VERIFICATION OF THE SEECOF–32 WINTER 2024/2025 CLIMATE OUTLOOK AND SEASONAL BULLETIN FOR THE TERRITORY OF SERBIA

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Temperature

The SEECOF-32 outlook for the winter 2024/2025 in Serbia indicated above- normal temperature in Serbia with 50% probability relative to the 1991–2020 climatological base period (*Figure* A).

Climatological monitoring showed that the winter 2024/2025 was warm in the entire Serbia, with above-normal temperature based on the tercile method (*Figure* B). The outlook for a warm winter was correct.

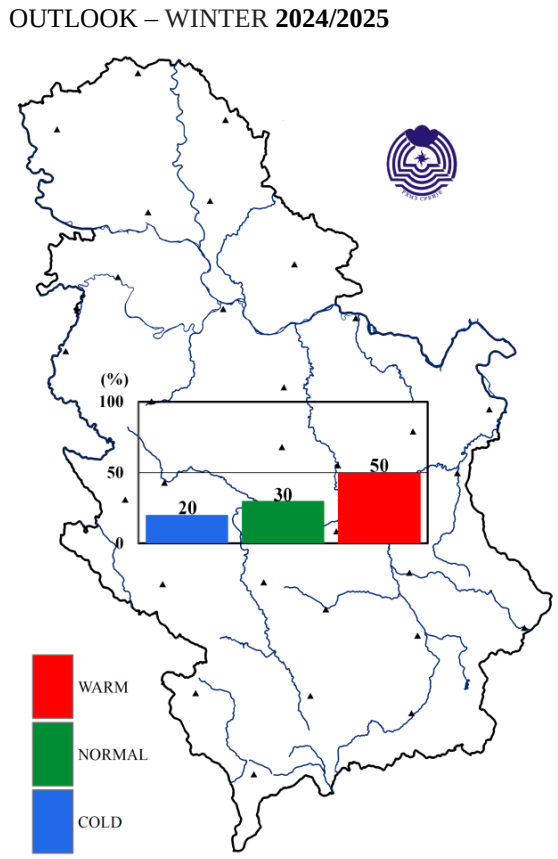

Figure A. SEECOF-32 – winter temperature outlook

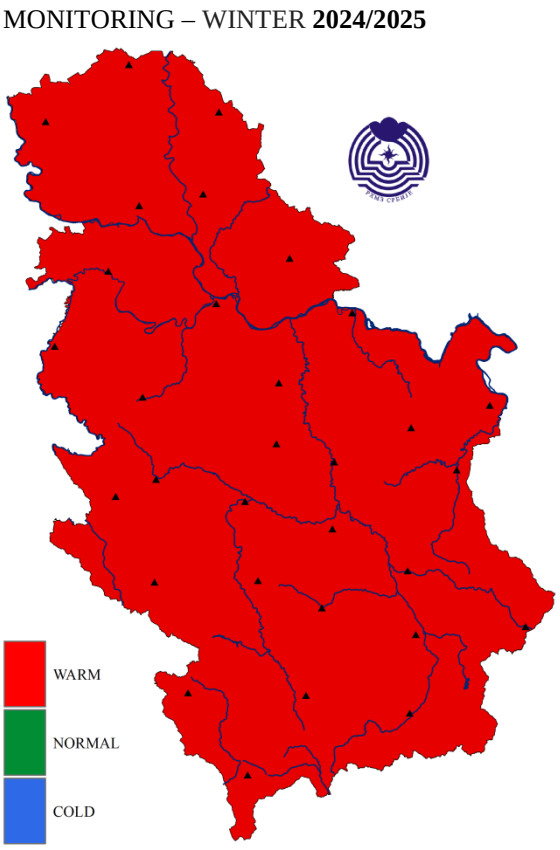

Figure B. Monitoring of the winter temperature using tercile method compared to the 1991-2020 base period

Precipitation

According to the SEECOF-32 outlook for the winter 2024/2025, approximately equal probabilities for below, near or above normal precipitation were indicated for Serbia, relative to the 1991–2020 climatological base period (*Figure* C), hence climatology (average seasonal precipitation) was suggested.

Based on the climatological monitoring of precipitation, the winter of 2024/2025 was dry in most of Serbia whilst average precipitation sums were recorded in some parts of eastern, northwestern, southwestern and central Serbia (*Figure* D). The outlook for the average winter precipitation sums was correct for some parts of eastern, northwestern, southwestern and central Serbia.

OUTLOOK – WINTER **2024/2025**

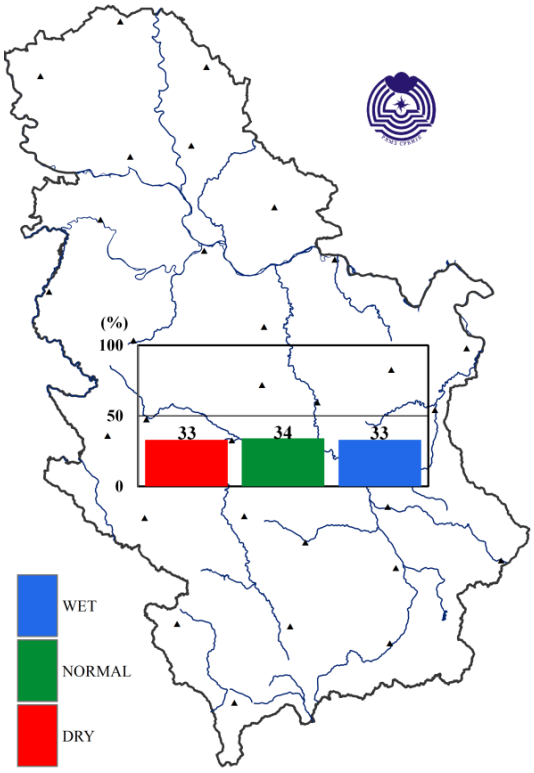

Figure C. SEECOF-32 - winter precipitation outlook

MONITORING – WINTER **2024/2025**

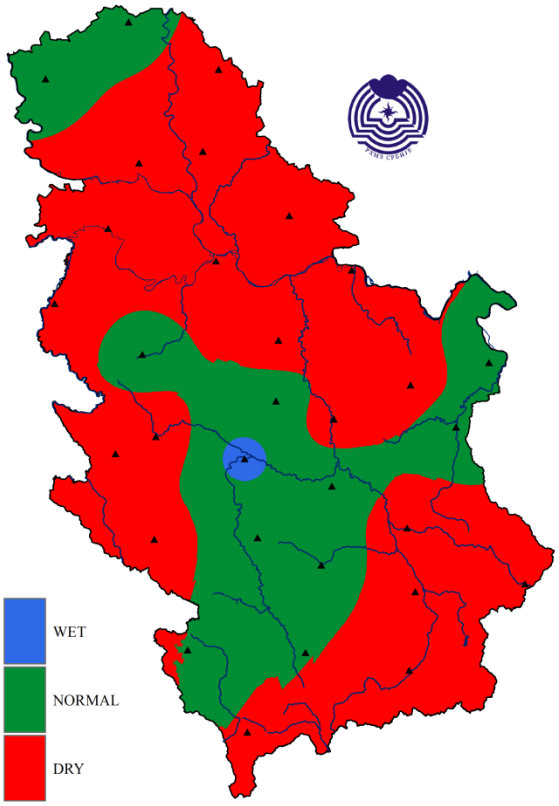

Figure D. Monitoring of the winter precipitation using tercile method compared to the 1991-2020 base period

Winter 2024/2025			**Air Temperature (°C)**			
Station	Rank*	Rank**	33	50	66	Observed value
Belgrade (1887-2024)	24	14	1.7	2.6	3.7	**4.2**
Palić (1945-2024)	23	15	0.2	1.0	2.1	**2.1**
Sombor (1941-2024)	21	15	0.5	1.1	2.1	**2.2**
Novi Sad (1948-2024)	23	14	0.8	1.3	2.4	**2.8**
Zrenjanin (1943-2024)	22	15	0.6	1.5	2.4	**2.6**
Kikinda (1948-2024)	14	14	0.3	1.4	2.1	**2.4**
Banatski Karlovac (1985-2024)	20	13	0.5	1.5	2.2	**2.8**
Loznica (1952-2024)	24	15	1.5	2.1	3.1	**3.3**
Sremska Mitrovica (1925-2024)	22	15	0.6	1.3	2.3	**2.5**
Valjevo (1926-2024)	21	13	1.2	1.9	2.8	**3.1**
Kragujevac (1925-2024)	19	12	1.2	2.2	2.8	**3.3**
Smederevska Palanka (1939-2024)	19	13	1.0	1.9	2.8	**3.2**
Veliko Gradište (1926-2024)	18	11	0.4	1.5	2.2	**2.7**
Crni Vrh (1966-2024)	13	11	-3.3	-2.8	-2.0	**-1.0**
Negotin (1927-2024)	13	9	0.7	1.4	1.9	**2.7**
Zlatibor (1950-2024)	16	11	-2.0	-1.2	-0.5	**0.0**
Sjenica (1946-2024)	13	11	-3.4	-2.5	-1.6	**-1.0**
Pozega (1952-2024)	14	10	-1.0	0.0	0.7	**1.1**
Kraljevo (1926-2024)	19	12	1.1	1.8	2.4	**2.8**
Kopaonik (1949-2024)	8	7	-5.0	-4.3	-3.6	**-2.5**
Kursumlija (1952-2024)	13	10	0.4	1.3	2.0	**2.8**
Krusevac (1927-2024)	20	13	0.8	1.9	2.4	**2.8**
Cuprija (1948-2024)	16	11	0.6	1.7	2.2	**2.9**

Nis (1925-2024)	18	13	1.2	2.1	2.9	**3.4**
Leskovac (1948-2024)	22	14	0.5	1.5	2.2	**2.5**
Zajecar (1929-2024)	15	11	0.1	0.7	1.2	**2.1**
Dimitrovgrad (1945-2024)	15	10	-0.3	0.6	1.5	**2.1**
Vranje (1926-2024)	23	13	0.5	1.4	2.2	**2.3**

*Rank –period of stations work (warmest season)
**Rank – 1991-2025 period (warmest season)

Winter 2024/2025			**Precipitation sums (mm)**			
Station	Rank*	Rank**	33	50	66	Observed Value
Belgrade (1887-2024)	36	9	139.2	155.4	168.8	**95.7**
Palić (1936-2024)	43	16	95.9	114.7	133.2	**106.6**
Sombor (1931-2024)	45	18	107.6	116.0	132.8	**116.0**
Novi Sad (1945-2024)	22	8	116.0	127.7	146.7	**101.4**
Zrenjanin (1925-2024)	21	9	110.7	122.9	140.6	**87.5**
Kikinda (1925-2024)	29	9	100.6	112.6	126.7	**94.6**
Banatski Karlovac (1946-2024)	16	10	108.3	124.3	143.6	**83.2**
Loznica (1925-2024)	44	11	171.7	205.5	209.6	**165.0**
Sremska Mitrovica (1925-2024)	14	7	103.7	124.9	137.9	**74.5**
Valjevo (1926-2024)	39	13	140.8	162.2	181.4	**145.0**
Kragujevac (1925-2024)	46	16	118.8	127.2	142.4	**123.5**
Smederevska Palanka (1926-2024)	32	10	124.0	144.5	165.6	**119.1**
Veliko Gradište (1926-2024)	11	6	110.3	142.8	162.3	**90.1**
Crni Vrh (1966-2024)	20	11	127.6	160.5	183.1	**124.3**
Negotin (1941-2024)	27	13	108.4	163.1	206.9	**120.6**

Zlatibor (1950-2024)	29	9	204.3	229.6	237.8	**185.4**
Sjenica (1925-2024)	41	10	143.5	170.7	192.5	**140.2**
Pozega (1925-2024)	23	10	122.6	155.7	171.1	**113.5**
Kraljevo (1926-2024)	64	23	127.3	142.5	163.6	**164.0**
Kopaonik (1949-2024)	30	12	156.1	207.8	254.5	**184.0**
Kursumlija (1925-2024)	43	14	123.5	150.9	175.8	**131.2**
Krusevac (1925-2024)	68	22	121.8	137.7	163.4	**161.1**
Cuprija (1947-2024)	30	10	136.7	159.6	176.9	**127.0**
Nis (1925-2024)	17	10	117.7	142.4	163.1	**91.2**
Leskovac (1925-2024)	27	8	134.0	153.8	174.9	**110.3**
Zajecar (1925-2024)	64	22	102.6	140.1	158.2	**151.4**
Dimitrovgrad (1926-2024)	24	8	118.4	130.3	171.3	**95.4**
Vranje (1926-2024)	27	10	121.1	133.4	154.3	**105.2**

*Rank –period of stations work (lowest seasonal precipitation)

**Rank – 1991-2025 period (lowest seasonal precipitation)

Country	Seasonal temperature DJF		Seasonal precipitation DJF		High Impact Events
	Observed	SEECOF-32 climate outlook for temperature	Observed	SEECOF-32 climate outlook for precipitation	
Serbia (1)	Above normal	**Above-normal** (20, 30, 50) in entire Serbia	Below normal in most of Serbia, average precipitation sums in some parts of eastern, northwestern, southwestern and central Serbia	**No predictive signal** (33, 34, 33) in entire Serbia	❖ ***In January at 10 stations absolute air maximum exceeded*** ❖ ***3 heat waves; the first was recorded in Negotin and Zajecar, the second in Kikinda, Belgrade and Nis, and the third in most of Serbia*** ❖ ***2 cold waves in Dimitrovgrad, and 1 in Zajecar*** ❖ ***Number of days with snow cover significantly below the normal in the low-lying areas of Serbia***

Analysis of winter season 2024/2025 for Serbia relative to the 1991-2020 base period

Warm and dry (*Figure 1*) with the mean seasonal air temperature slightly above the normal[1] and precipitation sums at the lower tercile threshold.

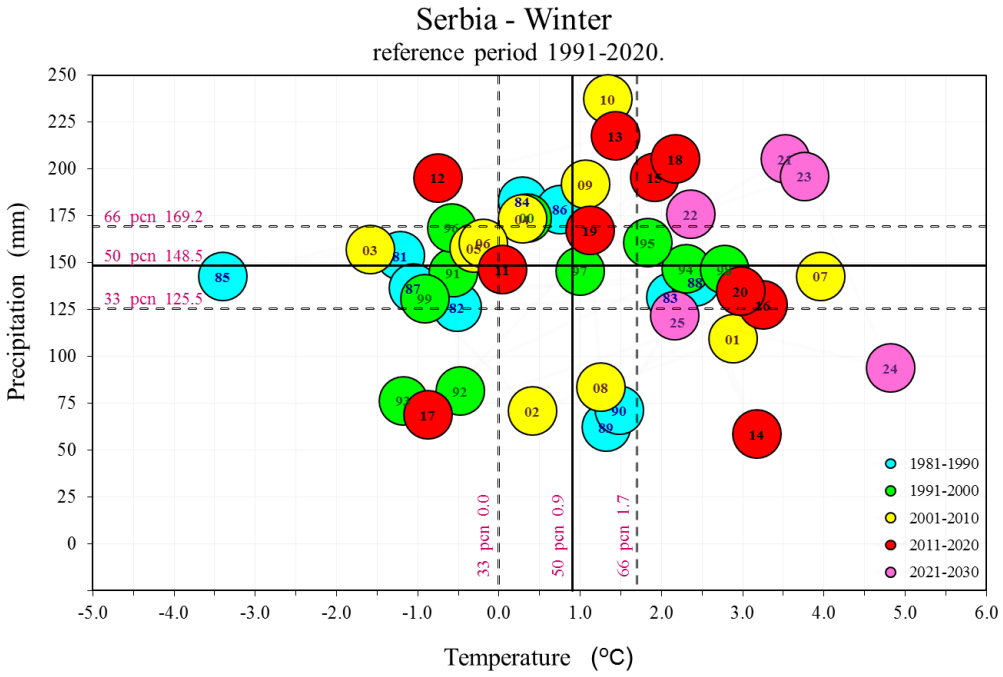

Figure 1. Assessment of mean air temperature and precipitation for winter in Serbia based on the accompanying terciles relative to the 1991-2020 base period

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

Temperature

Winter 2024/2025 was in Serbia with an average air temperature of 2.2 °C, which is +1.2 °C higher than normal in the period 1951-2025 (Figure 2). Winter season 2024/25 was the 8th warmest for Kopaonik since 1950 with the air temperature of -2,5 °C and anomaly of +1,6 °C.

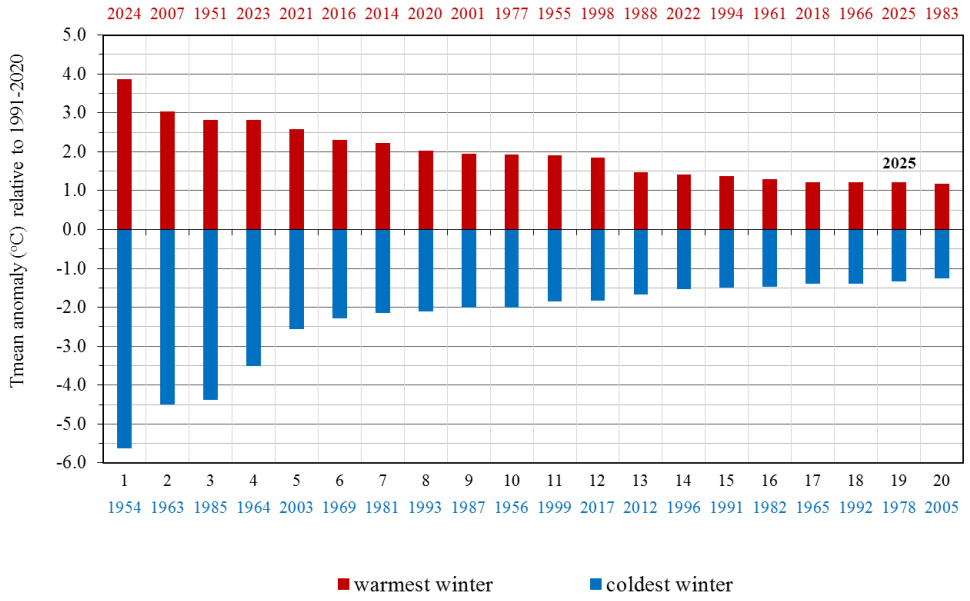

Figure 2. Rank of twenty warmest and coldest winter seasons in Serbia for the 1951-2025 period

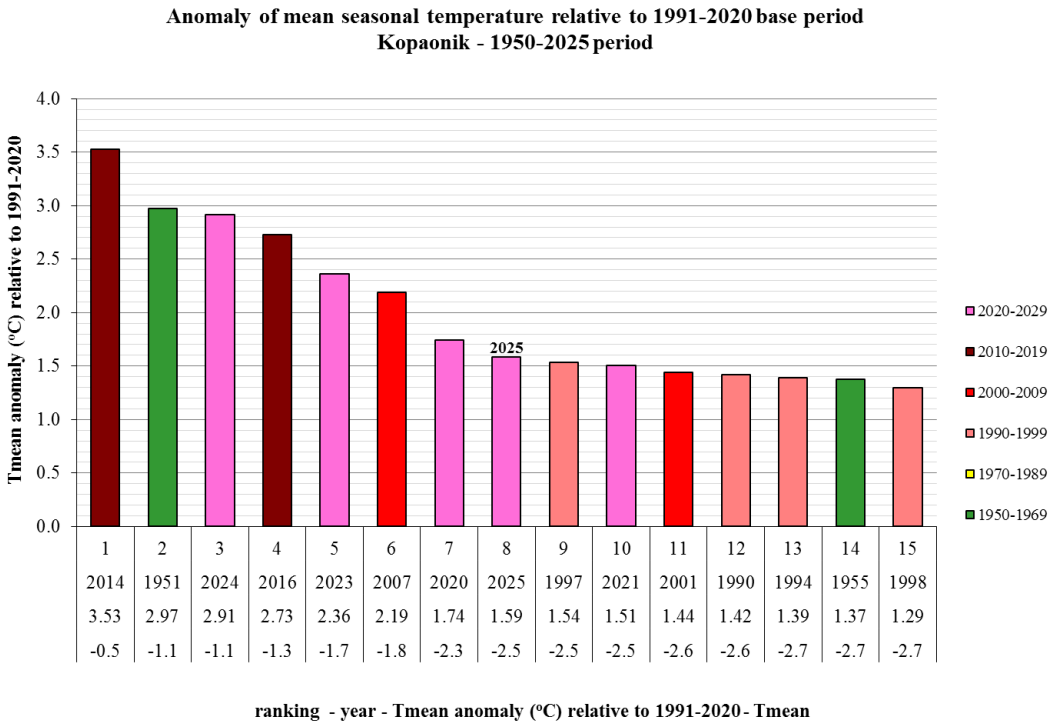

Figure 3. Rank of the warmest winters on Kopaonik for the 1950-2025 period

Mean seasonal winter air temperature ranged from 1,1 ºC in Pozega to 4,2 ºC in Belgrade, and on the mountains from –2,5 ºC at Kopaonik to 0,0 ºC at Zlatibor (*Figure 4*).

Departure of the mean seasonal air temperature from the normal during winter ranged from +0,9 ºC in Loznica and Sombor to +1,6 ºC at Kopaonik and Kuršumlija (*Figure 5*).

Based on the percentile method, mean seasonal winter air temperature was in the categories of normal and warm (*Figure 6).*

Based on the tercile method, mean seasonal winter air temperature was in the warm category in all of Serbia (*Figure 7).*

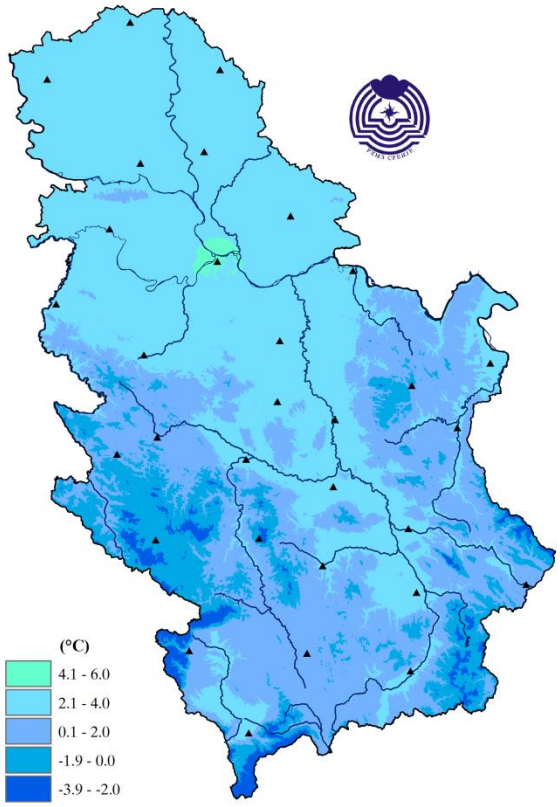

Figure 4. Spatial distribution of mean winter air temperature

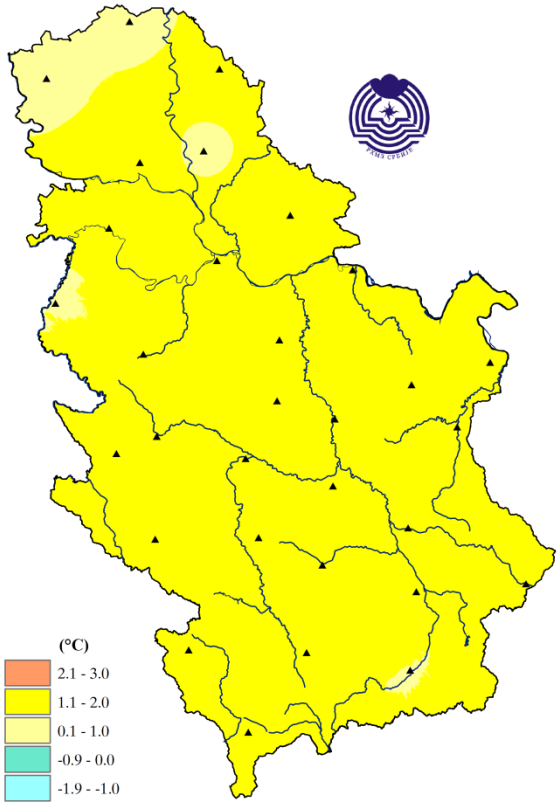

Figure 5. Spatial distribution of mean winter air temperature anomaly from the normal

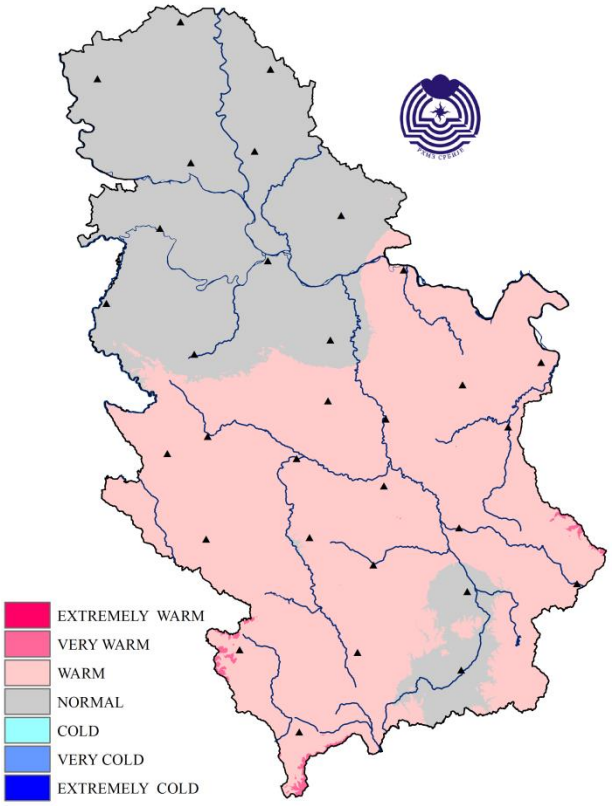

Figure 6. Spatial distribution of mean winter air temperature according to the percentile method

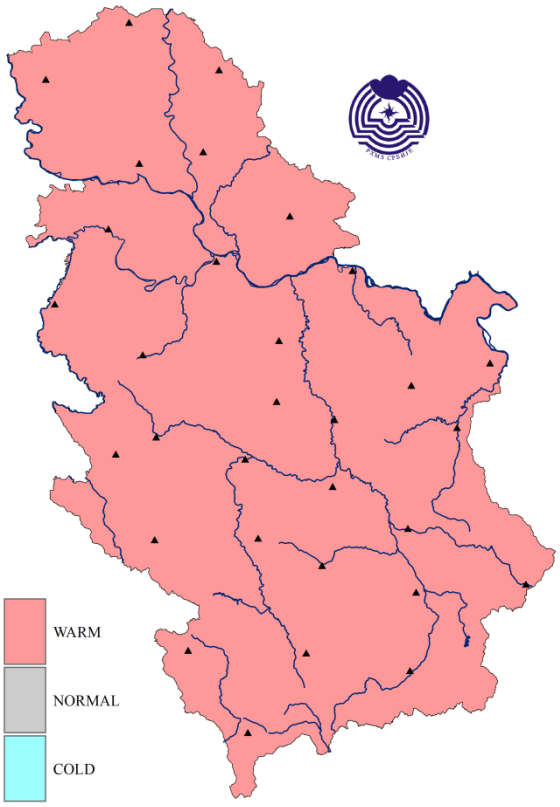

Figure 7. Spatial distribution of mean winter air temperature according to the tercile method

Mean maximum air temperature ranged from 5,7 °C in Pozega to 8,1 °C in Zajecar; Belgrade observed air temperature of 7,9 °C. In the upland it ranged from 1,1 °C at Kopaonik to 4,5 °C in Sjenica.

The highest winter air temperature of 21,8 ºC was measured in Kragujevac and Smederevska Palanka on January 28.

Number of ice days, with the maximum daily air temperature below 0 ºC ranged from 1 in Negotin to 12 in Kikinda; Belgrade recorded 6, while in the upland, their number ranged from 15 in Sjenica to 36 days at Kopaoniok. Number of ice days was below (from 5 to 15 days) the winter average in all of Serbia (*Figure 8).*

The mean minimum air temperature ranged from -2,6 °C in Zajecar to 1,0 °C in Belgrade, and in the upland from -5,4 °C in Sjenica to -2,8 °C at Zlatibor.

The lowest winter air temperature of -21,7 ºC was measured in Sjenica on February 20. On the same day, in the lowland, Dimitrovgrad recorded -15,5 °C. Additionally, on the same day, February 20, Belgrade observed the lowest air temperature of -5,4 °C

Number of frost days, with the minimum daily air temperature below 0 ºC, ranged from 40 days in Belgrade to 60 days in Zajecar, and on the mountains, from 62 at Zlatibor to 79 days at Kopaonik. Number of frost days was 3 to 10 days below the winter average (*Figure 9).*

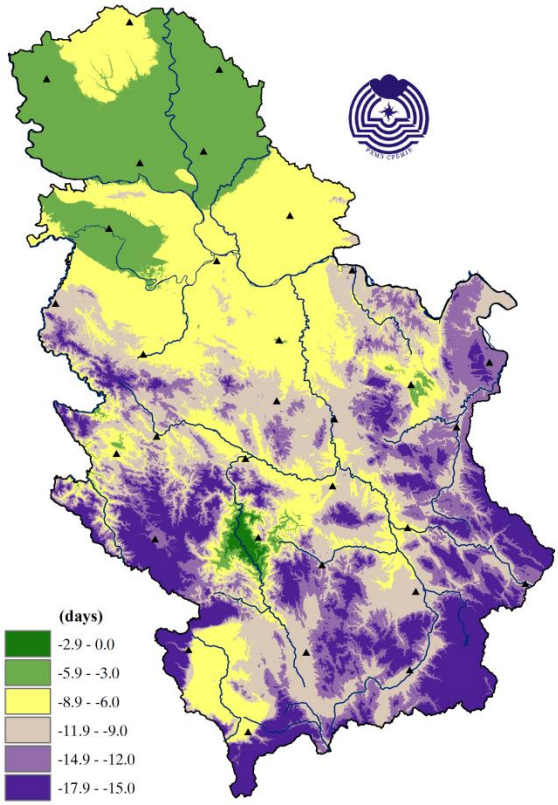

Figure 8. Deviation of the number of ice days from the normal

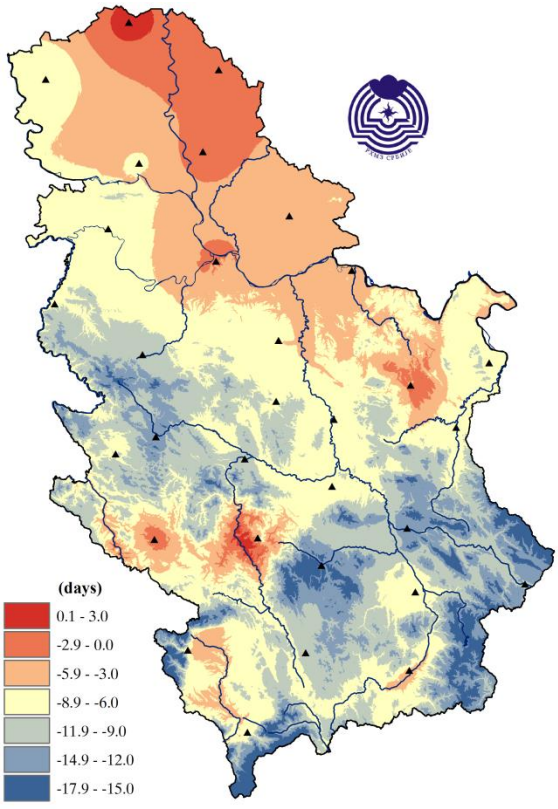

Figure 9. Deviation of the number of frost days from the normal

The highest number of days with severe frost, with the minimum daily temperature below -10 ºC was measured in Zajecar, total of 7 days, Dimitrovgrad recorded 6 days, Kursumlija registered 5 days, elsewhere up to 3 days with severe frost were recorded. On the mountains, their number ranged from 4 days at Zlatibor to 20 days in Sjenica. The recorded number of days with severe frost was up to 3 to 7 days below the winter average in most of country.

In Belgrade, warmer periods, with the air temperature above the multiannual average, were registered in mid-December, most of January, as well as at the beginning of the first decade, beginning of the second decade and end of February. Colder periods, with the air temperature below the multiannual average, were recorded at the end of December, beginning and mid-January, as well as most of February (*Figure 10).*

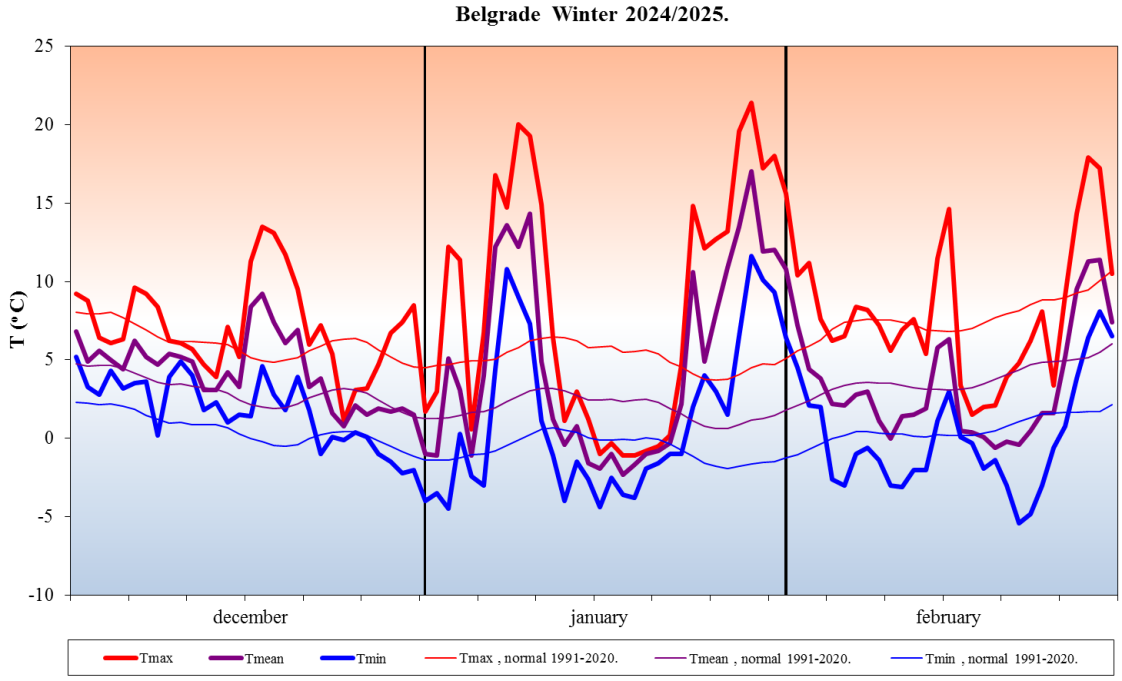

Figure 10. Three–month course of the mean, maximum and minimum daily air temperature in Belgrade

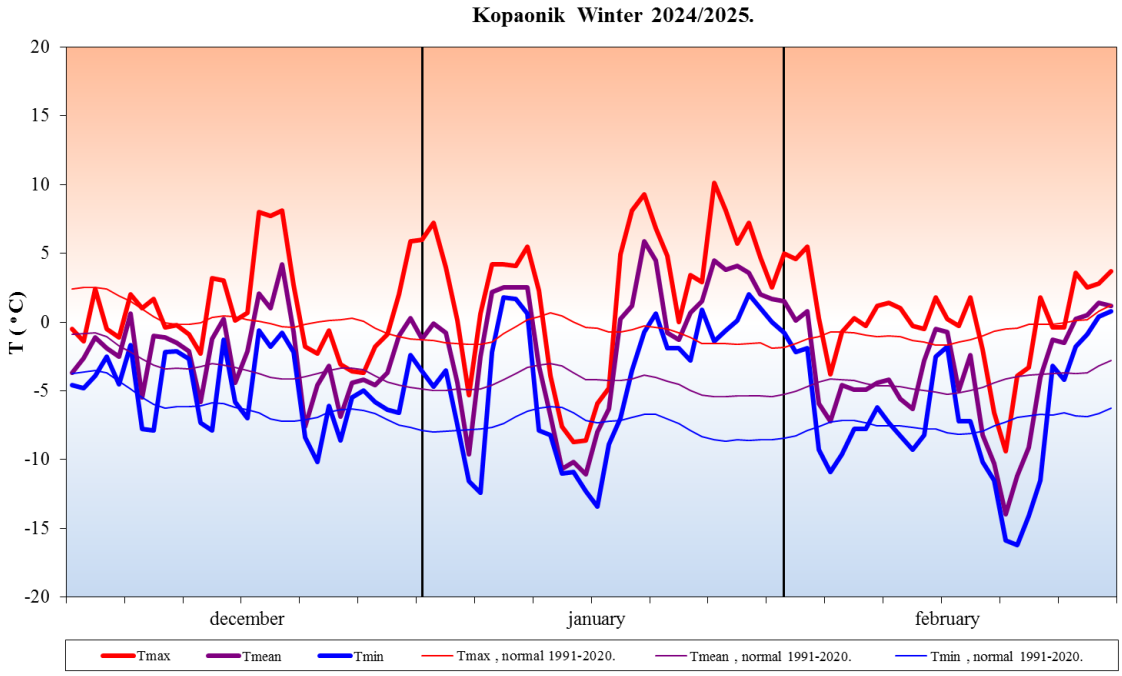

Figure 11. Three–month course of the mean, maximum and minimum daily air temperature at Kopaonik

Cold wave / heat wave

In winter 2024/2025, there were 3 heat waves[2] (*Table 1*). The first heat wave was recorded in Negotin and Zajecar, lasting from December 30 to January 3, the second heat wave was registered in Kikinda, Belgrade and Nis lasting from 6 to 10 January, and the third heat wave lasted from January 25 to 31 affecting most of Serbia apart from Loznica and Vranje. Dimitrovgrad observed 2 cold waves[3] lasting from 8 to 12 February, and then from 19 to 23 February corresponding with the cold wave observed in Zajecar.

Table 1.

HEAT AND COLD WAVES IN SERBIA - WINTER 2024/2025

(reference period 1991-2020)

DECEMBER

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

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

FEBRUARY

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
PALIC																												
SOMBOR																												
KIKINDA																												
ZRENJANIN																												
NOVI SAD																												
SR.MITROVICA																												
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KRUSEVAC																												
NEGOTIN	VW																											
ZAJECAR	VW																		VC	EC	EC	EC	EC					
CRNI VRH	VW																											
KOPAONIK																												
SJENICA																												
NIS																												
VRANJE																												
DIMITROVGRAD	VW							VC	VC	VC	VC	VC							EC	EC	EC	EC	VC					
LESKOVAC																												
KURSUMLIJA																												
B.KARLOVAC																												

EW	EXTREMELY WARM
VW	VERY WARM
VC	VERY COLD
EC	EXTREMELY COLD

[2] Heat wave, according to the percentile method, is a period of minimum five days with maximum daily air temperature is in the very warm and extremely warm categories
[3] Cold wave, according to the percentile method, is a period of minimum five days with minimum daily air temperature is in the very cold and extremely cold categories

Precipitation

Winter 2024/2025 was normal and dry. Winter precipitation totals ranged from 74,5 mm in Sremska Mitrovica to 165,0 mm in Loznica, and in the upland from 124,3 mm at Crni Vrh to 185,4 mm at Zlatibor (*Figure 12*).

Precipitations sums expressed in the percentages of normal ranged from 63% in Sremska Mitrovica to 114% in Krusevac, and in the upland from 79% at Crni Vrh to 88% at Kopaonik (*Figure 13*).

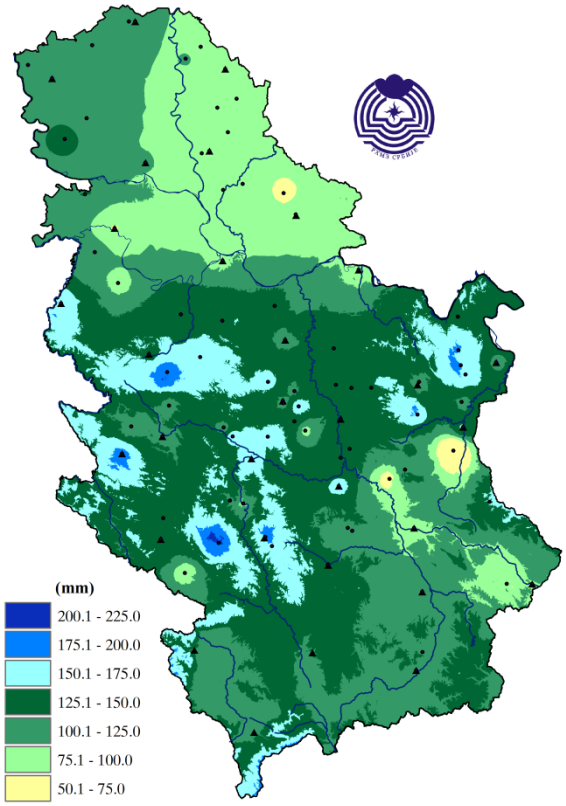


Figure 12. Spatial distribution of winter precipitation sums based on data from 28 Primary meteorological, 13 climatological and 47 rain gauge stations

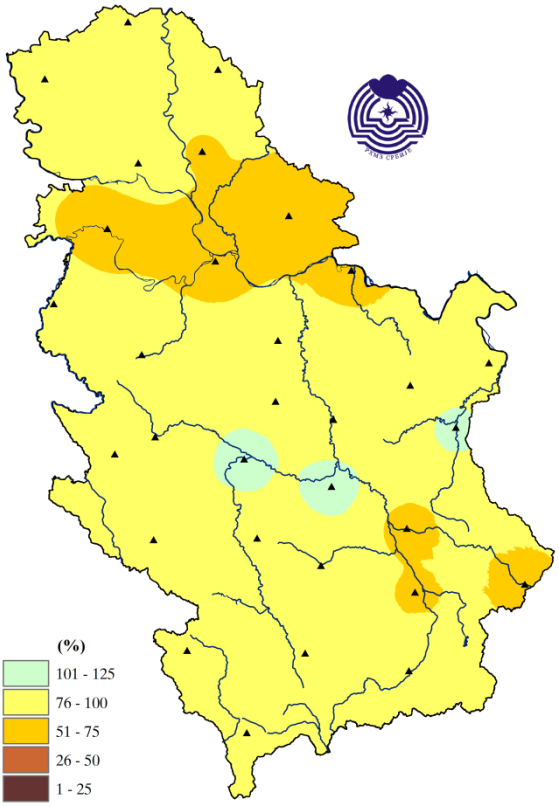


Figure 13. Spatial distribution of winter precipitation sums in percentage of normal

Based on the percentile method, winter precipitation sums were in the normal and dry categories (*Figure 14).*

Based on the tercile method, precipitation sums were in the dry category in almost entire Serbia, in the normal category on Palic, Sombor, Valjevo, Kragujevac, Negotin, Kursumlija, Krusevac, Zajecar and Kopaonik, and rainy category in Kraljevo (*Figure 15).*

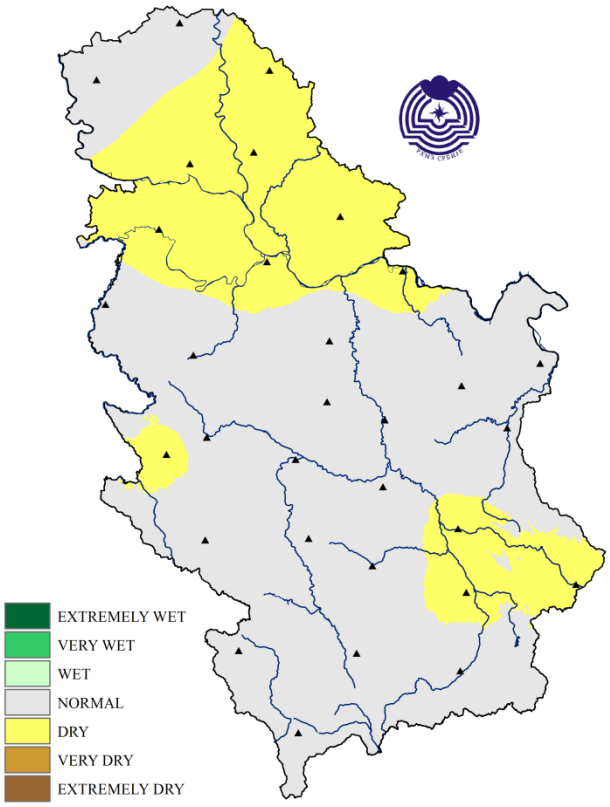


Figure 14. Winter precipitation sums according to the percentile method

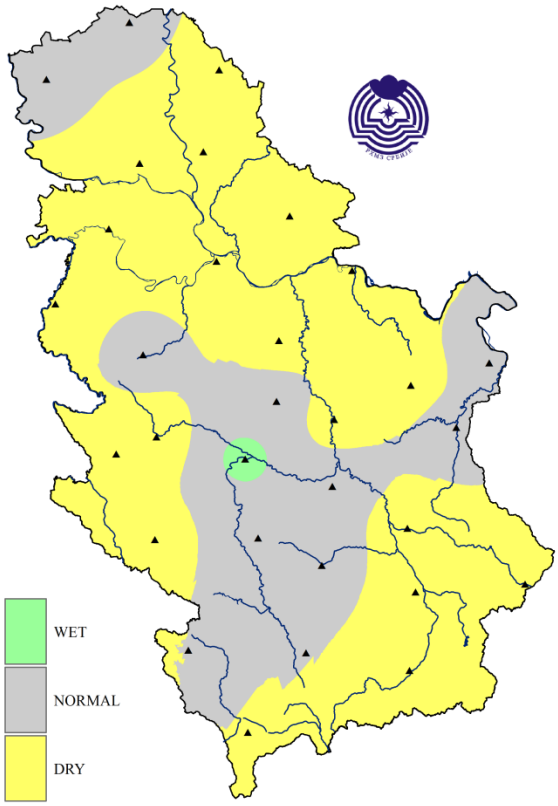


Figure 15. Winter precipitation sums according to the tercile method

The highest daily precipitation sum of 40,3 mm was measured on Zlatibor on December 1.

In winter, number of days with precipitation of 0,1 mm and above, ranged from 26 in Kikinda, Belgrade and Zajecar to 33 in Kursumlija, Leskovac and Dimitrovgrad, and on the mountains from 30 in Sjenica to 40 days at Kopaonik. The observed number of days with precipitation was up to 14 days below the winter average in most of Serbia (*Figure 16).*

During winter, snow cover wasn't recorded on Palic and Sremska Mitrovica while in the low-lying areas Pozega recorded up to 20 days. In the hilly-mountainous regions, number of days with snow cover ranged from 63 in Sjenica to 90 days at Kopaonik. **Number of days with snow cover was significantly below the normal in the low-lying areas of Serbia,** 15 days below the average in Loznica to 33 days below the average in Negotin (*Figure 17).*

On December 26, Crni Vrh recorded the maximum snow depth of 63 cm. In the low-lying areas, the highest snow depth of 21 cm was measured in Loznica on December 24.

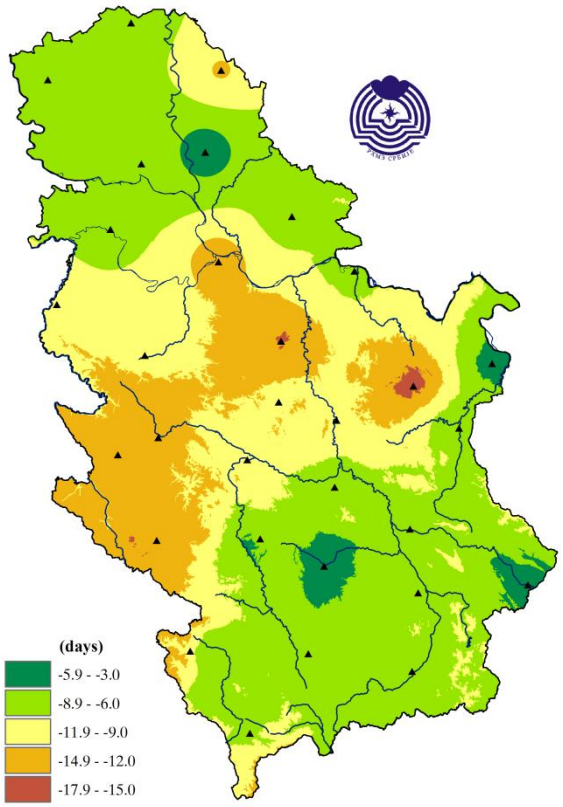


Figure 16. Deviation of number of days with precipitation of 0.1 mm and more from the normal

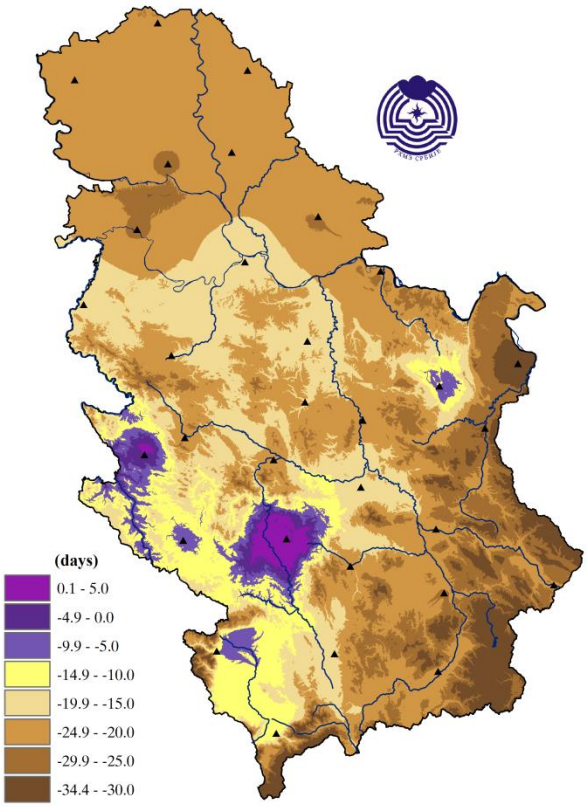


Figure 17. Deviation of number of days with snow cover from the normal

Figure 18 shows cumulative precipitation sums for Belgrade in winter, by month and compared to the average cumulative precipitation sums, and in the appendix are graphs for the stations: Sremska Mitrovica, Veliko Gradiste, Nis, Kikinda, Dimitrovgrad, Novi Sad, Krusevac and Zlatibor.

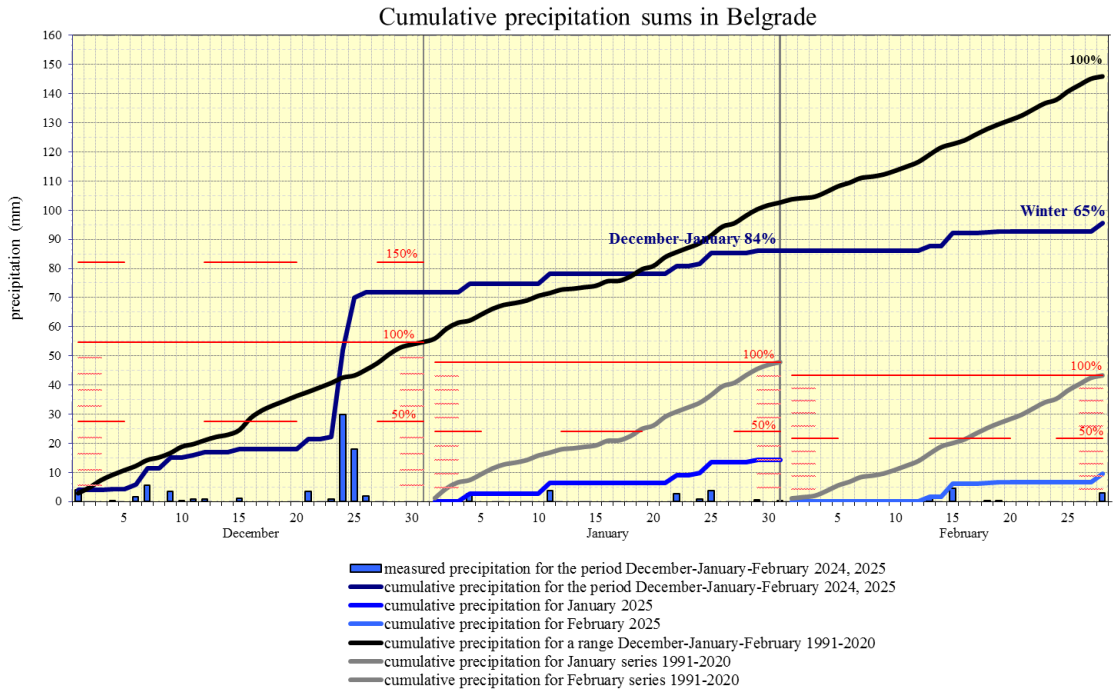


Figure 18. Daily and cumulative precipitation sums for Belgrade

Sunshine duration (insolation)

In winter, sunshine duration ranged from 183,7 hours in Pozega to 309,2 hours in Negotin (*Figure 19*).

Compared to the normal for the 1991-2020 base period, sunshine duration ranged from 85% at Zlatibor to 128% in Zajecar (*Figure 20*).

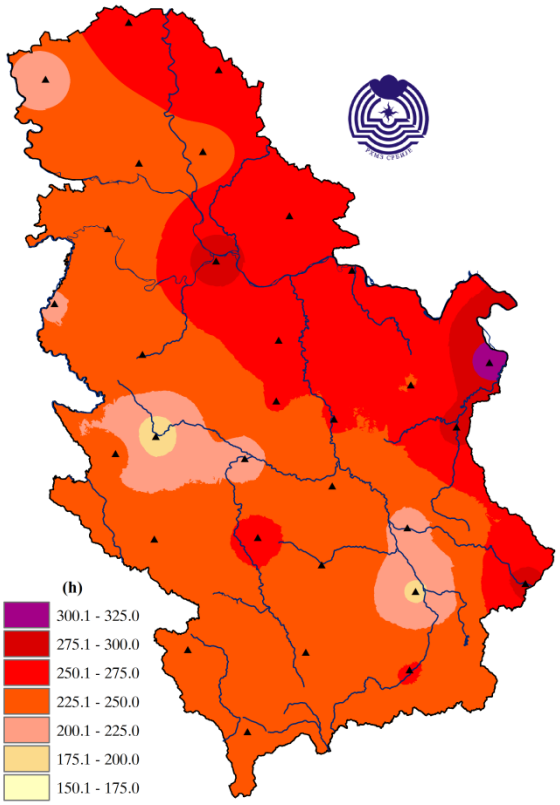


Figure 19. Insolation in hours

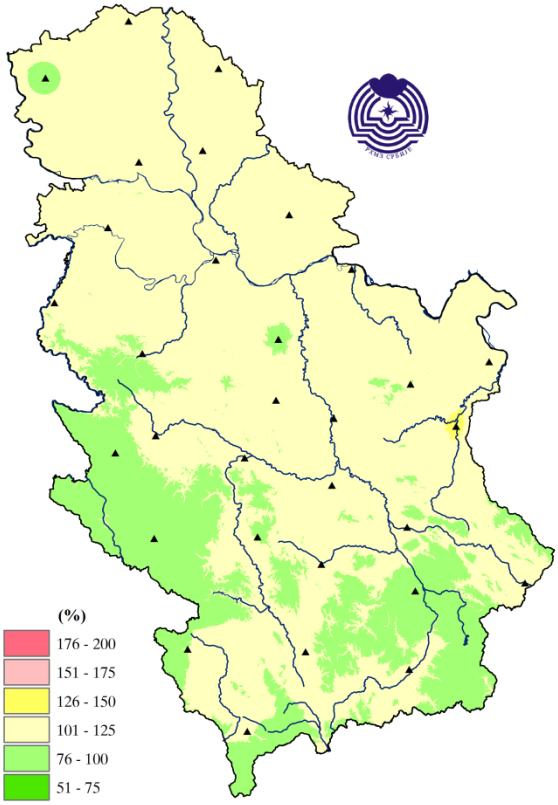


Figure 20. Insolation in percentage of normal

Analysis of the winter season 2024/2025 for Serbia relative to the 1961-1990 base period

Temperature

Departure of the mean air temperature from the normal for the 1961-1990 base period ranged from +1,5 ºC in Vranje to +2,4 ºC at Kopaonik (*Figure 21).*

Based on the percentile method, mean winter air temperature was in the categories of warm and very warm, and extremely warm in Sjenica and Kopaonik (*Figure 22).*

Based on the tercile method, mean winter air temperature was above the average, in the warm category in all of Serbia.

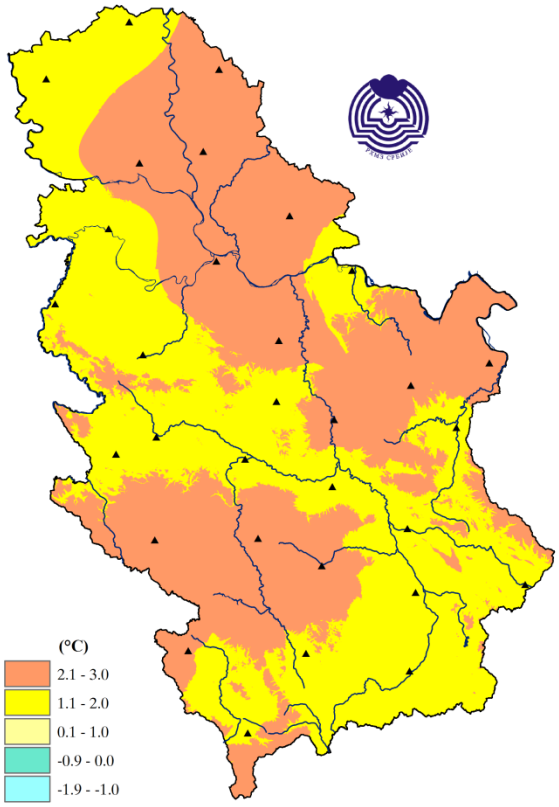


Figure 21. Spatial distribution of mean winter air temperature anomaly from the 1961-1990 normal

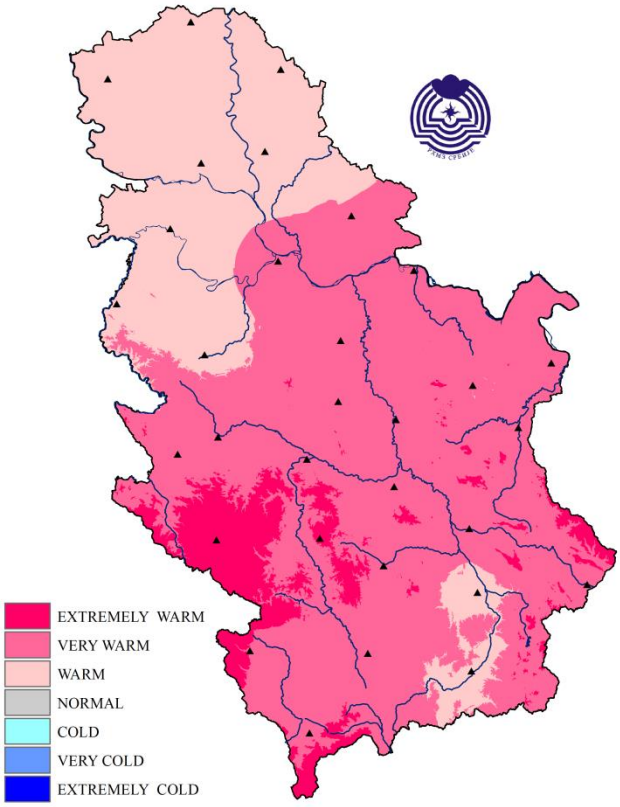


Figure 22. Spatial distribution of mean winter air temperature according to the percentile method

Precipitation

Precipitation sums expressed in the percentages of normal for the 1961-1990 base period ranged from 58% in Sremka Mitrovica to 118% in Krusevac (*Figure 23).*

Based on the percentile method, winter precipitation sums were in the normal and dry categories in most of Serbia, very dry in Veliko Gradiste, and rainy in Krusevac (*Figure 24).*

Precipitation sums, based on the tercile method, were in the categories of dry and normal in all of Serbia, and rainy category in Krusevac and Zajecar.

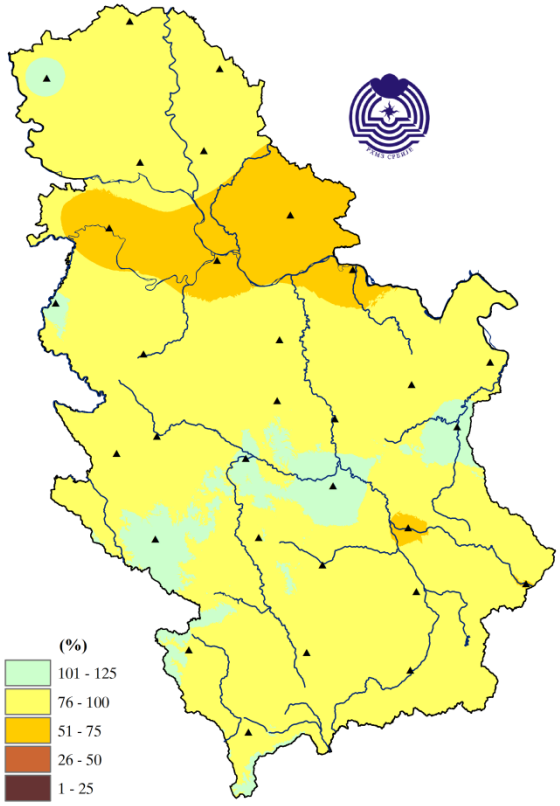


Figure 23. Spatial distribution of winter precipitation sums in percentage of the 1961-1990 normal

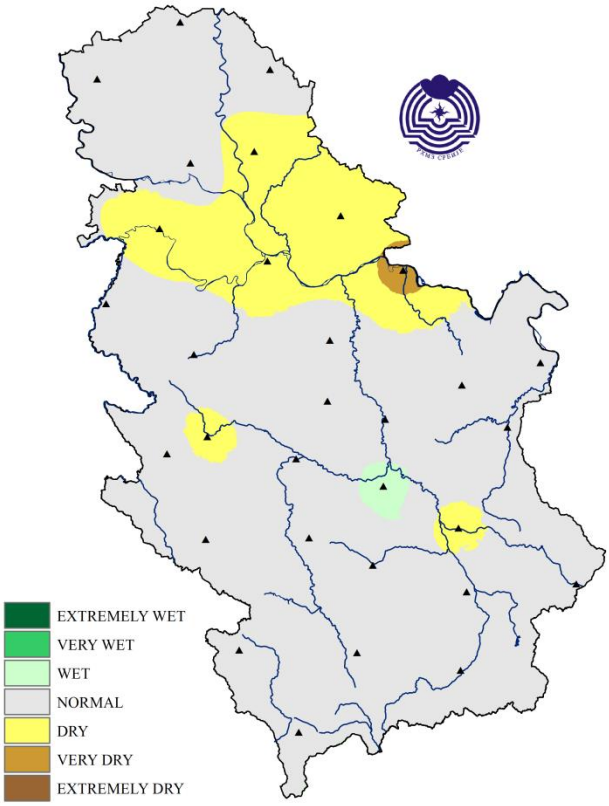
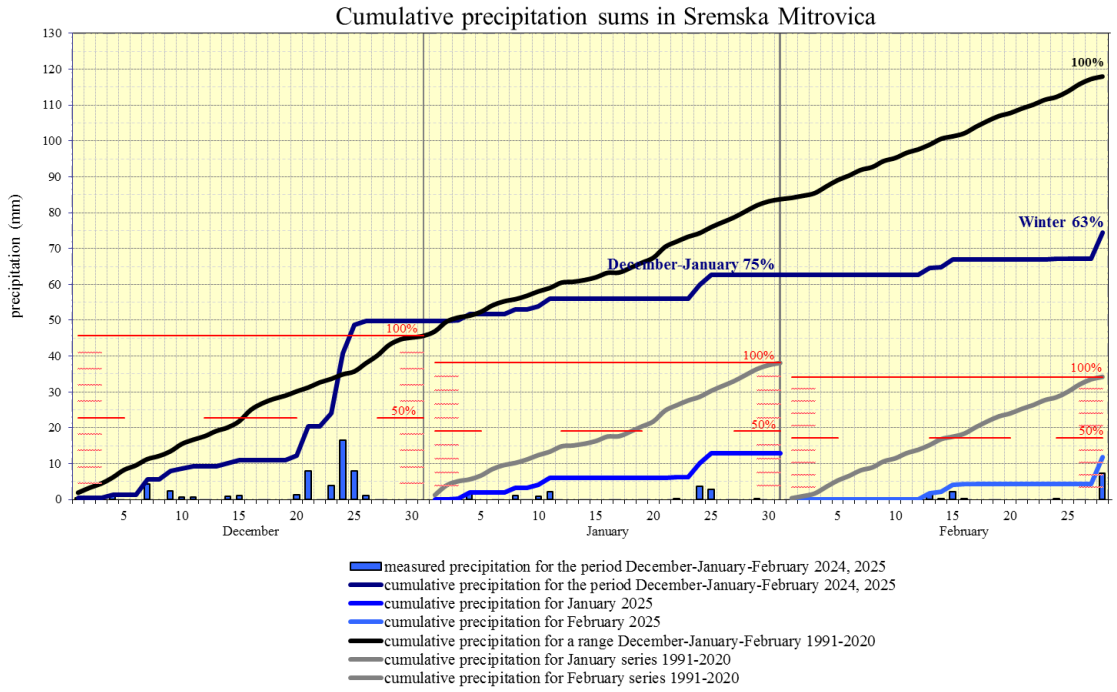


Figure 24. Winter precipitation sums according to the percentile method

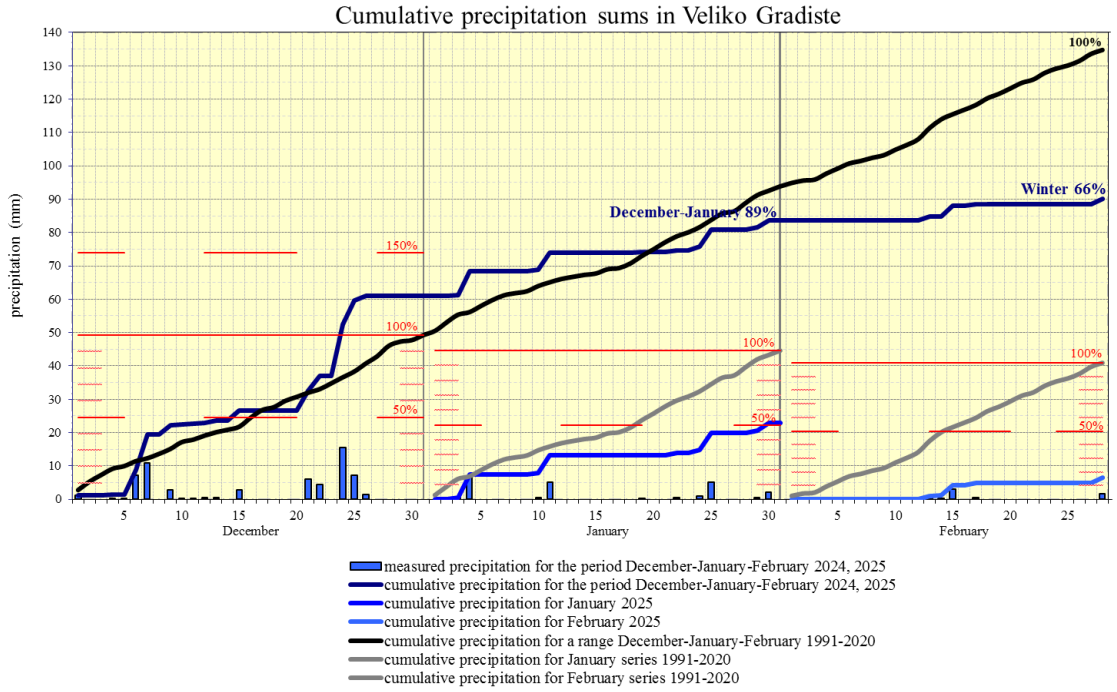
Note: Climatological analysis of the meteorological elements based on the preliminary data obtained from the 28 Primary meteorological stations

APPENDIX

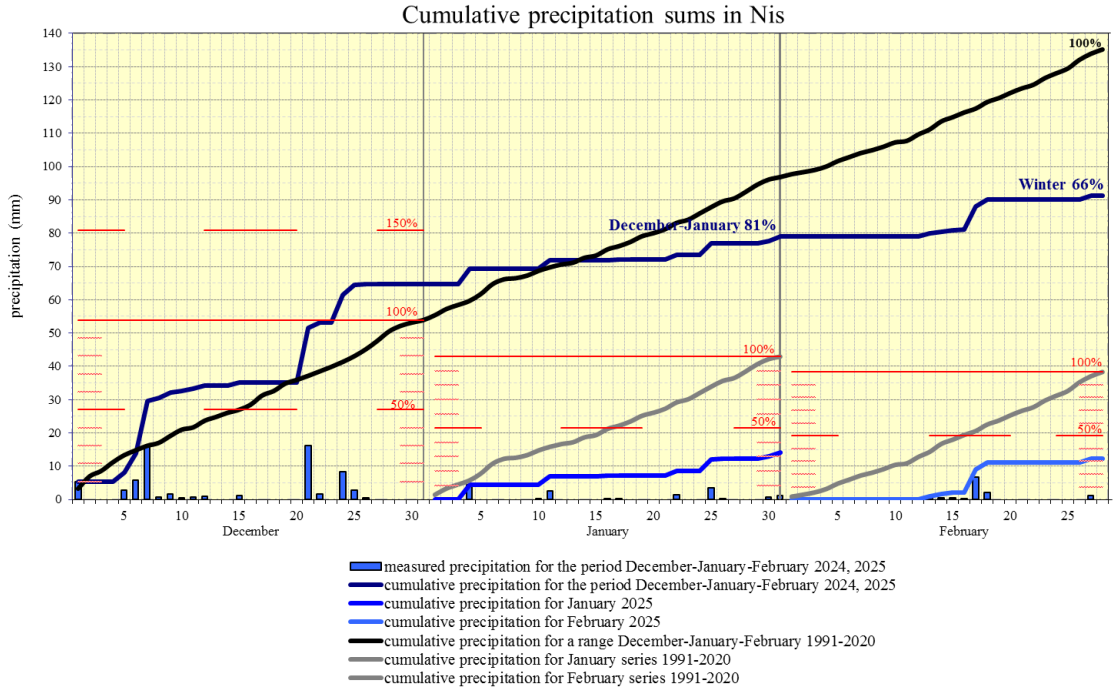
Precipitation



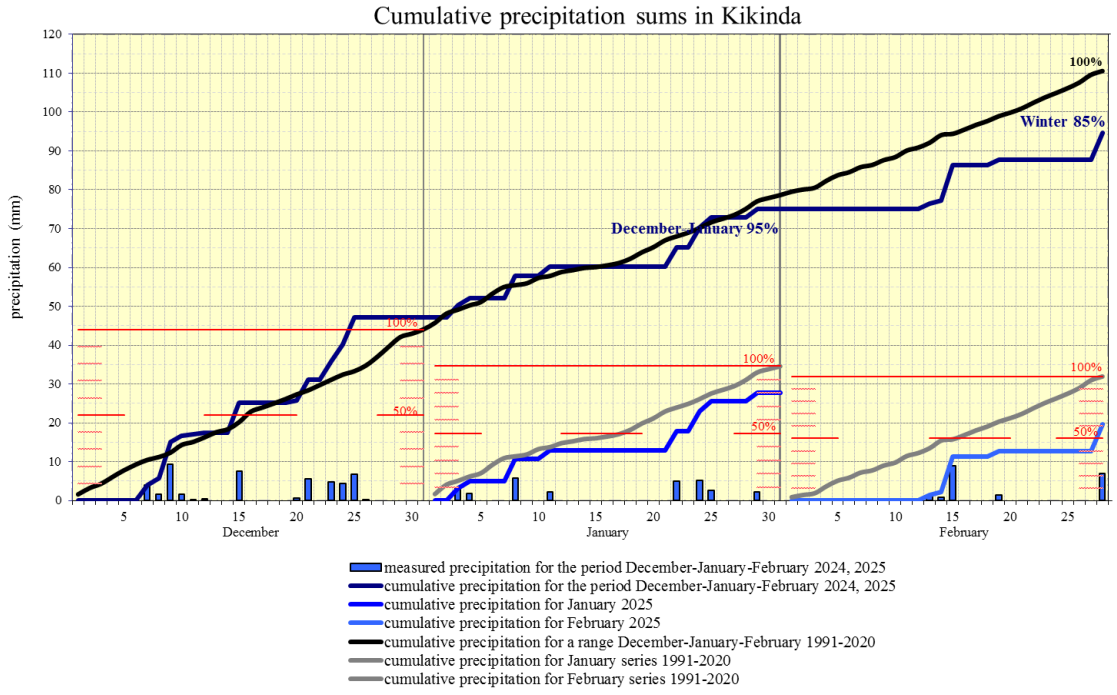
Appendix 1. Daily and cumulative precipitation sums for Sremska Mitrovica



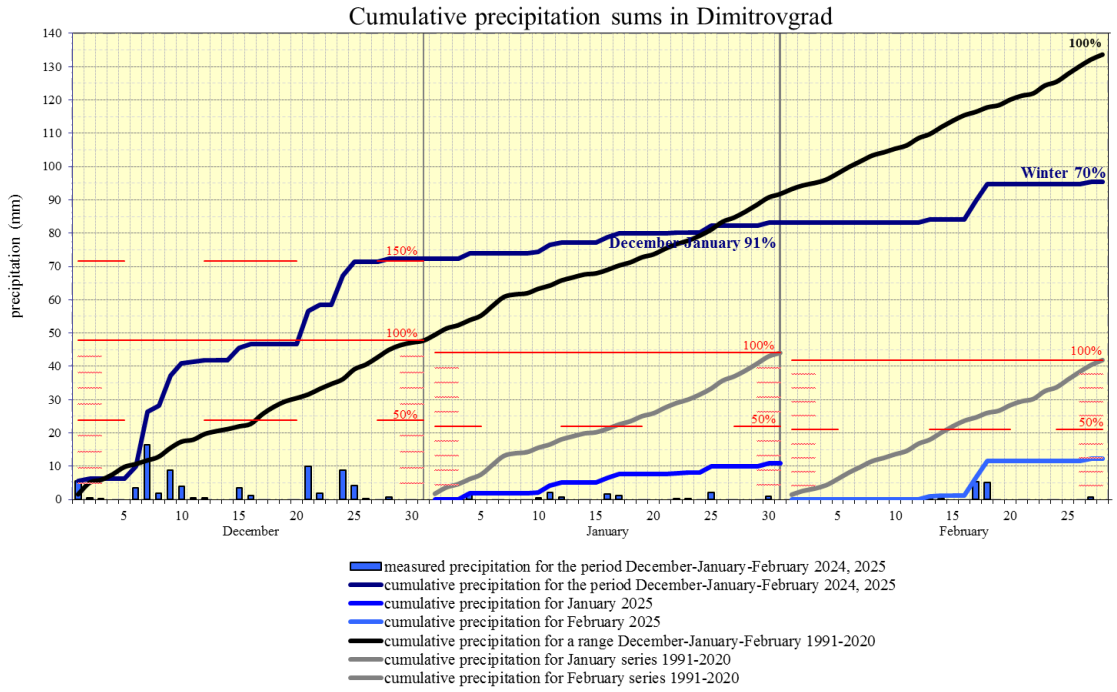
Appendix 2. Daily and cumulative precipitation sums for Veliko Gradiste



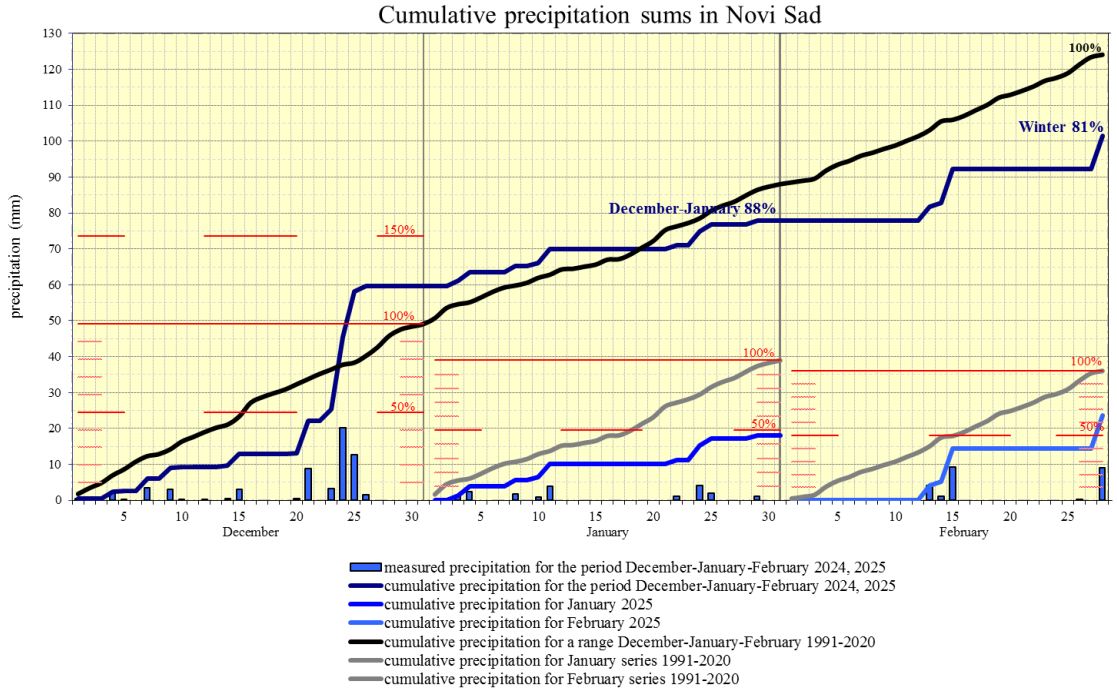
Appendix 3. Daily and cumulative precipitation sums for Nis



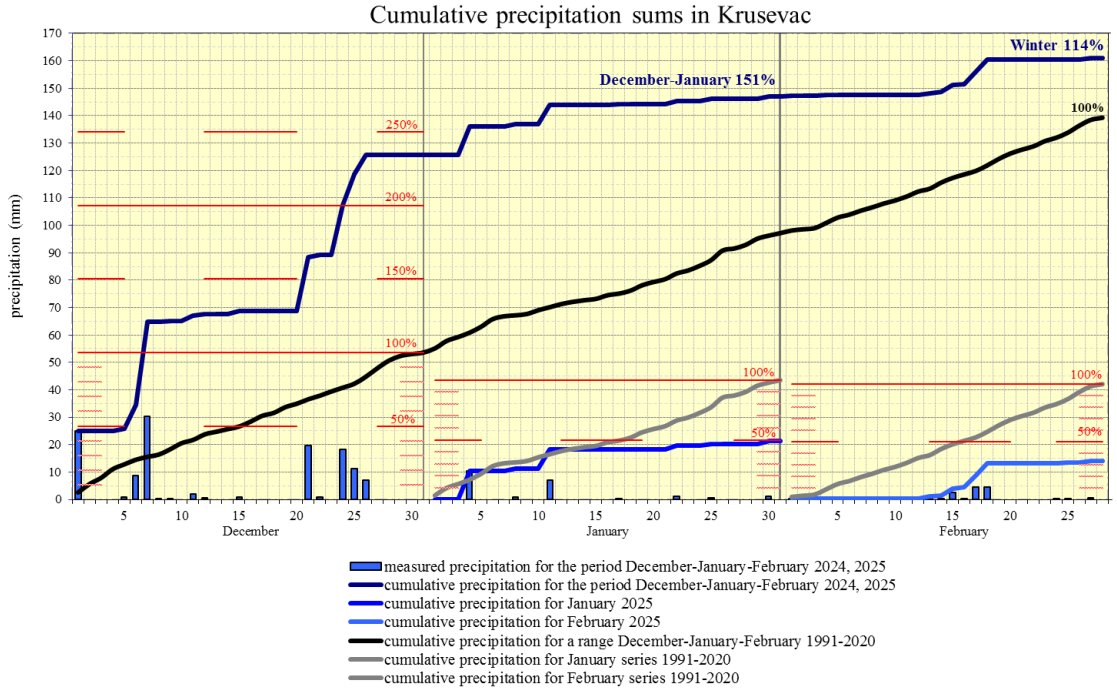
Appendix 4. Daily and cumulative precipitation sums for Kikinda



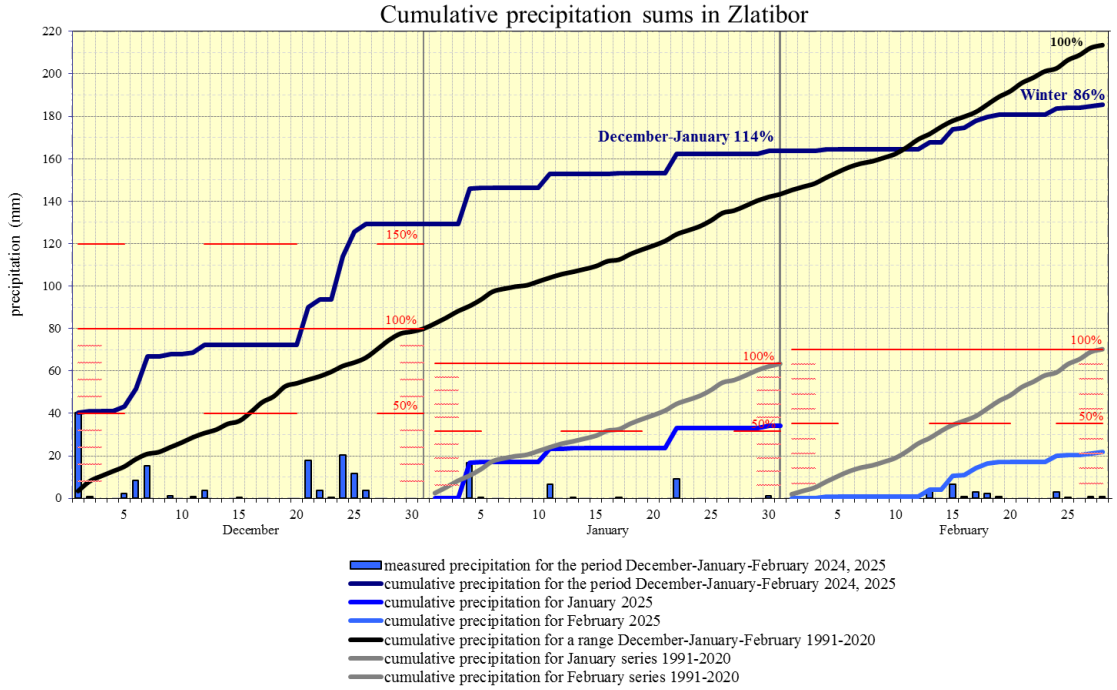
Appendix 5. Daily and cumulative precipitation sums for Dimitrovgrad



Appendix 6. Daily and cumulative precipitation sums for Novi Sad



Appendix 7. Daily and cumulative precipitation sums for Krusevac



Appendix 8. Daily and cumulative precipitation sums for Zlatibor