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

MONTHLY BULLETIN FOR SERBIA

OCTOBER 2024

Belgrade, the 5th of November 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

Contents

- ***Warm (14th warmest) and dry (20th driest) October across most of Serbia***
- ***6th warmest October for Kopaonik, 7th warmest for Sjenica and Pozega***
- ***3rd driest October for Crni Vrh***
- ***Heat wave at the end of October in Negotin***

AIR TEMPERATURE

Mean monthly air temperature

Warm October in most of the country. October 2024 ranks as the 6th warmest for Kopaonik since the record-keeping began (*Figure 1*), **7th warmest** for Sjenica and Pozega, and **14th warmest** for Serbia in the period from 1951-2024 (*Figure 2*).

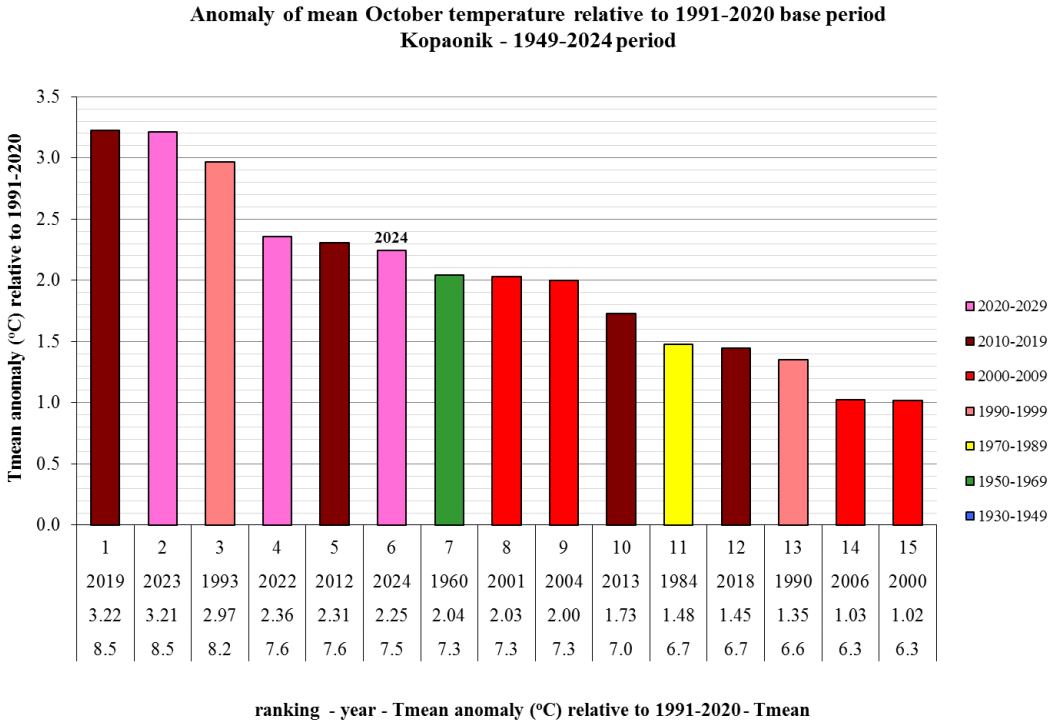


Figure 1. Rank of the warmest October on Kopaonik

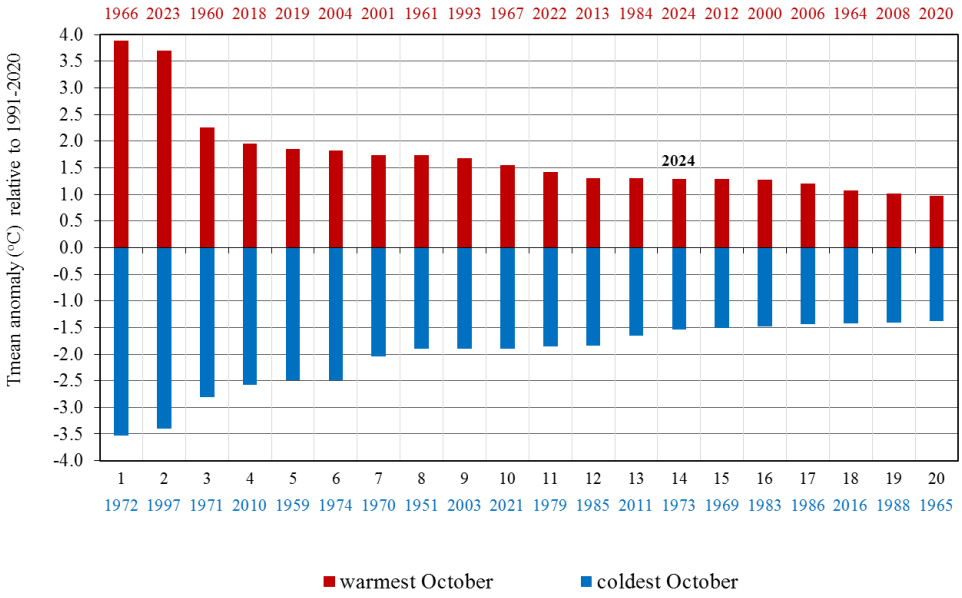


Figure 2. Rank of the warmest and coldest October in Serbia for the period from 1951 to 2024

The mean October air temperature ranged from 11,4ºC in Zajecar to 15,2ºC in Belgrade, and on the mountains from 7,5ºC at Kopaonik to 11,4ºC at Zlatibor (*Figure 3*).

Departure of the mean air temperature from the normal[1] for the 1991-2020 base period ranged from +0,5ºC in Zajecar to +2,3ºC at Zlatibor (*Figure 4*).

Mean October air temperature, based on the percentile method[2], was in the categories of normal and warm in most of the country, and very warm in Belgrade, Sjenica, Pozega, Zlatibor and Kopaonik (*Figure 5*).

[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

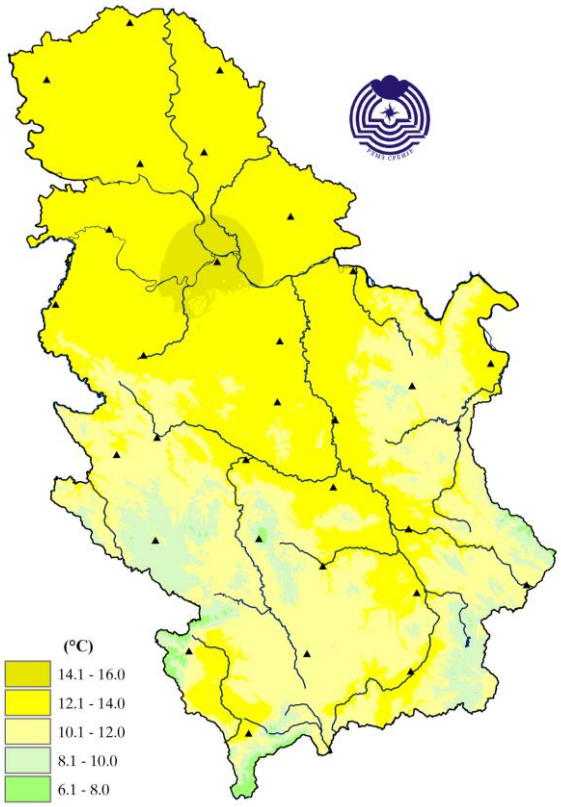


Figure 3. Spatial distribution of mean monthly air temperature (ºC)

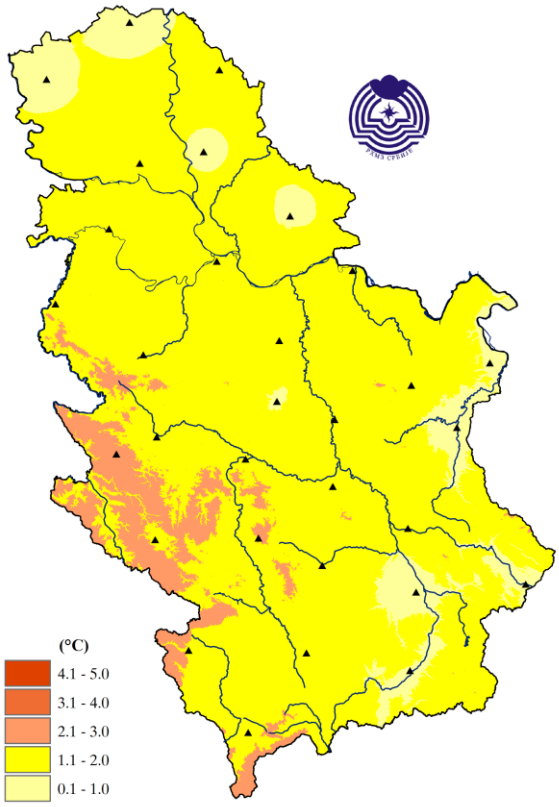


Figure 4. Spatial distribution of mean monthly air temperature anomaly (ºC)

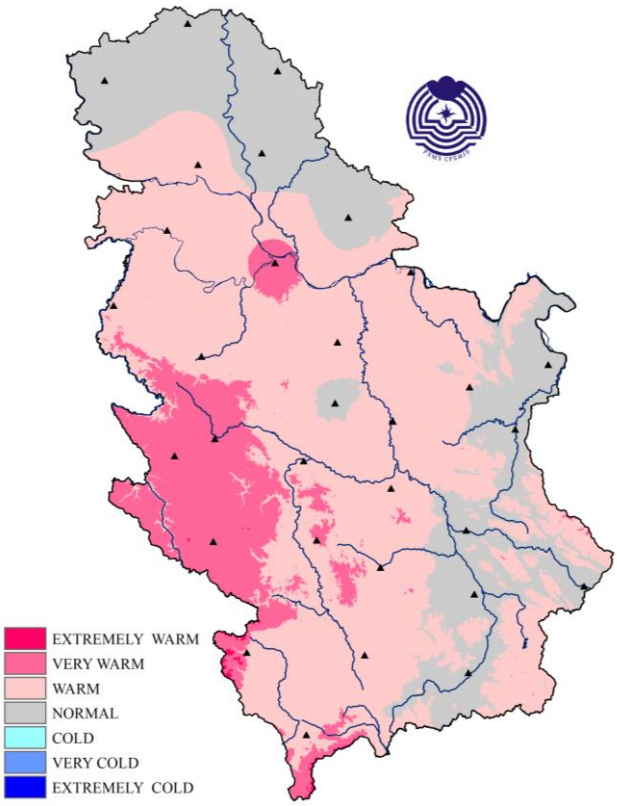


Figure 5. Spatial distribution of the mean monthly air temperature using percentile method

Mean daily air temperature in Belgrade, based on the percentile method was in the cold category at the beginning and middle of the first decade, in the categories of warm and extremely warm at the end of the first and beginning of the second decade and in the categories of very warm and warm at the end of the third decade (*Figure 6).* 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.

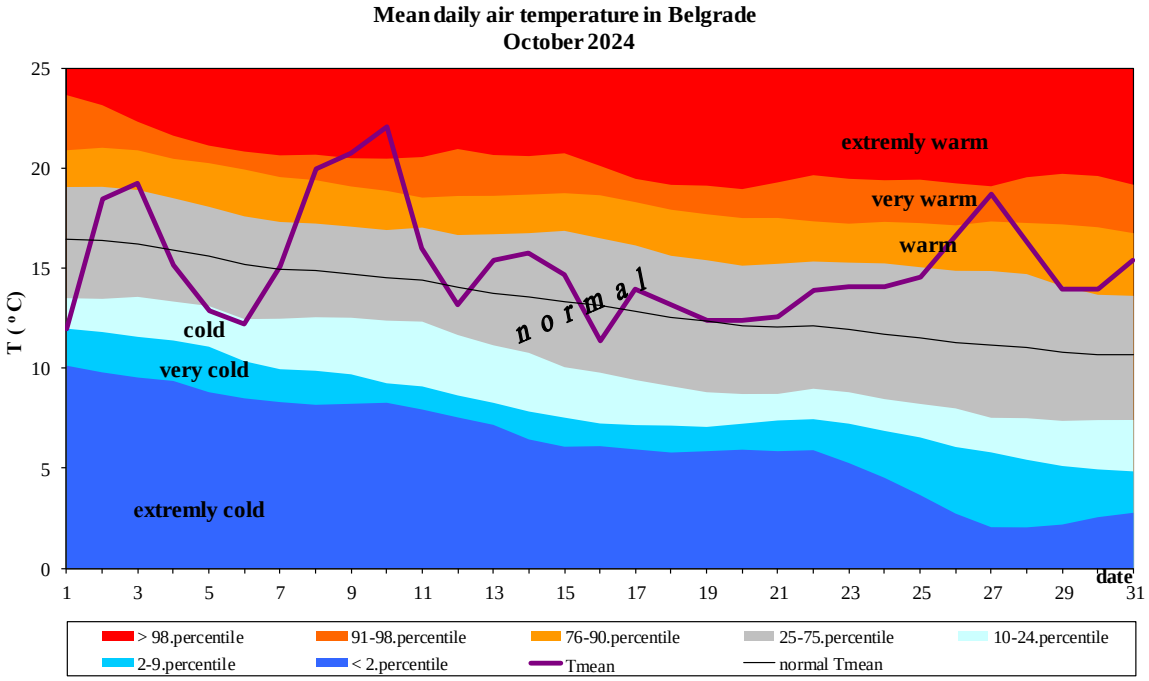


Figure 6. Daily course of the mean daily air temperature and accompanying percentiles for Belgrade

Maximum air temperature

Mean maximum air temperature in October ranged from 18,9ºC on Palic to 21,6ºC in Ćuprija, while Belgrade recorded 21,2°C. On the mountains, mean maximum October air temperature ranged from 12,6ºC at Kopaonik to 18,9ºC in Sjenica.

Based on the percentile method, mean maximum air temperature was in the categories of warm and very warm in most of the country, and normal on Palic, Kikinda, Nis and Leskovac.

In Serbia, the highest maximum daily air temperature of 30,6ºC was measured in Loznica on October 10. On the same day, Belgrade observed the highest air temperature of 29,2ºC for this October.

Summer days[3] were recorded in the entire country apart from the mountains. The highest number, total of 7 summer days, was recorded in Cuprija, 5 days in Loznica and Valjevo, 4 days in Belgrade, Niš, Kruševac and Zaječaru, elsewhere their number ranged from 1 to 3. The recorded number of summer days was around October average in most of the country.

Tropical days[4] are seldom in October. One tropical day was recorded in Loznica and Valjevo.

[3] Summer day refers to a day with maximum daily air temperature 25°C and above
[4] Tropical day refers to a day with maximum daily air temperature 30°C and above

Heat wave[5] was recorded in Negotin lasting from 28 October to 2 November.

Figure 7 shows daily course of the maximum daily air temperature and the accompanying percentiles for Belgrade in October 2024 and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje are given in the Appendix.

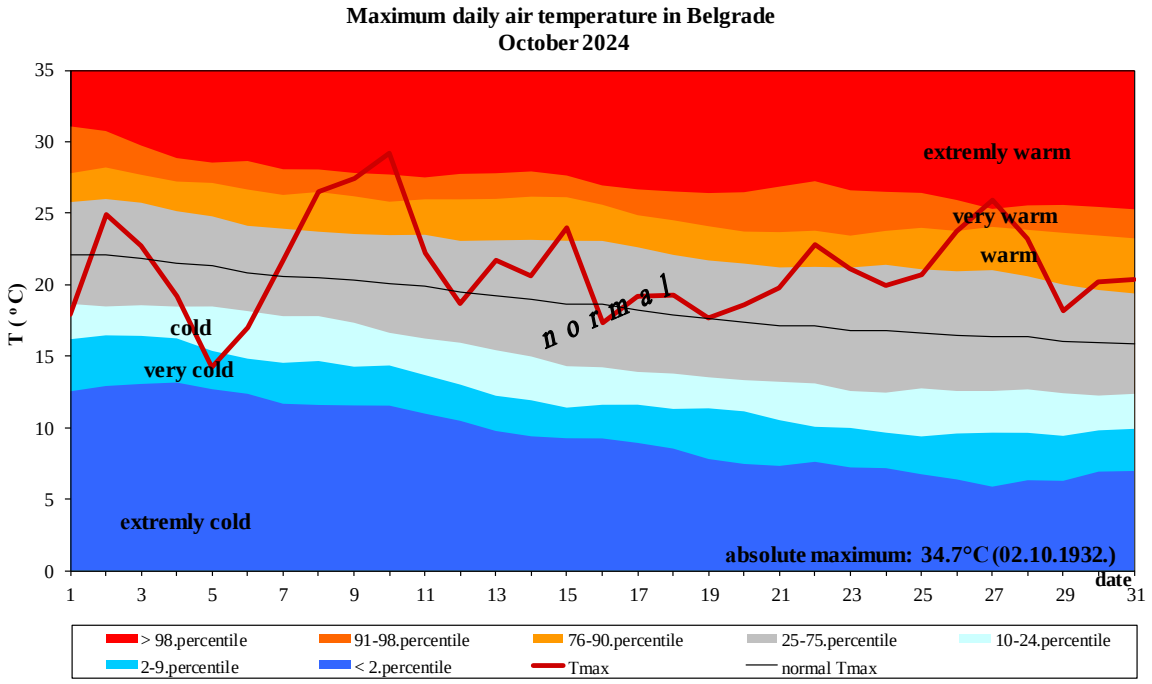


Figure 7. Daily course of the maximum daily air temperature and accompanying percentiles for Belgrade

Minimum air temperature

Mean minimum air temperature in October ranged from 3,7ºC in Zajecar to 10,9ºC in Belgrade. On the mountains, mean minimum air temperature ranged from 3,0ºC in Sjenica to 7,6ºC at Zlatibor.

Based on the percentile method, mean minimum air temperature was in the following categories: normal and warm in most of the country, very warm in Loznica, Zlatibor and Kopaonik, cold category in Negotin, Dimitrovgrad and Vranje, and very cold in Zajecar.

The lowest minimum daily air temperature of -4,8ºC was measured in Sjenica on October 22. In the lowland, the lowest daily air temperature of -3,4ºC was measured in Zajecar on October 21 and 22. On October 1, Belgrade observed the lowest monthly air temperature of 6,7ºC.

Number of frost days[6] was the following: Sjenica and Zajecar recorded 6 and Crni Vrh and Kopaonik observed 1. The recorded number of frost days was 2 to 3 days below October average in most of the country.

Figure 8 shows assessment of the minimum and maximum air temperature in Serbia for October based on the tercile distribution relative to the 1991-2020 base period. It can be noted

[5] 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
[6] Frost day is defined as the day with minimum air temperature lower than 0°C

that the mean minimum air temperature was around the upper tercile threshold and the mean maximum air temperature above the upper tercile threshold.

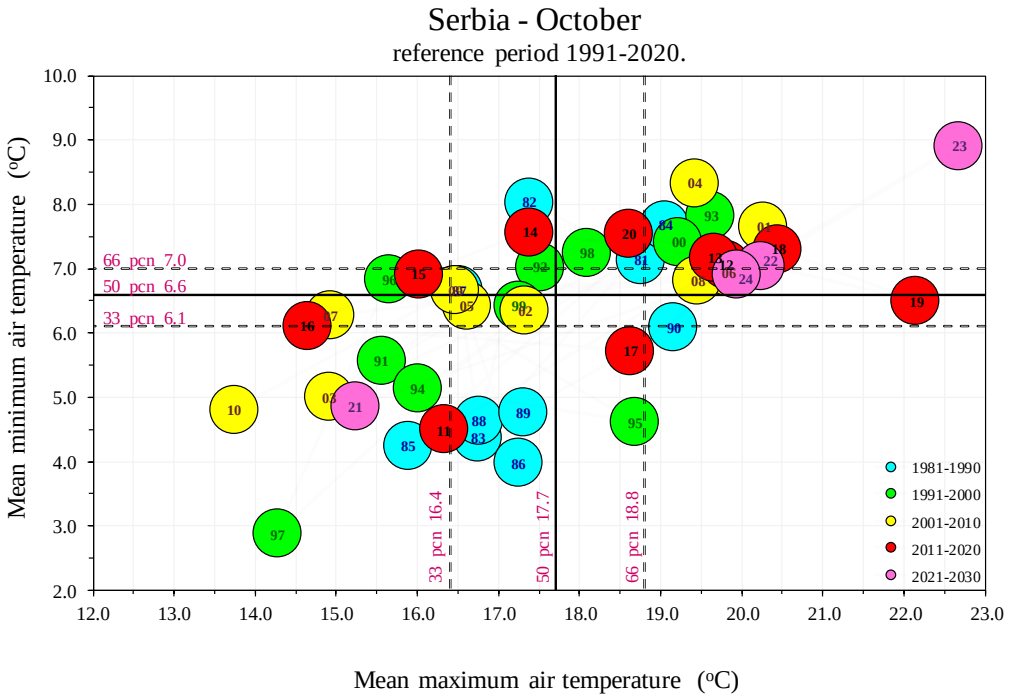


Figure 8. Assessment of minimum and maximum air temperature for Serbia with the accompanying terciles in relation to the 1991-2020 base period

Figure 9 shows daily course of the minimum daily air temperature and the accompanying percentiles for Belgrade in October 2024, and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje are given in the Appendix.

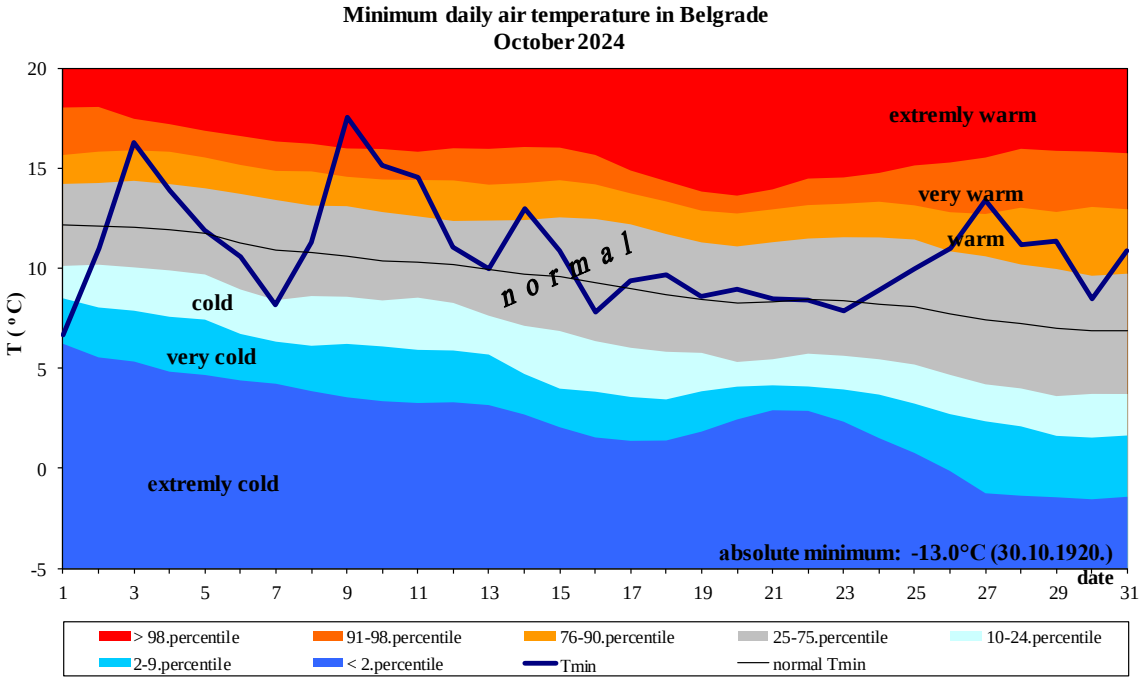


Figure 9. Daily course of the minimum daily air temperature and accompanying percentiles for Belgrade

PRECIPITATION

Dry October in most of Serbia, in the north average precipitation sums. October 2024 ranks as **the 3rd driest** for Crni Vrh (*Figure 10)*. This October was **the 20th driest** in the period from 1951-2024 (*Figure 11*).

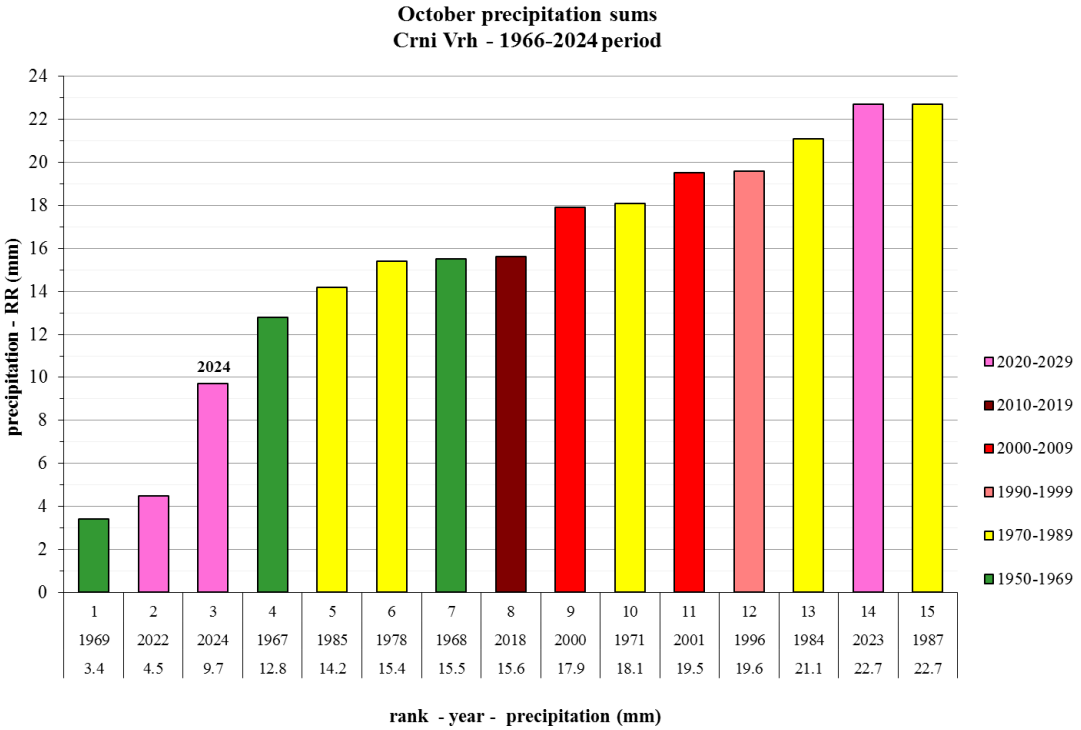


Figure 10. Rank of the lowest precipitation on Crni Vrh

Figure 11. Rank of the wettest and driest October in Serbia for the period from 1951 to 2024

October precipitation sums ranged from 6,8 mm in Negotin to 51,5 mm in Loznica, while Belgrade observed 22,2 mm (*Figure 12*).

Precipitation totals compared to the normal for the 1991-2020 base period ranged from 12% in Negotin to 85% in Sremska Mitrovica (*Figure 13*).

Based on the percentile method, precipitation sums were in the categories of dry and normal in most of the country, and extremely dry at Crni Vrh (*Figure 14*).

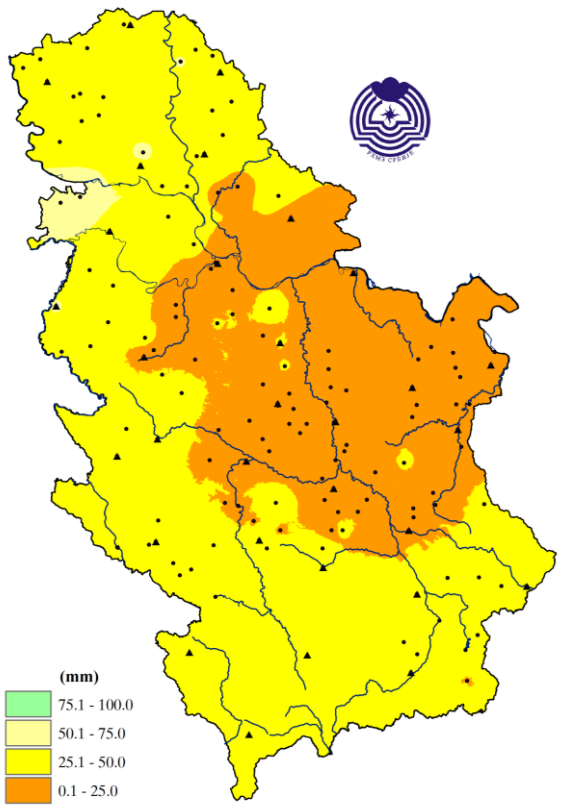


Figure 12. Spatial distribution of the monthly precipitation sums (mm) according to data from 28 major meteorological, 27 climatological and 92 rain gauge stations

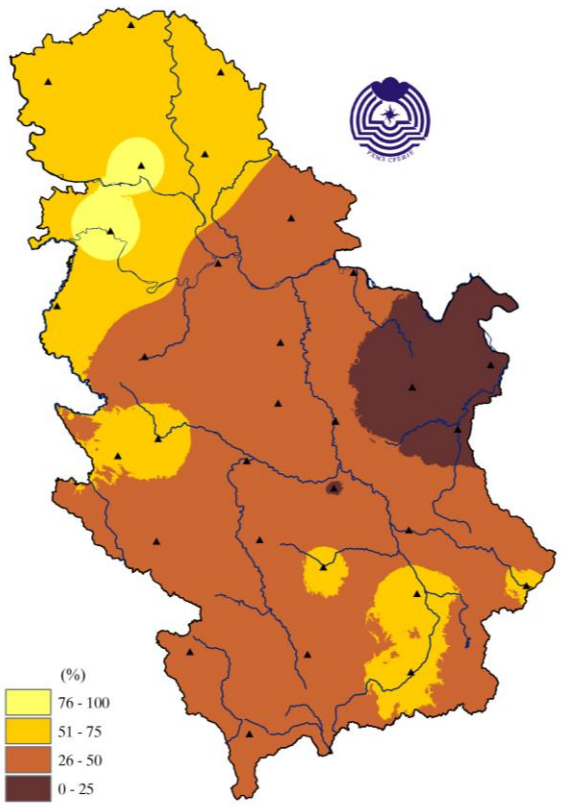


Figure 13. Spatial distribution of the monthly precipitation sums in the percentages of normal for the 1991–2020 base period

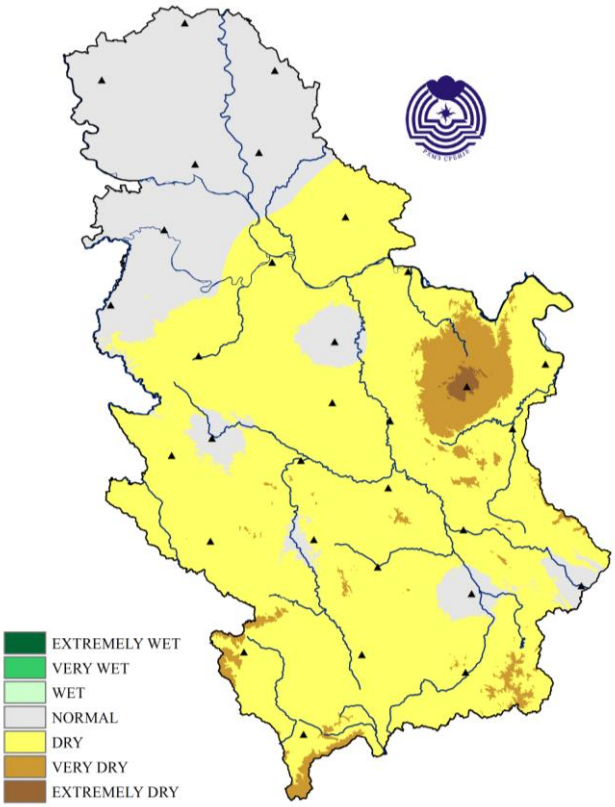


Figure 14. Monthly precipitation sums according to the percentile method

The highest daily precipitation sum of 28,6 mm was recorded in Novi Sad and Sremska Mitrovica on October 4. On October 5, Belgrade recorded the highest daily precipitation sum of 14,0 mm.

Number of days with precipitation during October ranged from 5 in Banatski Karlovac, Kursumlija and Dimitrovgrad to 11 in Vranje (*Figure 15).* The recorded number of days with precipitation was 2 to 5 days below the October average in most of the country (*Figure 16).*

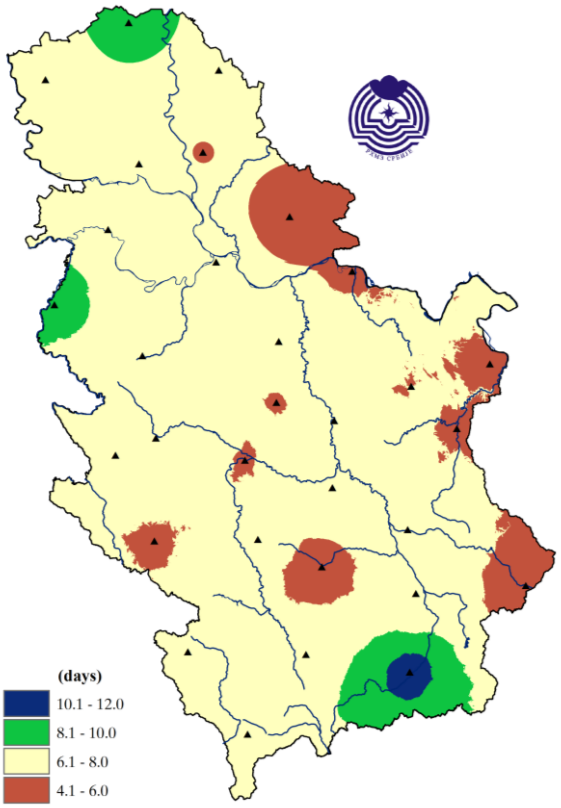


Figure 15. Spatial distribution of number of days with precipitation

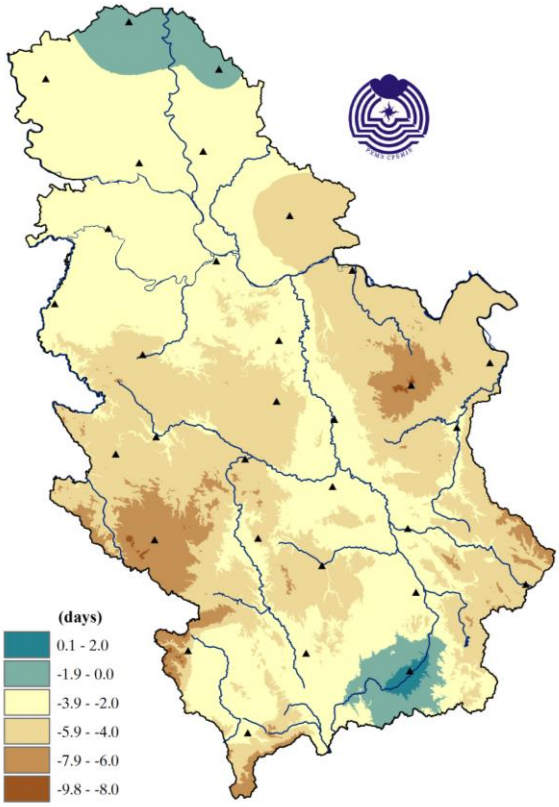


Figure 16. Spatial distribution of deviation of number of days with precipitation

Figure 17 shows assessment of air temperature and precipitation sums for Serbia for October based on the tercile distribution relative to the 1991 – 2020 base period. It can be noted that October 2024 was marked by air temperature above the upper tercile threshold and precipitation sums below the lower tercile threshold.

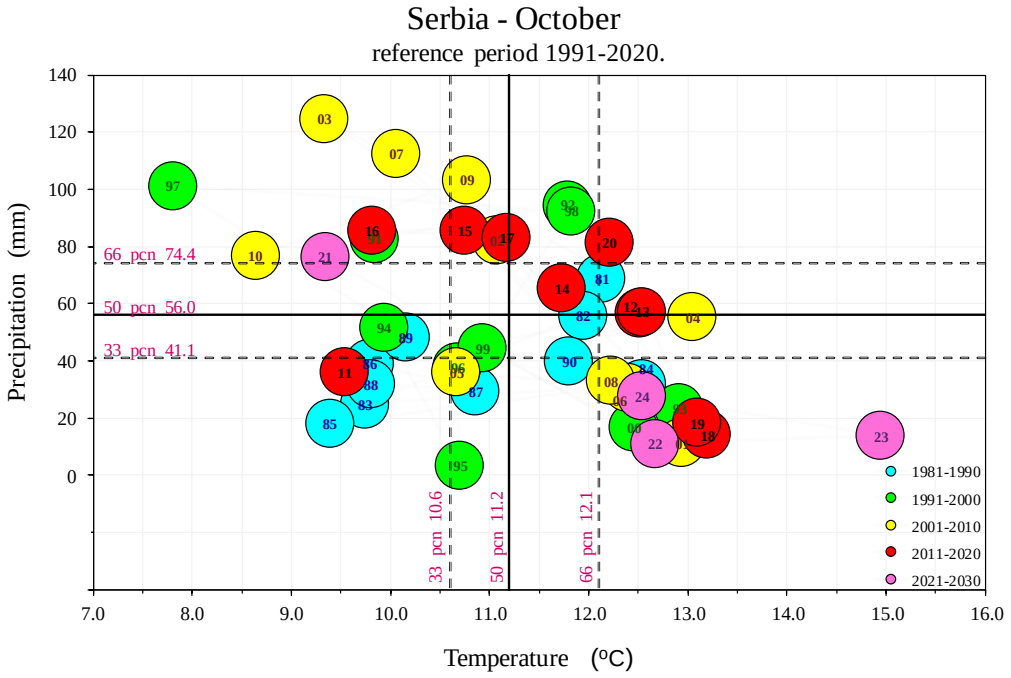


Figure 17. Assessment of air temperature and precipitation for Serbia with the accompanying terciles in relation to the 1991-2020 base period

Figure 18 show daily and cumulative precipitations sums with averaged normal 1991-2020 for October in Belgrade, and for the stations Sombor, Novi Sad, Loznica, Negotin, Kragujevac, Zlatibor, Nis and Vranje precipitation sums are given in Appendix.

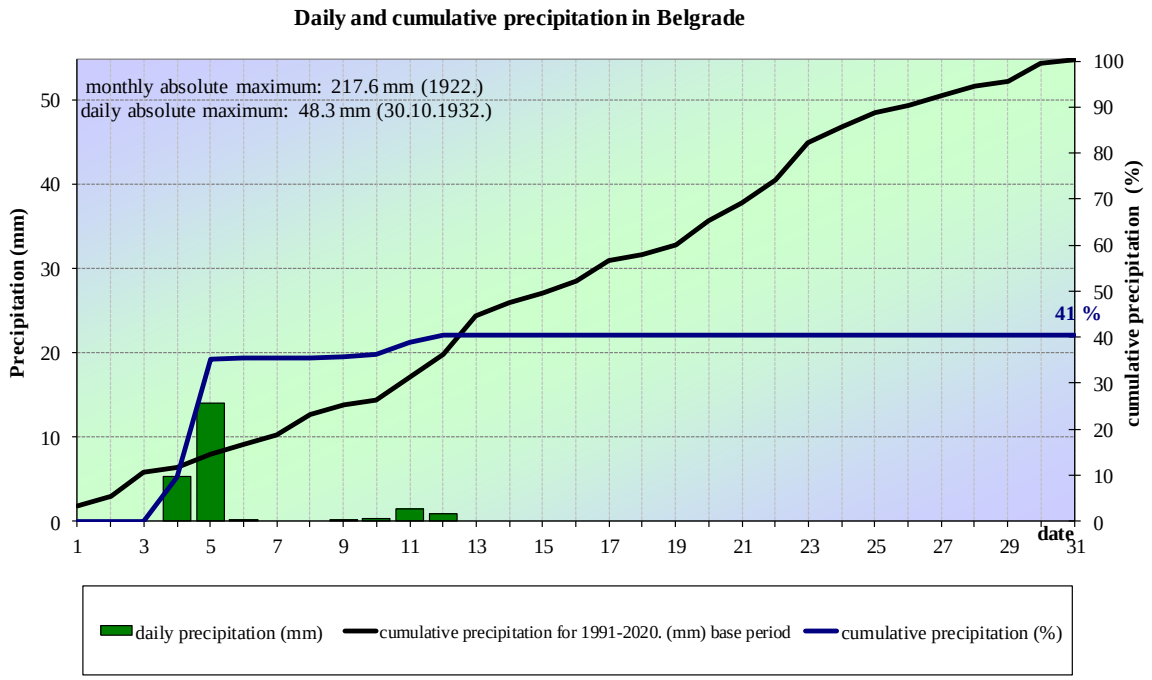


Figure 18. Daily and cumulative precipitation in Belgrade

CLOUD COVER, BRIGHT AND CLOUDY DAYS

Mean October cloud cover in Serbia was 1/10 to 2/10 below the average, ranging from 3/10 in Negotin and Banatski Karlovac to 6/10 in Pozega. Figures 19, 20 and 21 show average daily cloud cover in October for Belgrade, Pozega and Negotin.

Pozega didn't observe any bright days[7] whereas the highest number, total of 14 days, was recorded in Negotin. Belgrade recorded 10 bright days. The observed number of bright days was 2 to 5 days above the October average in the east, south and northeast of the country. In Negotin, 7 days above the October average were recorded.

Number of bright days[8] ranged from 1 in Negotin to 8 in Kursumlija, whilst Belgrade observed 4 bright days. Number of bright days was 3 to 6 days below October average.

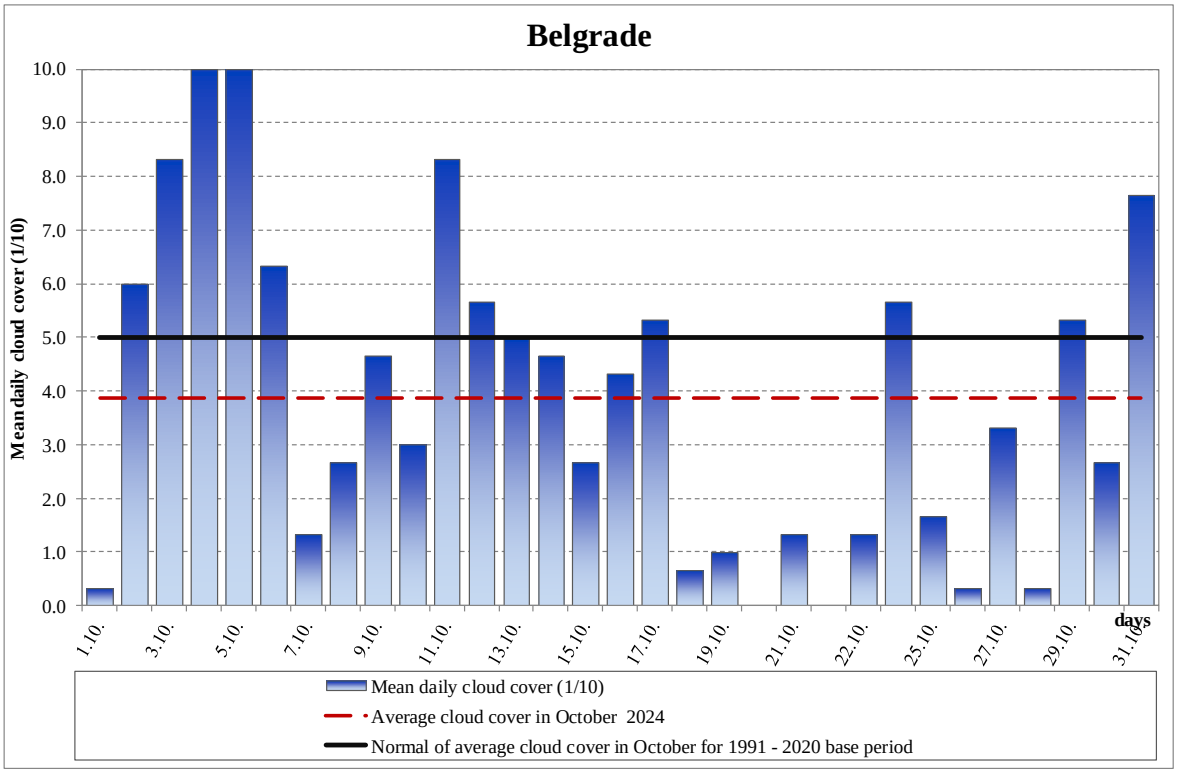


Figure 19. Mean daily cloud cover in Belgrade

[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

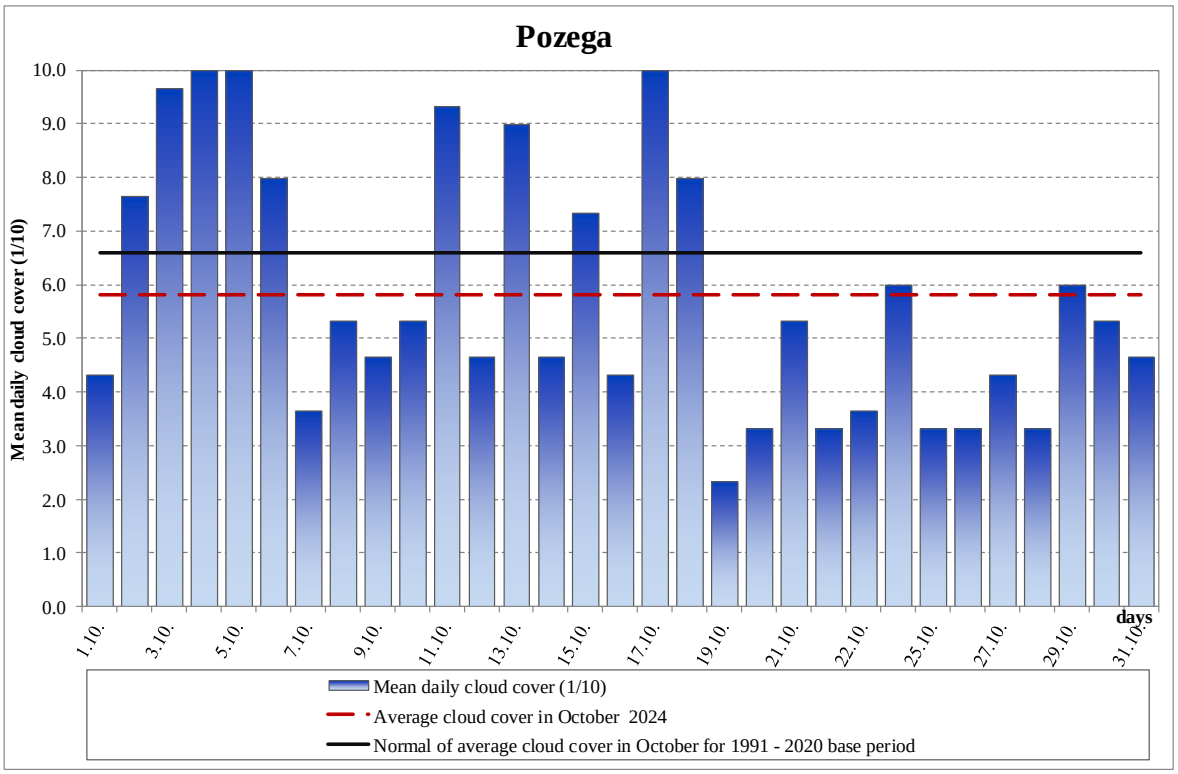


Figure 20. Mean daily cloud cover in Pozega

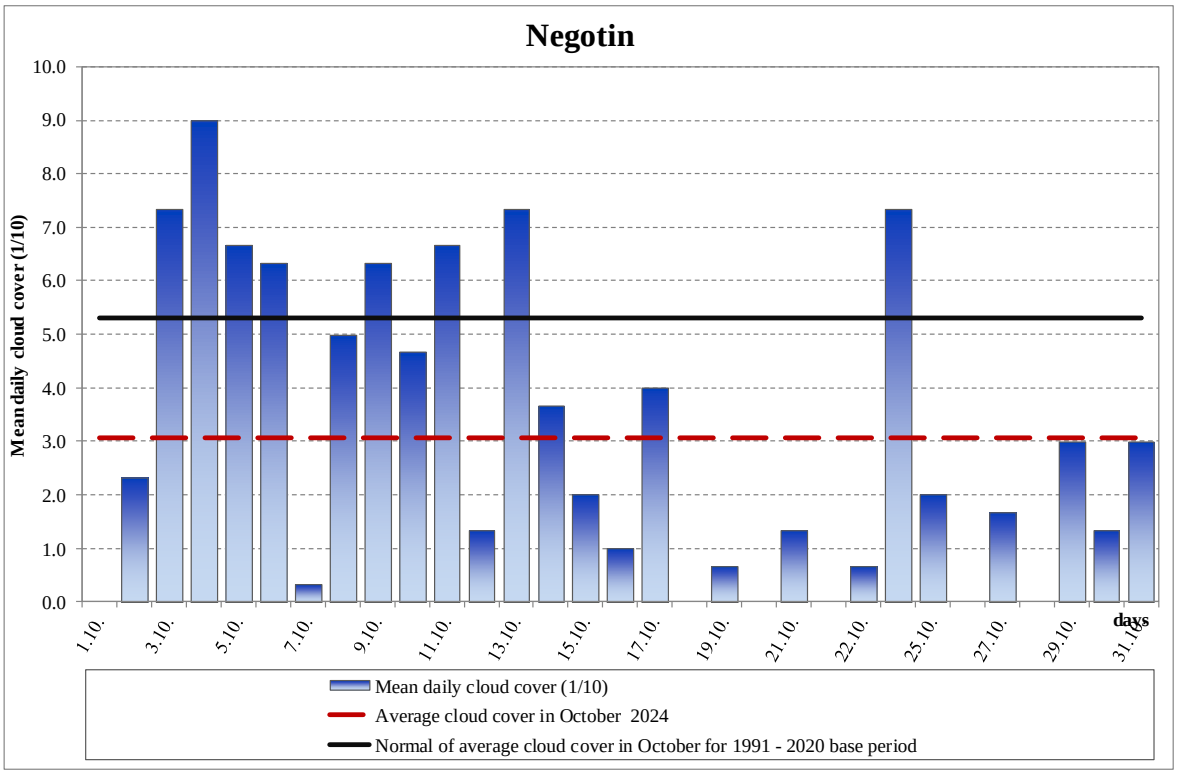


Figure 21. Mean daily cloud cover in Negotin

SUNSHINE DURATION (INSOLATION)

Sunshine duration in October ranged from 125,8 hours in Pozega to 229,5 hours in Negotin (*Figure 22*).

October insolation ranged from 103% in Leskovac to 159% in Negotin compared to the normal for the 1991-2020 base period (*Figure 23).*

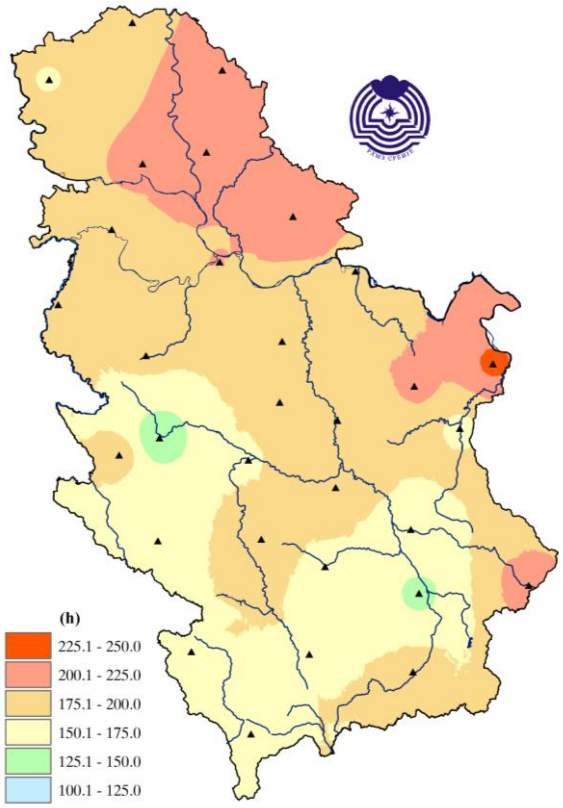


Figure 22. Insolation, expressed in hours

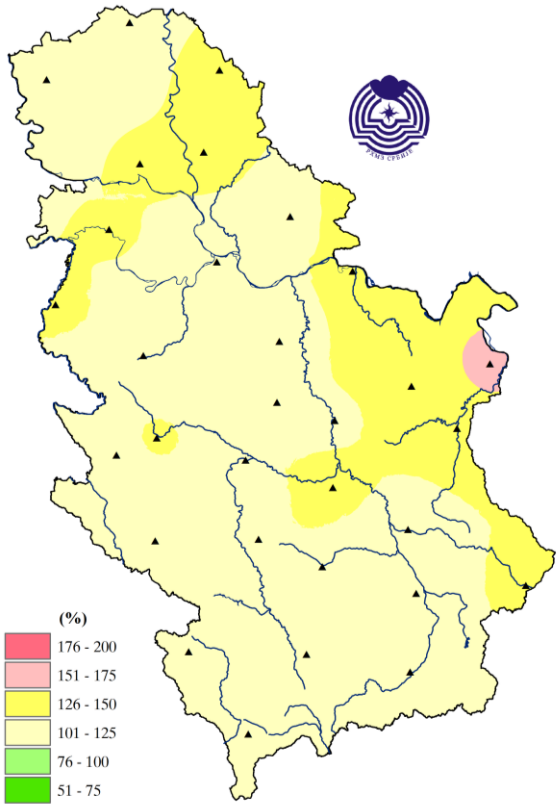


Figure 23. Insolation expressed in the percentages of normal

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

OVERVIEW OF THE SYNOPTIC SITUATION*

In the first half of the month, it was relatively warm but changeable weather, with occasional rain and showers, i.e. with the prevailing influence of the cold and moist air masses within the low pressure from the northwest and west of the continent. Subsequently, influence of anticyclone and ridge prevailed, briefly interrupted at the end of the second decade, but generally settled and dry weather remained.

Period at the beginning of the month was marked by warm and stable weather. After a few days, low pressure was developed in the North Sea with upper air trough strengthening over the western Europe and western Mediterranean and gradually transferring towards Central Europe and the Balkan Peninsula which caused change in the weather. Deep low pressure from the Alps and western Mediterranean with the accompanying frontal waves of the wet air moved eastward towards the Carpathians across our region causing cloudiness, rain and thundershowers, at first in the western and northwestern parts of the country, and later across the entire country accompanied by a brief noticeable cooling.

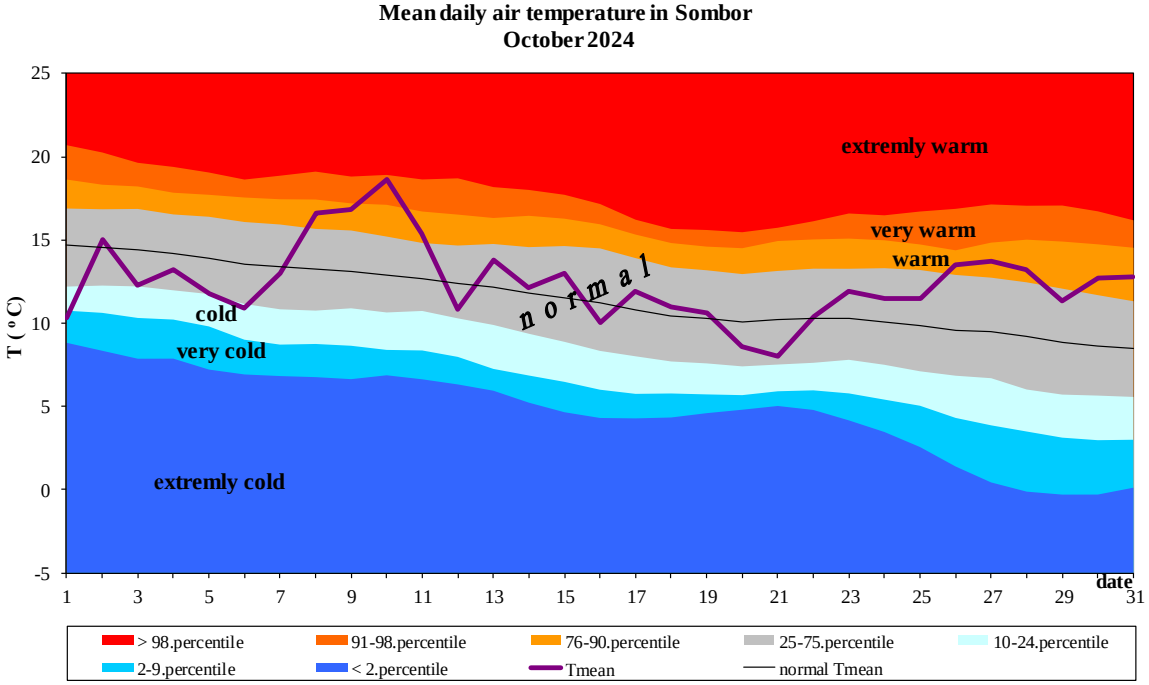
Second part of the first decade, as well as at the beginning of the second decade was marked by influence of wet air mass within the low pressure developing over the Atlantic, and moving eastward. This caused meridional deformations in the geopotential field across the Balkans. The low pressure was established in the western Mediterranean and central Europe with occasionally cloudy weather and rain.

Then, for most of the second decade and until the end of the month, weather was predominantly dry, relatively warm, and settled under the influence of high-pressure systems and ridges. Low pressure circulations mostly took place in the west, over the Bay of Biscay and Western Europe, and to the east of our region, maintaining an omega-blocking pattern for most days. In the second half of the second decade, low pressure developed in the Tyrrhenian Sea and its slow filling led to cloudier weather in the west and south of the country, with occasional light rain or brief showers and stronger southeast winds in the Košava region. In the second half of the third decade, a weak frost was recorded in the east. At the end of the month, low pressure strengthened to the north of the continent, disrupting the ridge.

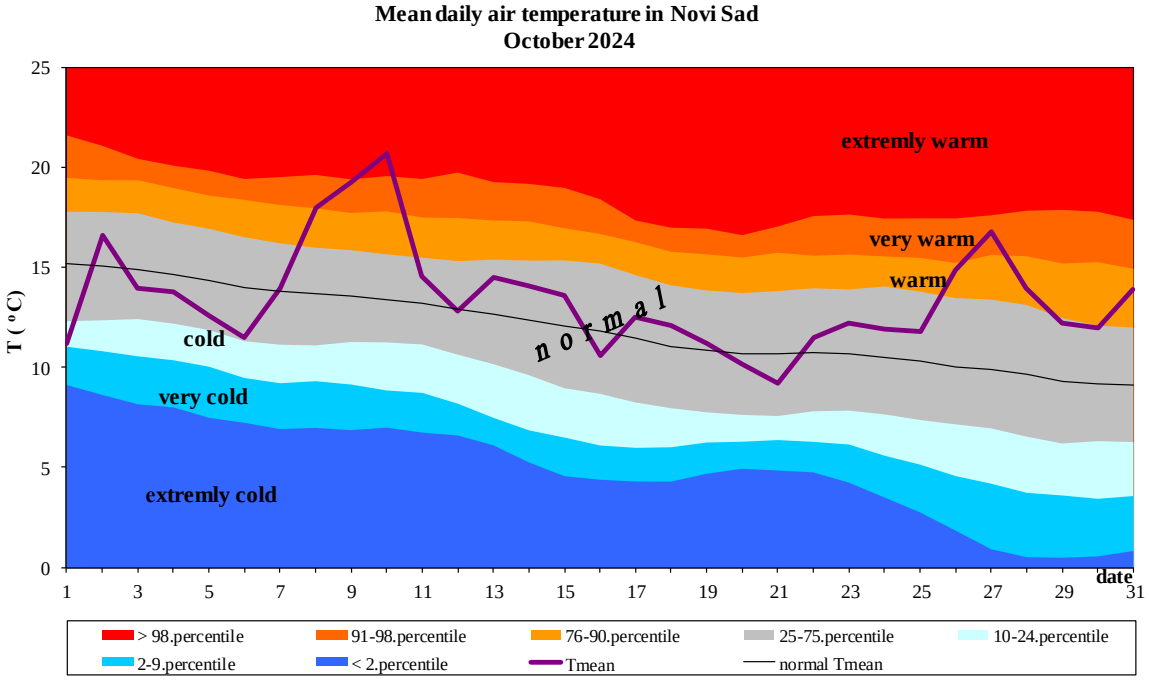
* National Center for Hydrometeorlogical Early Warning System

APPENDIX

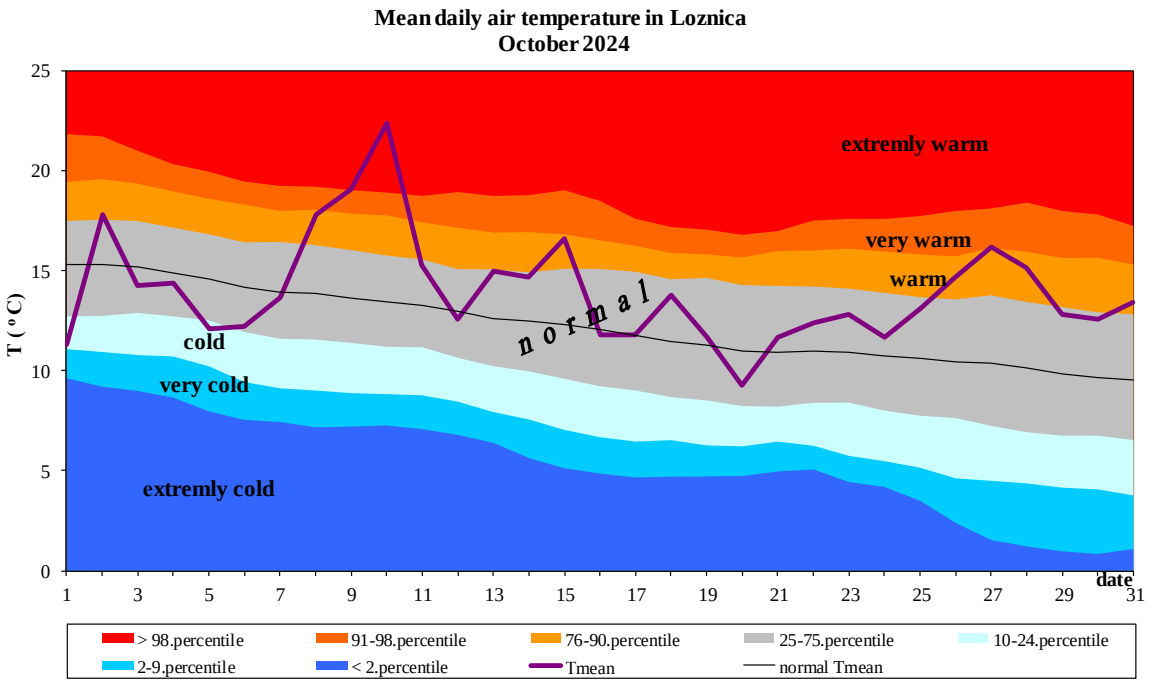
Mean air temperature



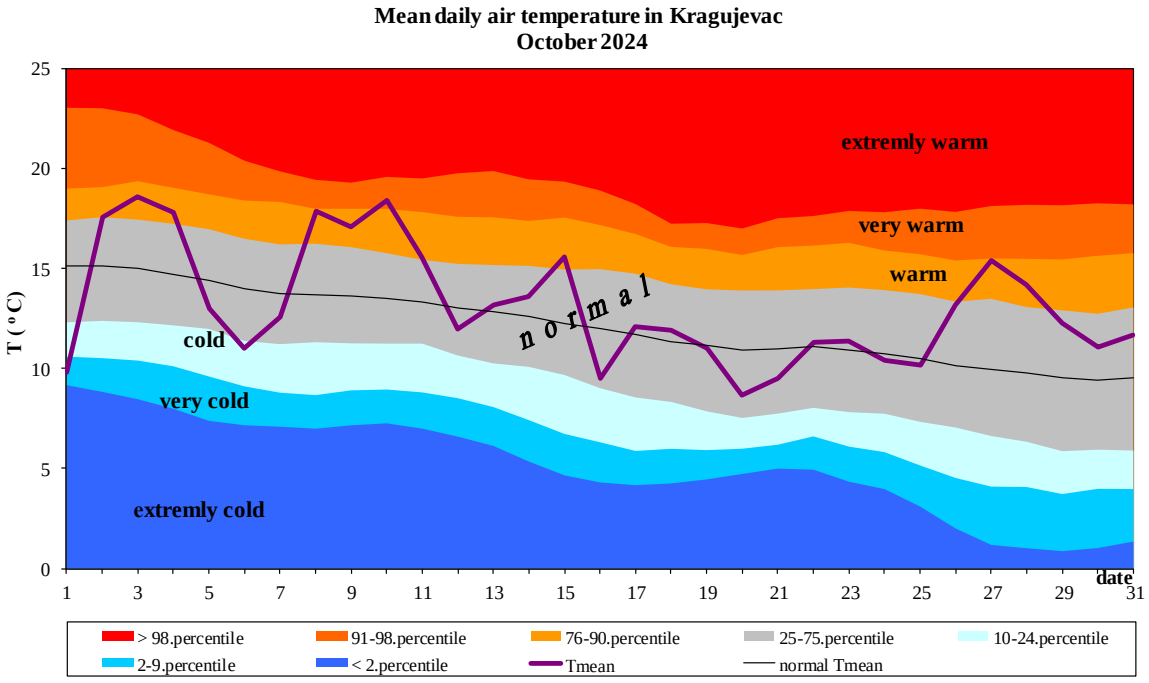
Appendix 1. Daily course of the mean daily air temperature and accompanying percentile for Sombor



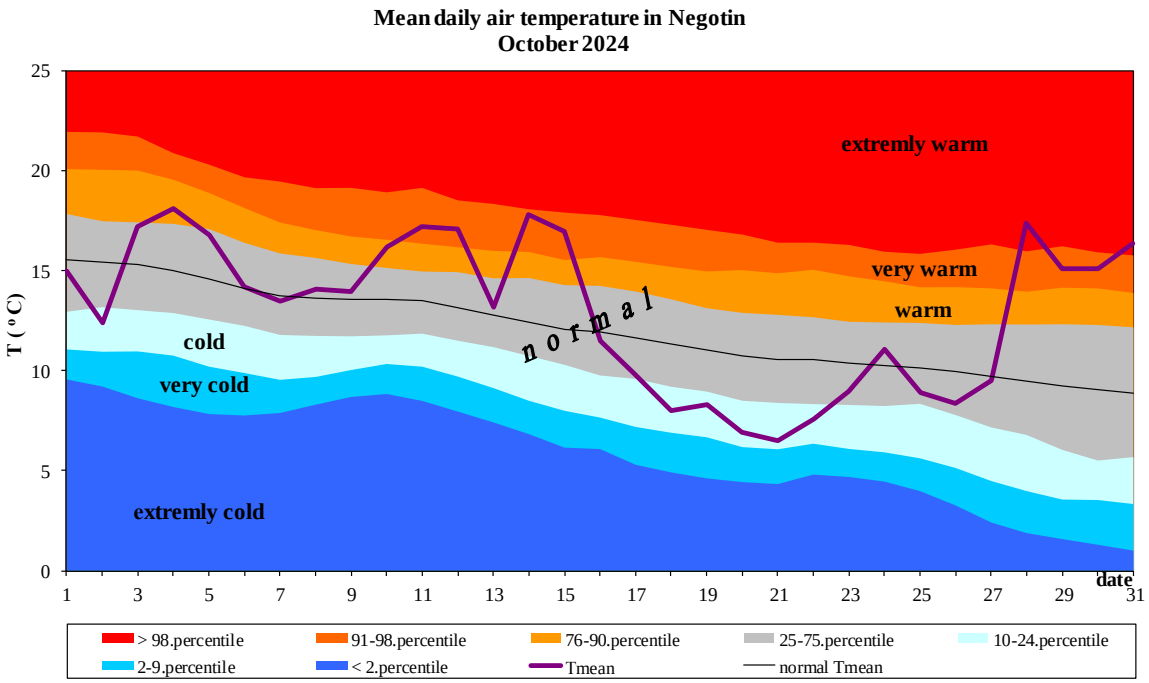
Appendix 2. Daily course of the mean daily air temperature and accompanying percentile for Novi Sad



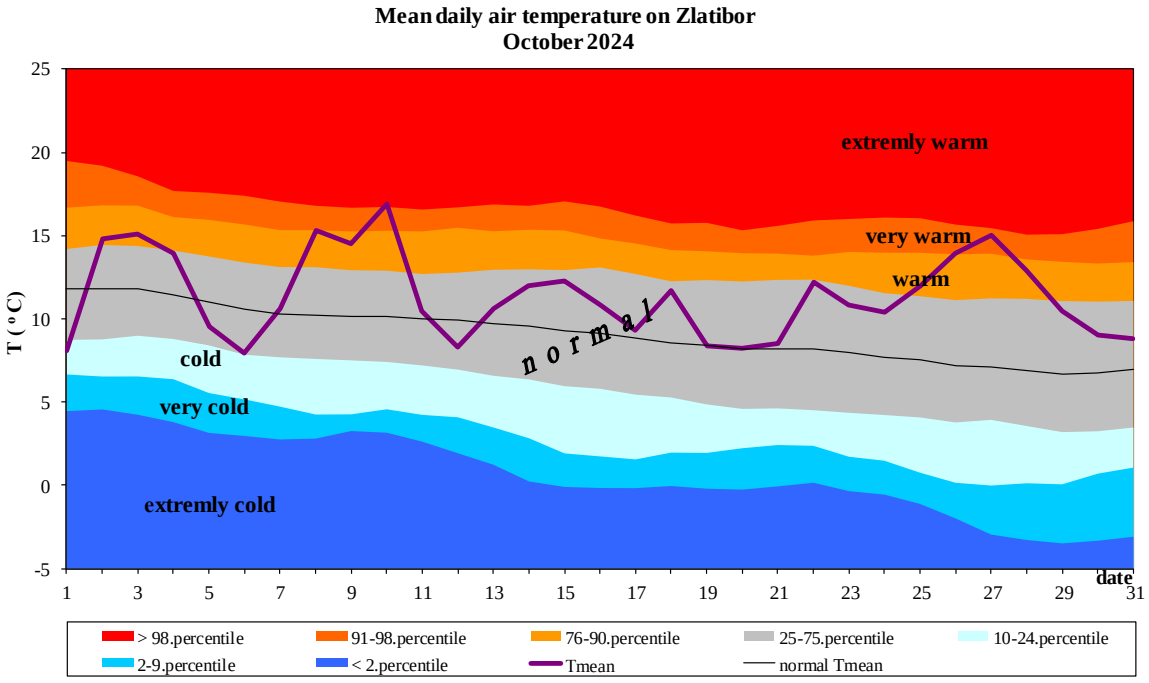
Appendix 3. Daily course of the mean daily air temperature and accompanying percentile for Loznica



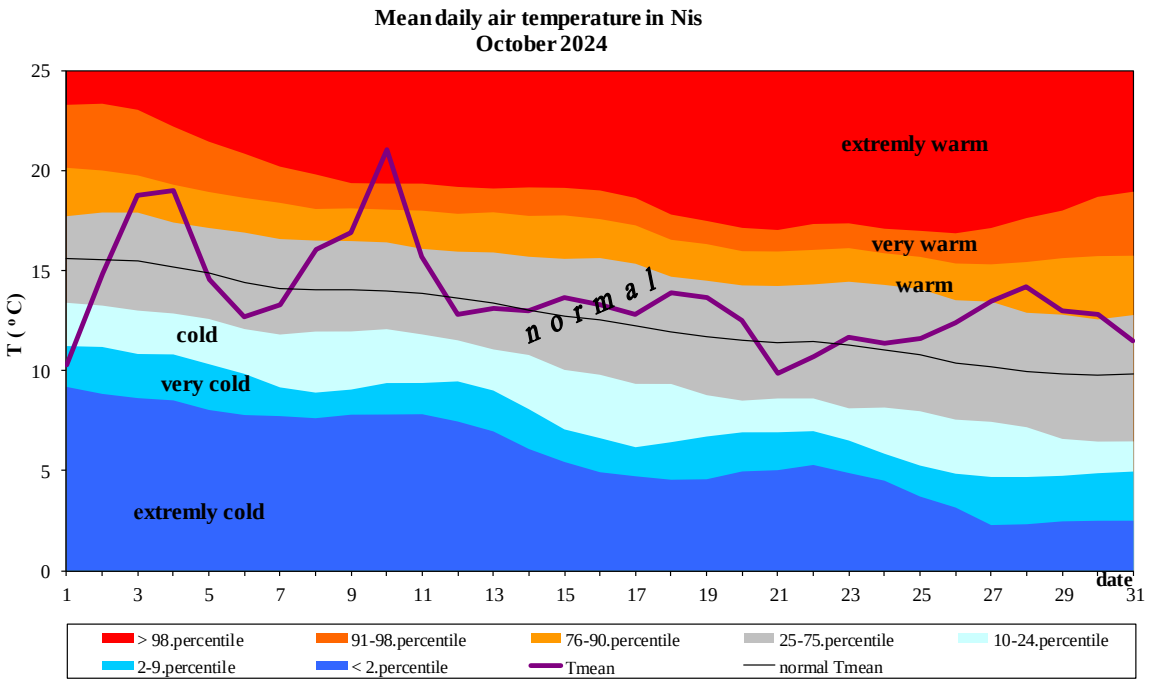
Appendix 4. Daily course of the mean daily air temperature and accompanying percentile for Kragujevac



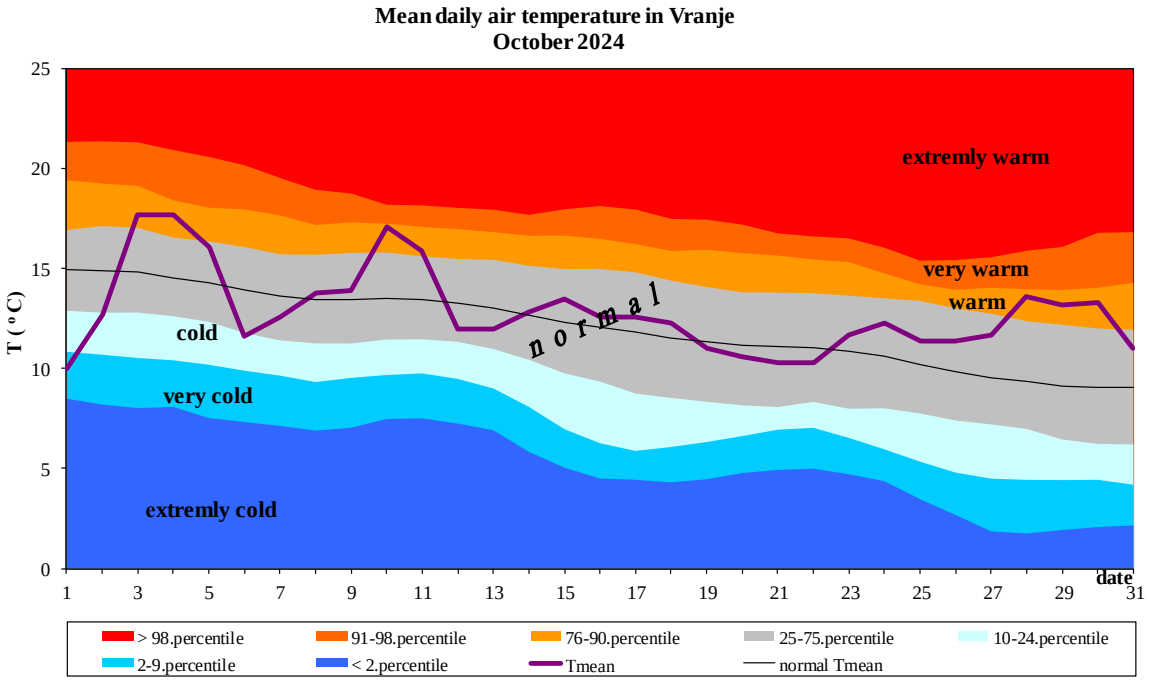
Appendix 5. Daily course of the mean daily air temperature and accompanying percentile for Negotin



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

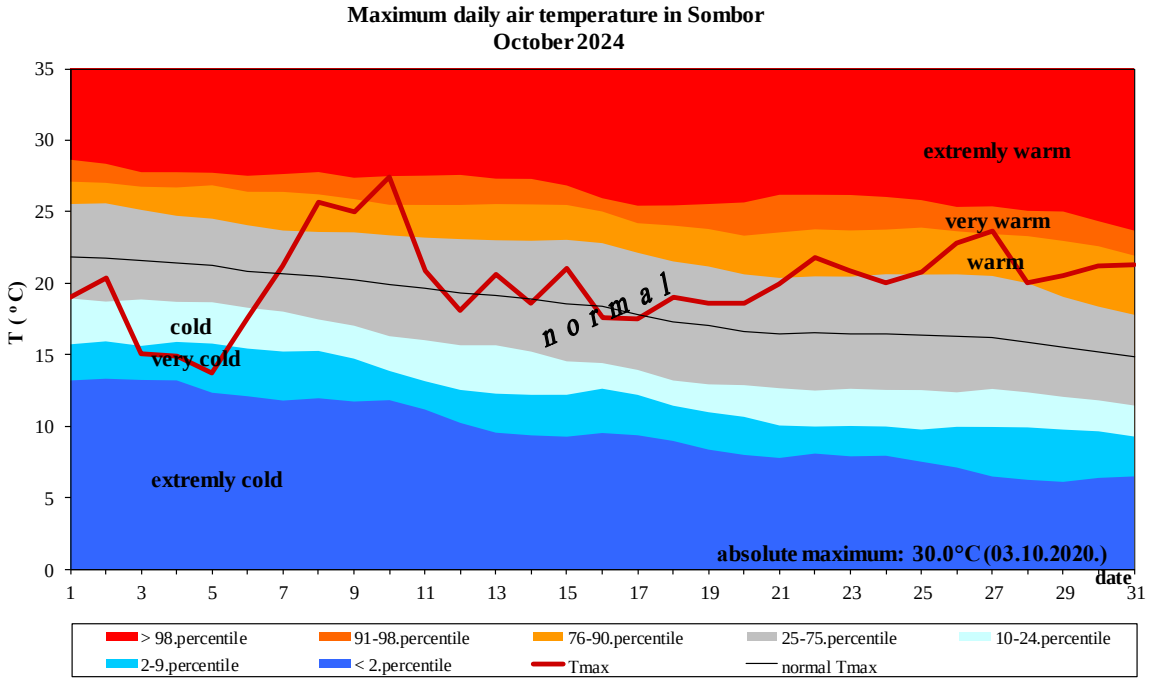


Appendix 7. Daily course of the mean daily air temperature and accompanying percentile for Nis

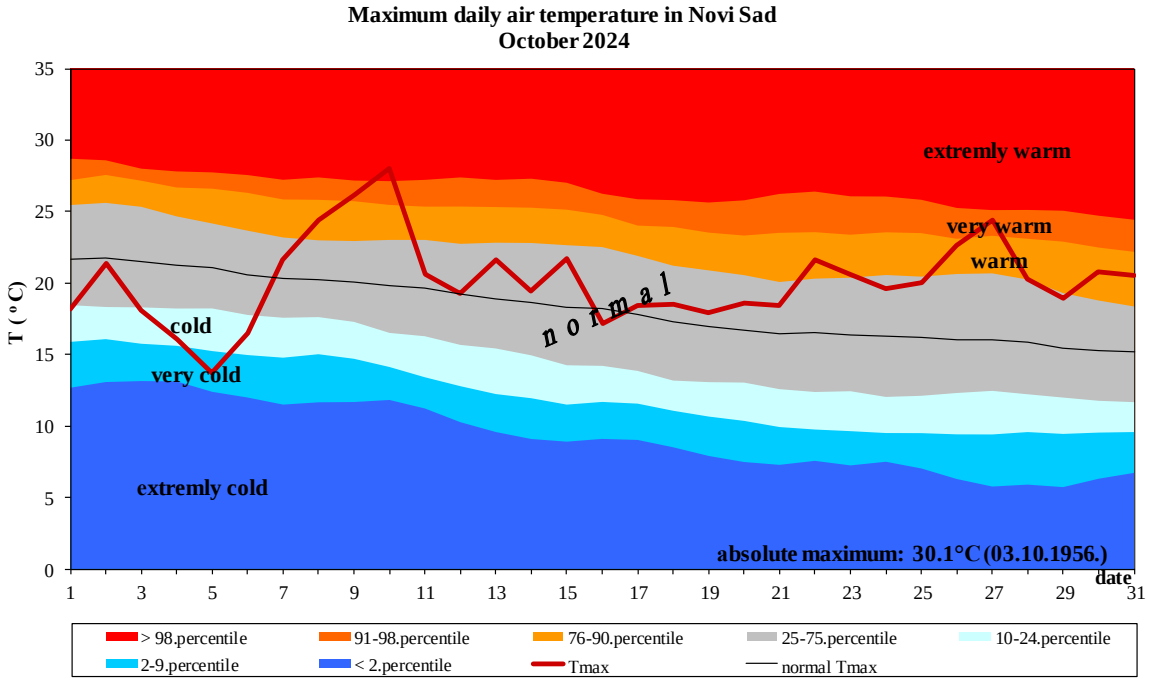


Appendix 8. Daily course of the mean daily air temperature and accompanying percentile for Vranje

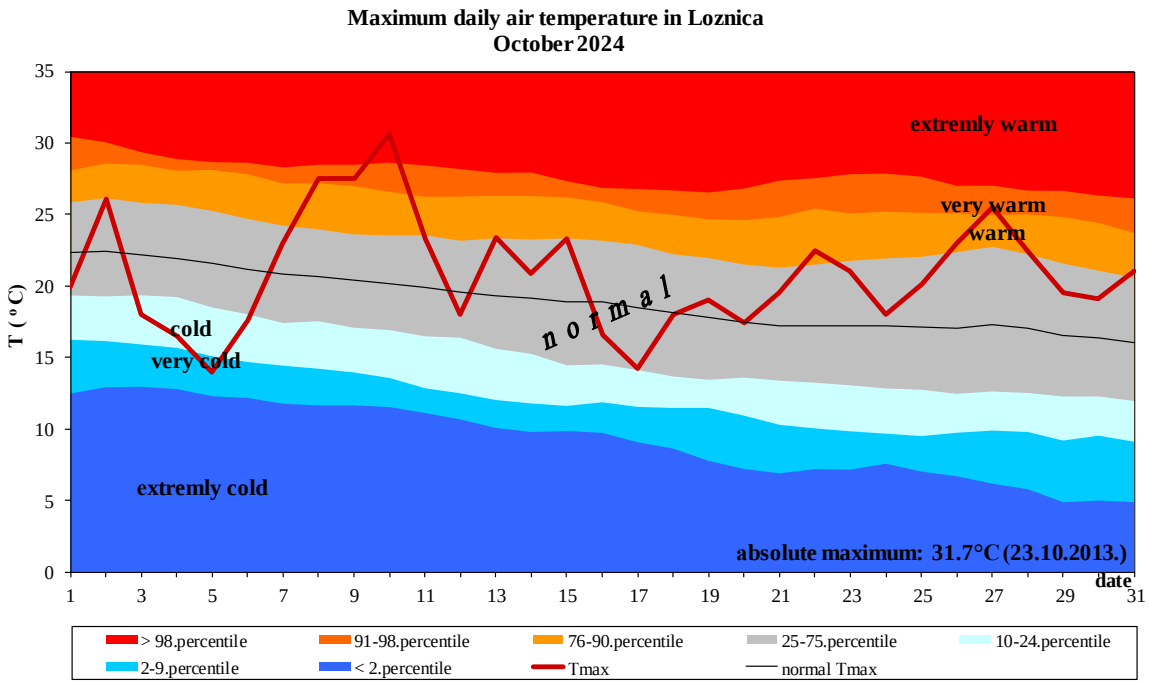
Maximum air temperature



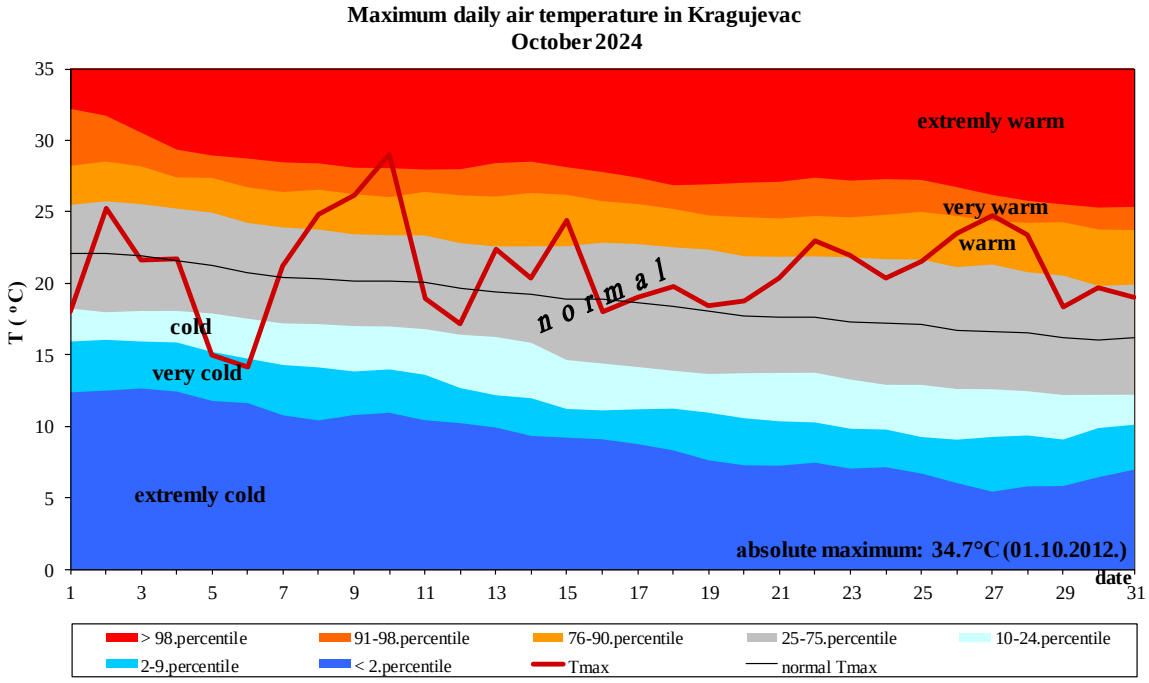
Appendix 9. Daily course of the maximum daily air temeperature and the accompanying percentile for Sombor



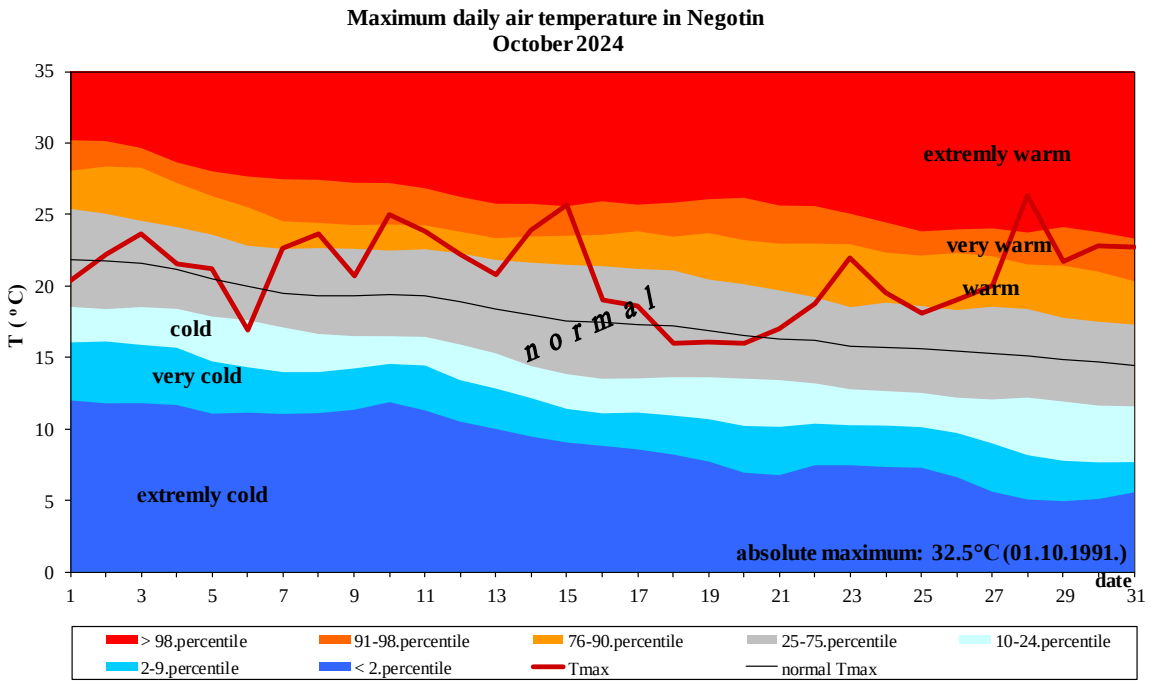
Appendix 10. Daily course of the maximum daily air temeperature and the accompanying percentile for Novi Sad



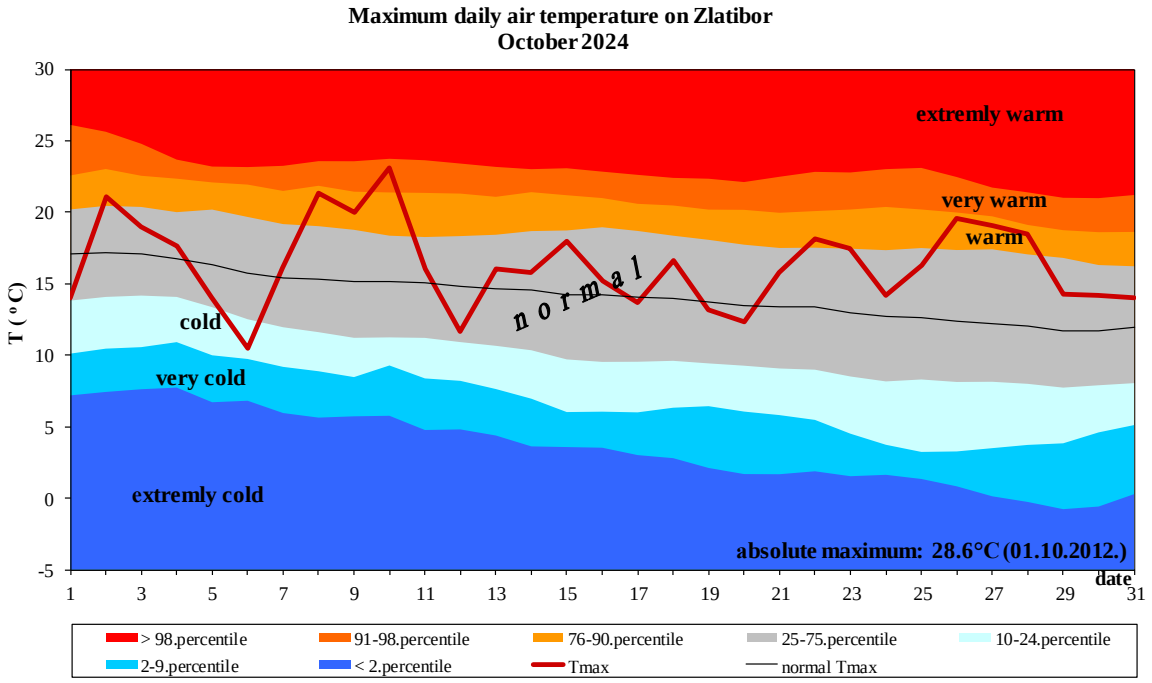
Appendix 11. Daily course of the maximum daily air temeperature and the accompanying percentile for Loznica



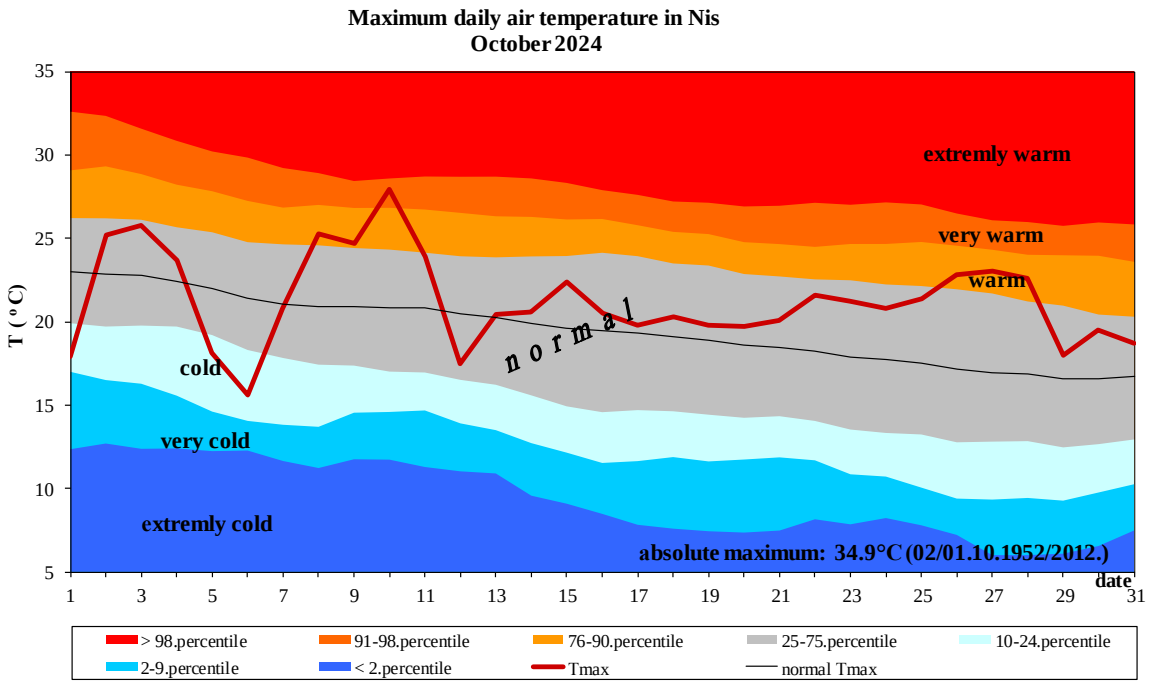
Appendix 12. Daily course of the maximum daily air temeperature and the accompanying percentile for Kragujevac



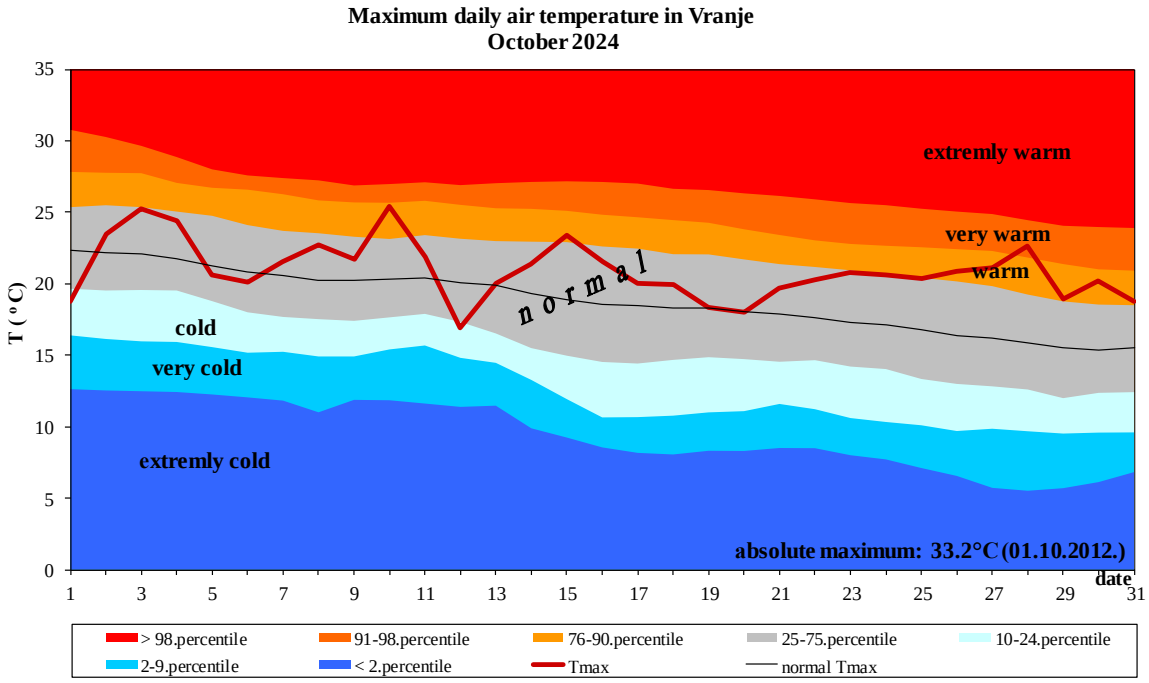
Appendix 13. Daily course of the maximum daily air temeperature and the accompanying percentile for Negotin



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

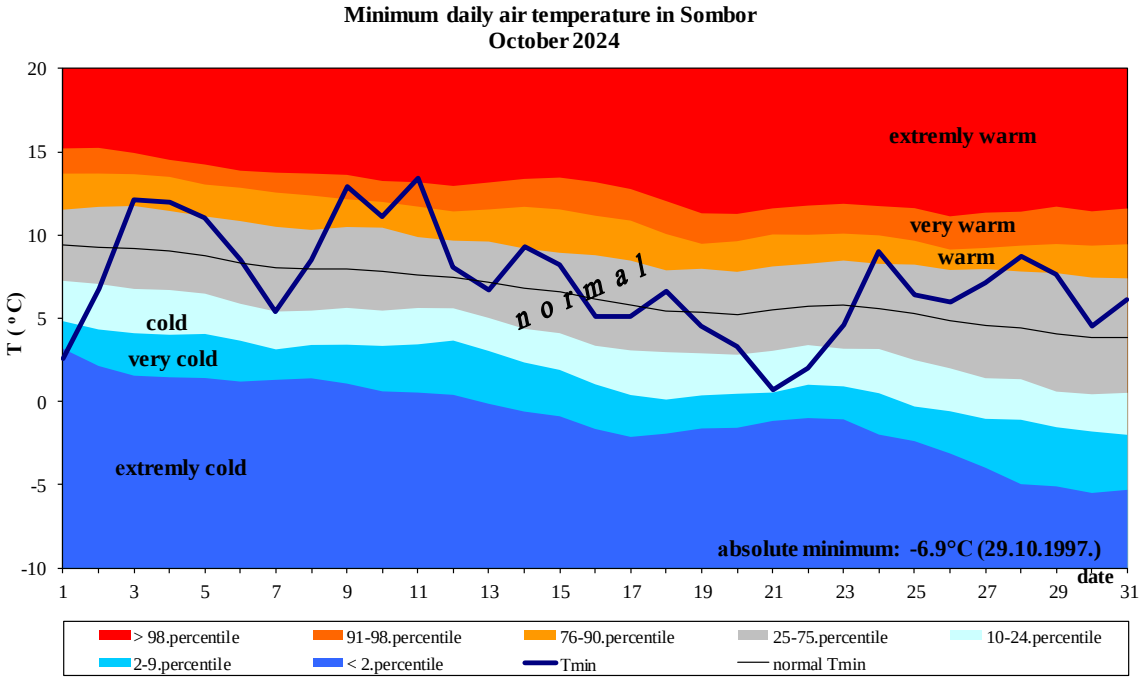


Appendix 15. Daily course of the maximum daily air temeperature and the accompanying percentile for Nis

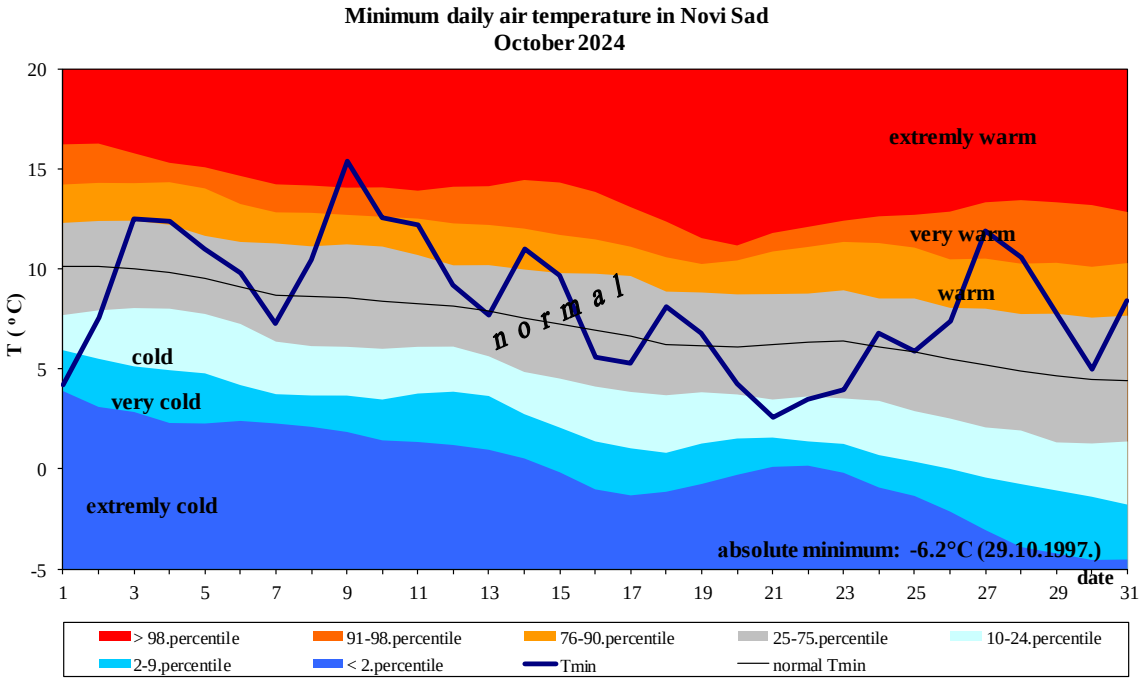


Appendix 16. Daily course of the maximum daily air temeperature and the accompanying percentile for Vranje

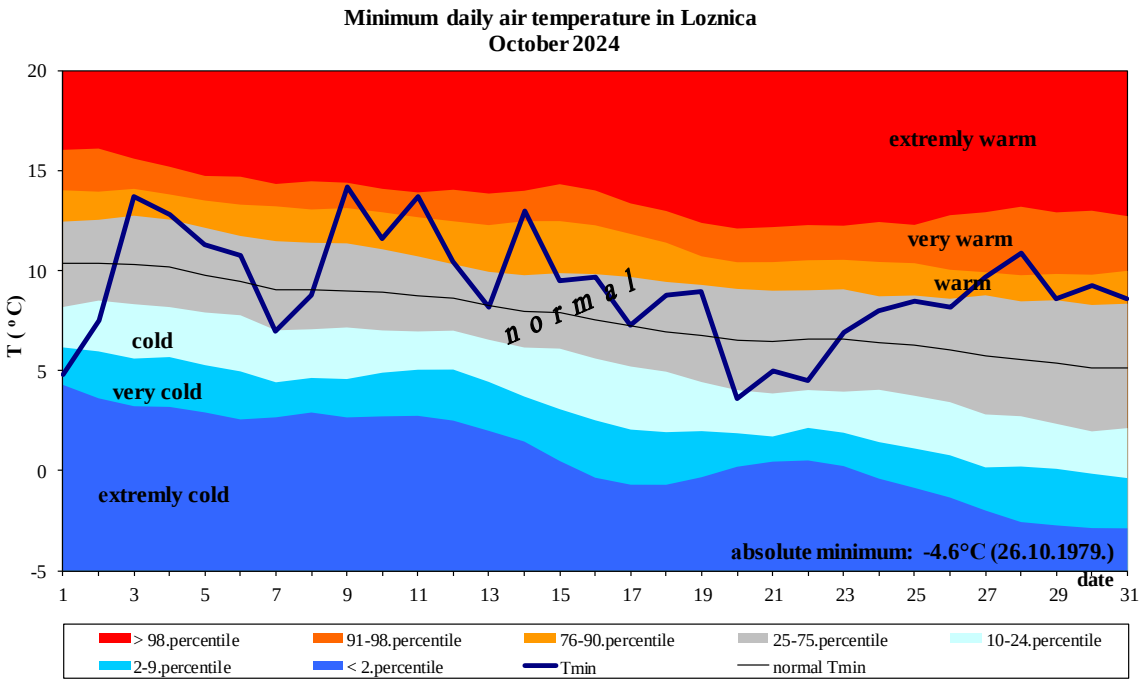
Minimum air temperature



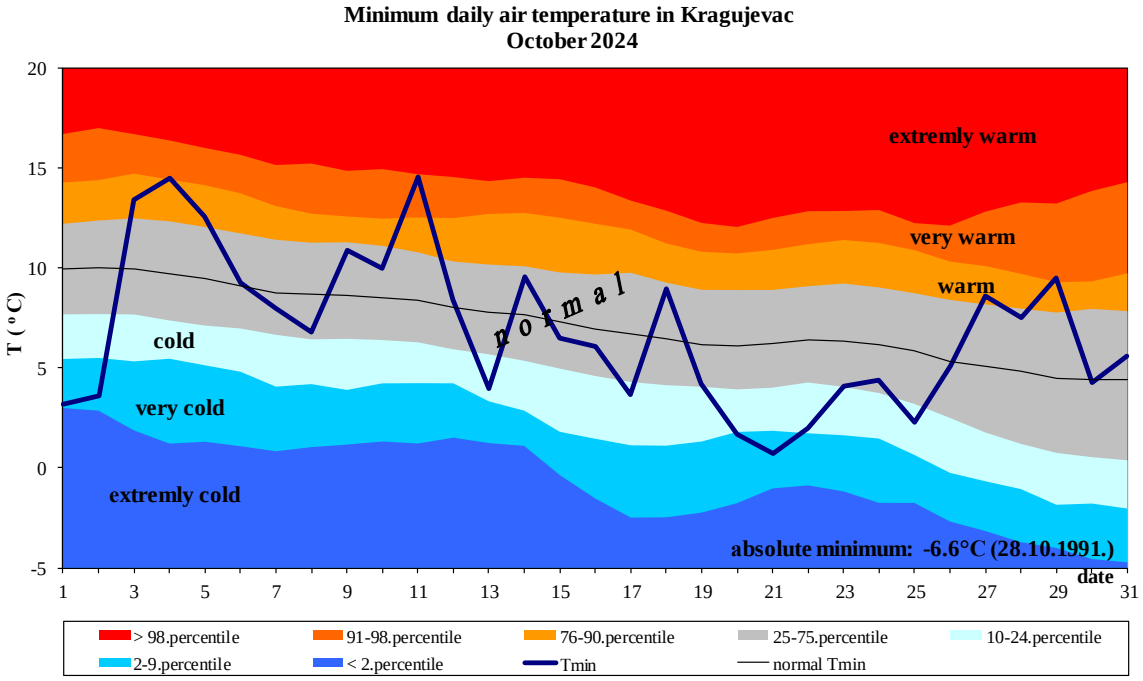
Appendix 17. Daily course of the minimum daily air temperature and the accompanying percentile for Sombor



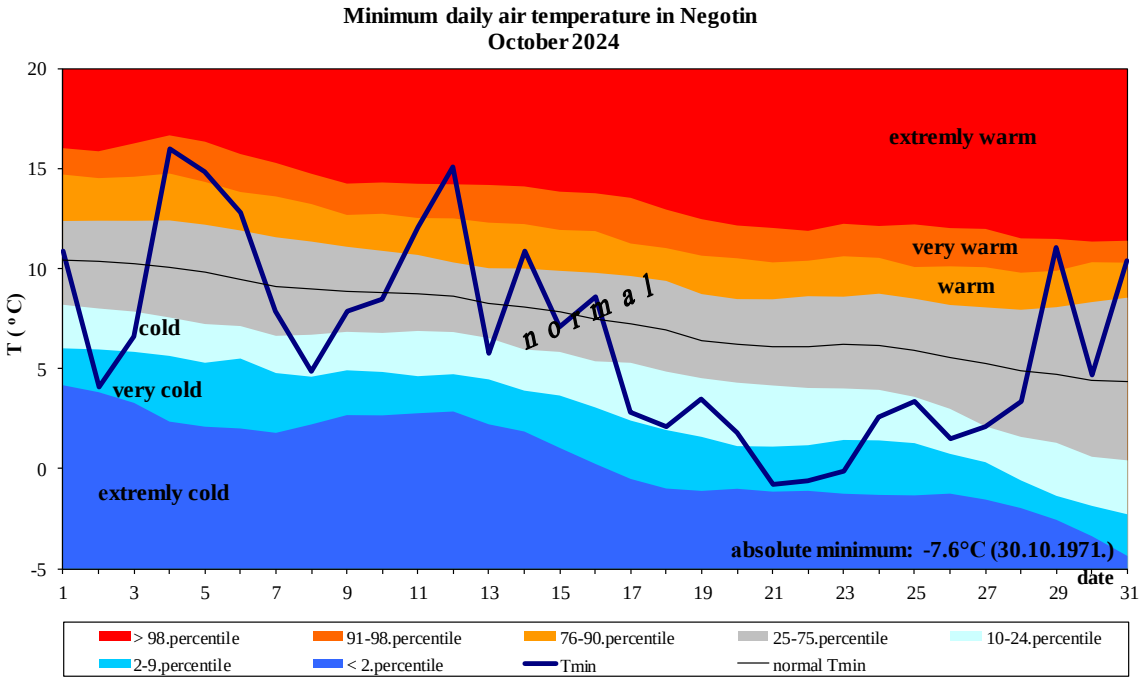
Appendix 18. Daily course of the minimum daily air temperature and the accompanying percentile for Novi Sad



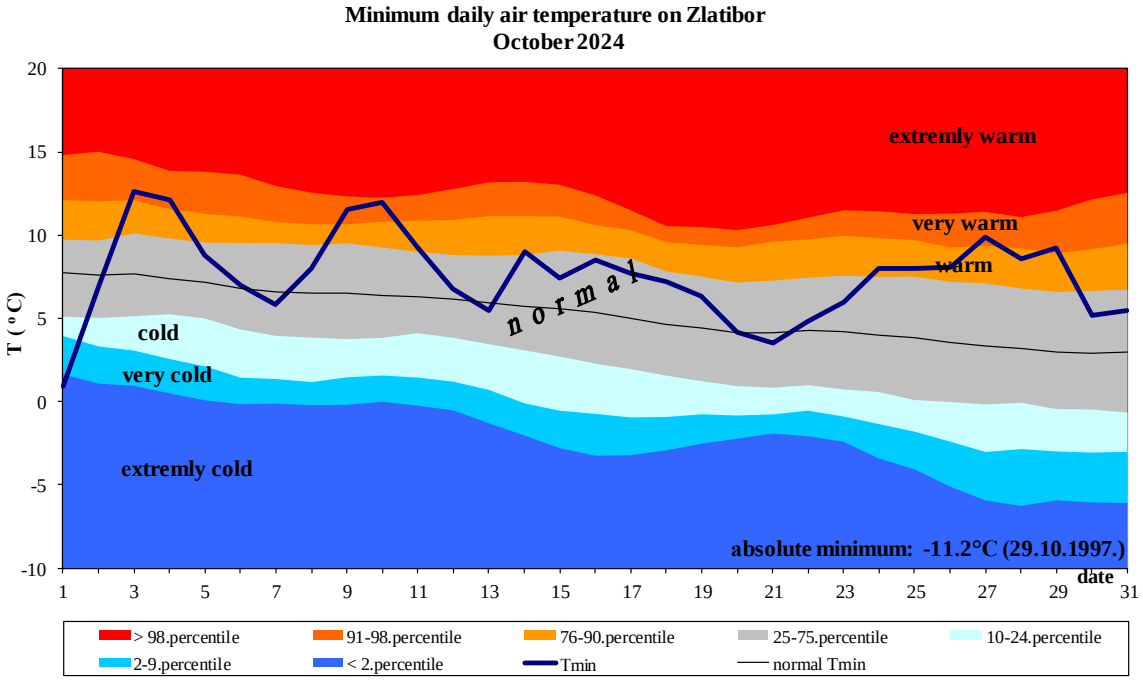
Appendix 19. Daily course of the minimum daily air temperature and the accompanying percentile for Loznica



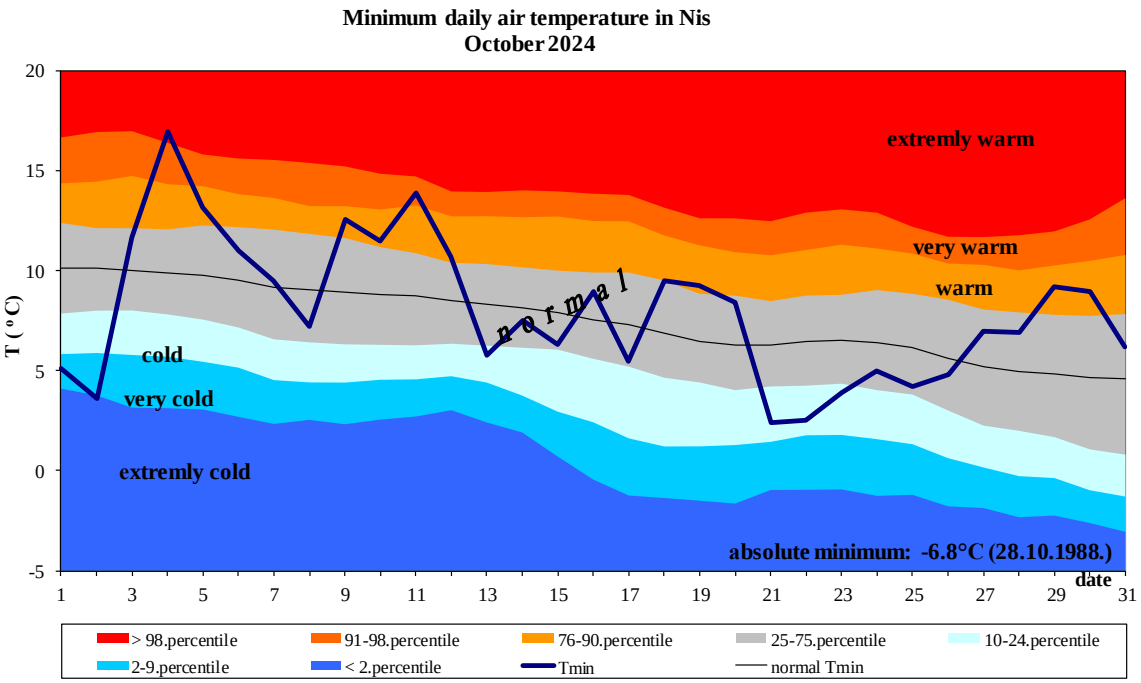
Appendix 20. Daily course of the minimum daily air temperature and the accompanying percentile for Kragujevac



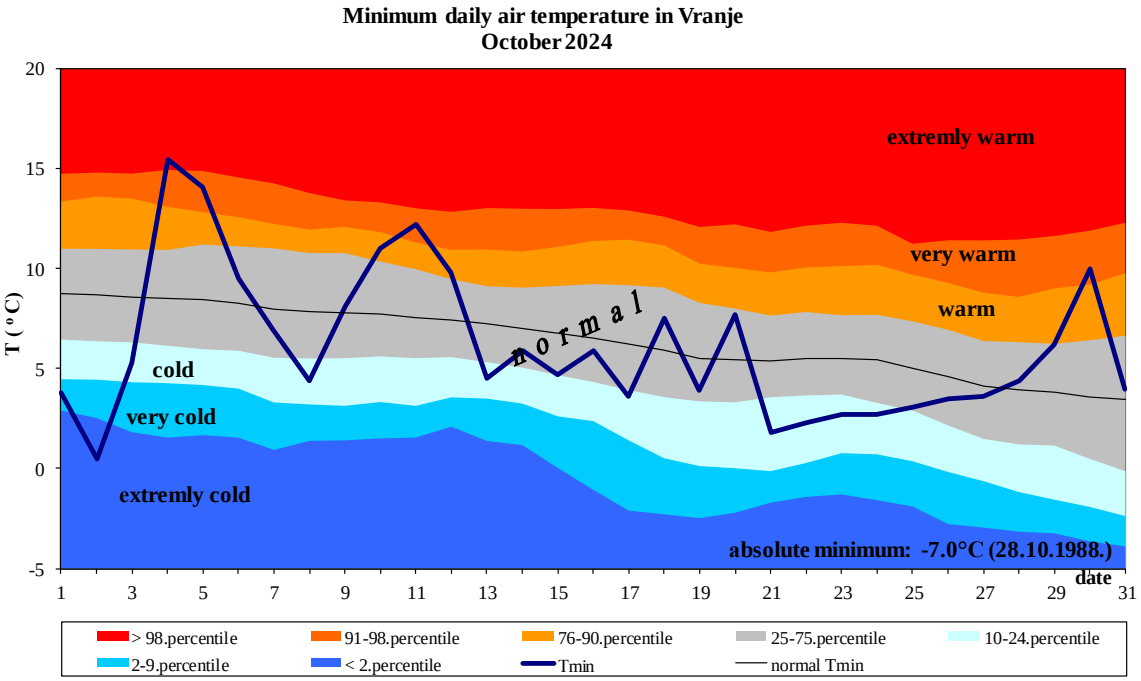
Appendix 21. Daily course of the minimum daily air temperature and the accompanying percentile for Negotin



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

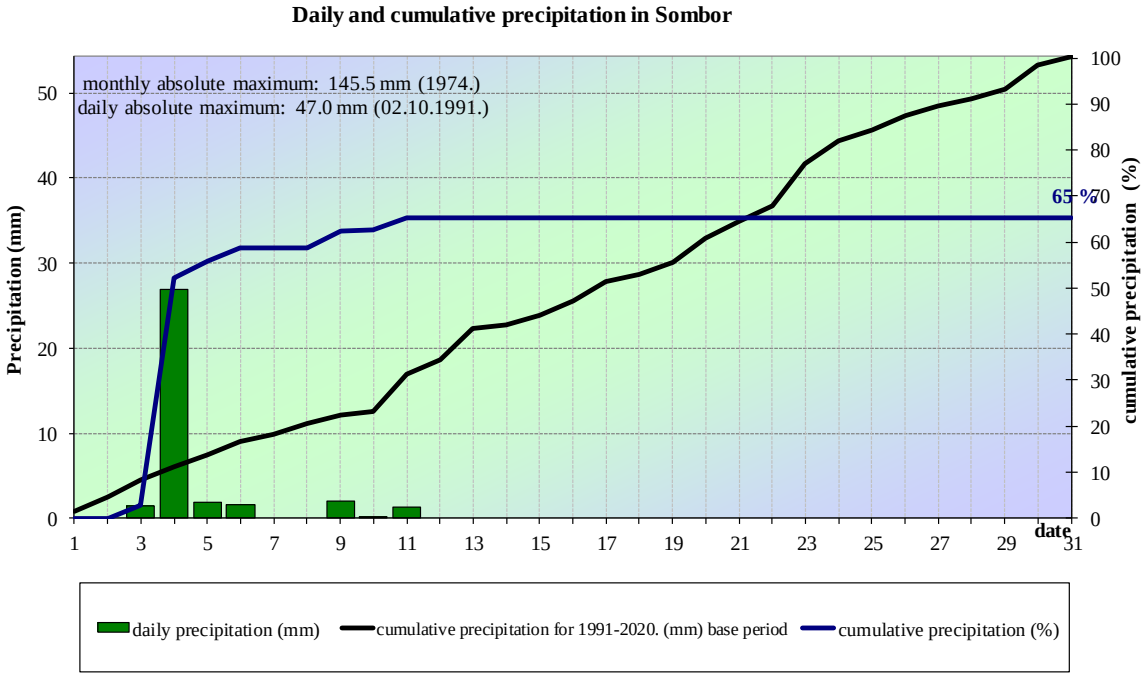


Appendix 23. Daily course of the minimum daily air temperature and the accompanying percentile for Nis

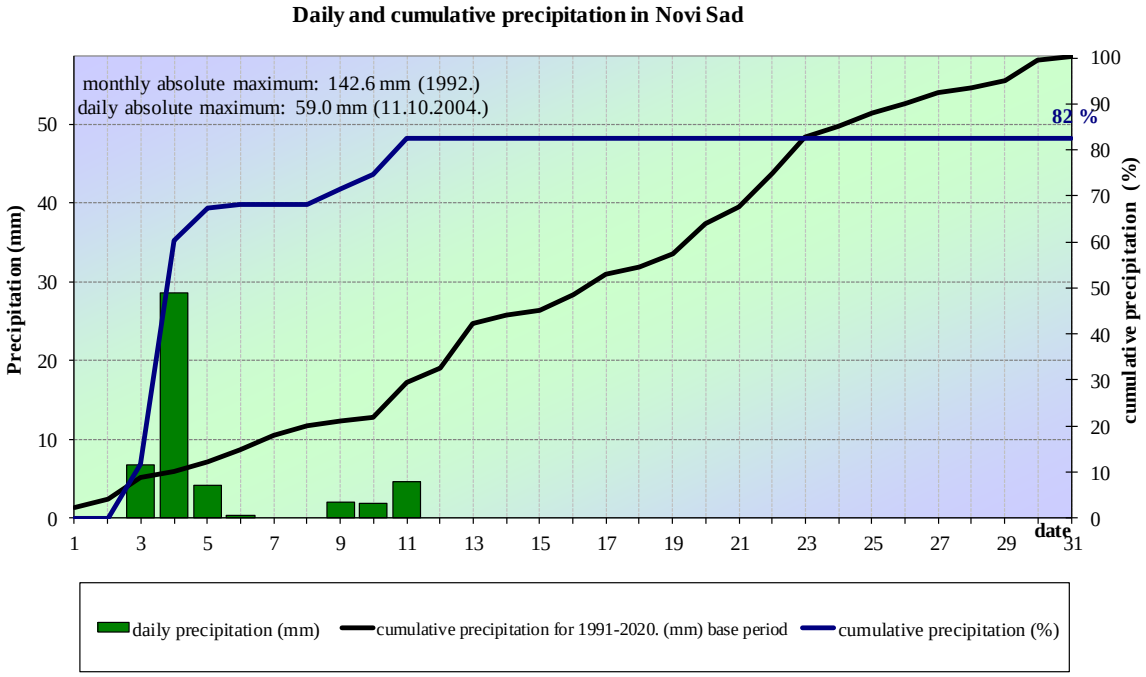


Appendix 24. Daily course of the minimum daily air temperature and the accompanying percentile for Vranje

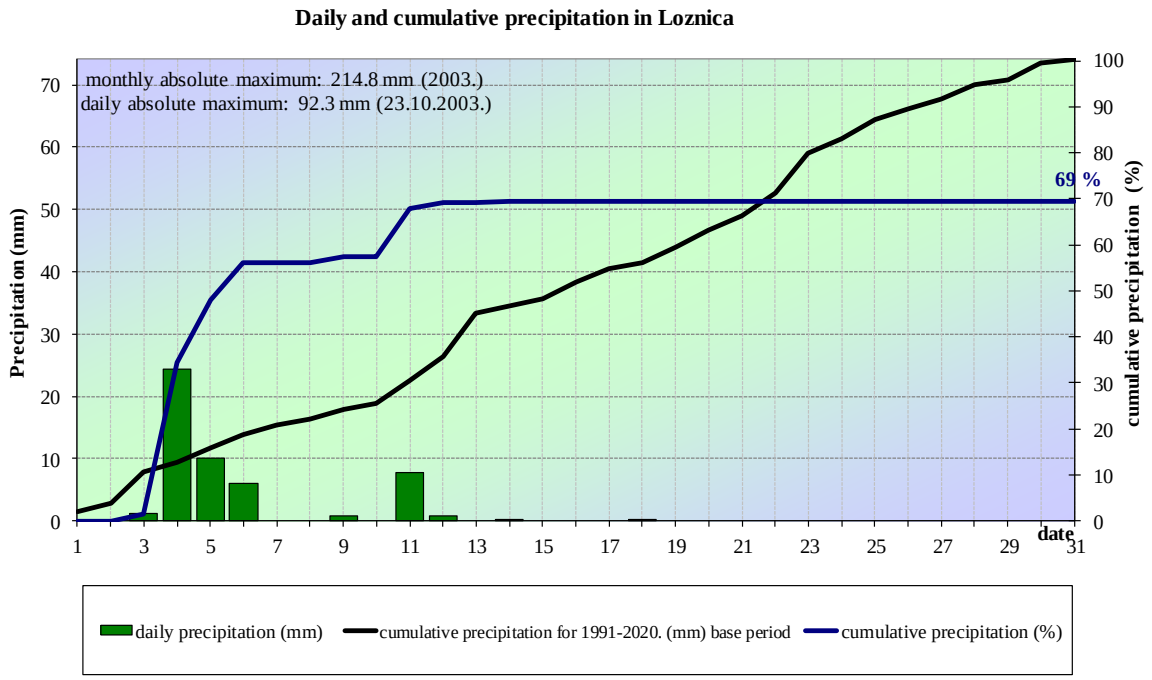
Precipitation



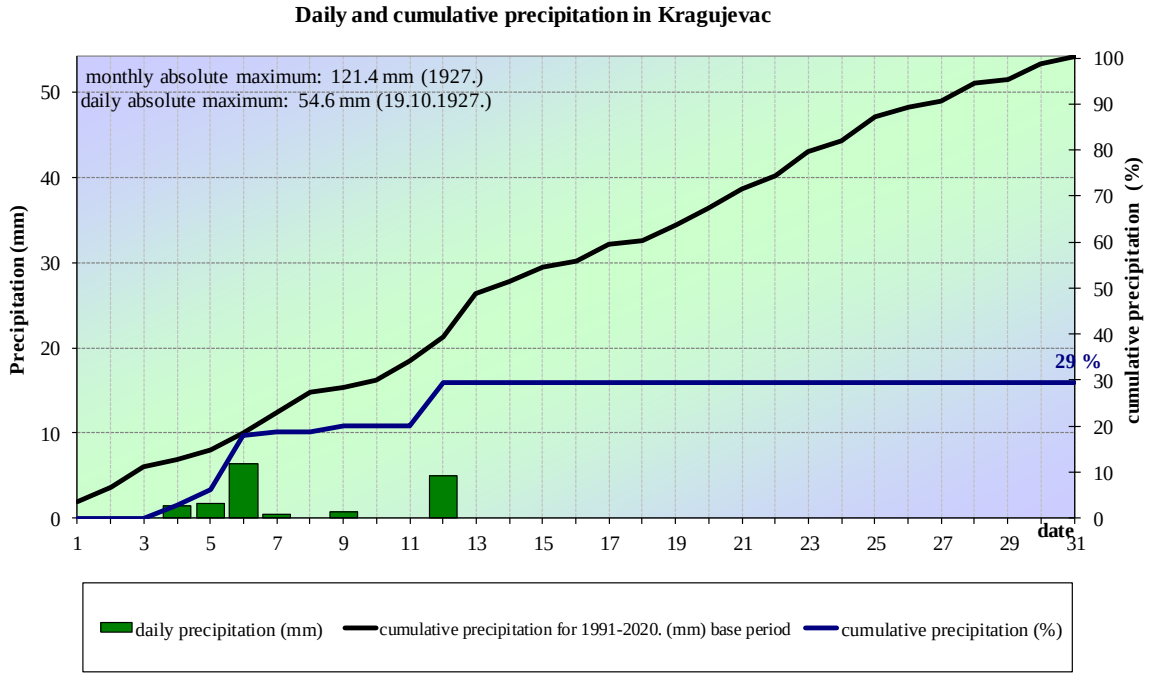
Appendix 25. Daily and cumulative precipitation sums for Sombor



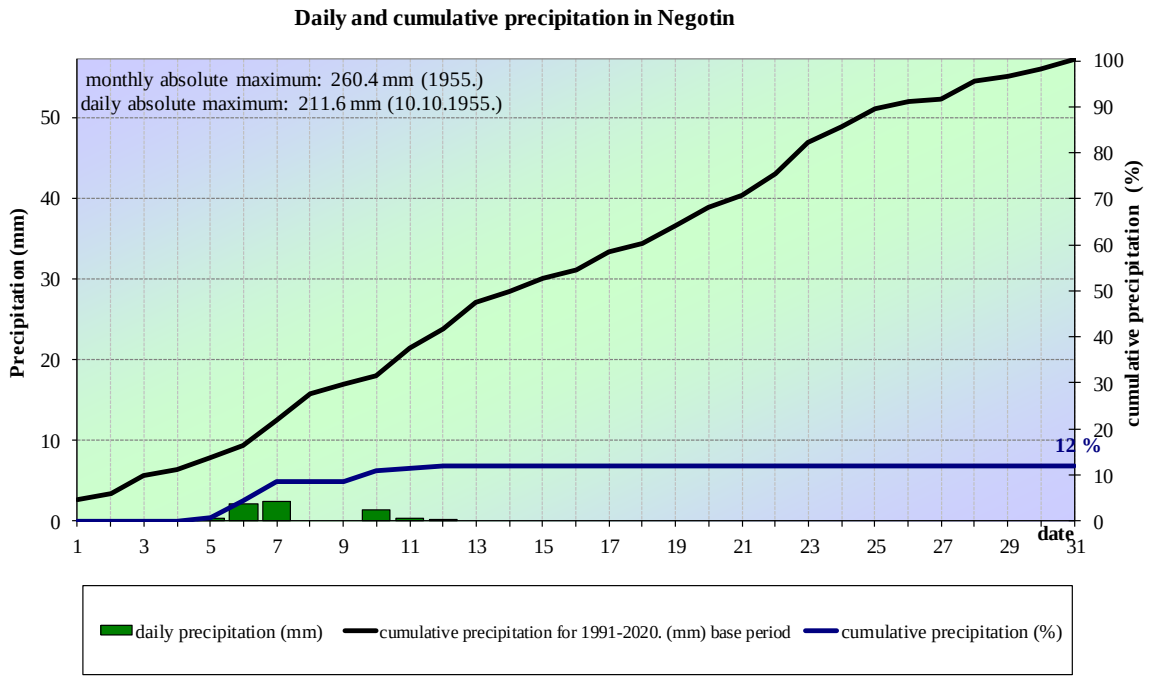
Appendix 26. Daily and cumulative precipitation sums for Novi Sad



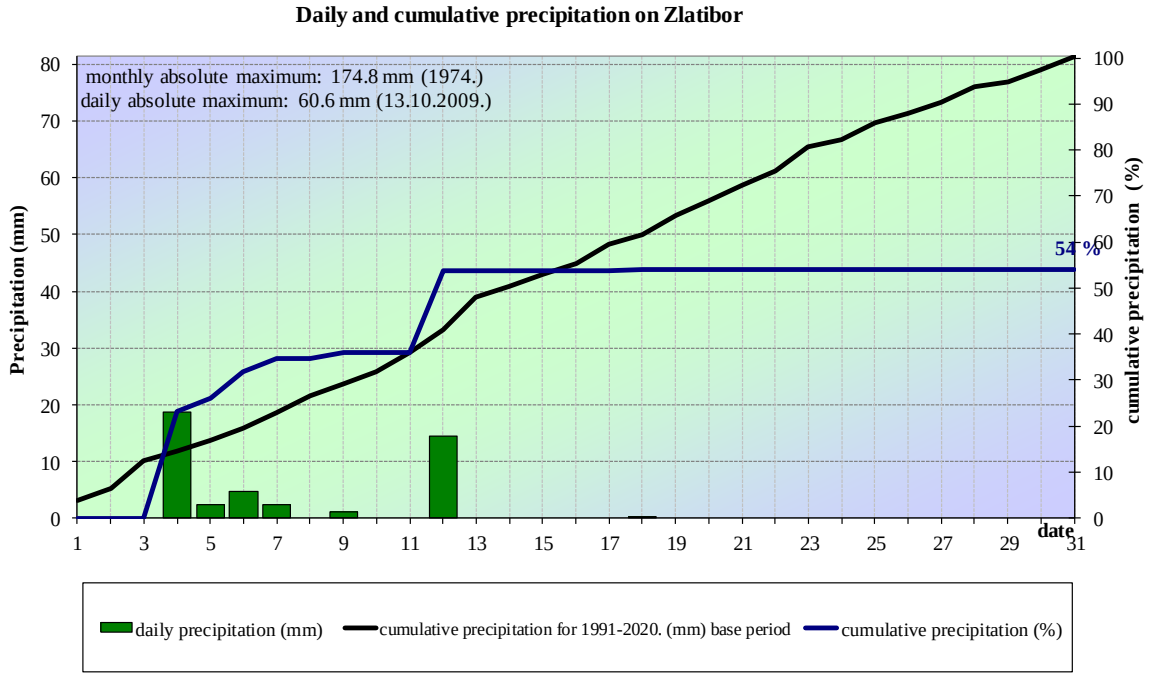
Appendix 27. Daily and cumulative precipitation sums for Loznica



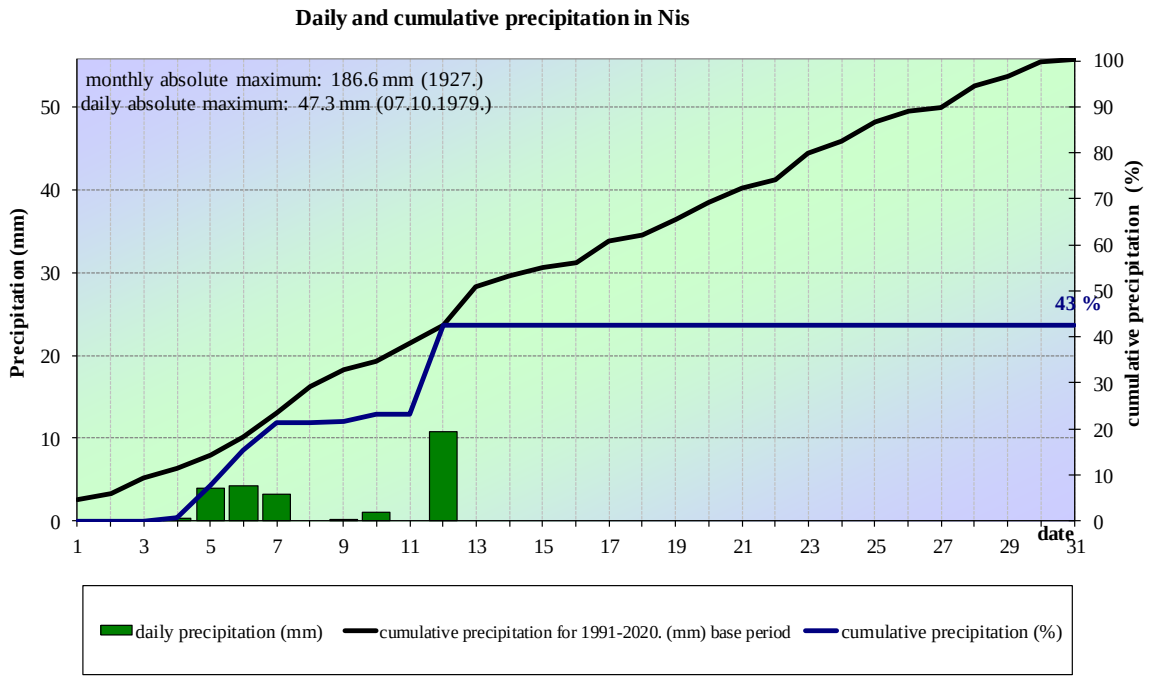
Appendix 28. Daily and cumulative precipitation sums for Kragujevac



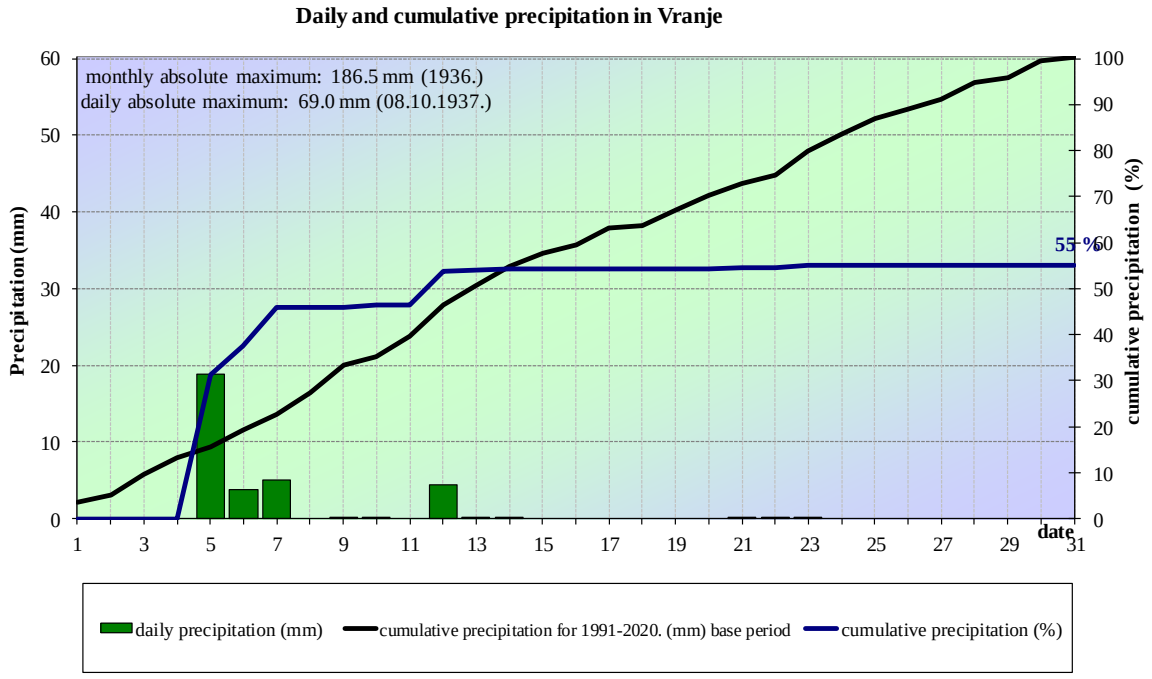
Appendix 29. Daily and cumulative precipitation sums for Negotin



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