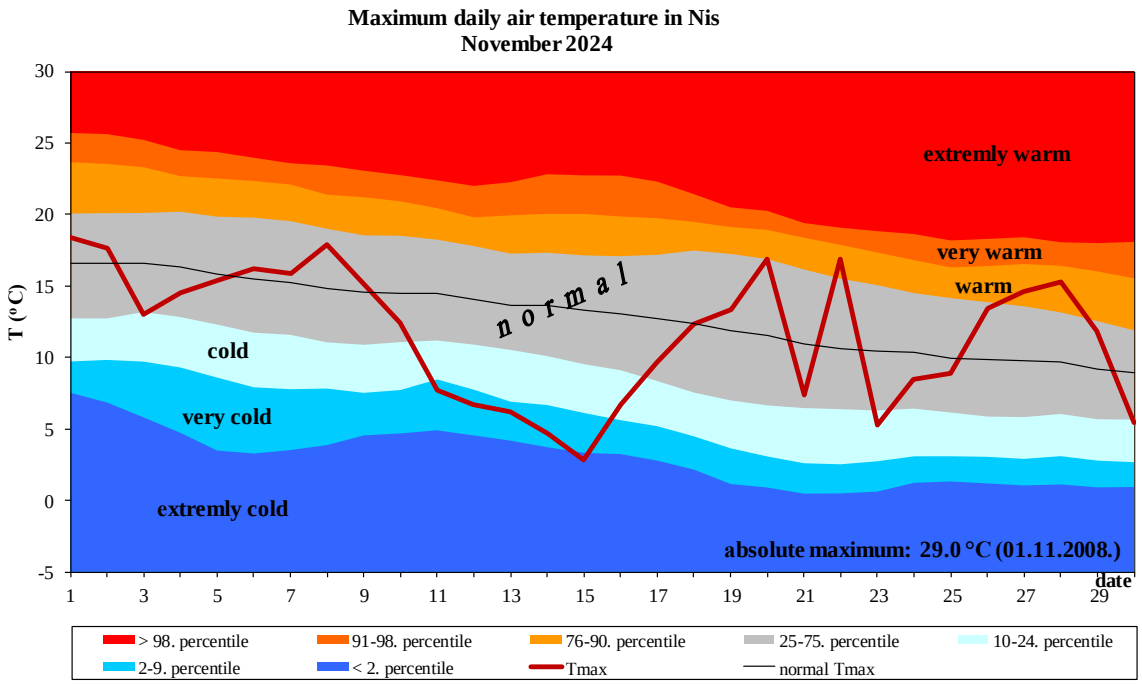
Appendix 12. Daily course of the maximum daily air temeperature and the accompanying percentile for Kragujevac



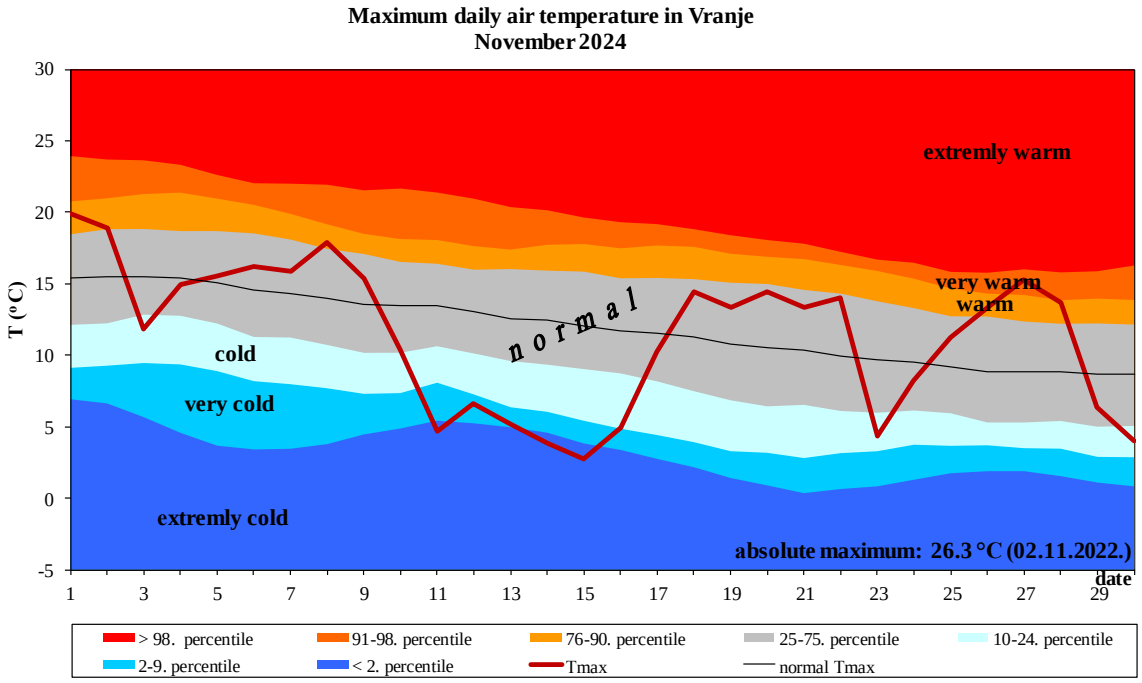
Appendix 13. Daily course of the maximum daily air temeperature and the accompanying percentile for Negotin



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

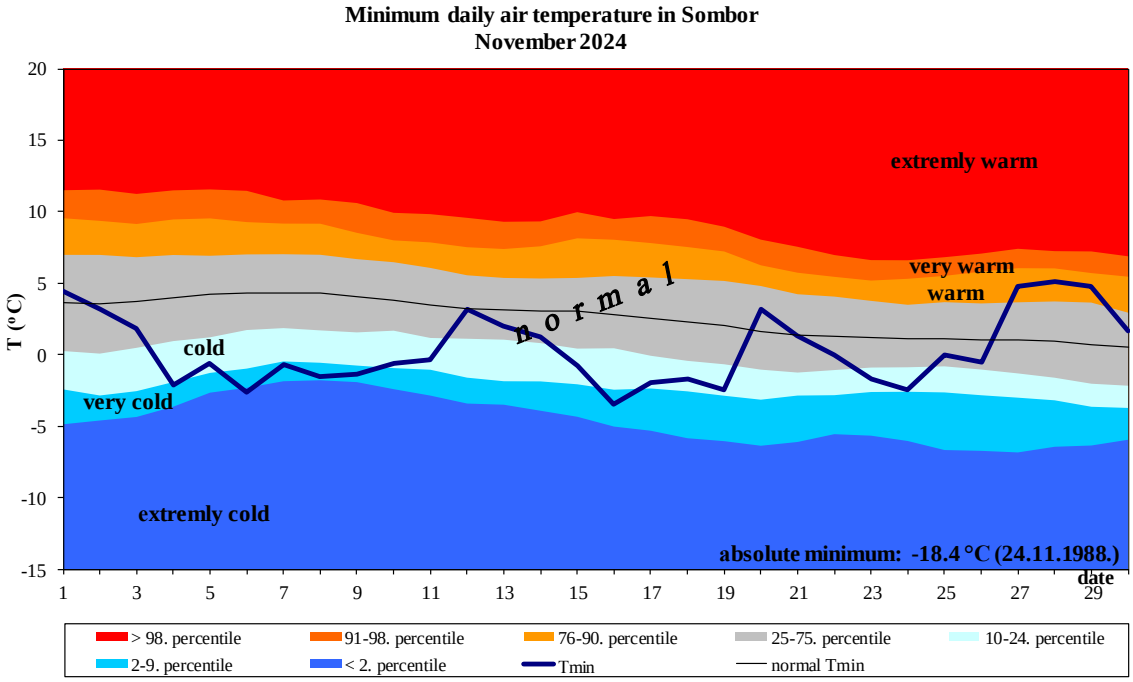


Appendix 15. Daily course of the maximum daily air temeperature and the accompanying percentile for Nis

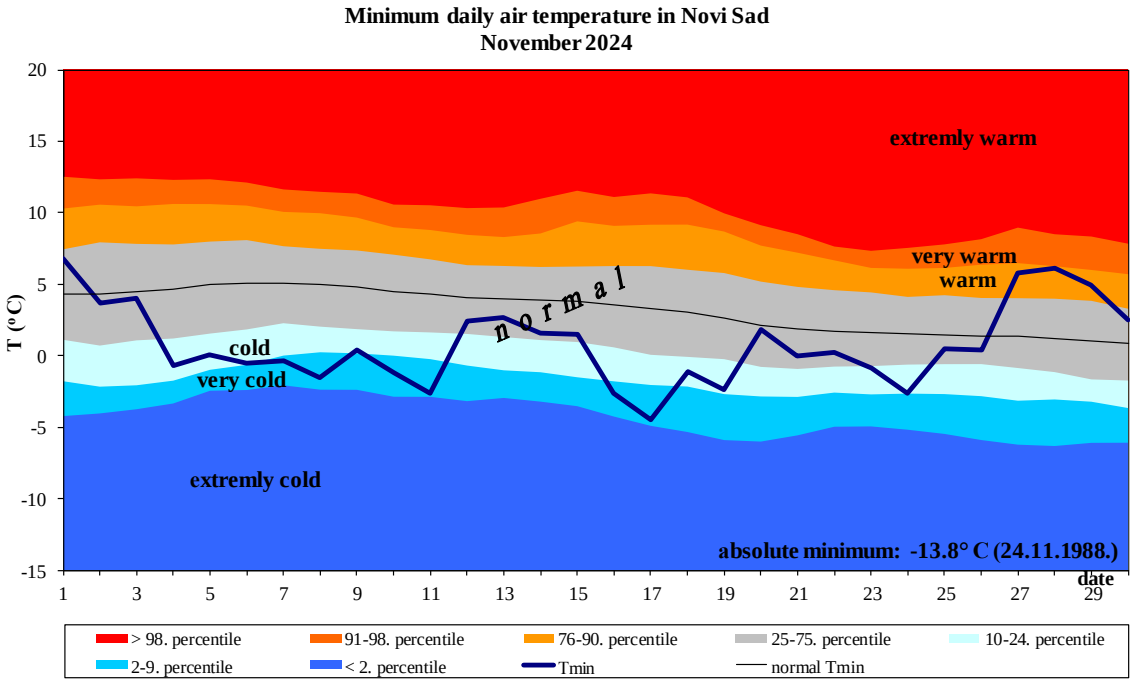


Appendix 16. Daily course of the maximum daily air temeperature and the accompanying percentile for Vranje

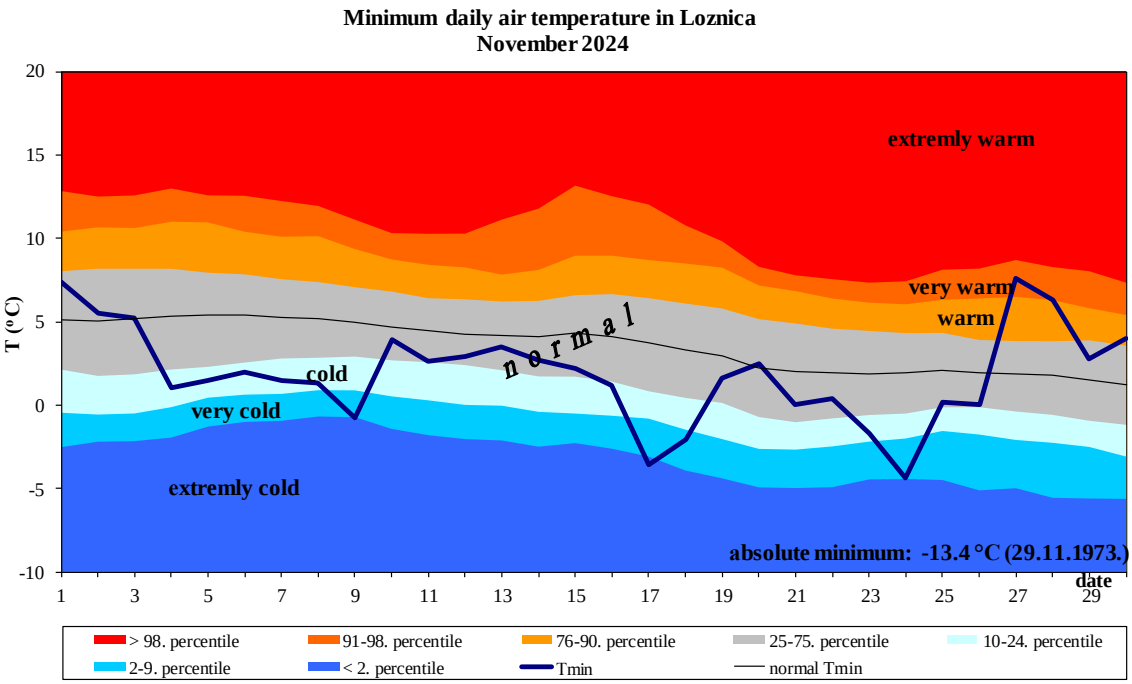
Minimum air temperature



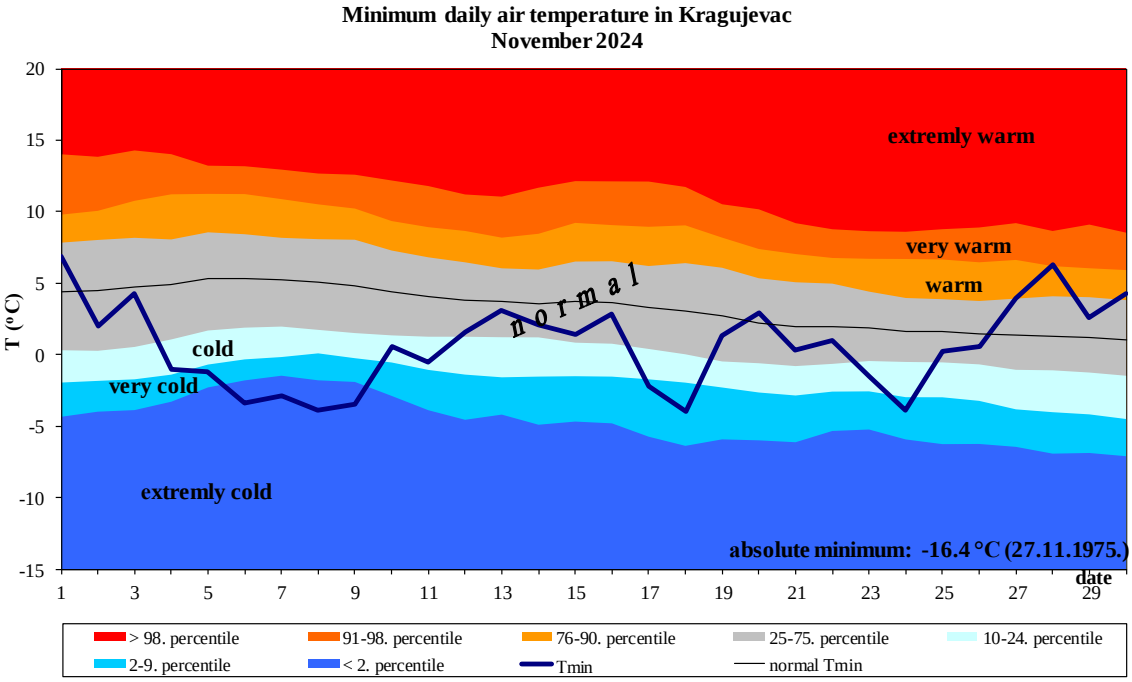
Appendix 17. Daily course of the minimum daily air temperature and the accompanying percentile for Sombor



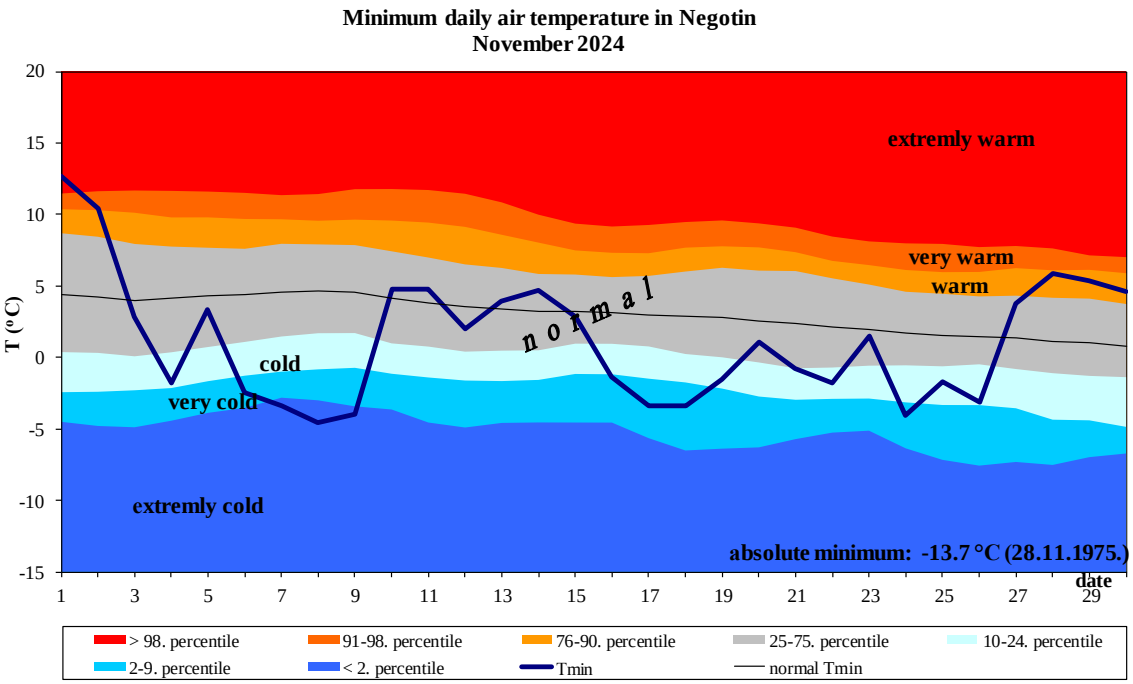
Appendix 18. Daily course of the minimum daily air temperature and the accompanying percentile for Novi Sad



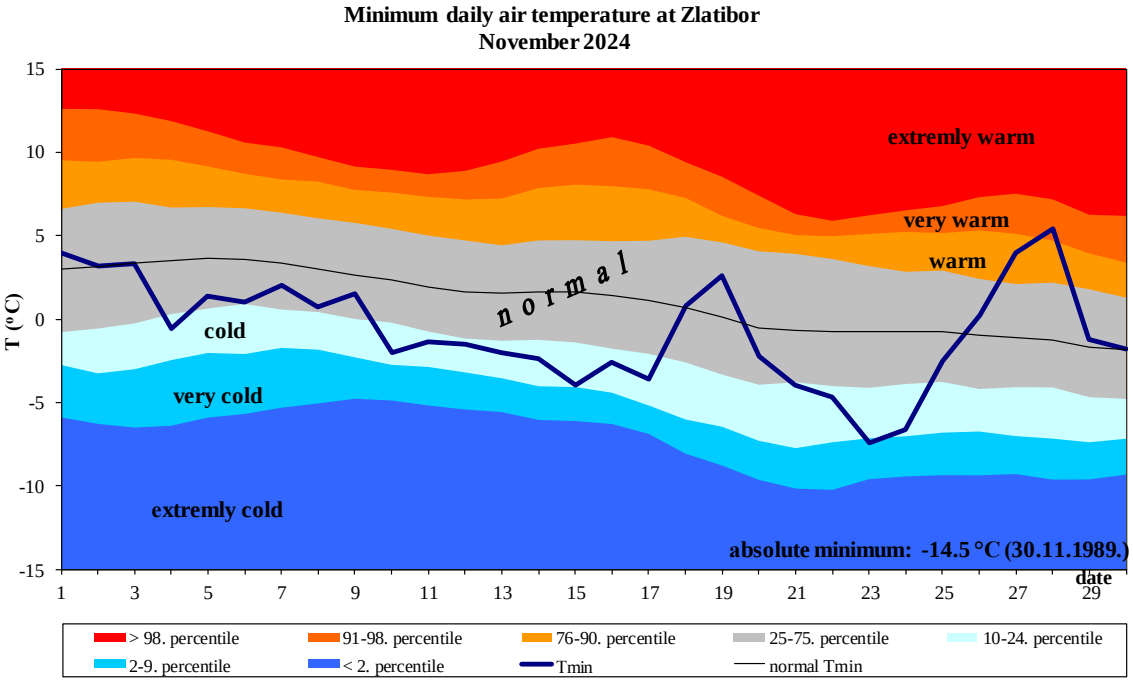
Appendix 19. Daily course of the minimum daily air temperature and the accompanying percentile for Loznica



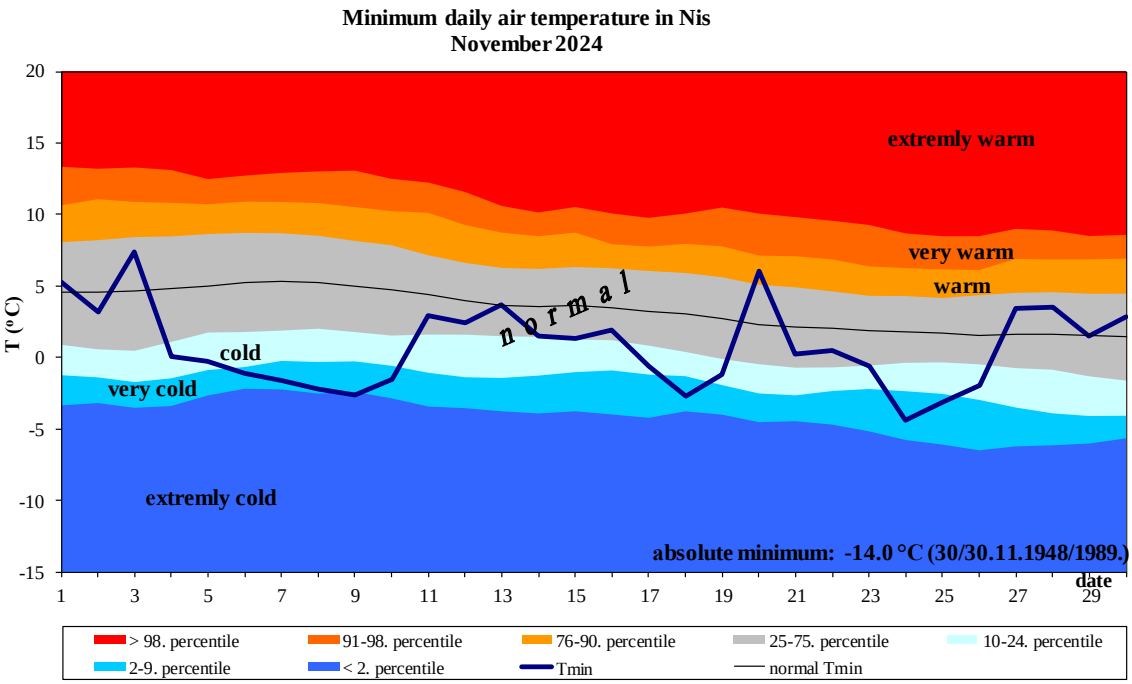
Appendix 20. Daily course of the minimum daily air temperature and the accompanying percentile for Kragujevac



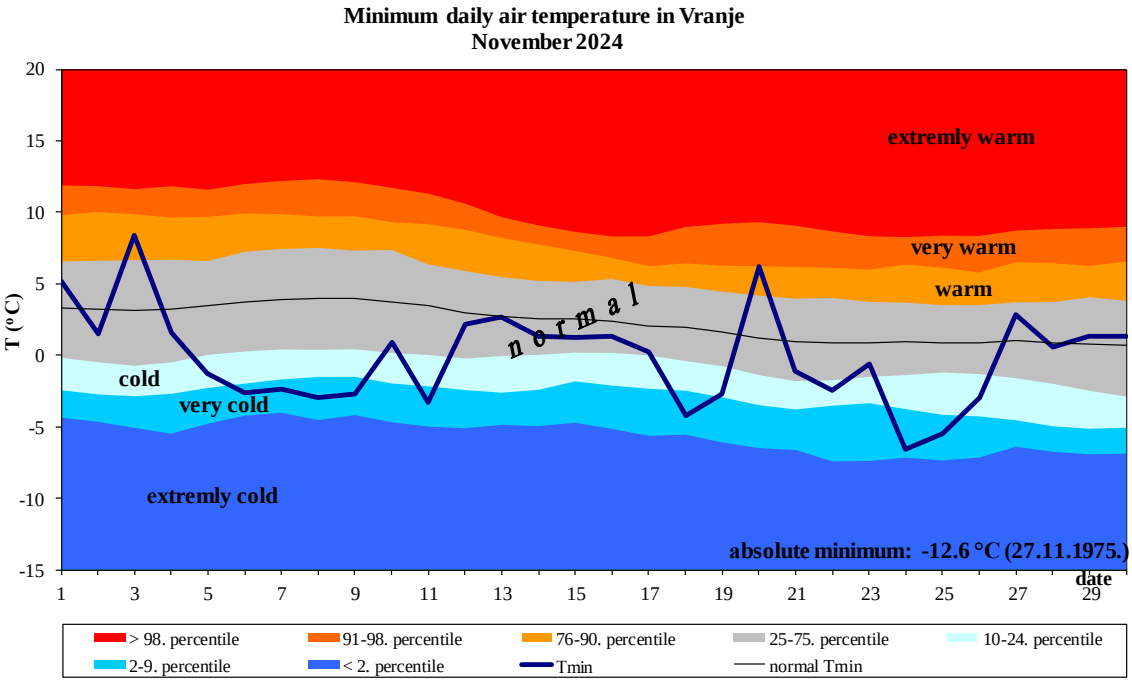
Appendix 21. Daily course of the minimum daily air temperature and the accompanying percentile for Negotin



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

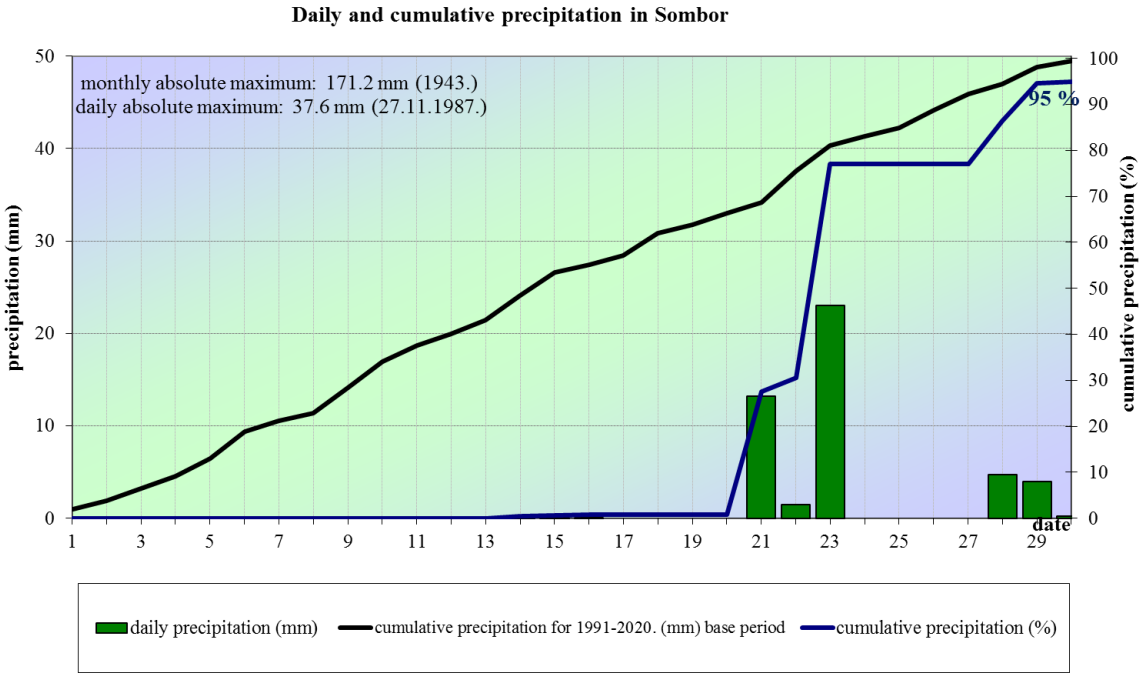


Appendix 23. Daily course of the minimum daily air temperature and the accompanying percentile for Nis

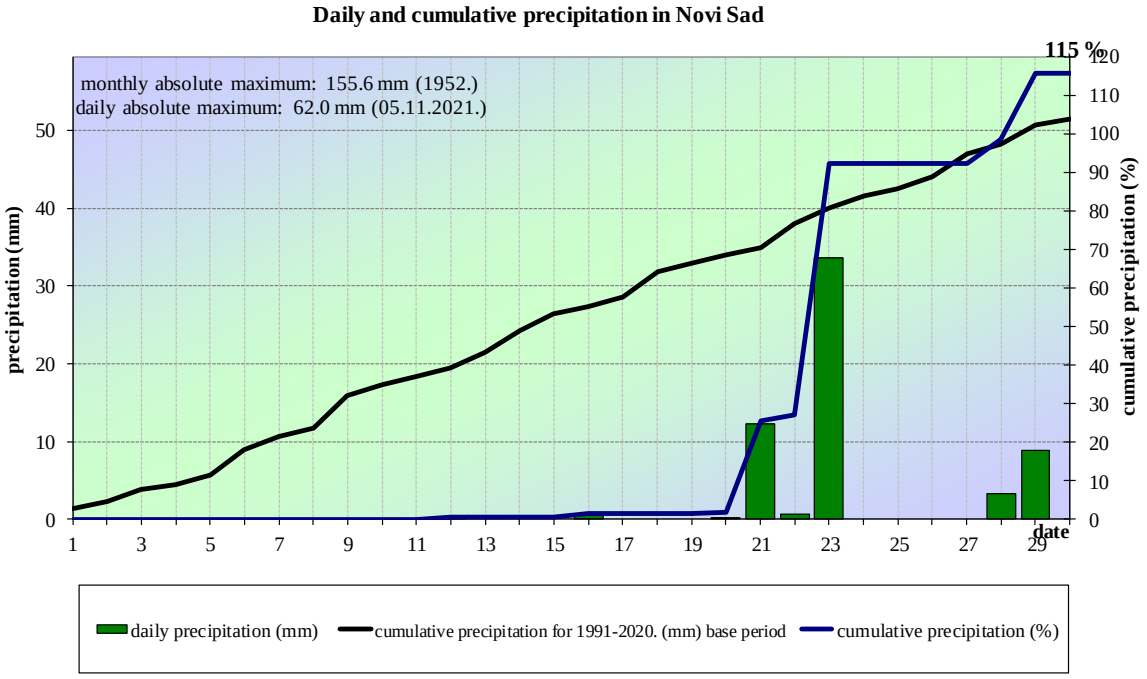


Appendix 24. Daily course of the minimum daily air temperature and the accompanying percentile for Vranje

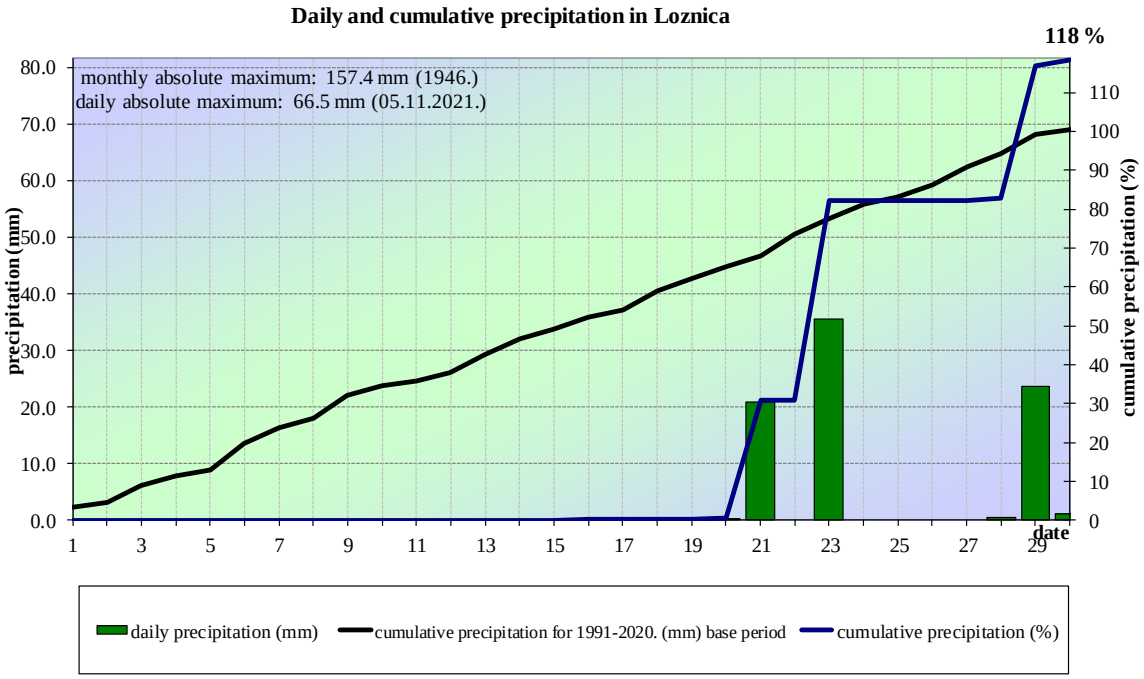
Precipitation



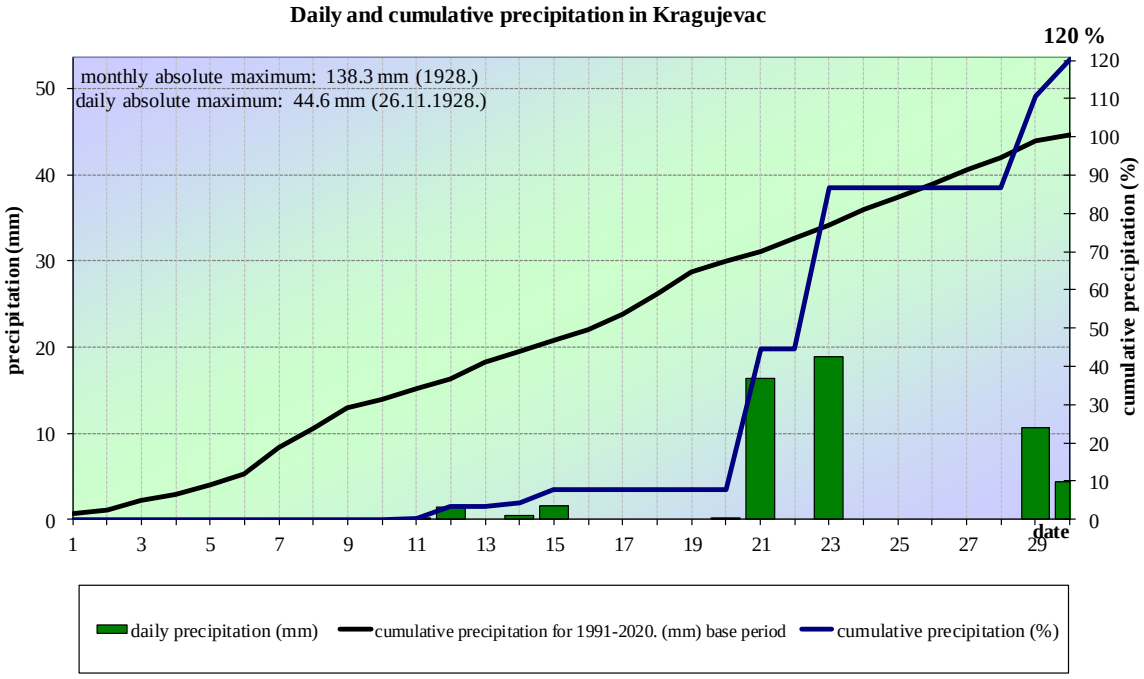
Appendix 25. Daily and cumulative precipitation sums for Sombor



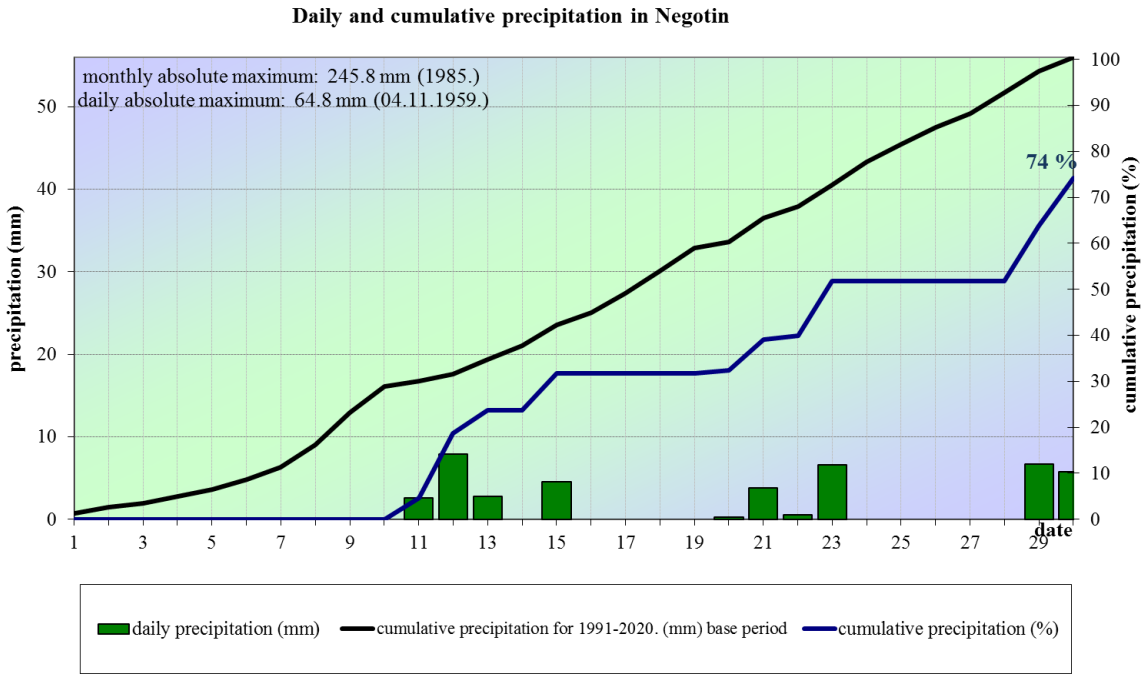
Appendix 26. Daily and cumulative precipitation sums for Novi Sad



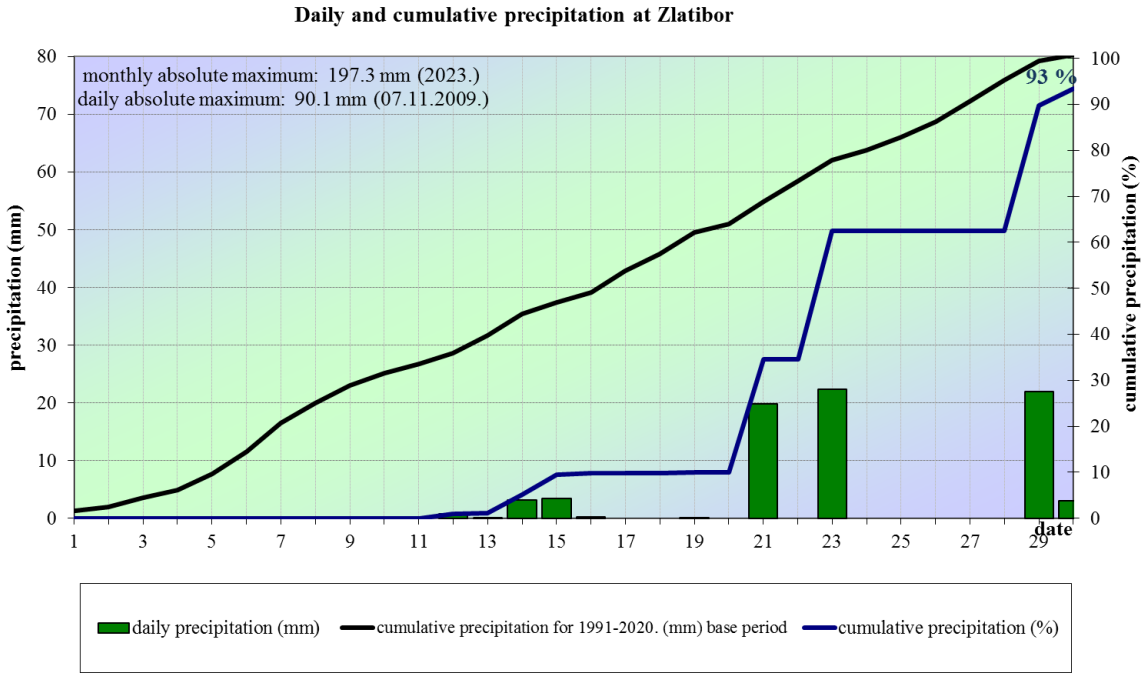
Appendix 27. Daily and cumulative precipitation sums for Loznica



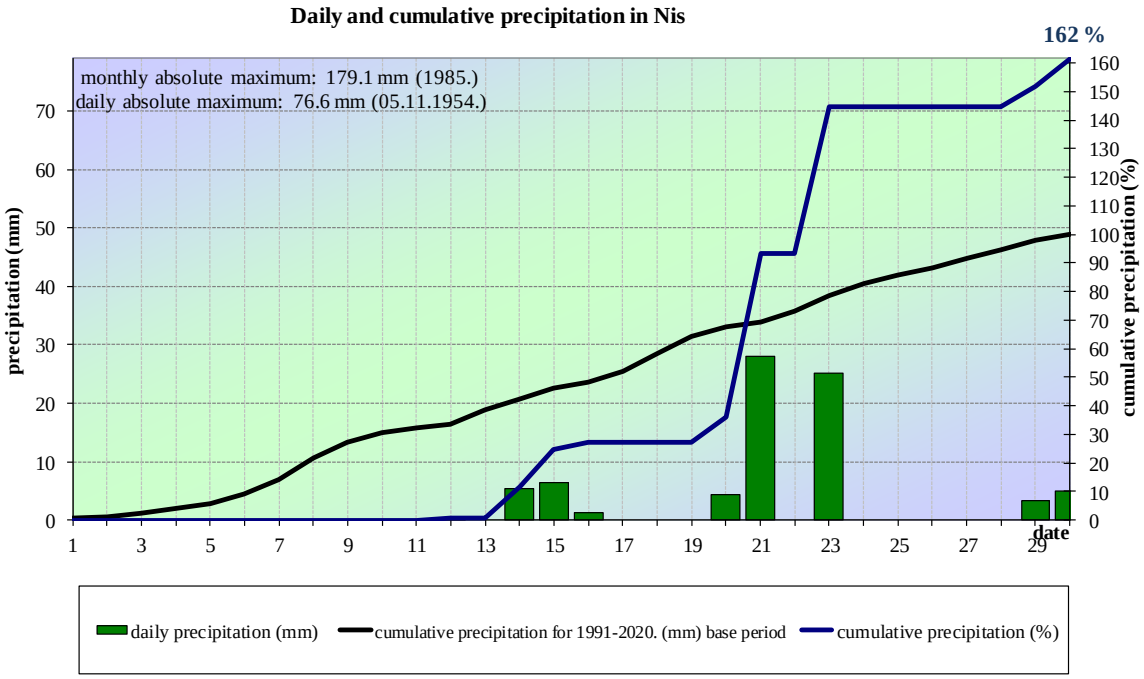
Appendix 28. Daily and cumulative precipitation sums for Kragujevac



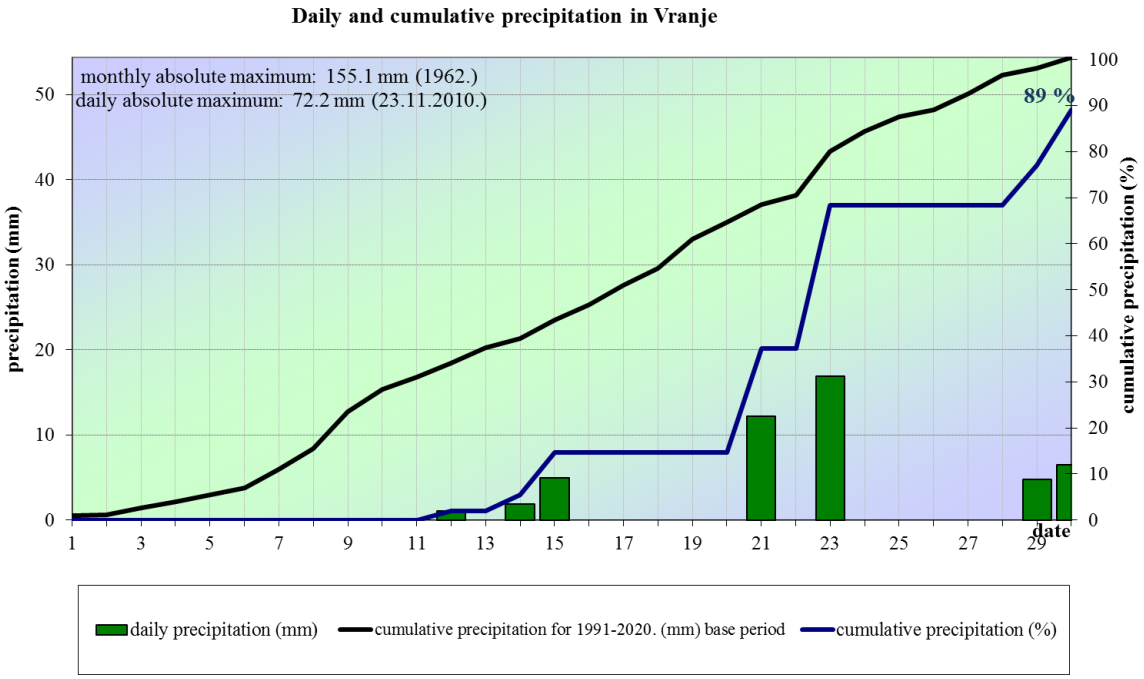
Appendix 29. Daily and cumulative precipitation sums for Negotin



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