Republic Hydrometeorological Service of Serbia
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11000 Belgrade
Republic of Serbia

MONTHLY BULLETIN FOR SERBIA

DECEMBER 2024

Belgrade, the 4th of January 2025

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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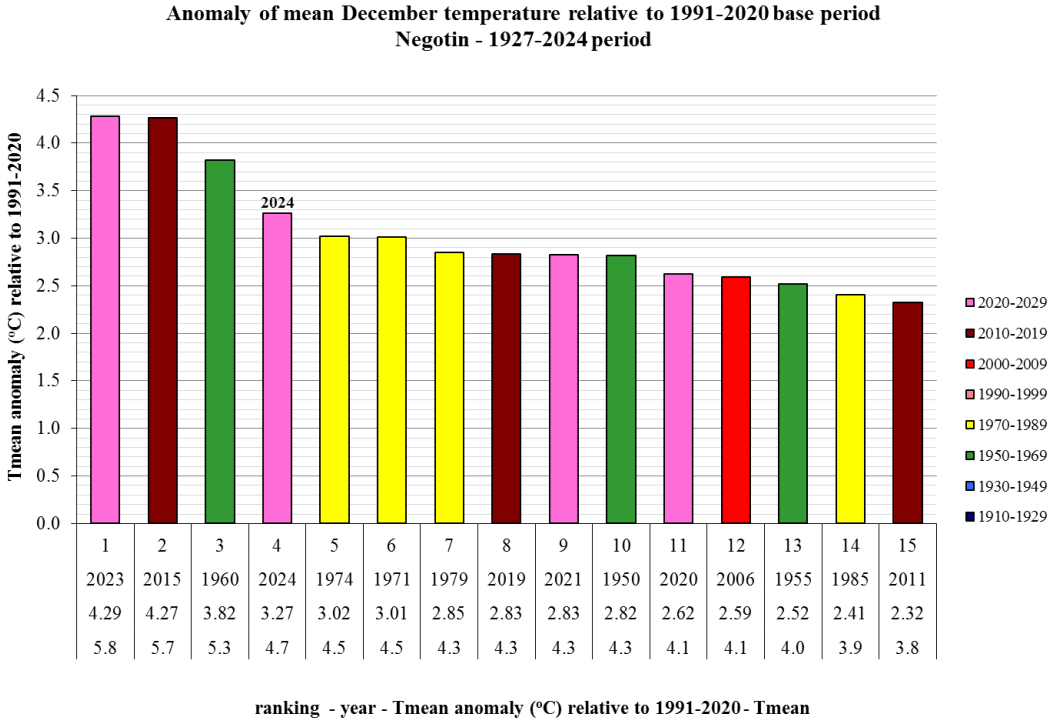
AIR TEMPERATURE

Mean monthly air temperature

December 2024 was warm in most of the country, in the north and west averagely warm. It was the **4th warmest** for Negotin in the period from 1927 to 2024 (*Figure 1).*



Slika 1. Rank of the warmest December in Negotin

Mean air temperature in Serbia ranged from 1,6 ºC in Pozega to 4,7 ºC in Negotin, 4,2 ºC in Belgrade, and on the mountains from -2,3 ºC at Kopaonik to -0,5 ºC at Zlatibor and Crni Vrh (*Figure 2*).

Departure of the mean air temperature from the normal[1] for the 1991–2020 base period ranged from +0,4 ºC in Sjenica and Zlatibor to +3,3 ºC in Negotin (*Figure 3*).

Mean 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 Negotin and Zajecar (*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

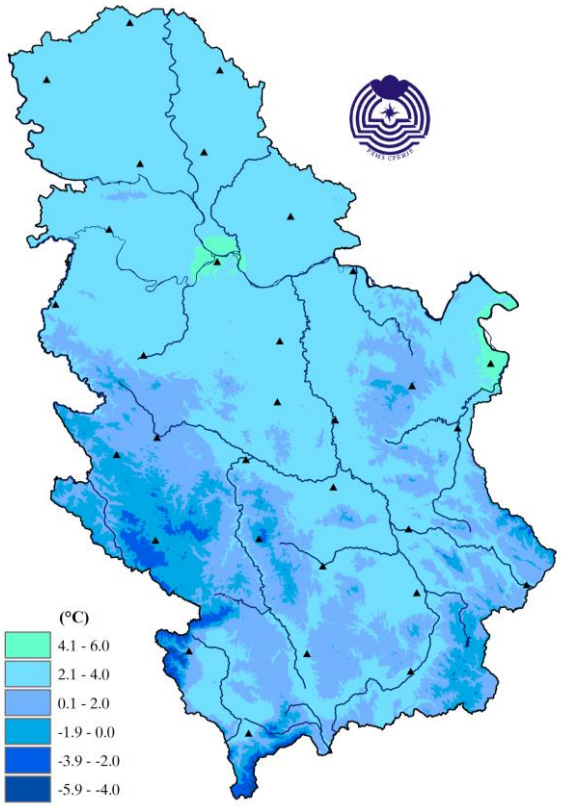


Figure 2. Spatial distribution of mean monthly air temperature (ºC)

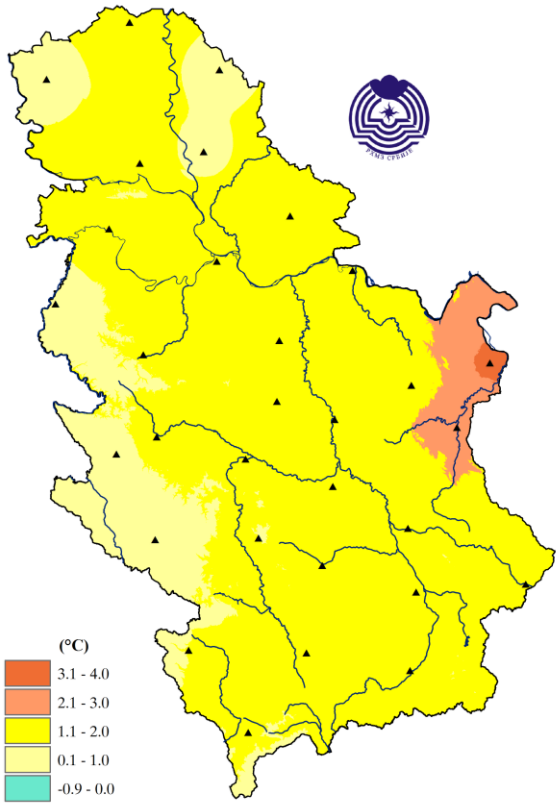


Figure 3. Spatial distribution of mean monthly air temperature anomaly (ºC)

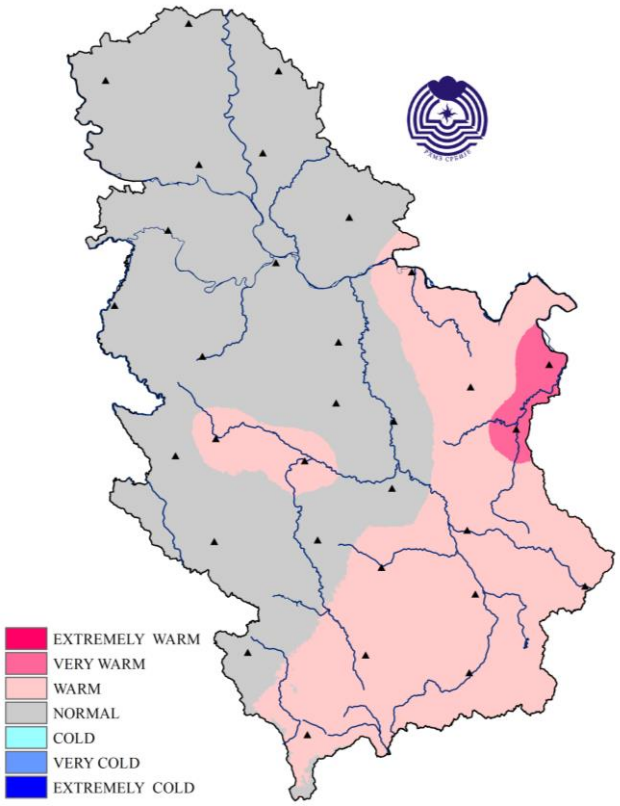


Figure 4. Spatial distribution of the mean monthly air temperature using percentile method

[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

Mean daily air temperature in Belgrade, based on the percentile method, was in the normal category most of December, and categories of warm and very warm in the middle of the month (*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.

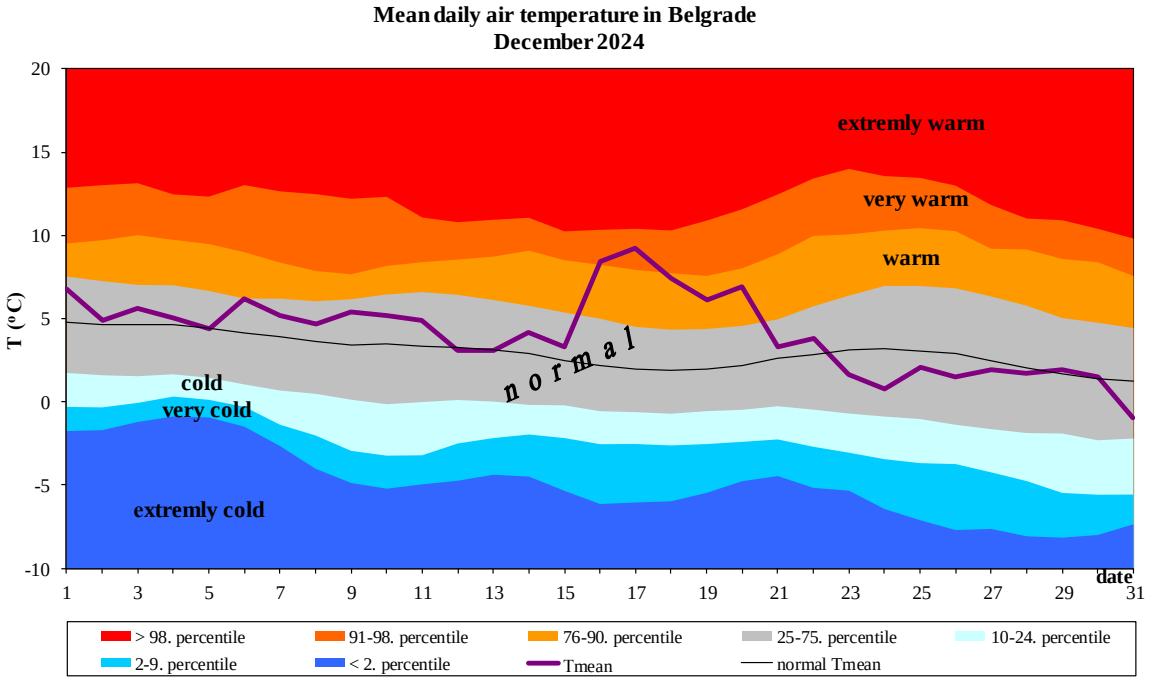


Figure 5. Daily course of the mean daily air temperature and accompanying percentiles for Belgrade

Maximum air temperature

Mean maximum air temperature in December ranged from 4,8 ºC in Pozega to 7,9 ºC in Negotin and Zajecar, whereas Belgrade observed air temperature of 7,0 °C. On the mountains, mean maximum air temperature ranged from 0,9 ºC at Kopaonik to 2,6 ºC in Sjenica.

Based on the percentile method, mean maximum air temperature was in the normal category in most of the country, warm category in Banatski Karlovac, Leskovac, Zajecar and Vranje, and very warm in Negotin.

The highest maximum daily air temperature of 19,3 ºC was measured in Zajecar on December 17. On the same day, Belgrade observed air temperature of 13,5 ºC.

Ice days[3] were recorded on the mountains, in the northern and parts of central Serbia. Number of ice days was as follows: 1 day in Banatski Karlovac, Sremska Mitrovica and Pozega, 2 in Sombor, Novi Sad and Zrenjanin, 3 on Palic, 4 in Kikinda. On the mountains: 4 in Sjenica, 7 at Zlatibor, 11 at Crni Vrh, 16 at Kopaonik. The recorded number of ice days was 2 to 6 days below December average.

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

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

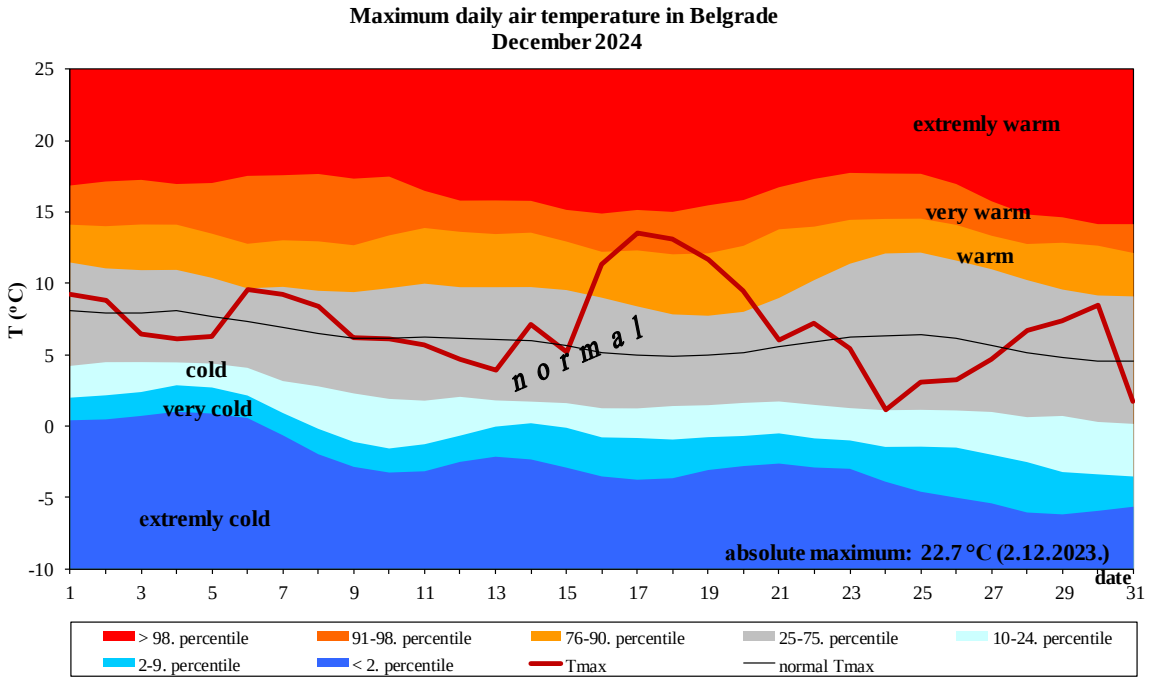


Figure 6. Daily course of the maximum daily air temperature and accompanying percentiles for Belgrade

Minimum air temperature

Mean minimum air temperature in December ranged from -0,4 ºC in Vranje and Pozega to 2,0 ºC in Negotin, whereas Belgrade observed air temperature of 1,6 ºC. On the mountains, mean minimum air temperature ranged from -4,8 ºC at Kopaonik to -2,4 ºC at Crni Vrh.

Based on the percentile method, mean minimum air temperature was in the following categories: normal and warm in the most of the country, very warm in Pozega, Kursumlija, Krusevac, Nis, Zajecar and Dimitrovgrad and extremely warm in Negotin.

The lowest minimum daily air temperature of -13,6 ºC was measured in Sjenica on December 31. In the lowland, on the same day, the lowest daily air temperature of -7,3 ºC was measured in Dimitrovgrad. On the same day, 31 December, Belgrade observed the lowest monhtly air temperature of -4,0 ºC.

Number of frost days[4] ranged from 7 days in Belgrade to 16 days in Cuprija and Vranje. On the mountains, frost days ranged from 27 at Zlatibor and Crni Vrh to 31 day at Kopaonik. The recorded number of frost days was from 4 to 9 days below December average.

Sjenica observed 5 days with severe frost[5], while Kopaonik recorded 1 day.

Figure 7 shows assessment of the minimum and maximum air temperature in Serbia for December based on the tercile distribution relative to the 1991-2020 base period. It can be

[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

noted that mean minimum air temperature was below the upper tercile threshold and mean maximum air temperature at the upper tercile threshold.

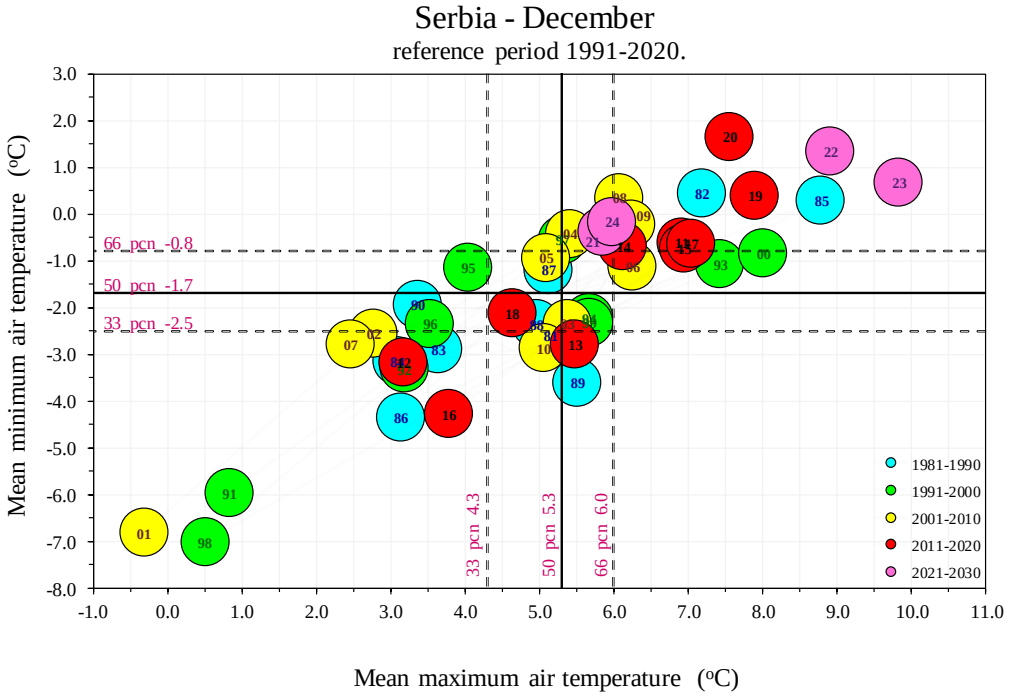


Figure 7. Assessment of minimum and maximum air temperature for Serbia with the accompanying terciles in relation to the 1991-2020 base period

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

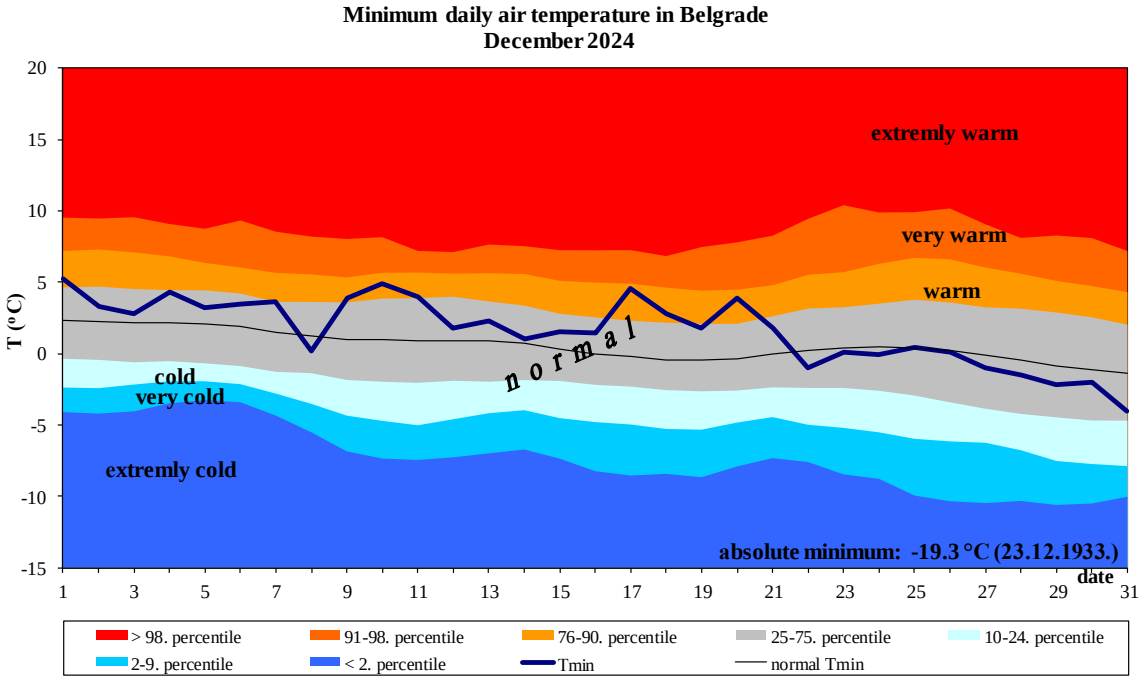


Figure 8. Daily course of the minimum daily air temperature and accompanying percentiles for Belgrade

PRECIPITATION

December 2024 ranks as **the 7th wettest** for Serbia since 1951 (*Figure 9*). It was **the 2nd wettest** for Zajecar, Kraljevo and Krusevac, 4th wettest for Crni Vrh, 5th wettest for Loznica and Zlatibor, 6th wettest for Kragujevac. In the appendix are graphs showing 15 wettest years since the record-keeping began.

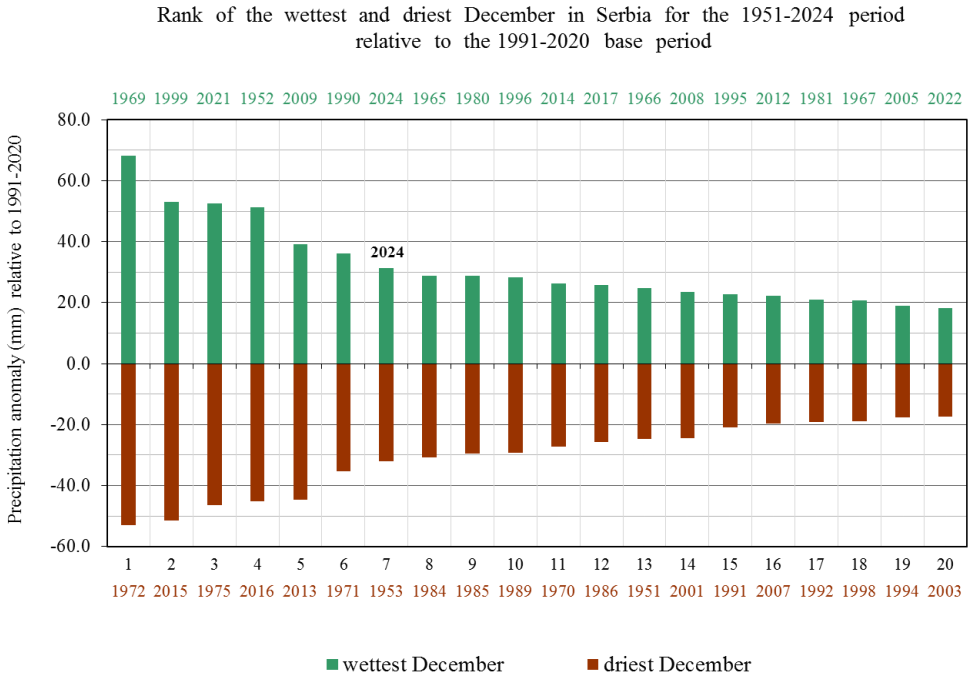


Figure 9. Rank of the wettest and driest December in Serbia for the period from 1951 to 2024

December precipitation sums ranged from 47,2 mm in Kikind to 138,2 mm in Zajecar, while Belgrade recorded 71,8 mm of precipitation (*Figure 10*).

Precipitation totals relative to the normal for the 1991-2020 base period ranged from 102% in Zrenjanin to 253% in Zajecar (*Figure 11*).

Based on the percentile method, precipitation sums were in the categories of rainy and very rainy in most of the country, normal category in the northern areas, and extremely rainy in Kraljevo, Krusevac and Zajecar (*Figure 12).*

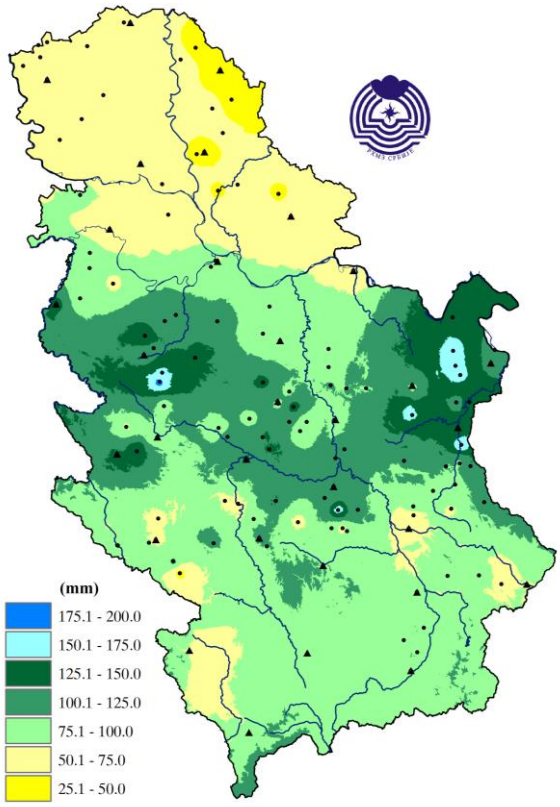


Figure 10. Spatial distribution of the monthly precipitation sums (mm) according to data from 28 major meteorological, 24 climatological and 78 rain gauge stations

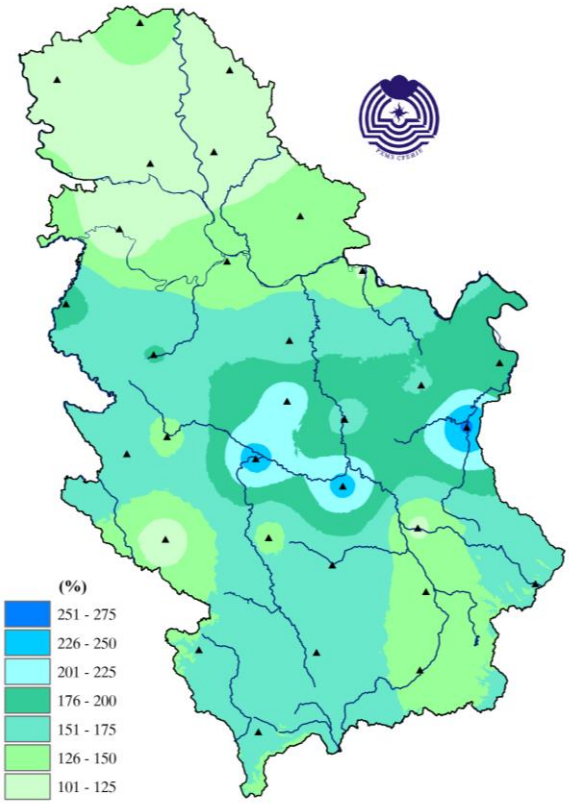


Figure 11. Spatial distribution of the monthly precipitation sums in the percentages of normal for the 1991–2020 base period

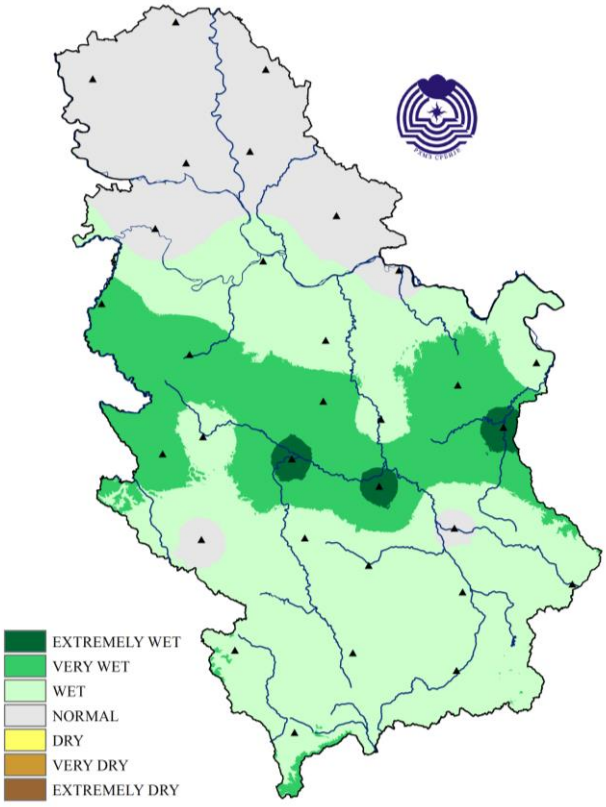


Figure 12. Monthly precipitation sums according to the percentile method

The highest daily precipitation sum of 40,3 mm was registered at Zlatibor on December 1. On December 24, Belgrade recorded daily precipitation sum of 29,8 mm.

Number of days with precipitation in December ranged from 12 in Banatski Karlovac to 18 in Dimitrovgrad (*Figure 13).* The recorded number of days with precipitation was around December average in most of Serbia *(Figure 14).*

Snow cover was observed in most of Serbia, apart from Palic, Kikinda, Sremska Mitrovica, Veliko Gradiste and Negotin. The highest snow depth of 63 cm was measured on December 26 at Crni Vrh. As for the lowland, snow depth of 21 cm was measured in Loznica on December 24.

Snow cover was registered on the mountains throughout the entire December. The highest number of days with snow cover in the lowland was registered in Loznica and Pozega, total of 9 days. The recorded number of days with snow cover was up to 7 days below the December average.

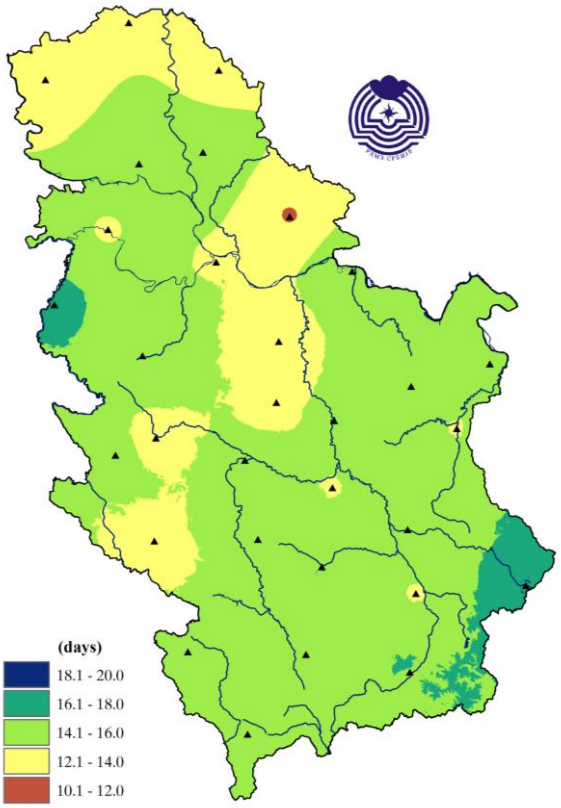


Figure 13. Spatial distribution of number of days with precipitation

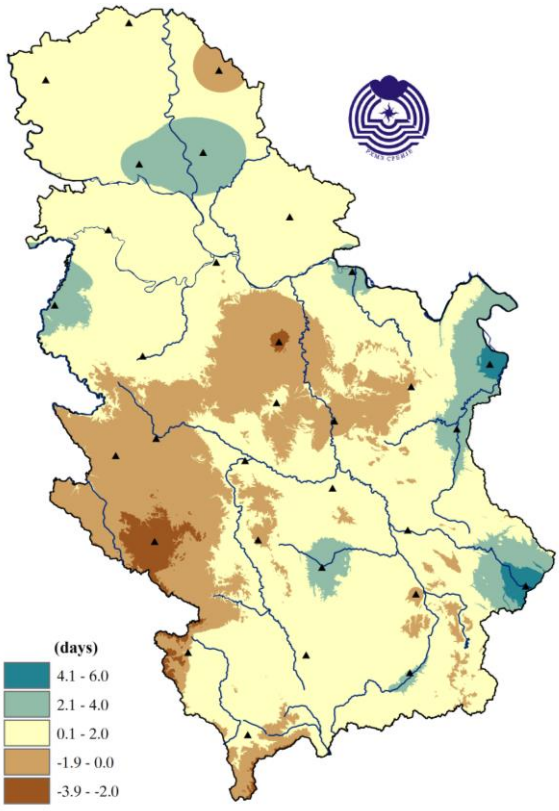


Figure 14. Spatial distribution of deviation of number of days with precipitation

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

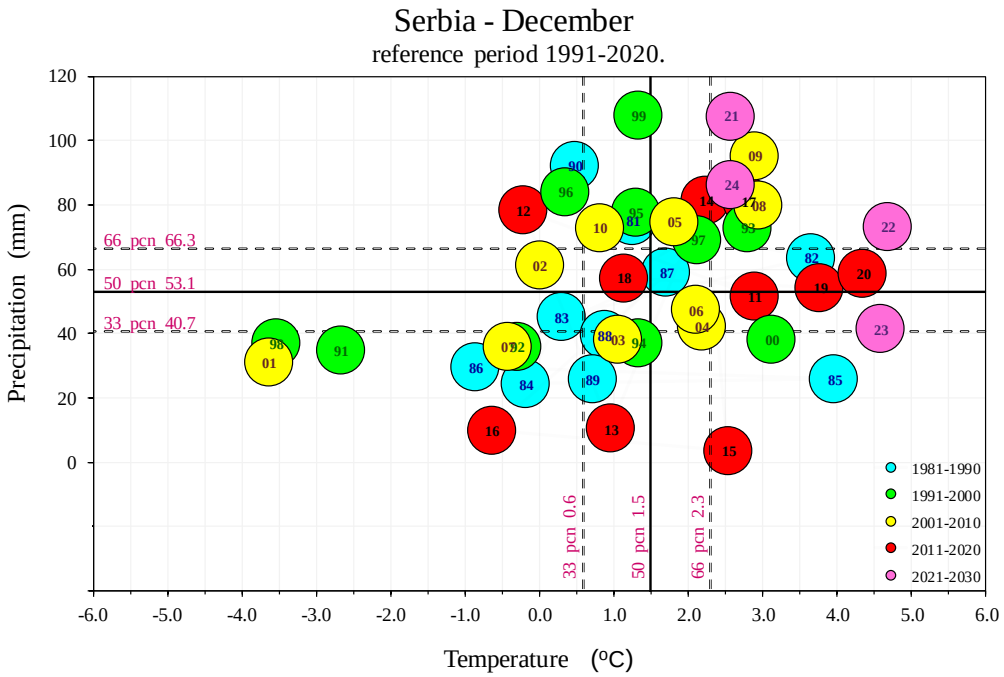


Figure 15. Assessment of air temperature and precipitation for Serbia with the accompanying terciles in relation to the 1991-2020 base period

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

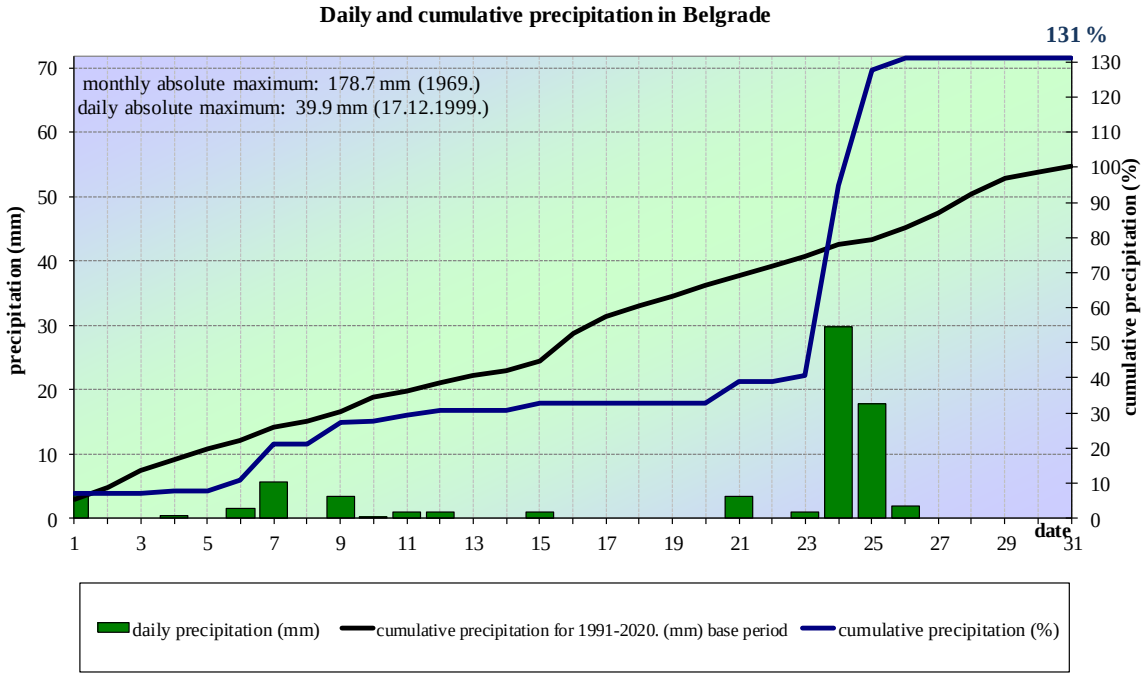


Figure 15. Daily and cumulative precipitation in Belgrade

CLOUD COVER, BRIGHT AND CLOUDY DAYS

Mean December cloud cover in Serbia was around the average, ranging from 7/10 to 8/10. Figures 17, 18 and 19 show average daily cloud cover for December in Belgrade.

The least number of bright days[6] was recorded in Novi Sad and Pozega, total of 2, while Nis observed the highest number, total of 8. Belgrade recorded 3 bright days. The recorded number of bright days was around the average for December.

Number of cloudy days[7] ranged from 14 in Banatski Karlovac and Negotin to 22 in Pozega, while Belgrade observed 16. Number of cloudy days was 1 to 3 days above the December average.

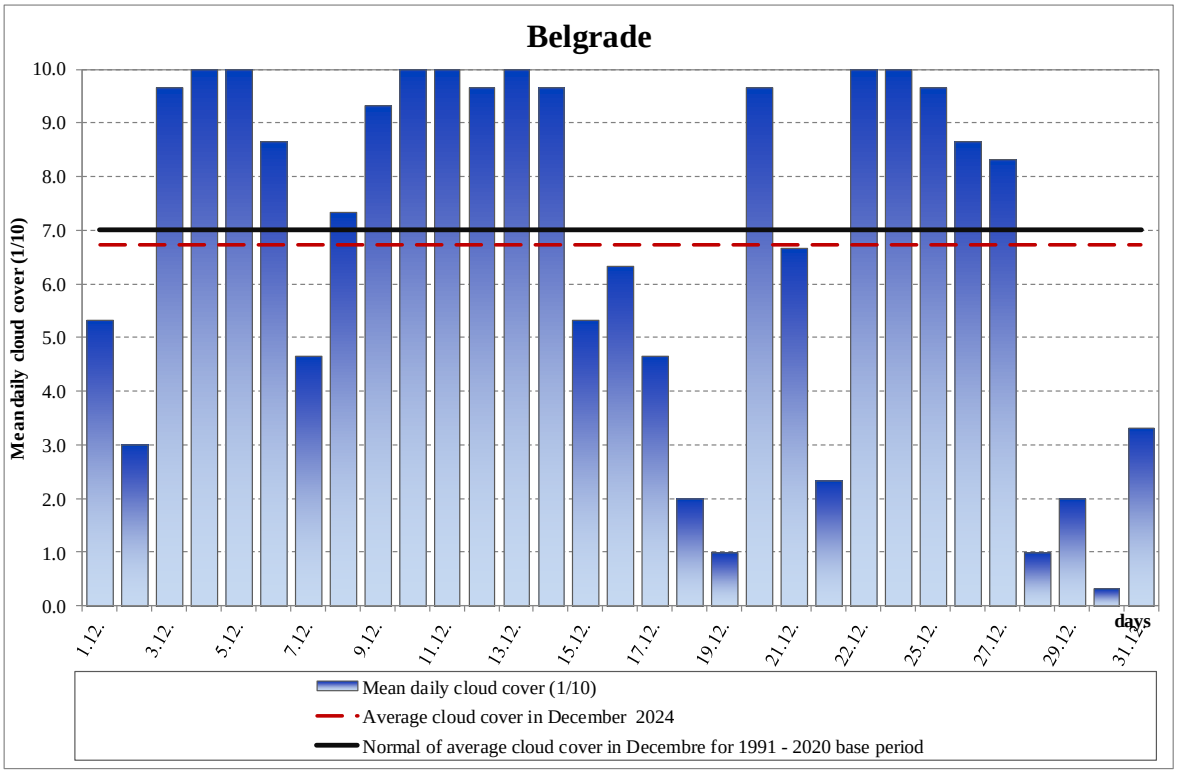


Figure 17. Mean daily cloud cover in Belgrade

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

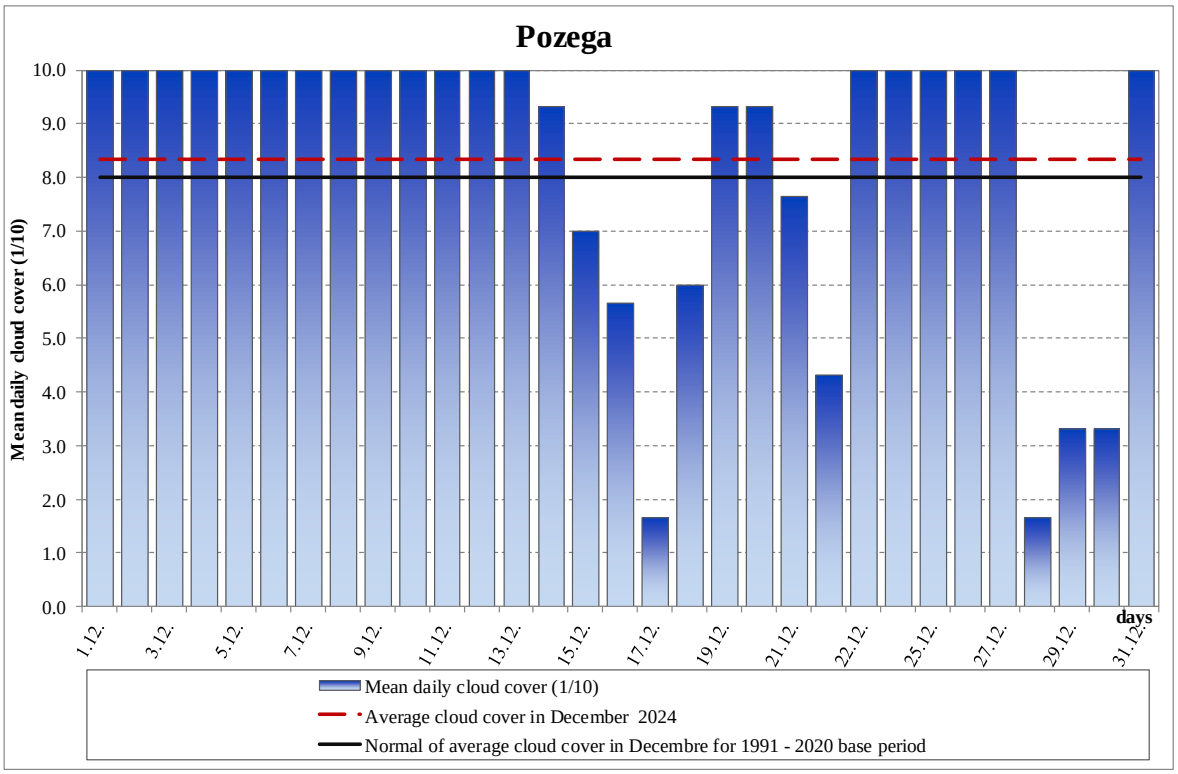


Figure 18. Mean daily cloud cover in Pozega

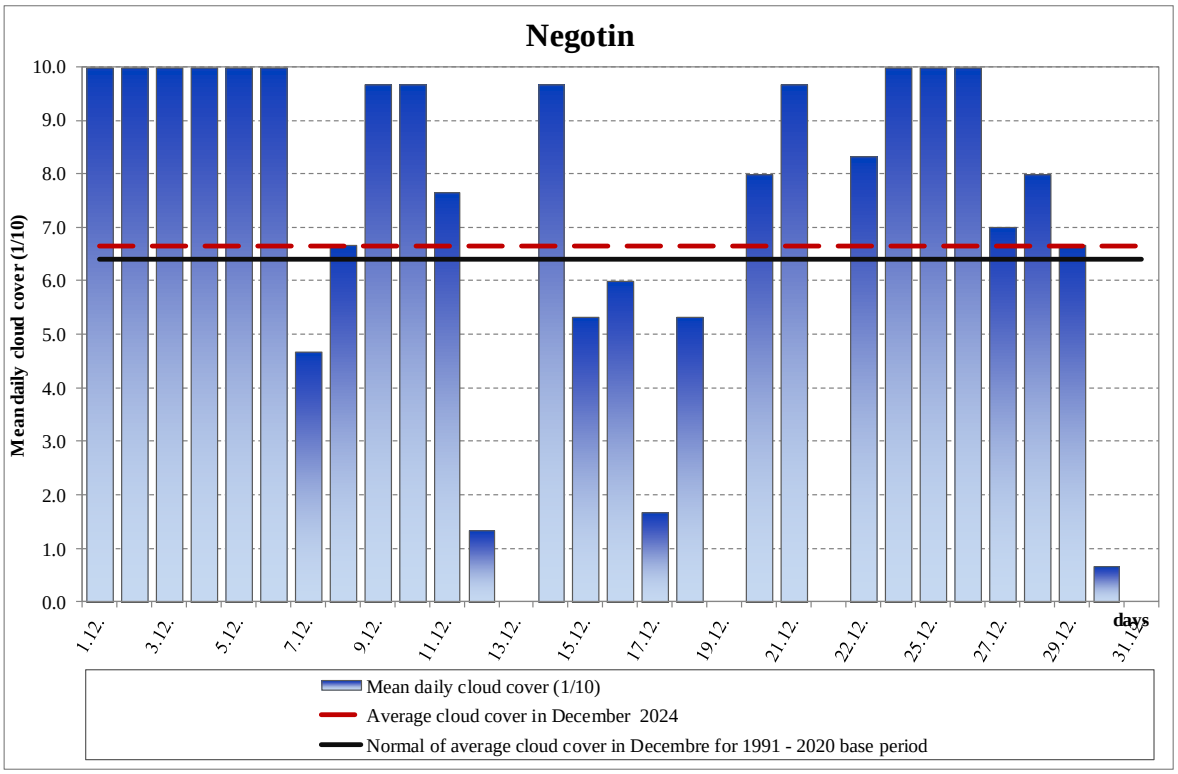


Figure 19. Mean daily cloud cover in Negotin

SUNSHINE DURATION (INSOLATION)

Sunshine duration in December ranged from 28,4 hours in Pozega to 79,7 hours in Belgrade (*Figure 20*).

December insolation ranged from 60% in Zrenjanin to 130% in Vranje relative to the normal for the 1991- 2020 base period (*Figure 21).*

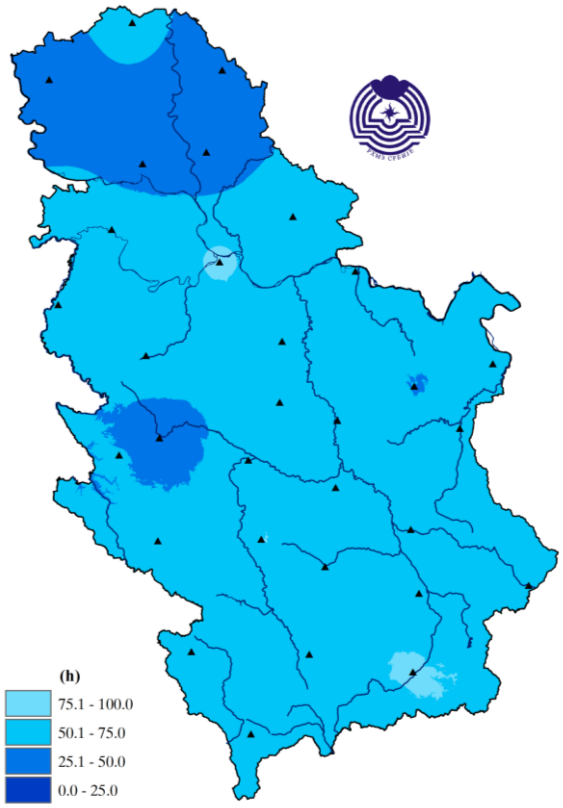


Figure 20. Insolation, expressed in hours

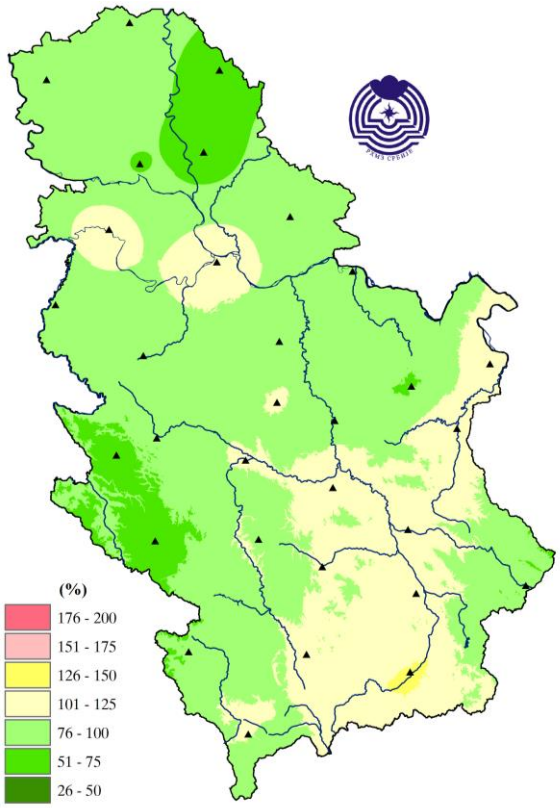


Figure 21. Insolation expressed in the percentages of normal

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

OVERVIEW OF THE SYNOPTIC SITUATION*

Frequent incursions of the low pressure from the western Mediterranean and northern Adriatic, with oscillations in the pressure field, toward southeast, the Levant, and Asia Minor; cloudy, with intermittent rain, at places heavy rain. Brief periods of ridge influence from the southwest as well as warm air mass from the south, also, during the third decade, a very pronounced incursion, initially from the southwest with maritime air masses, followed by cold air from the north, a deep trough, and an upper-air low pressure; rainy weather, cooling, and snow in lower regions

Period at the beginning of the month was marked by settled weather due to the persistence of the Siberian anticyclone. Period until middle of the month was characterized by a series of low pressures from the west, developments over the North Sea and northern Europe, as well as developments in the western Mediterranean, strengthening over the Adriatic, central, southern, and southeastern Balkans, with waves of moist air causing changeable cloudy weather and relatively warm conditions, occasionally with rain. In the western and northern regions, as well as locally in the southwest, east, and Pomoravlje, with stronger intensity, snow on the mountains. Period until the beginning of the third decade was marked by ridge from the southwest from western Mediterranean and dry conditions, at places with low clouds or fog.

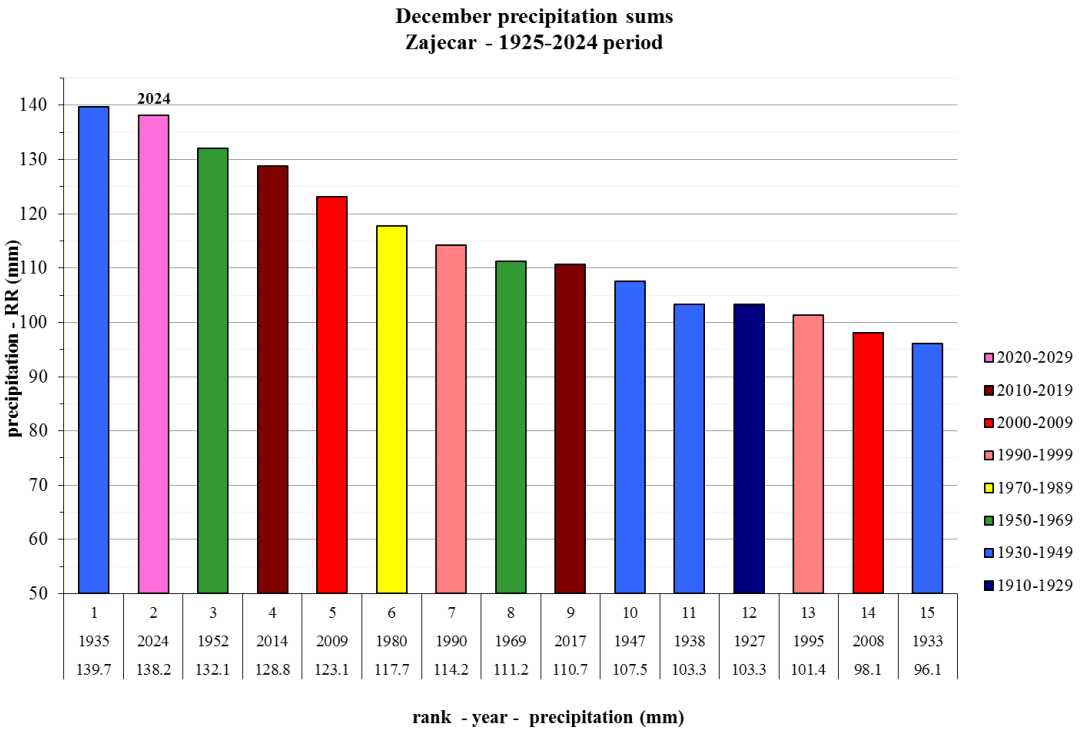
Period during the third decade was characterized by a low pressure from the southwest and west, moving over the Adriatic toward the Aegean Sea, with simultaneous advection of cold air masses from the north and northwest in conjunction with a trough, followed by a depression moving southeast and east over our region; cloudiness and cooling with rain and snow, along with the persistence and formation of a snow cover in most of the country.

Stabilization marked the end of the year, rise in pressure and prevalence of the anticyclone above most of the continent from the Atlantic and western Europe with center mostly in central areas and the Pannonia Plain. In the north and plains, it was cloudy and foggy, plenty of sunny hours and warmer conditions were observed in the south and east of the country as well as mountains.

* National Center for Hydrometeorlogical Early Warning System

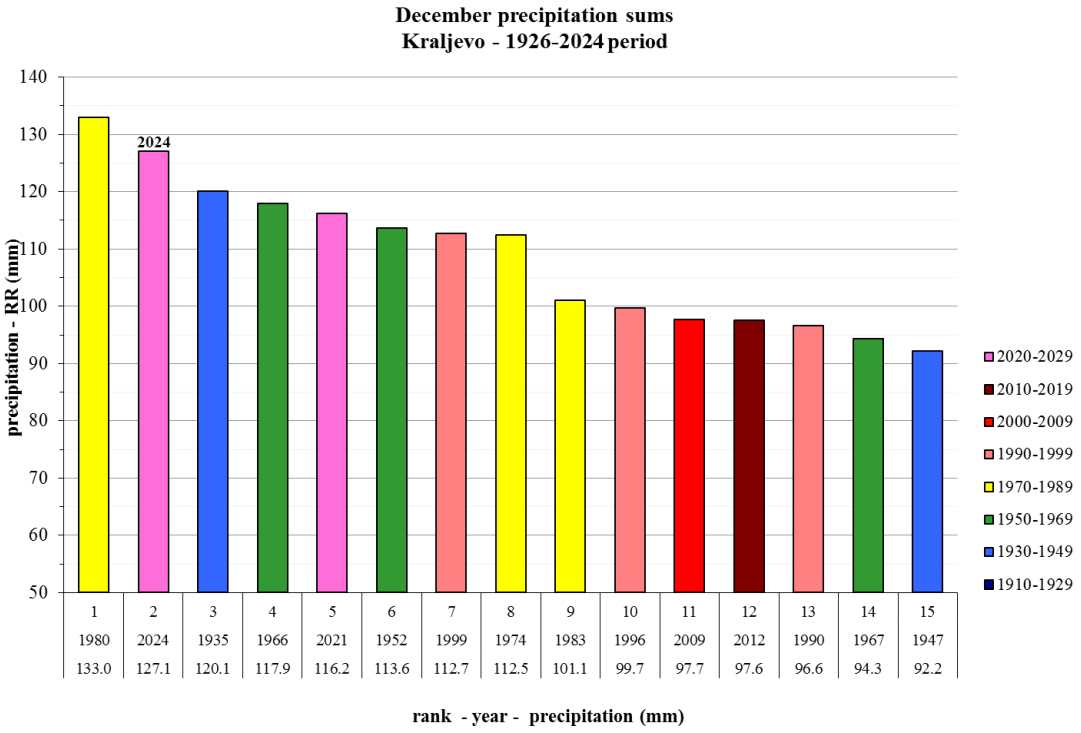
APPENDIX

Ranks of the highest precipitation in December



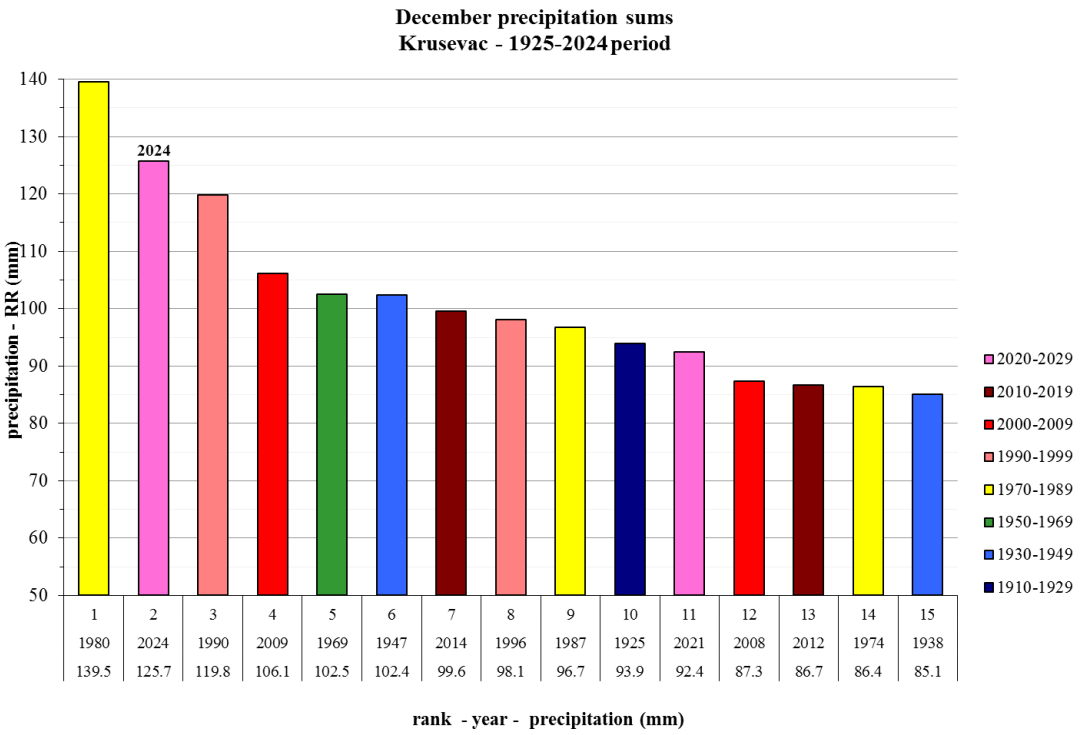
rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
year	1935	2024	1952	2014	2009	1980	1990	1969	2017	1947	1938	1927	1995	2008	1933
precipitation (mm)	139.7	138.2	132.1	128.8	123.1	117.7	114.2	111.2	110.7	107.5	103.3	103.3	101.4	98.1	96.1

Appendix 1. Rank of the highest precipitation in Zajecar

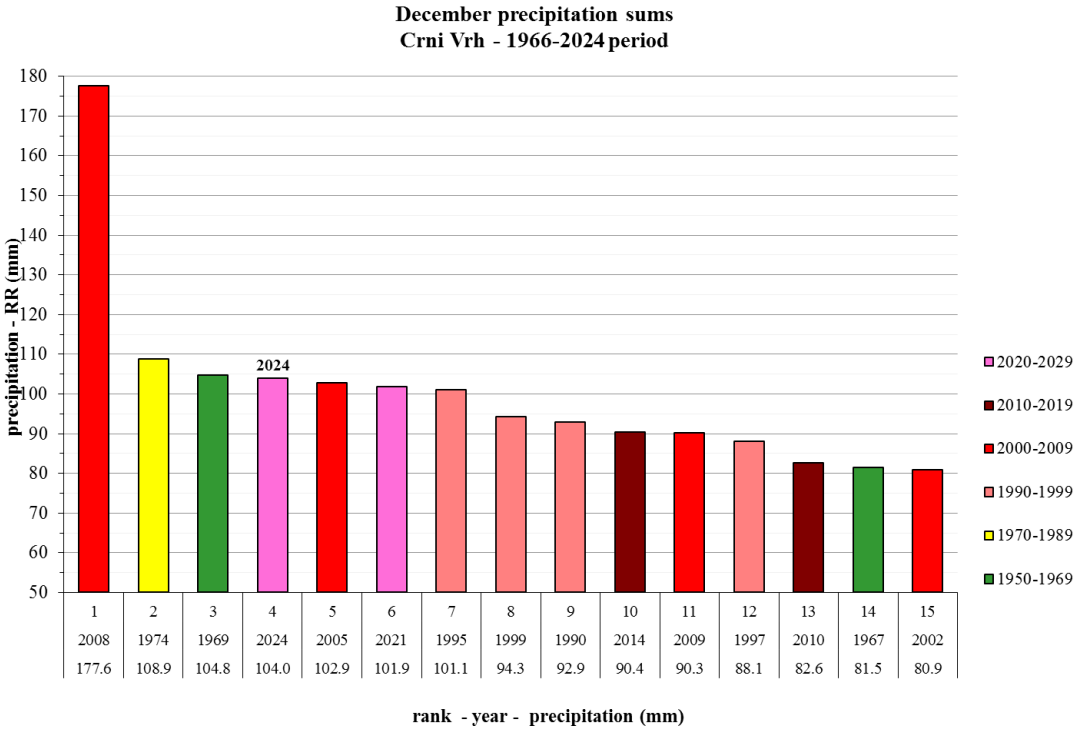


rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
year	1980	2024	1935	1966	2021	1952	1999	1974	1983	1996	2009	2012	1990	1967	1947
precipitation (mm)	133.0	127.1	120.1	117.9	116.2	113.6	112.7	112.5	101.1	99.7	97.7	97.6	96.6	94.3	92.2

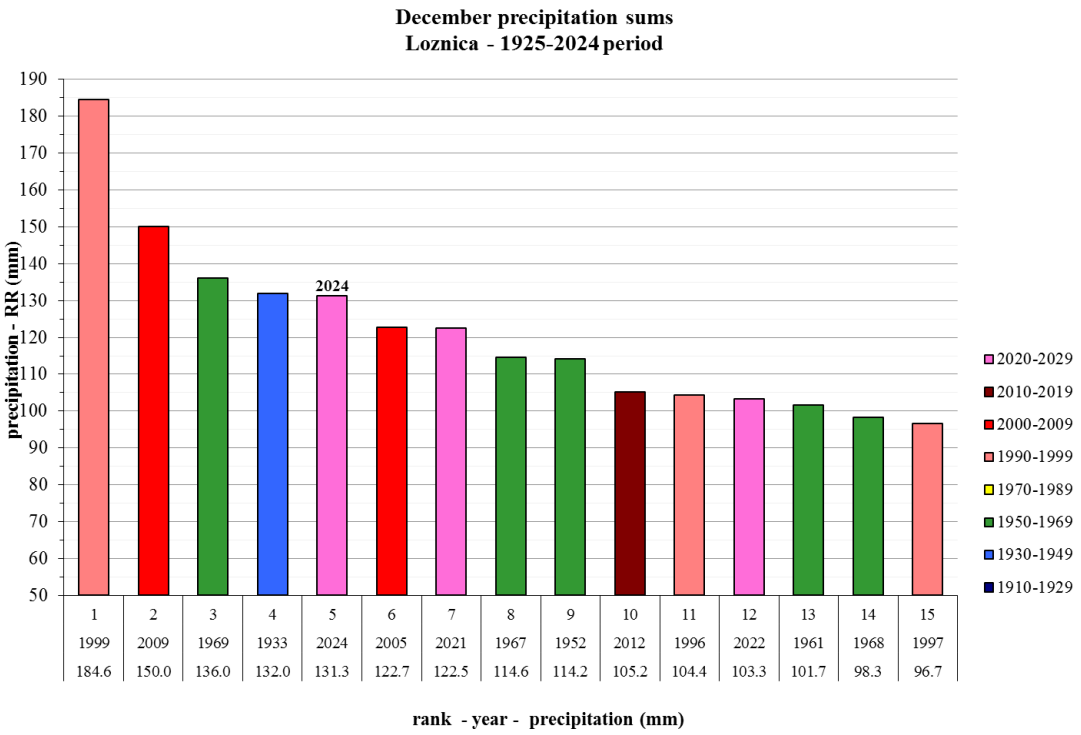
Appendix 2. Rank of the highest precipitation in Kraljevo



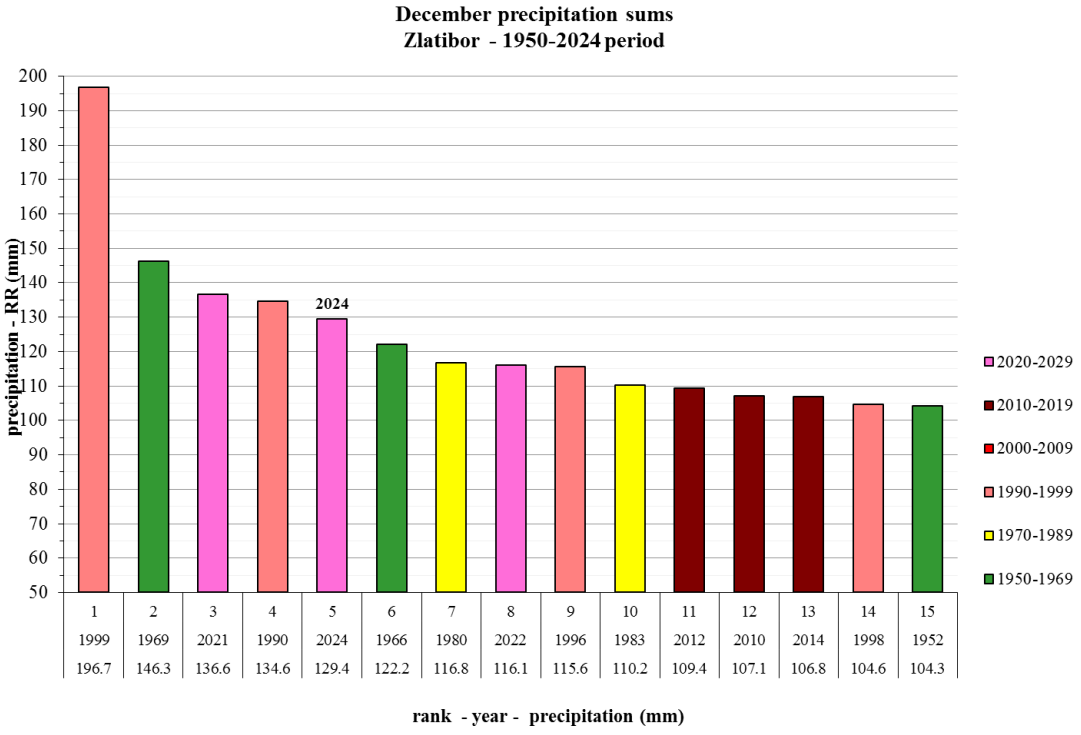
Appendix 3. Rank of the highest precipitation in Krusevac



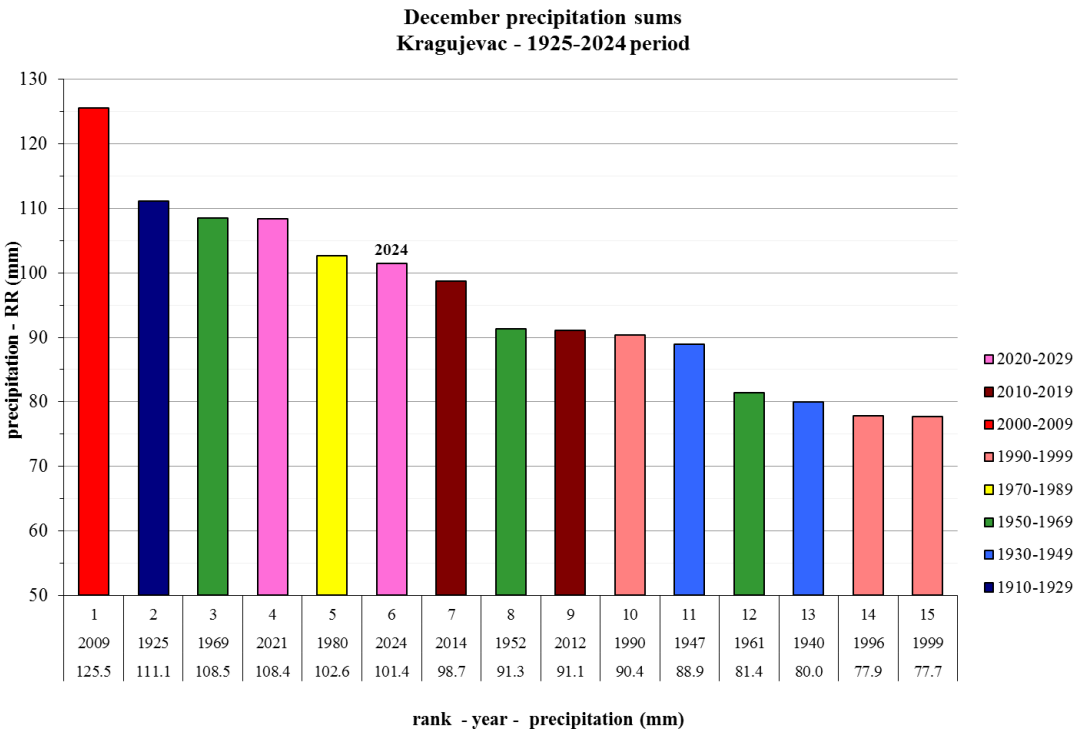
Appendix 4. Rank of the highest precipitation on Crni Vrh



Appendix 5. Rank of the highest precipitation in Loznica

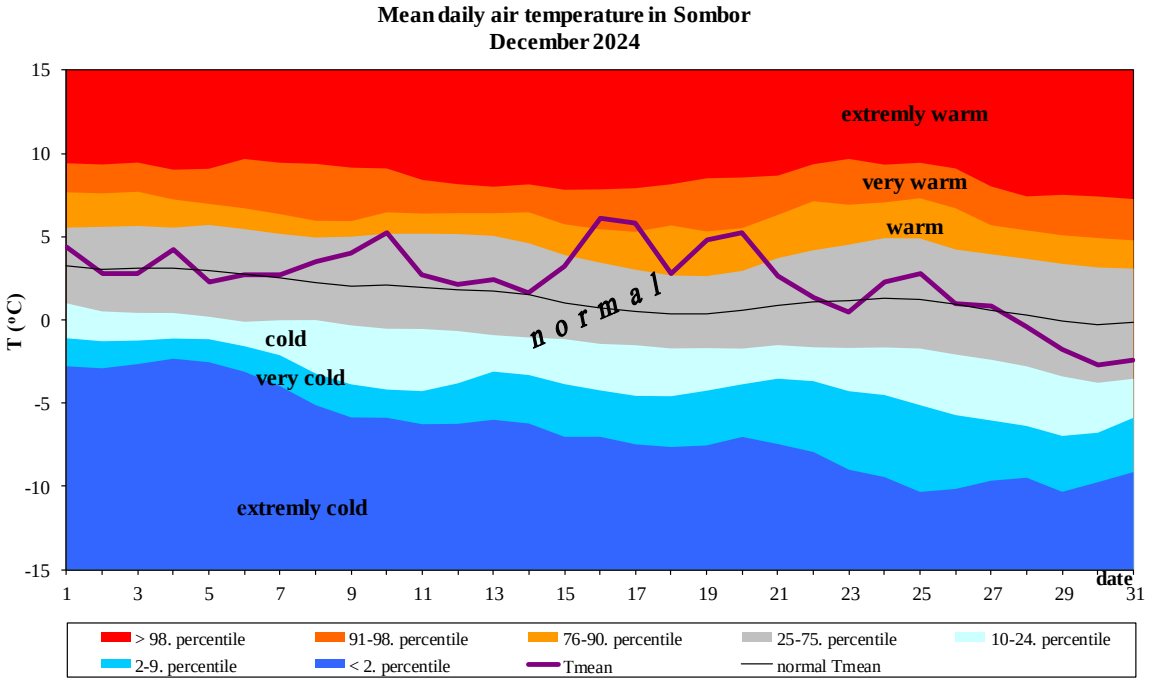


Appendix 6. Rank of the highest precipitation on Zlatibor

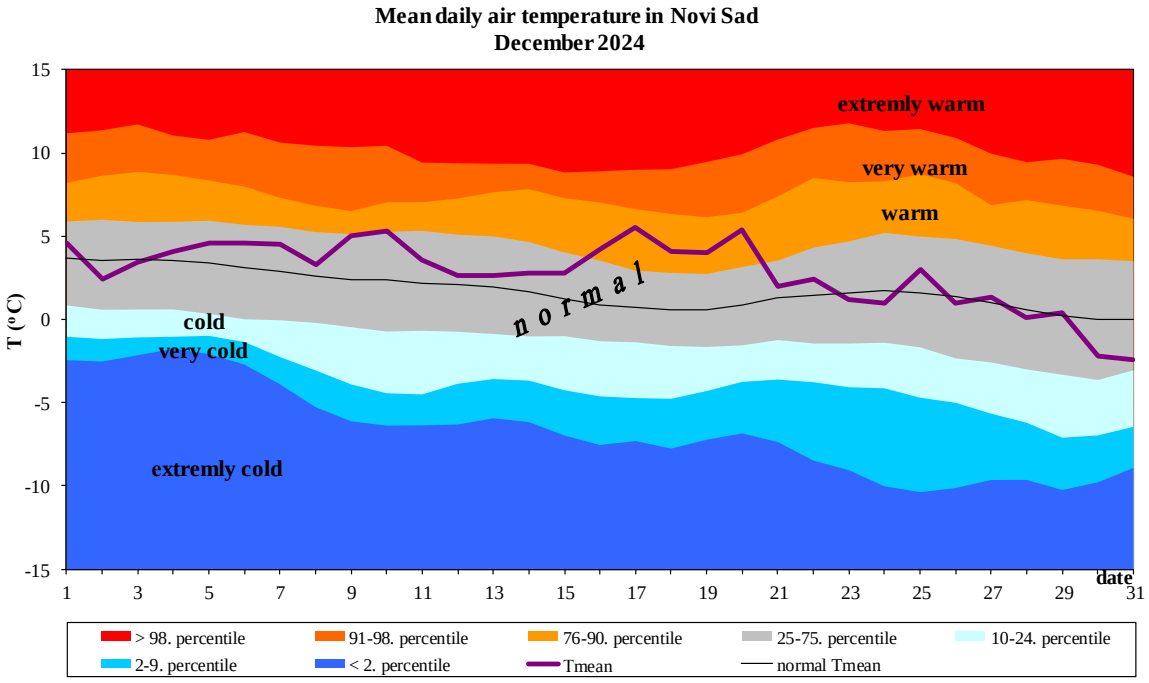


Appendix 7. Rank of the highest precipitation in Kragujevac

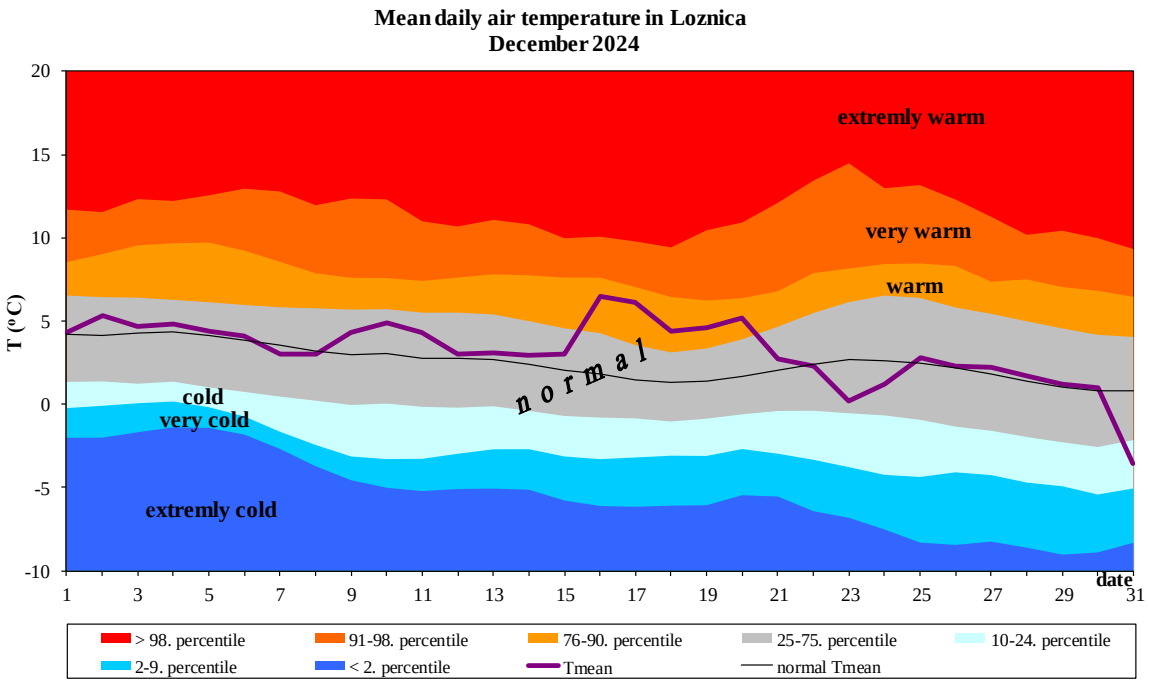
Mean air temperature



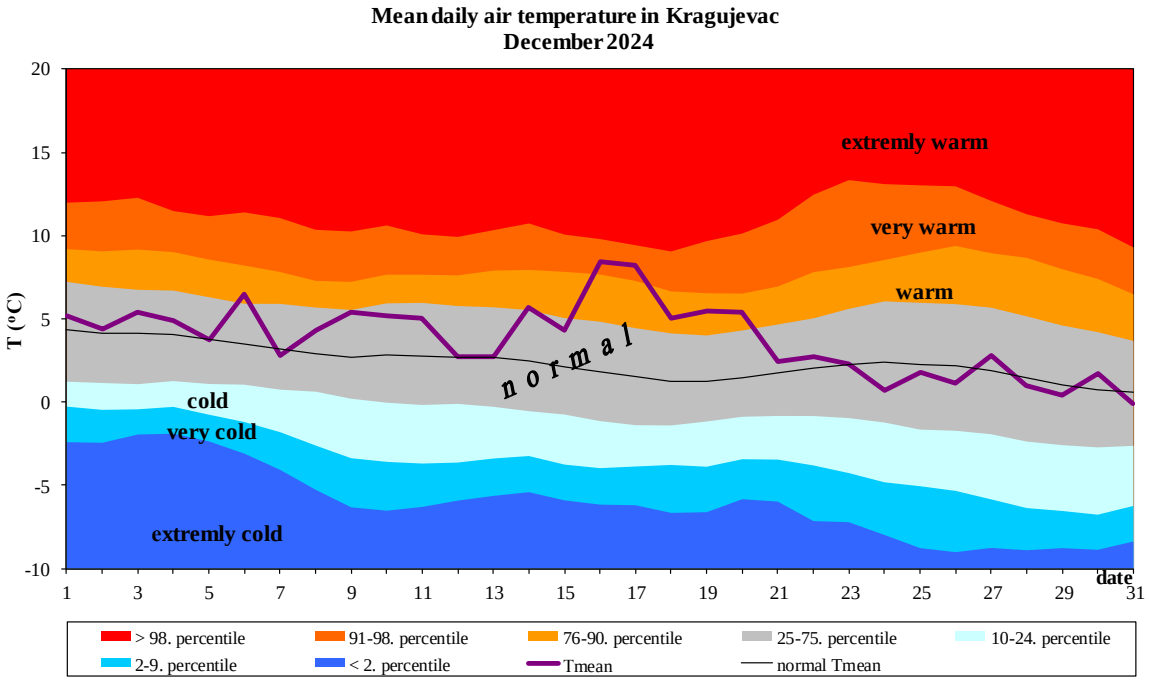
Appendix 8. Daily course of the mean daily air temperature and accompanying percentile for Sombor



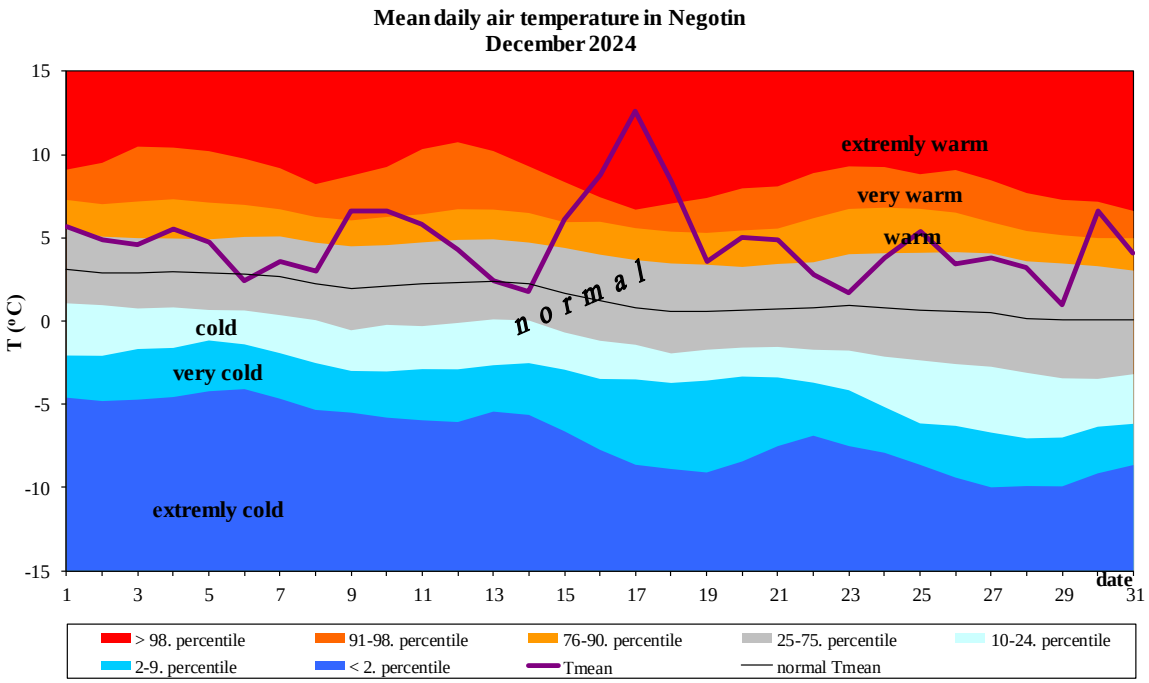
Appendix 9. Daily course of the mean daily air temperature and accompanying percentile for Novi Sad



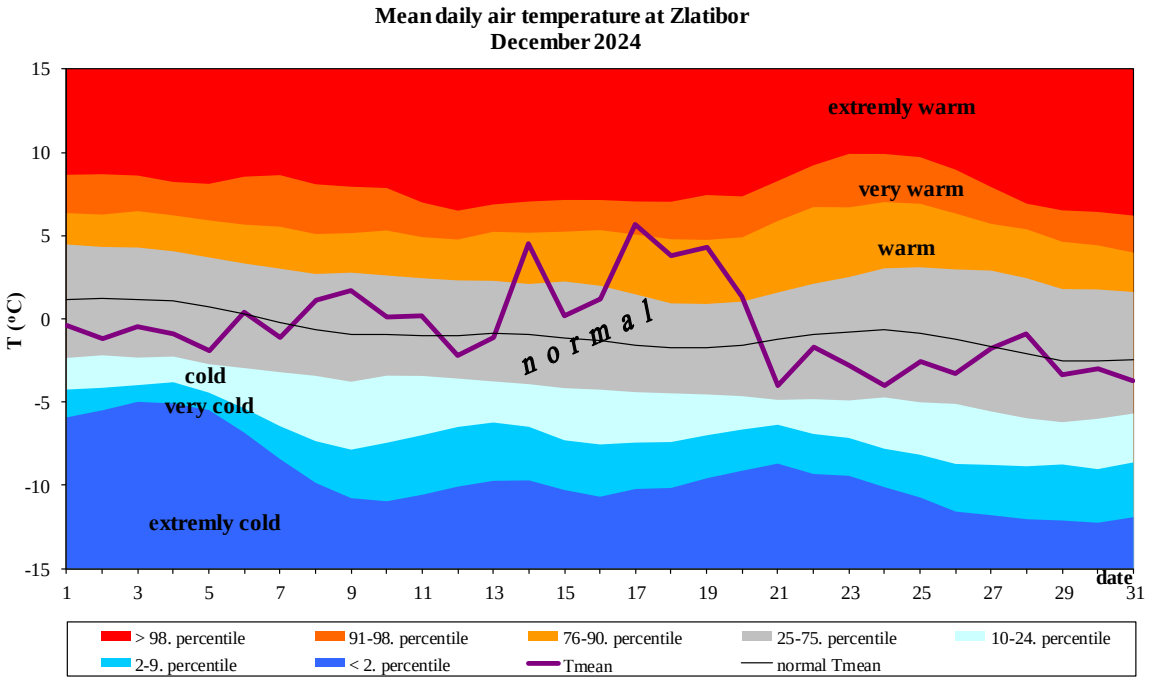
Appendix 10. Daily course of the mean daily air temperature and accompanying percentile for Loznica



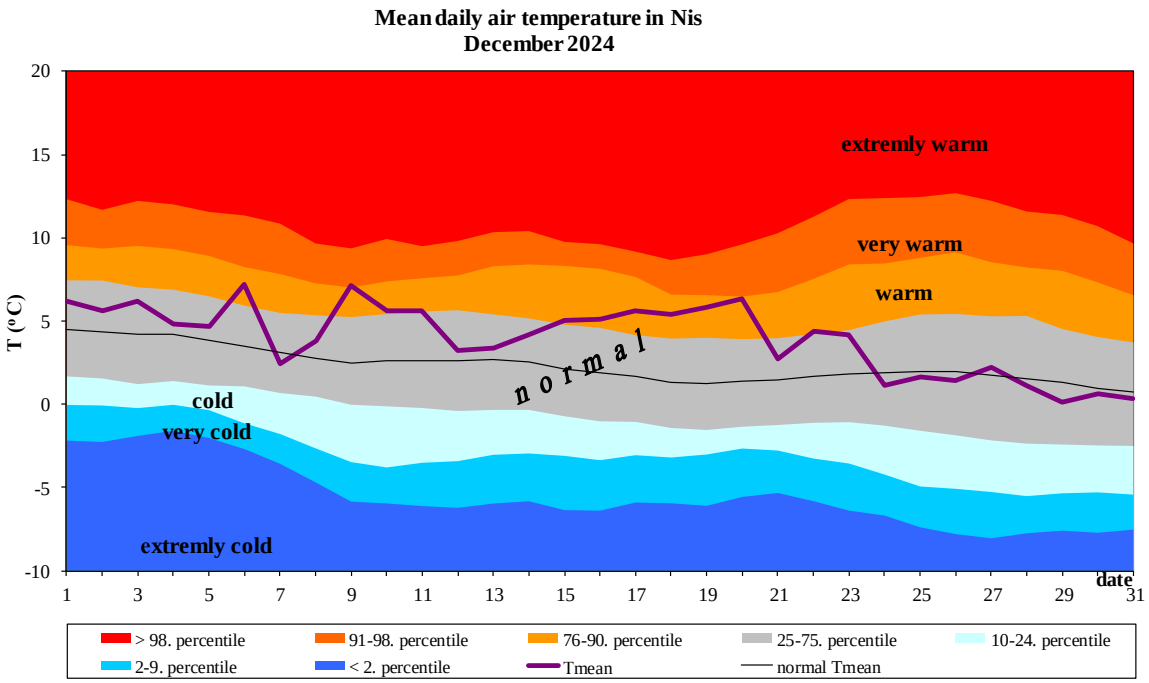
Appendix 11. Daily course of the mean daily air temperature and accompanying percentile for Kragujevac



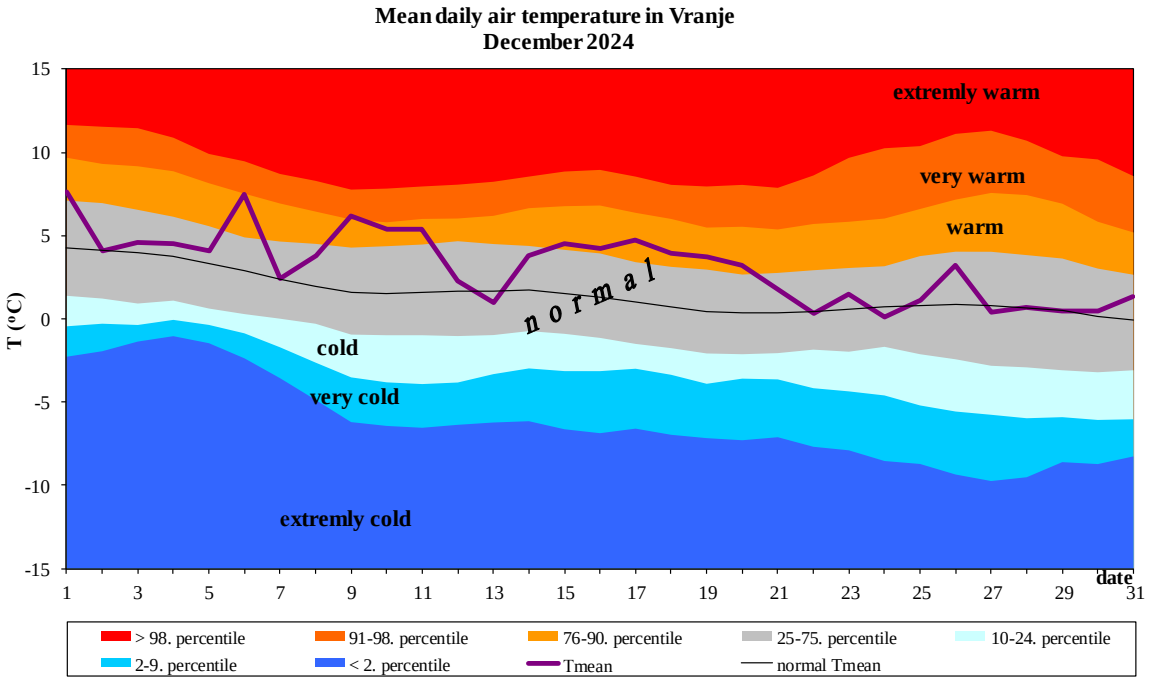
Appendix 12. Daily course of the mean daily air temperature and accompanying percentile for Negotin



Appendix 13. Daily course of the mean daily air temperature and accompanying percentile on Zlatiboru

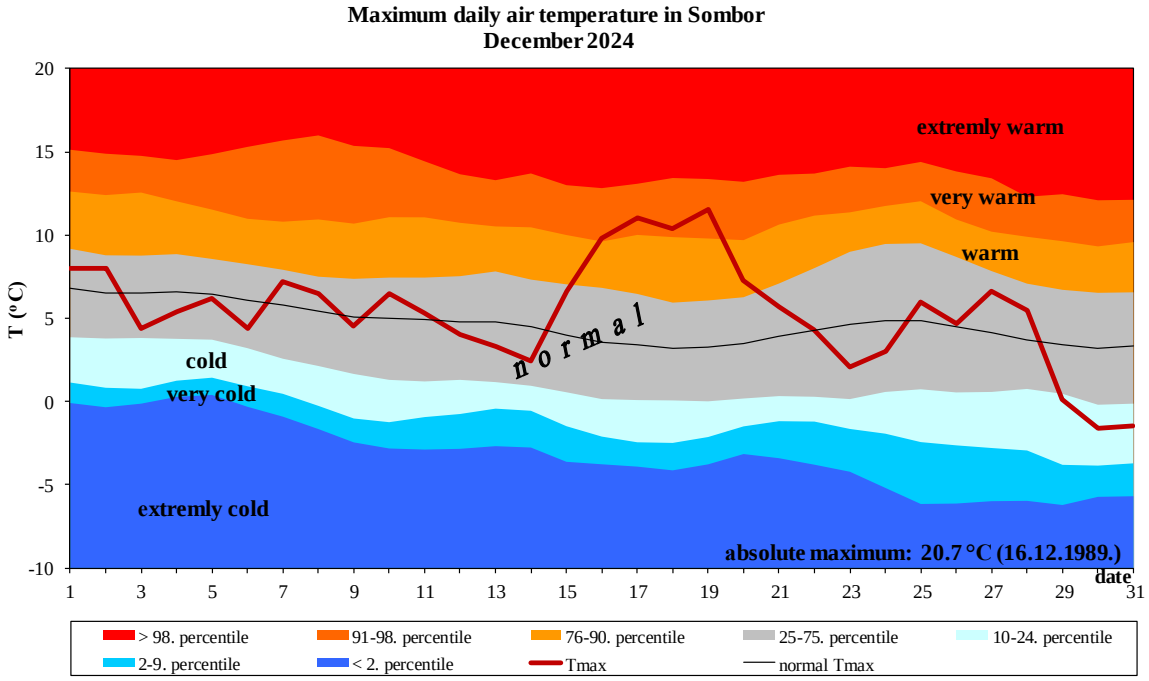


Appendix 14. Daily course of the mean daily air temperature and accompanying percentile for Nis

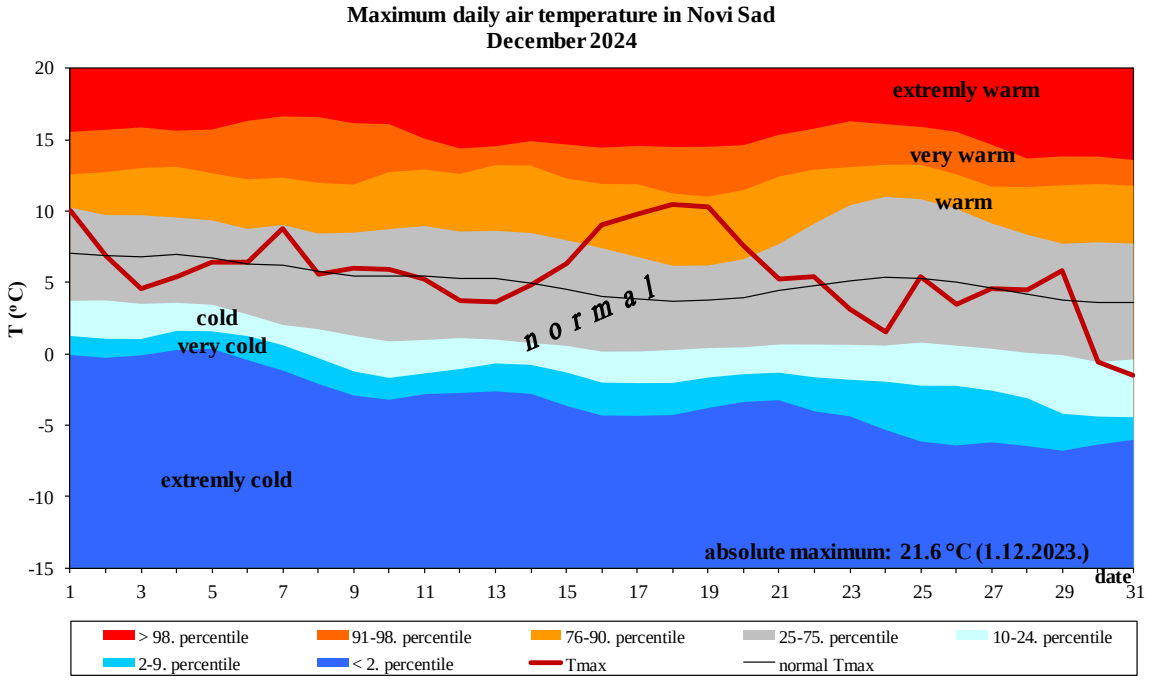


Appendix 15. Daily course of the mean daily air temperature and accompanying percentile for Vranje

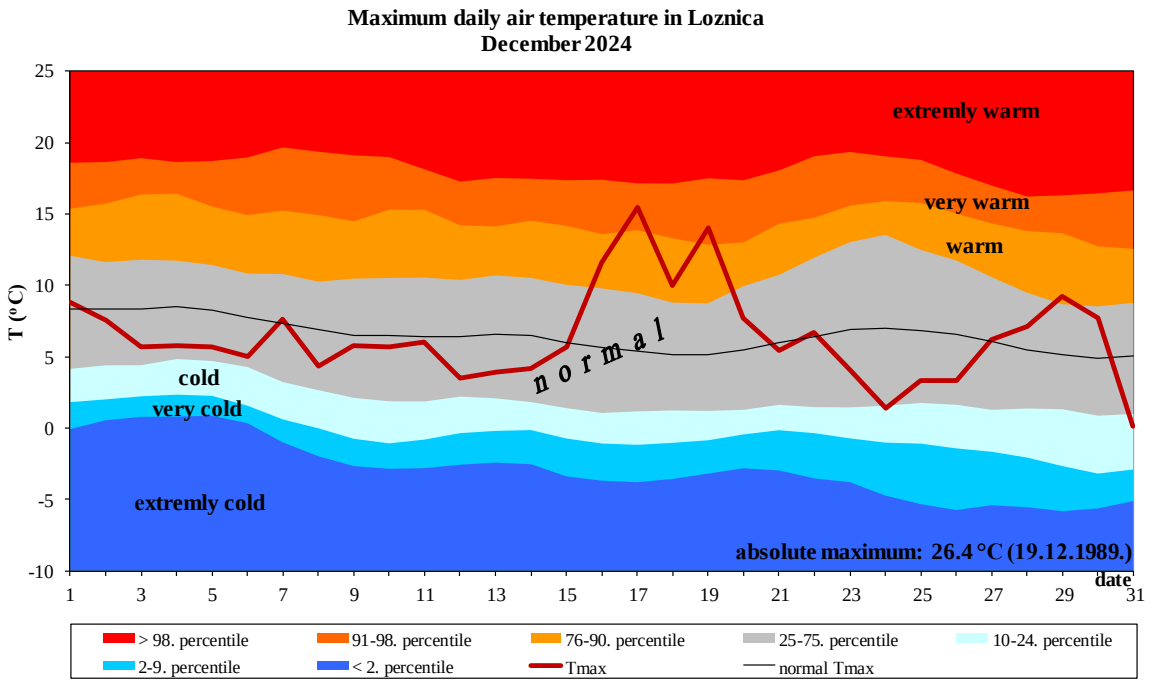
Maximum air temperature



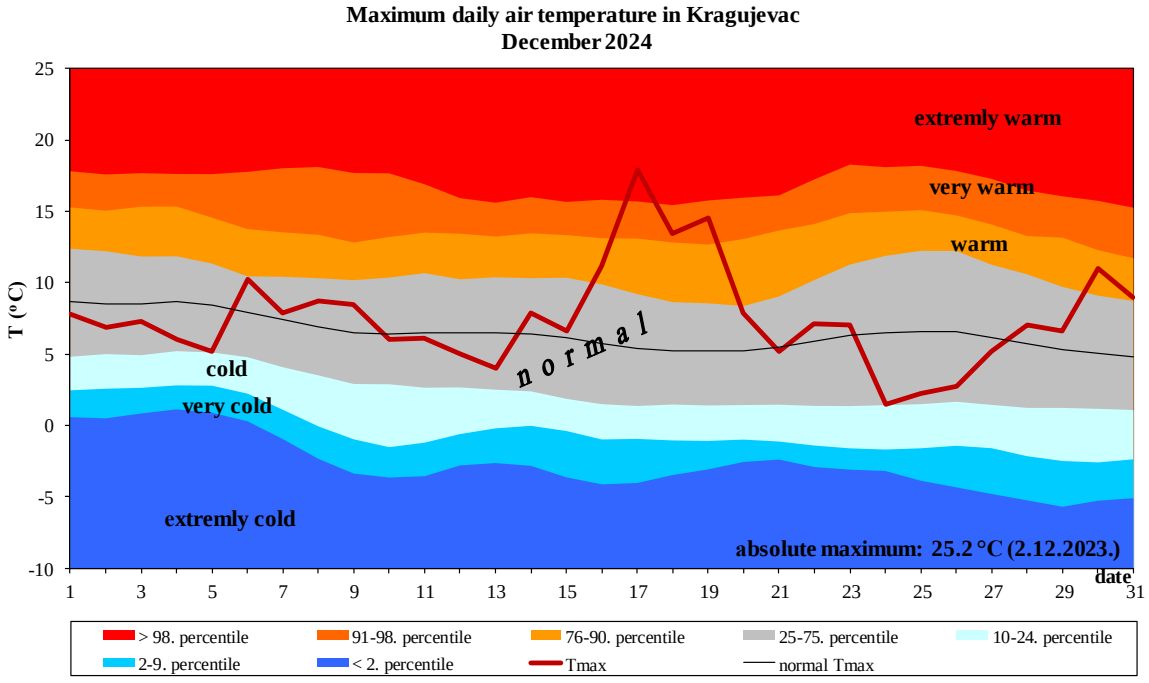
Appendix 16. Daily course of the maximum daily air temeperature and the accompanying percentile for Sombor



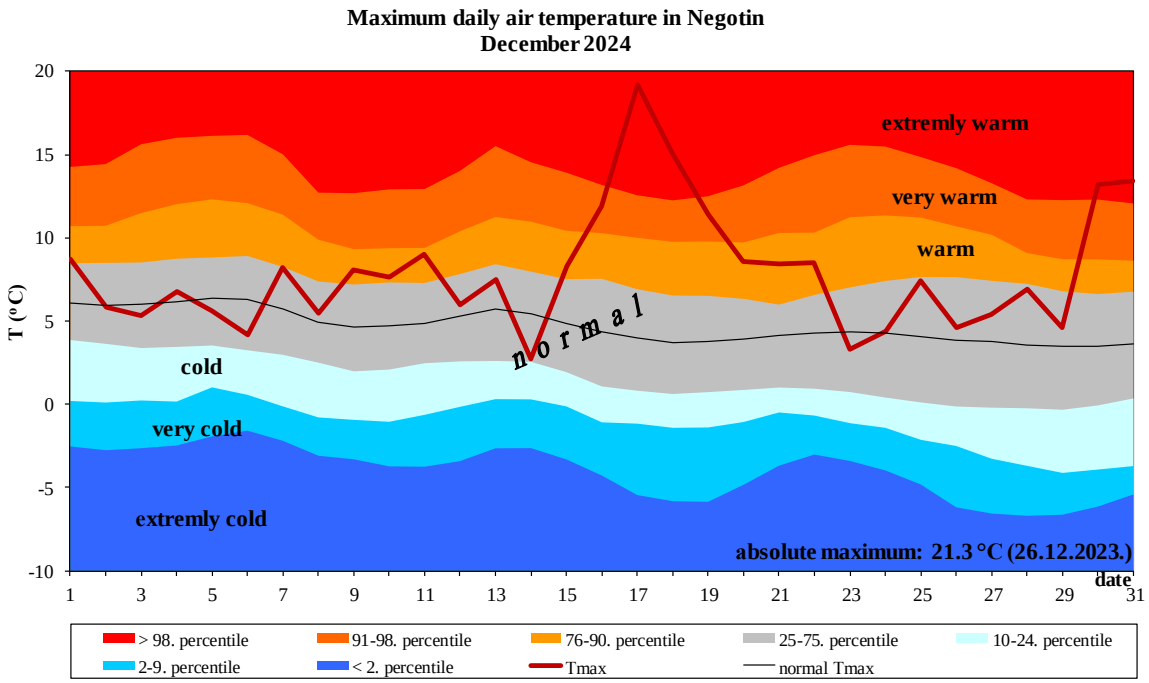
Appendix 17. Daily course of the maximum daily air temeperature and the accompanying percentile for Novi Sad



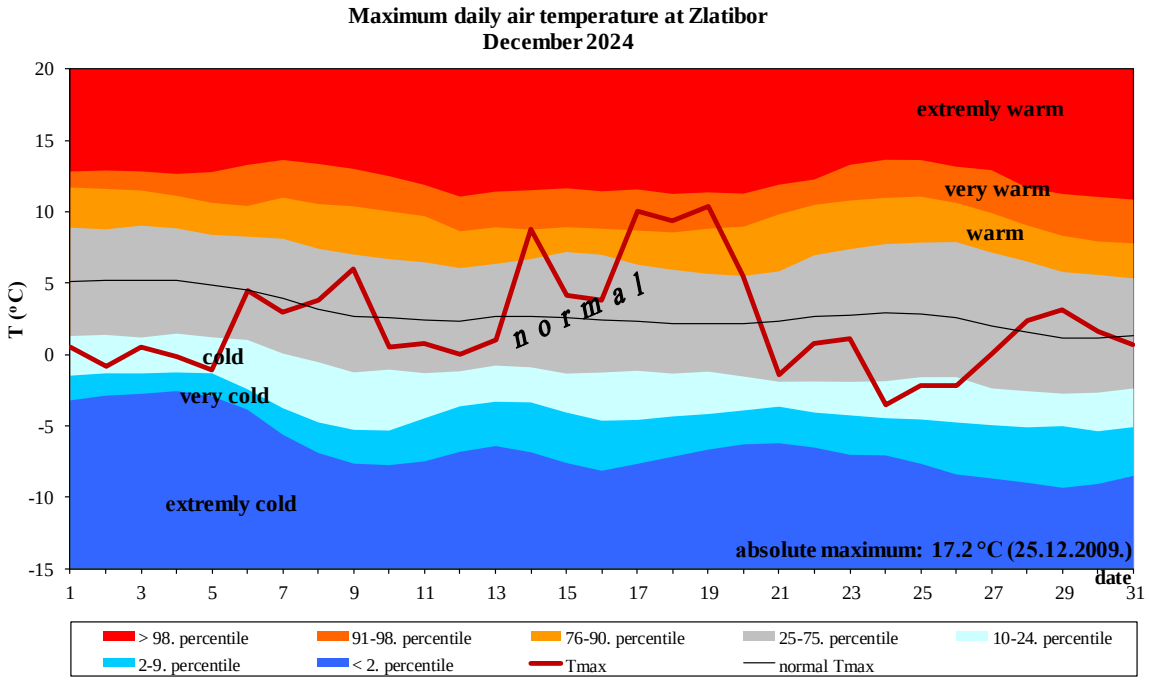
Appendix 18. Daily course of the maximum daily air temeperature and the accompanying percentile for Loznica



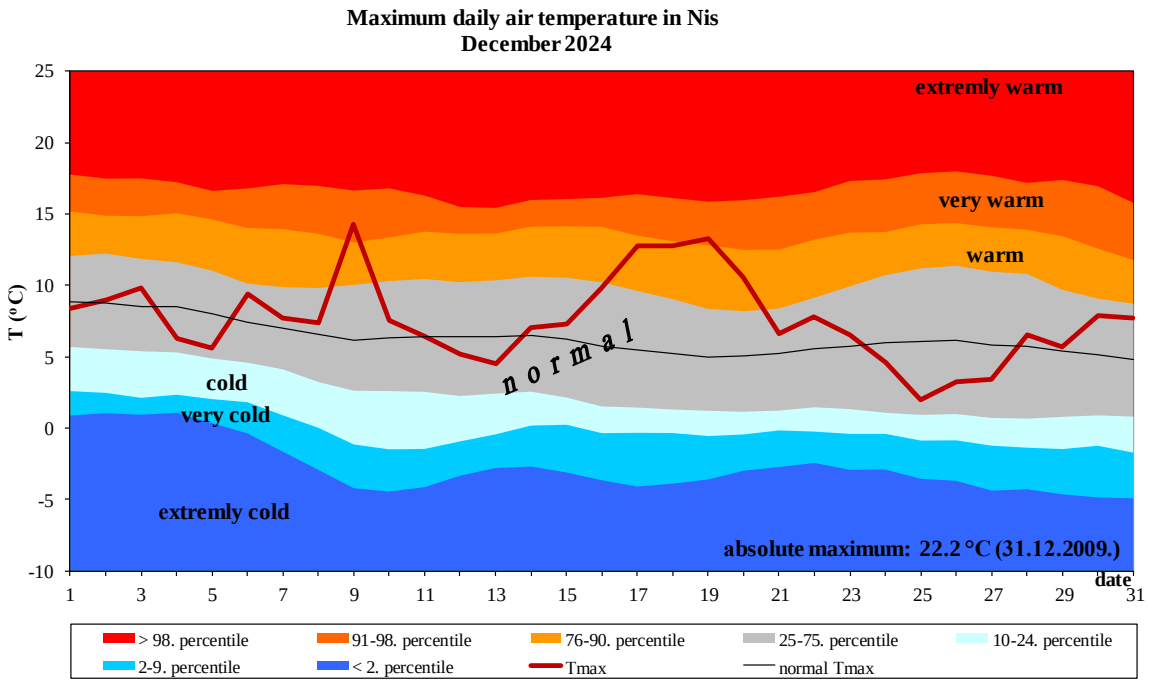
Appendix 19. Daily course of the maximum daily air temeperature and the accompanying percentile for Kragujevac



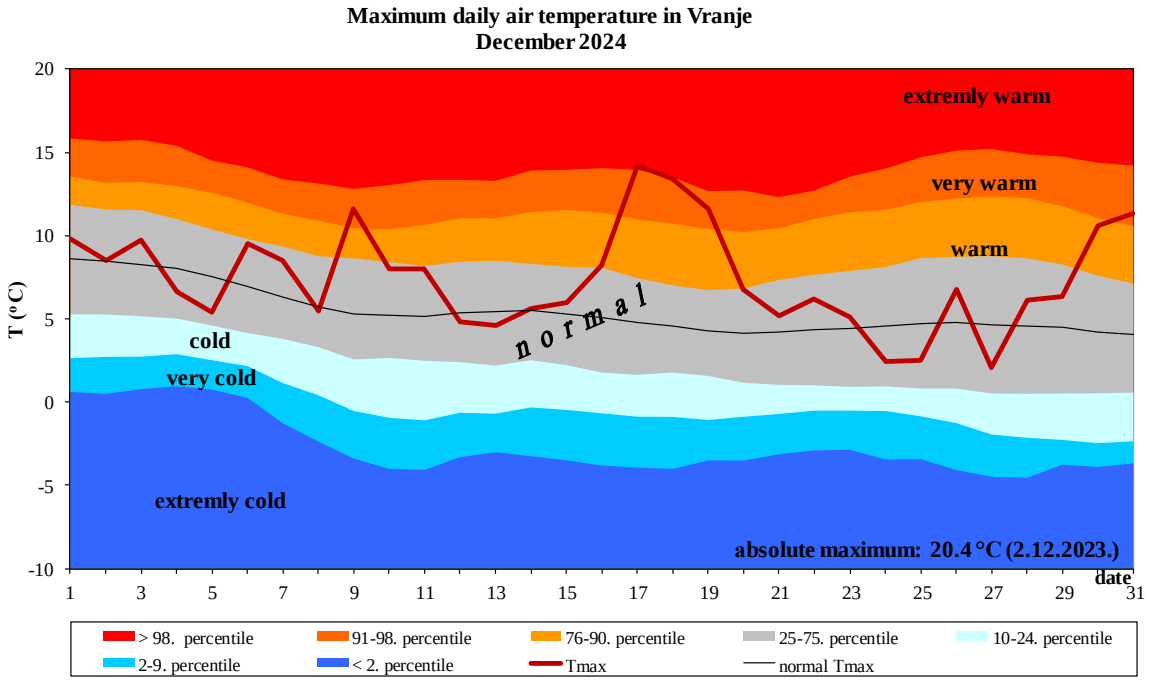
Appendix 20. Daily course of the maximum daily air temeperature and the accompanying percentile for Negotin



Appendix 21. Daily course of the maximum daily air temeperature and the accompanying percentile on Zlatibor

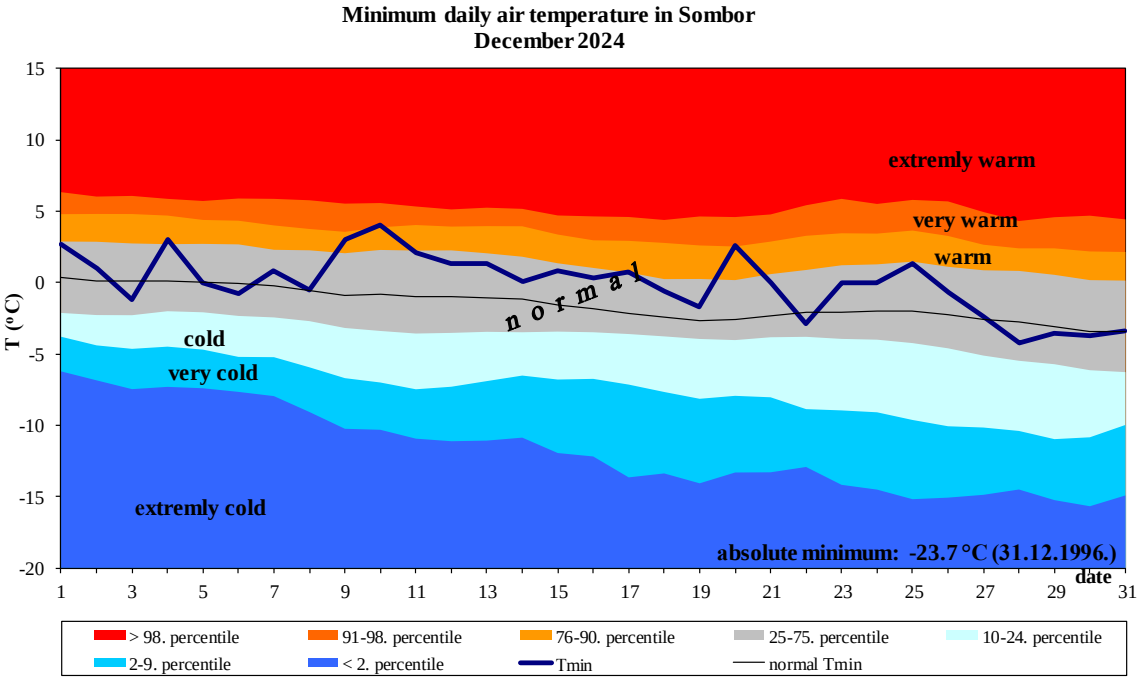


Appendix 22. Daily course of the maximum daily air temeperature and the accompanying percentile for Nis

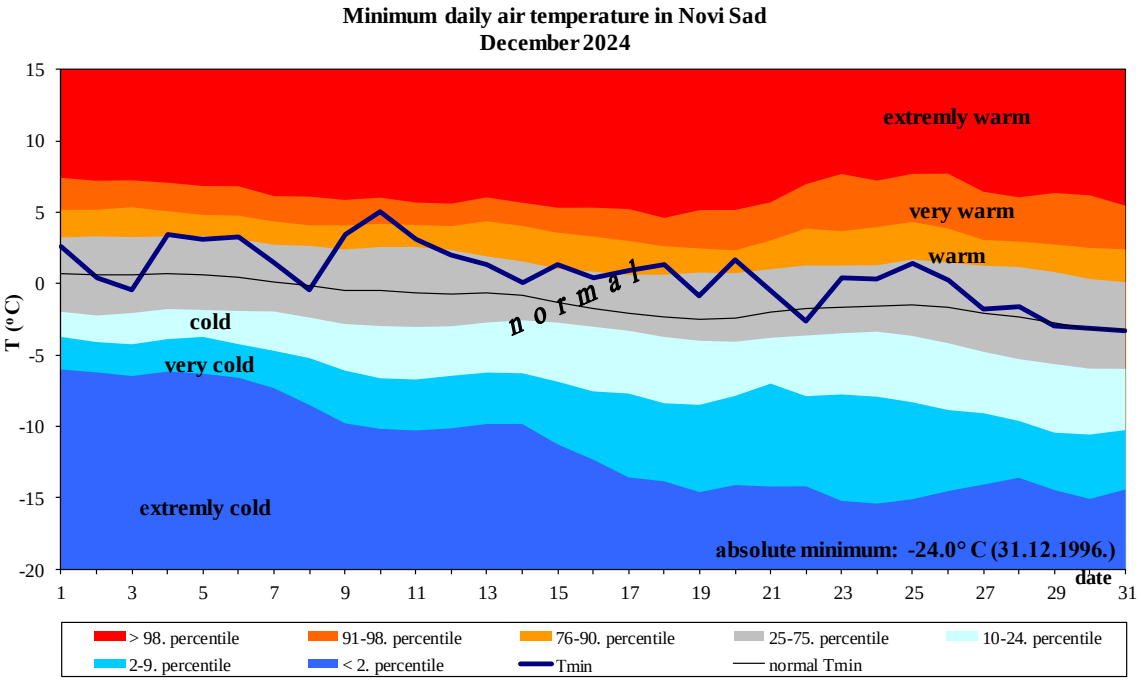


Appendix 23. Daily course of the maximum daily air temeperature and the accompanying percentile for Vranje

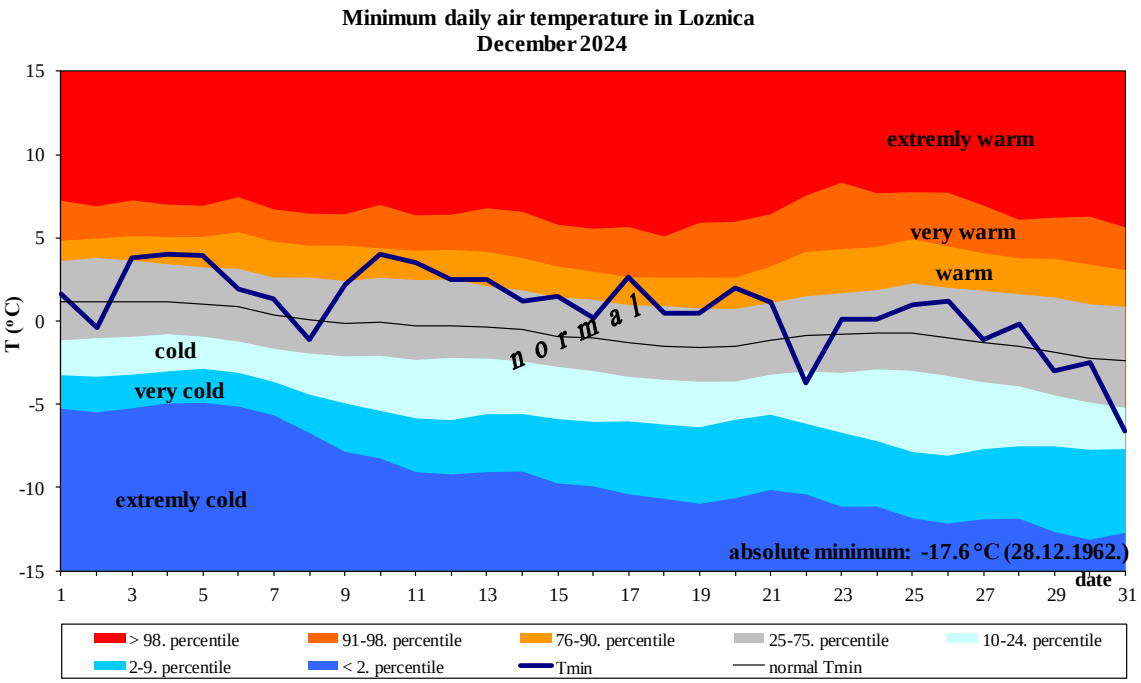
Minimum air temperature



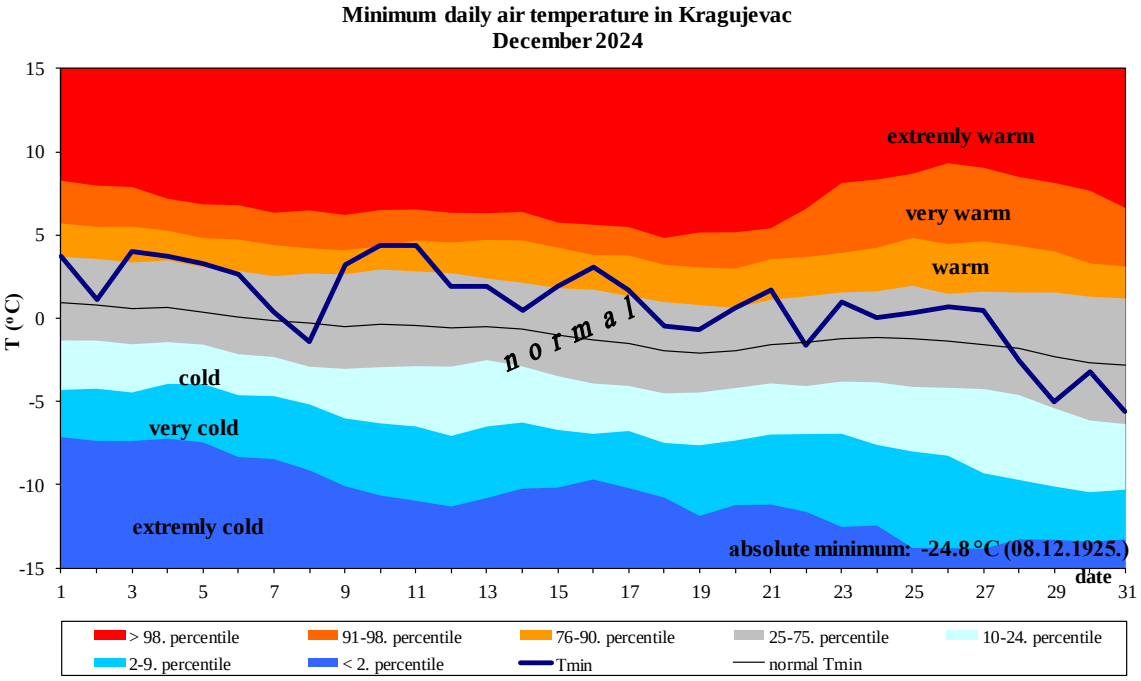
Appendix 24. Daily course of the minimum daily air temperature and the accompanying percentile for Sombor



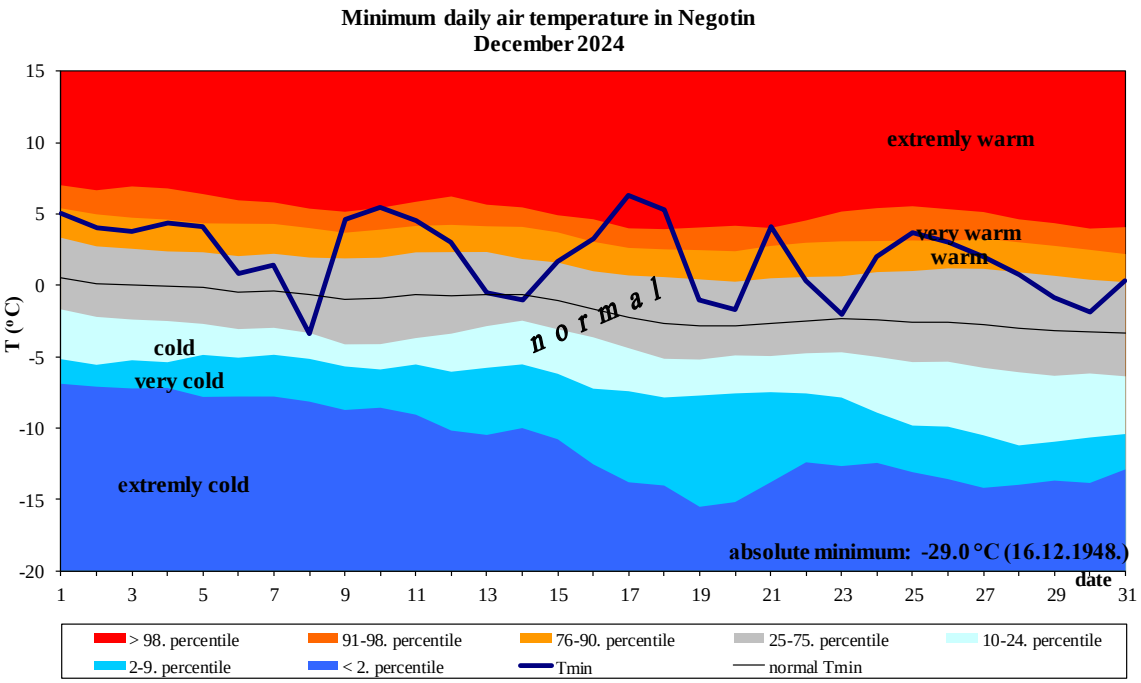
Appendix 25. Daily course of the minimum daily air temperature and the accompanying percentile for Novi Sad



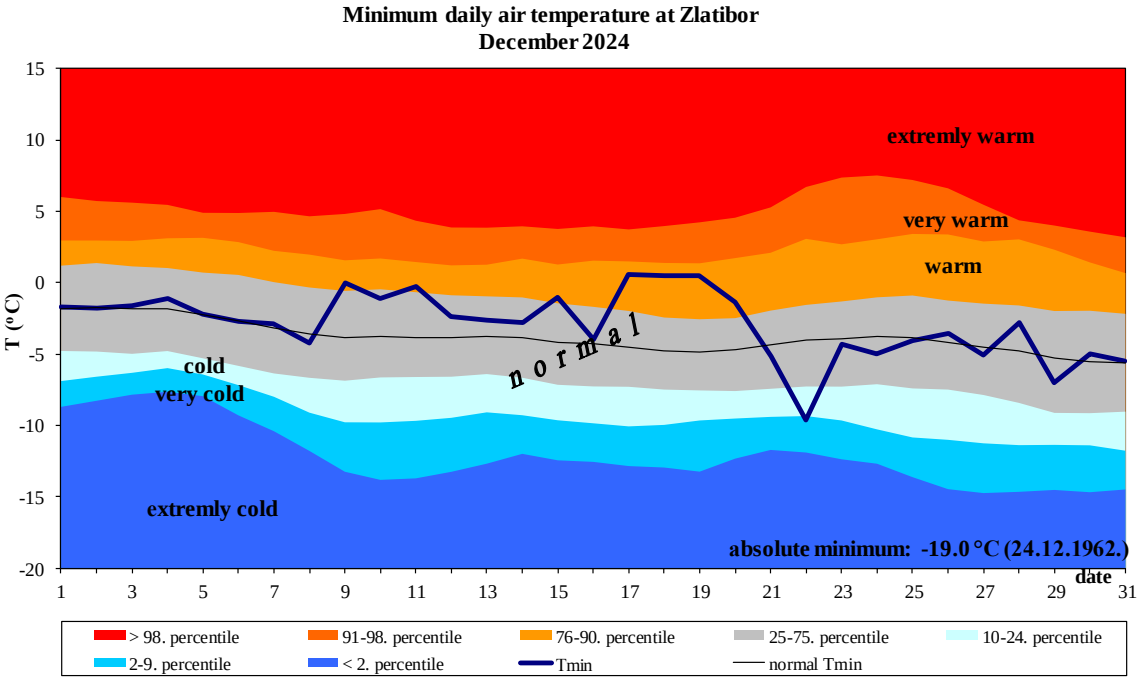
Appendix 26. Daily course of the minimum daily air temperature and the accompanying percentile for Loznica



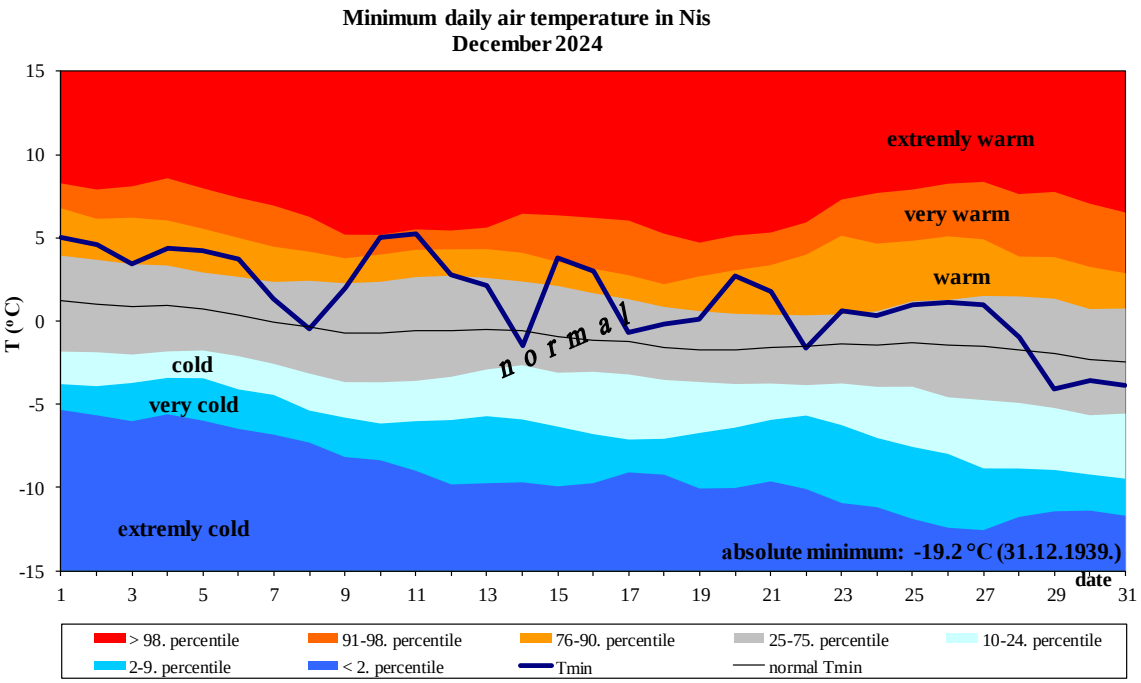
Appendix 27. Daily course of the minimum daily air temperature and the accompanying percentile for Kragujevac



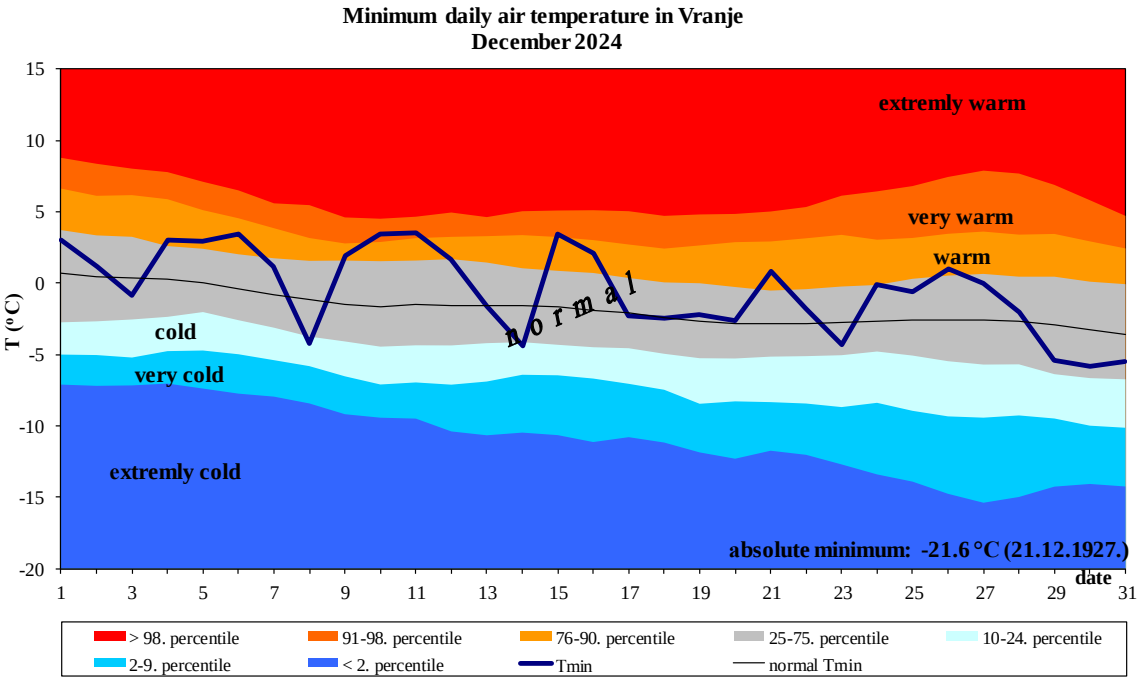
Appendix 28. Daily course of the minimum daily air temperature and the accompanying percentile for Negotin



Appendix 29. Daily course of the minimum daily air temperature and the accompanying percentile on Zlatibor

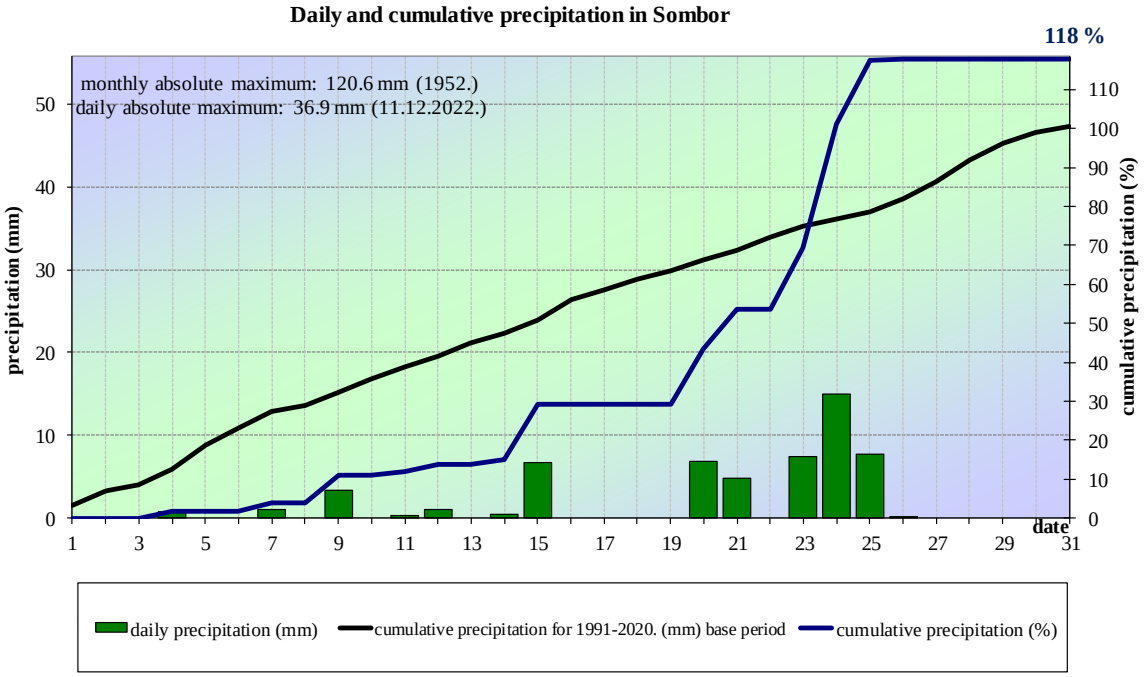


Appendix 30. Daily course of the minimum daily air temperature and the accompanying percentile for Nis

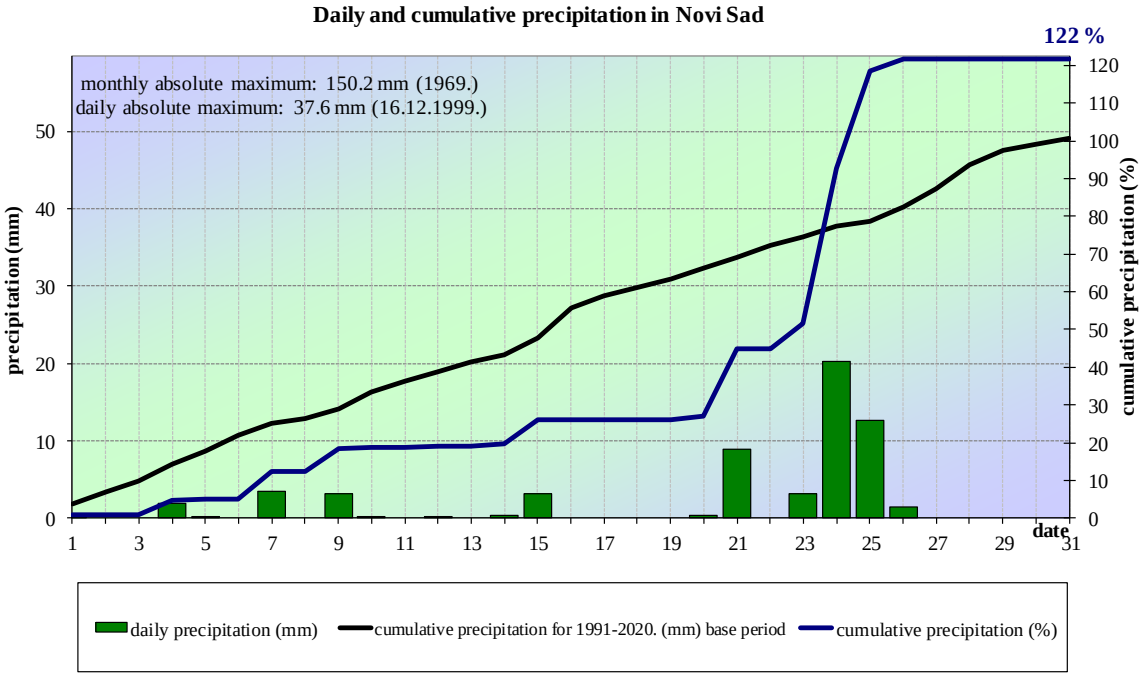


Appendix 31. Daily course of the minimum daily air temperature and the accompanying percentile for Vranje

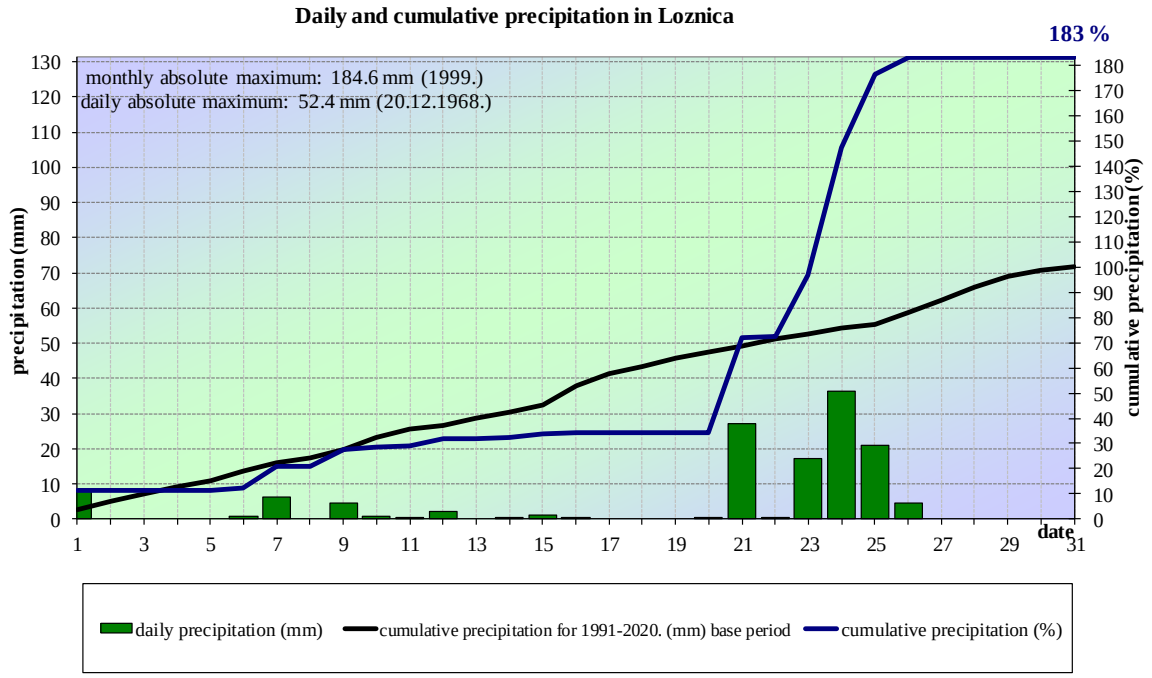
Precipitation



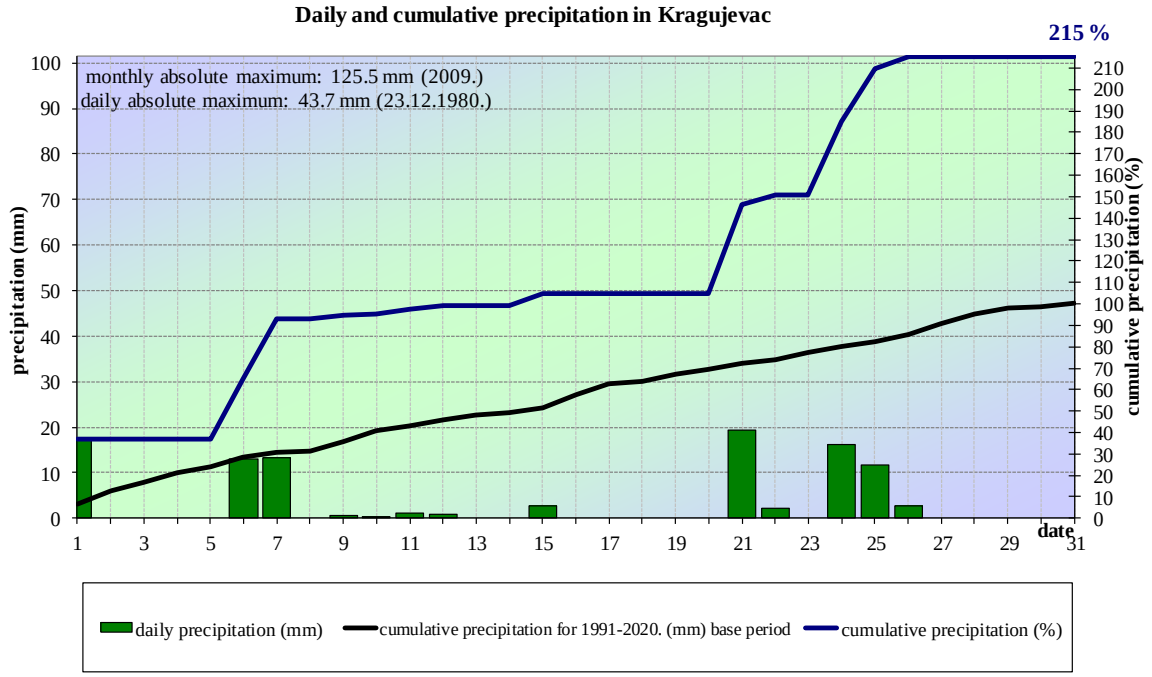
Appendix 32. Daily and cumulative precipitation sums for Sombor



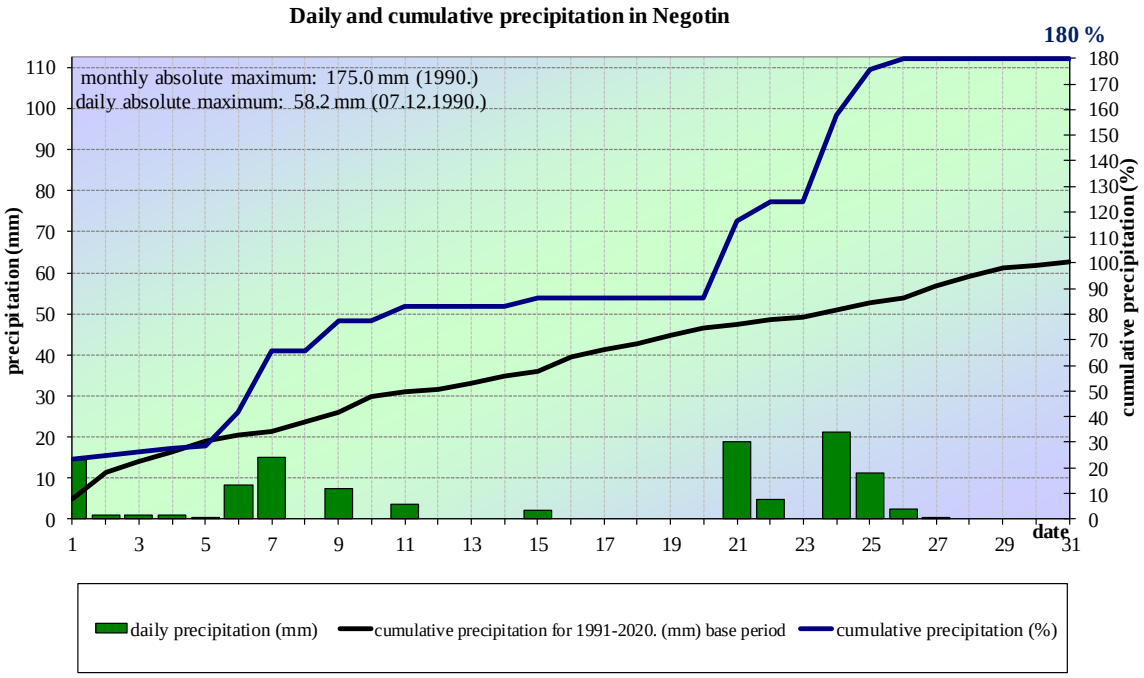
Appendix 33. Daily and cumulative precipitation sums for Novi Sad



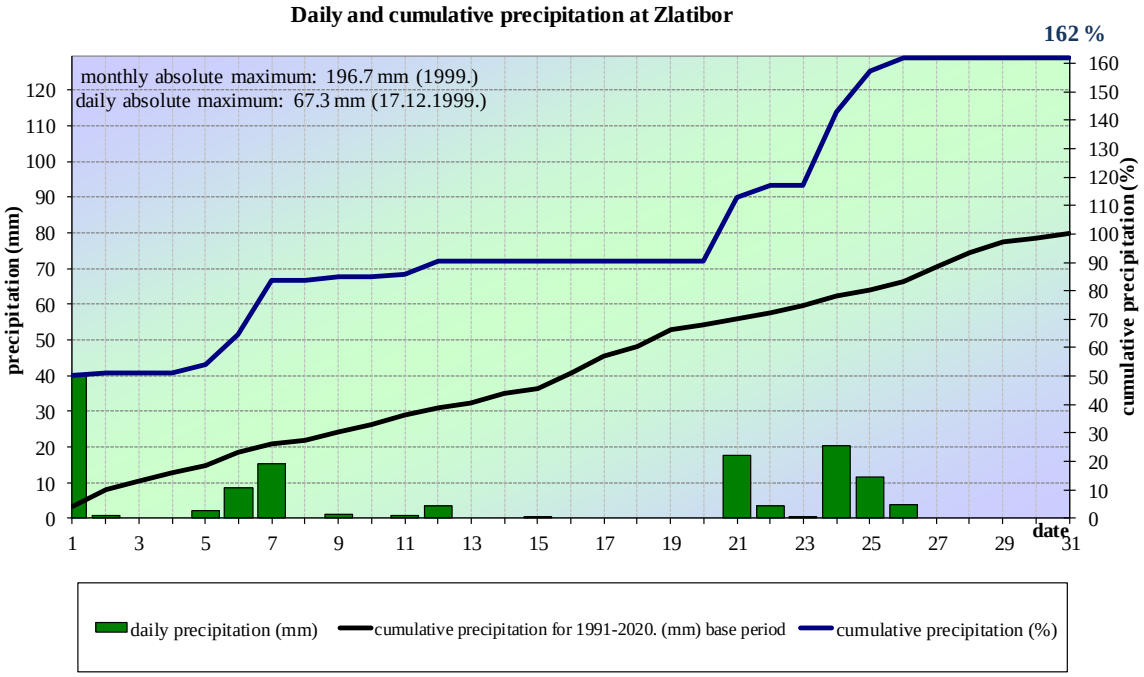
Appendix 34. Daily and cumulative precipitation sums for Loznica



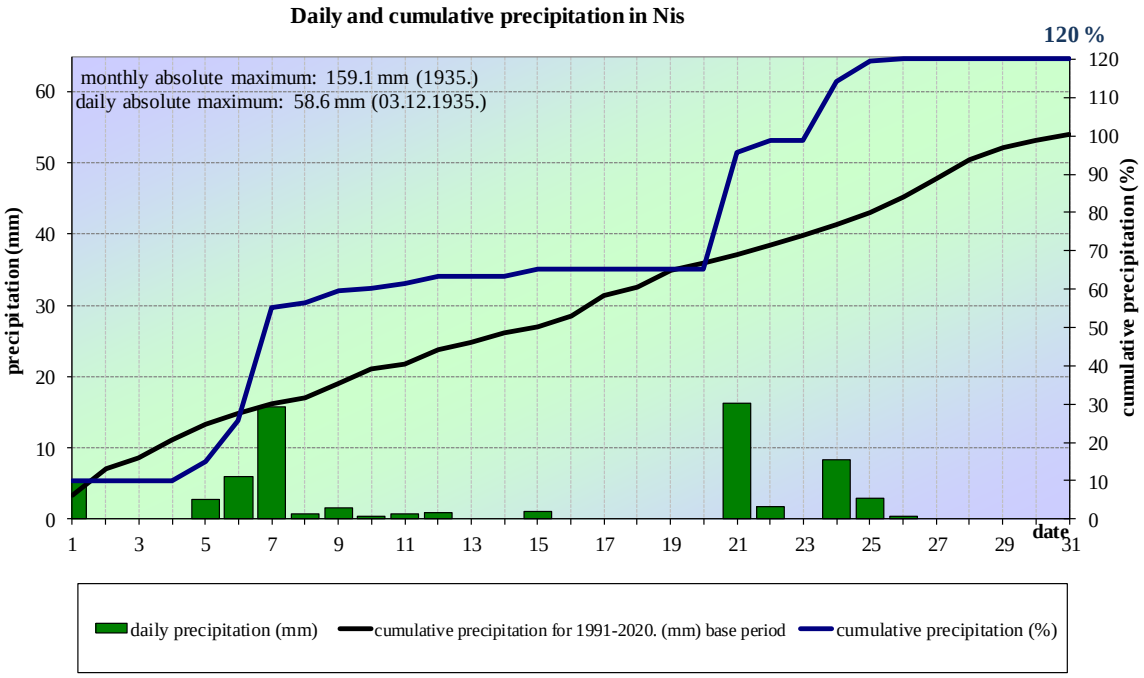
Appendix 35. Daily and cumulative precipitation sums for Kragujevac



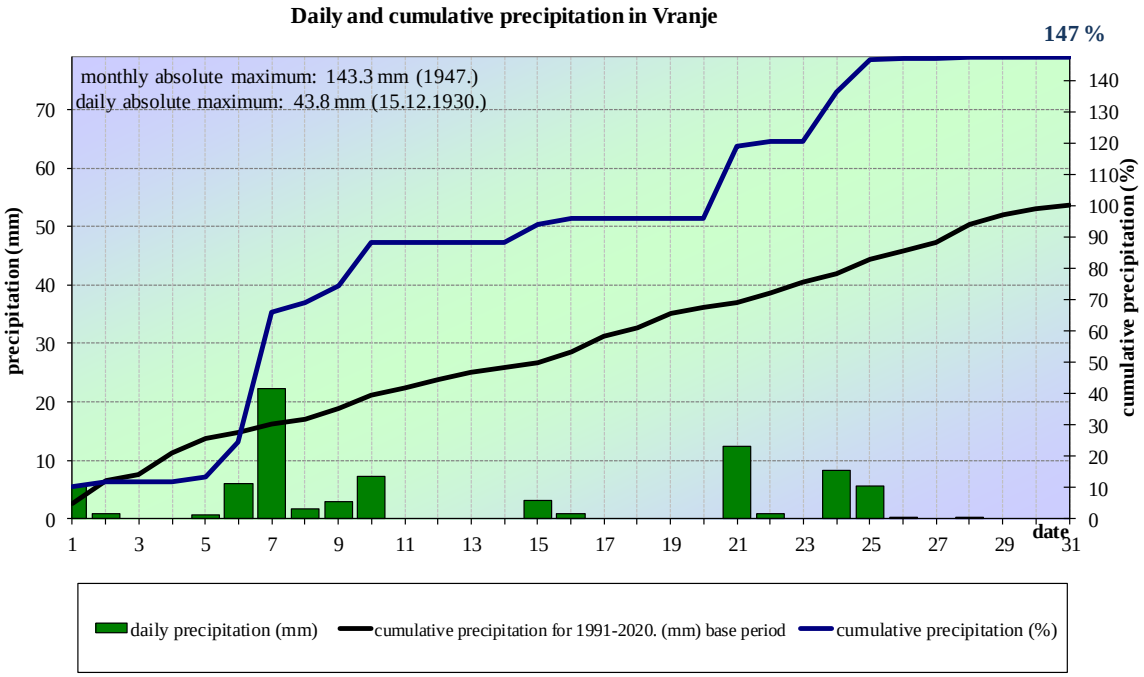
Appendix 36. Daily and cumulative precipitation sums for Negotin



Appendix 37. Daily and cumulative precipitation sums on Zlatibor



Appendix 38. Daily and cumulative precipitation sums for Nis



Appendix 39. Daily and cumulative precipitation sums for Vranje