

VERIFICATION OF THE SEECOF-12 WINTER 2014/2015 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA COMPARED TO THE 1981-2010 BASE PERIOD

Temperature

According to the SEECOF-12 outlook for the winter of 2014/2015 in Serbia, near or above-normal temperature was indicated (above normal and normal with 40% probability and below normal with 20% probability), compared to the 1981-2010 climatological base period.

Meteorological monitoring showed that the winter 2014/2015 was warm in almost entire Serbia with above normal temperature according to the tercile method (*Figure 1*).

The outlook for a warm summer was correct. Verification showed that the temperature reach the upper tercile which was indicated in the outlook with the 40% probability.

Precipitation

The SEECOF-12 climate outlook for the winter 2014/2015 in Serbia didn't show any clear signal for precipitation (below normal with 33% probability, normal with 34% probability and above normal with 33% probability).

Monitoring of precipitation showed wet winter conditions in entire Serbia (*Figure 2*).

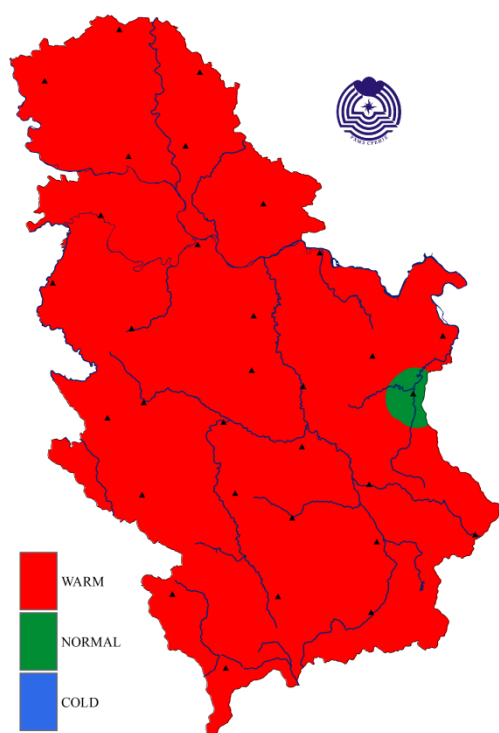


Figure 1. Monitoring of the winter 2014/2015 temperature in Serbia using the tercile method, compared to the 1981-2010 base period

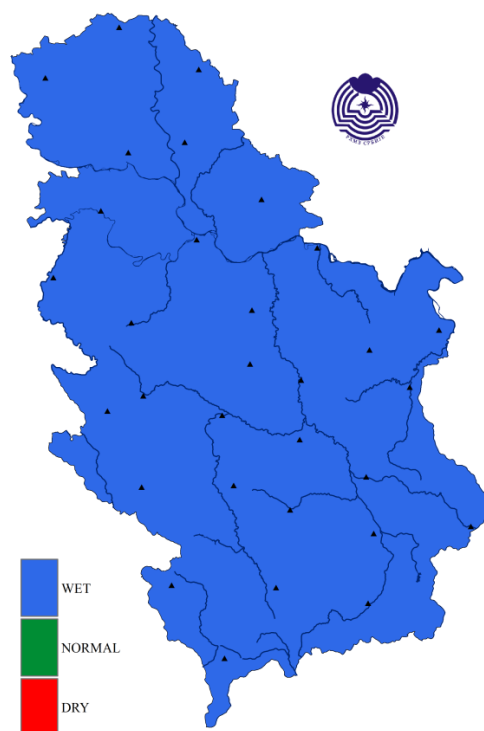


Figure 2. Monitoring of the winter 2014/2015 precipitation in Serbia using the tercile method, compared to the 1981-2010 base period

Winter 2014/15 was marked by warm and very rainy conditions in most of Serbia. Pozega observed the least number of frost days on record since the measurements began. One heat wave was registered in most of the country.

Analysis of the 2014/15 winter season for Serbia compared to the 1961-1990 base period

Temperature

The mean air temperature ranged from 0.9°C in Pozega to 4.2°C in Belgrade and in the mountainous regions from -3.5°C on Kopaonik to -0.5°C on Zlatibor (Figure 1).

The departure of the mean air temperature from the normal¹, for the 1961-1990 base period ranged from 0.9°C in Zajecar up to 2.6°C on Palic and Zrenjanin (Figure 2).

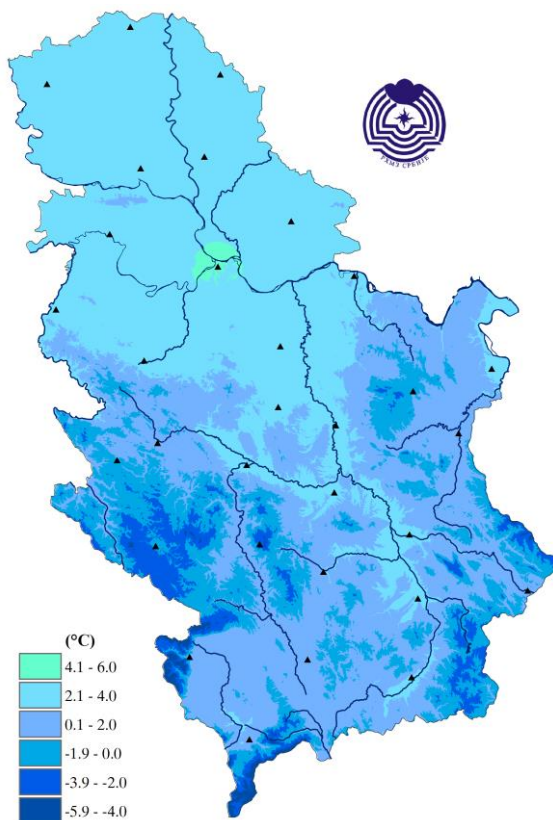


Figure 1. Spatial distribution of mean seasonal air temperature (°C) during winter 2014/15

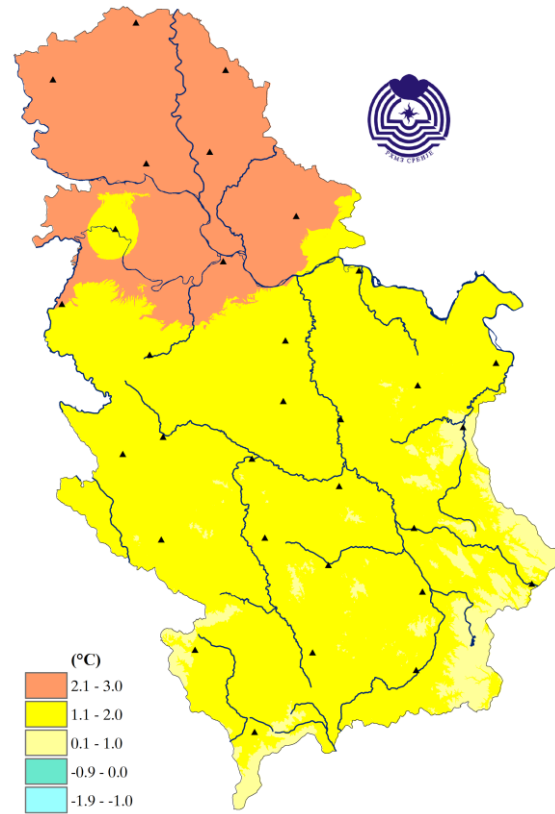


Figure 2. Mean seasonal air temperature anomaly in Serbia during winter 2014/15 compared to the 1961-1990 base period

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, 1961 to December 31, 1990

According to the percentile method², the mean air temperature was in the following categories: warm in most of Serbia, normal in parts of eastern and western regions, very warm in northern parts of the country and extremely warm in northeastern Serbia (Figure 3).

According to the tercile method, the mean air temperature was in the warm category in the entire Serbia (Figure 4).

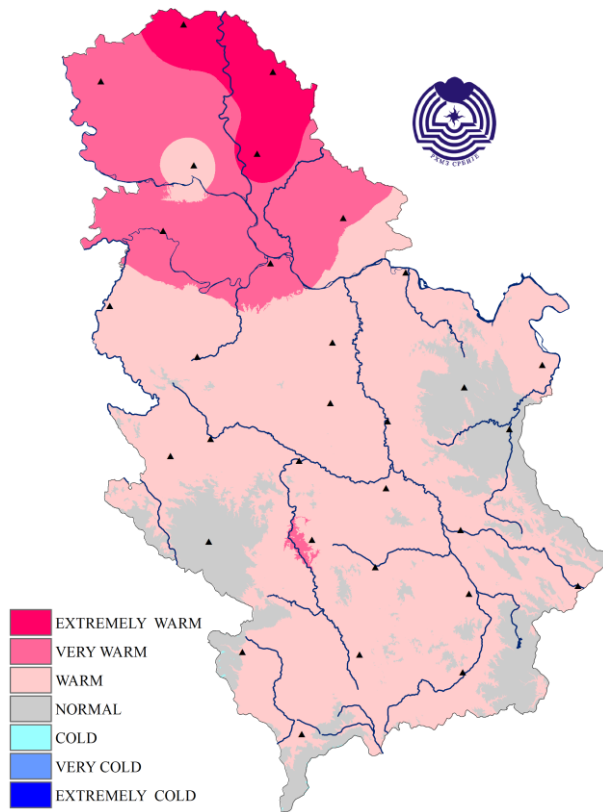


Figure 3. Assessment of the air temperature in Serbia during winter 2014/15 using percentile method compared to the 1961-1990 base period

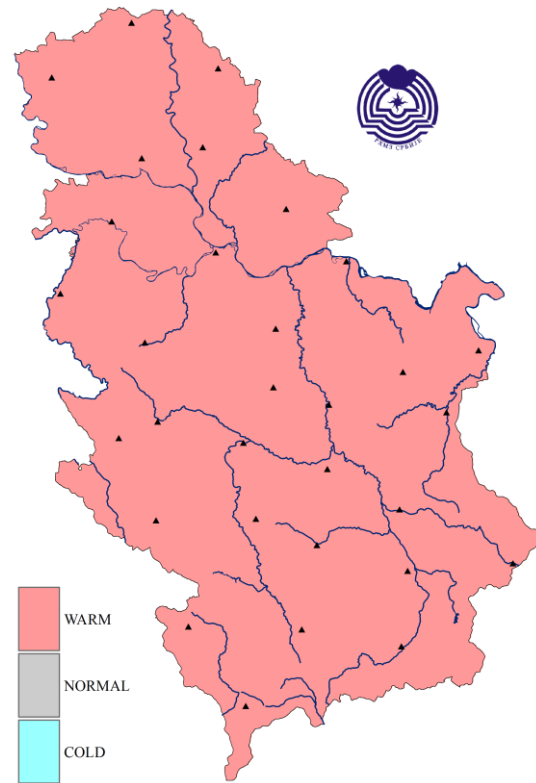


Figure 4. Assessment of the air temperature in Serbia during winter 2014/15 using tercile method compared to the 1961-1990 base period

The highest daily air temperature during winter was registered in Zajecar, on December 24, measuring 19.1°C.

The number of ice days with the maximum daily air temperature below 0°C varied from 5 in Loznica and Belgrade to 13 days in Dimitrovgrad, and in the mountainous regions from 24 days on Zlatibor to 42 days on Crni Vrh and Kopaonik. The recorded number of ice days was 5 to 13 days less than the average for the winter season (Figure 5).

The lowest air temperature during winter was recorded in Sjenica on January 1, measuring -26.2°C.

²nth 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

The number of frost days with the minimum air temperature below 0°C varied from 26 days in Belgrade to 57 days in Zajecar, and in the mountainous regions from 66 days on Zlatibor to 80 days on Kopaonik. The number of frost days was 7 to 28 days less than the average for the winter season (Figure 6). Pozega observed the least number of frost days on record since the measurements on that station began. The recorded number of frost days in Pozega this winter was 56 days compared to the previous record of 58 days registered in 1955.

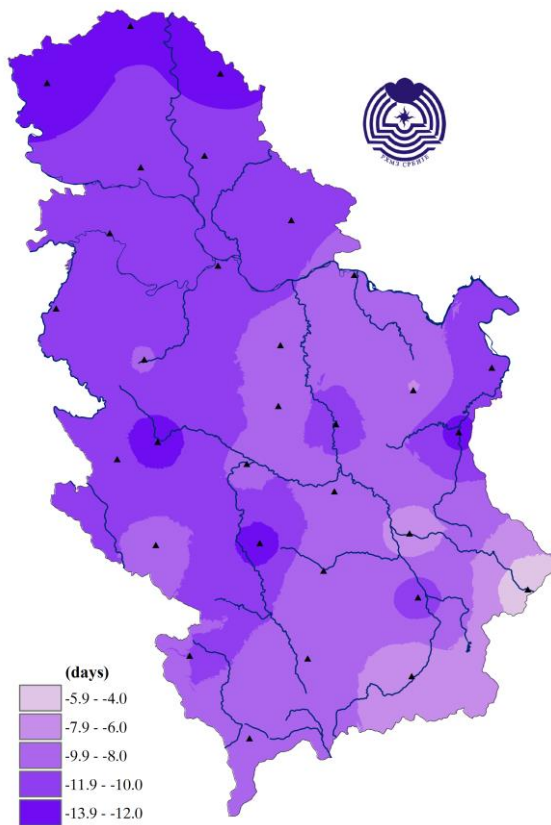


Figure 5. The deviation of the number of ice days during winter 2014/15 compared to the normal 1961-1990

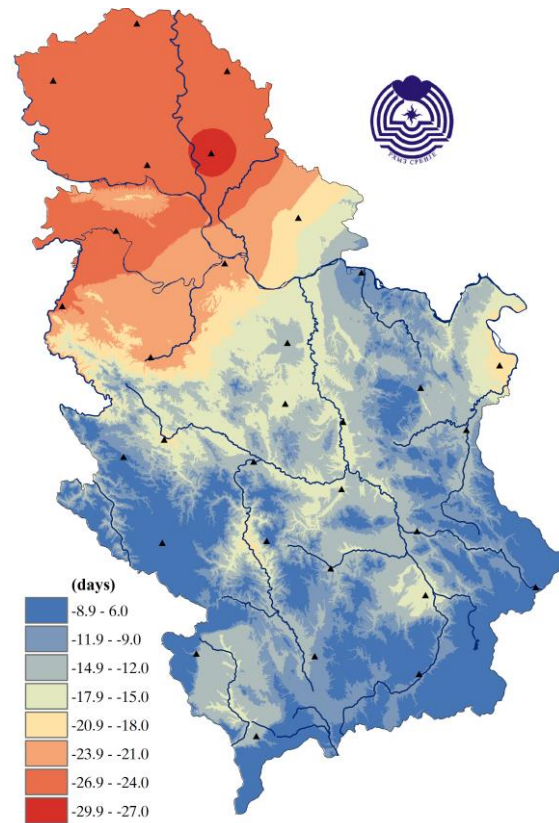


Figure 6. The deviation of the number of frost days during winter 2014/15 compared to the normal 1961-1990

The mean, maximum and minimum air temperature in Belgrade during winter was above the multiannual average. Below average temperatures were recorded at the end of December, beginning of January and the middle of February (Figure 7).

Three-month course of the mean daily air temperature for Belgrade, Zajecar and Kopaonik during winter 2014/15 is shown in Figures 8, 9 and 10.

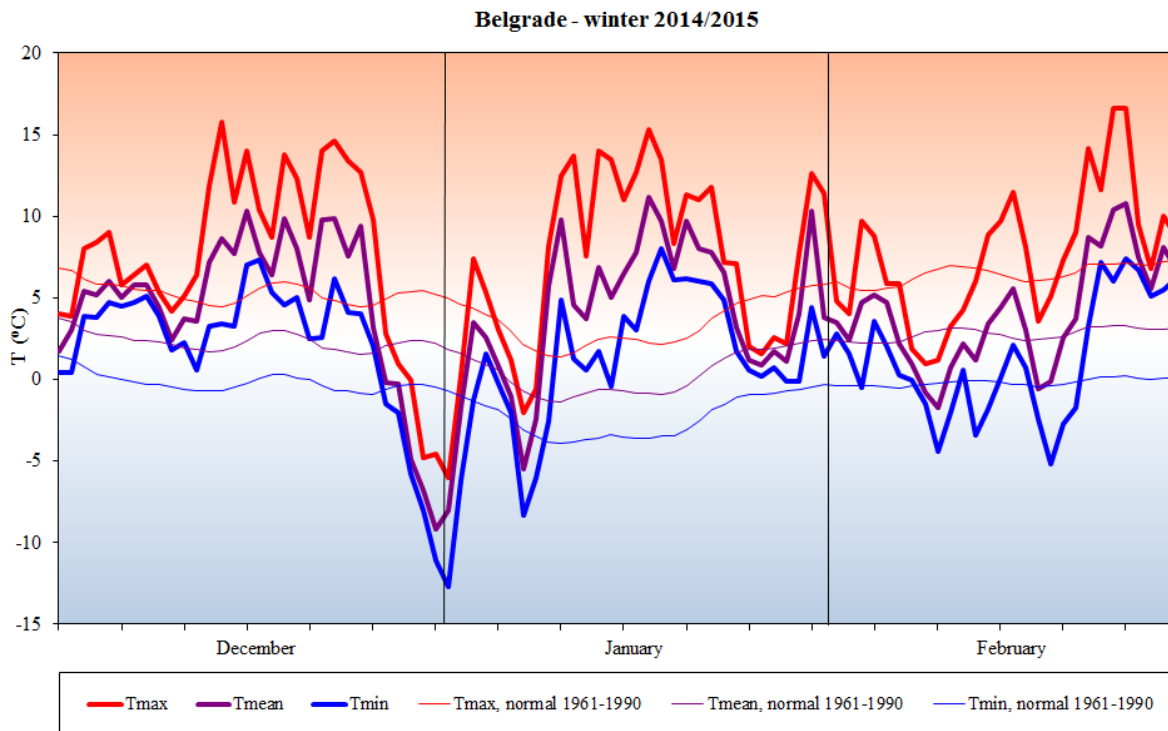


Figure 7. Three-month course of the mean, maximum and minimum air temperature in Belgrade during winter 2014/15

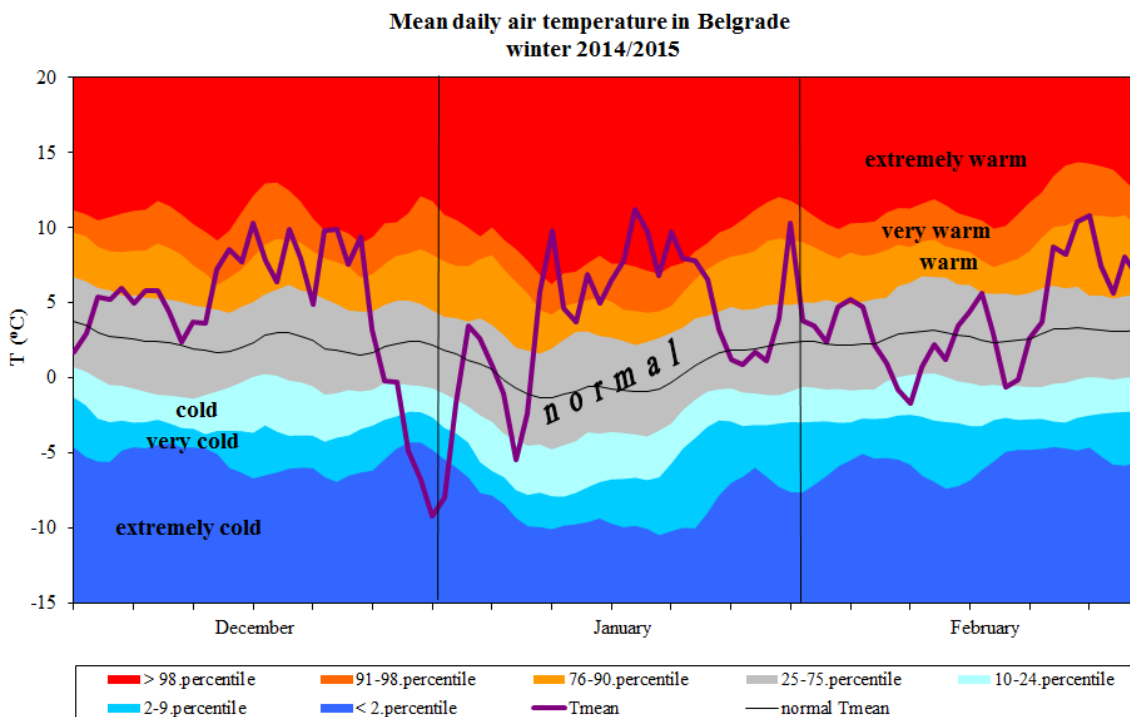


Figure 8. Three-month course of the mean daily air temperature in Belgrade during winter 2014/15

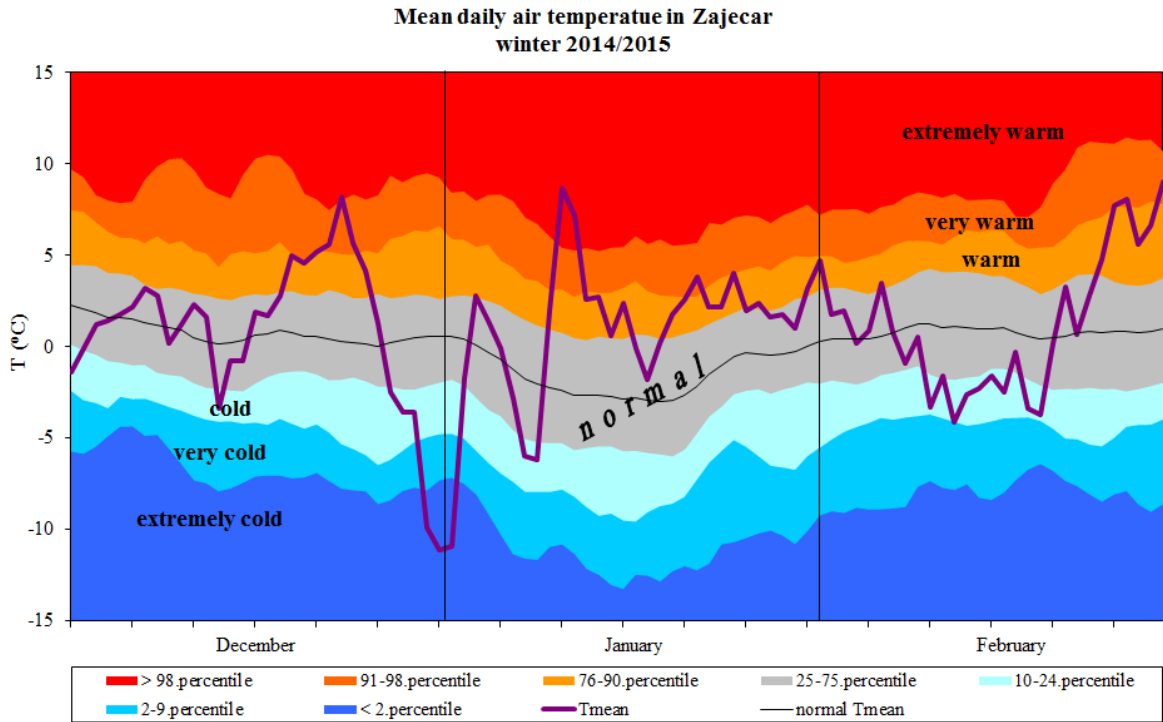


Figure 9. Three-month course of the mean daily air temperature in Zajecar during winter 2014/15

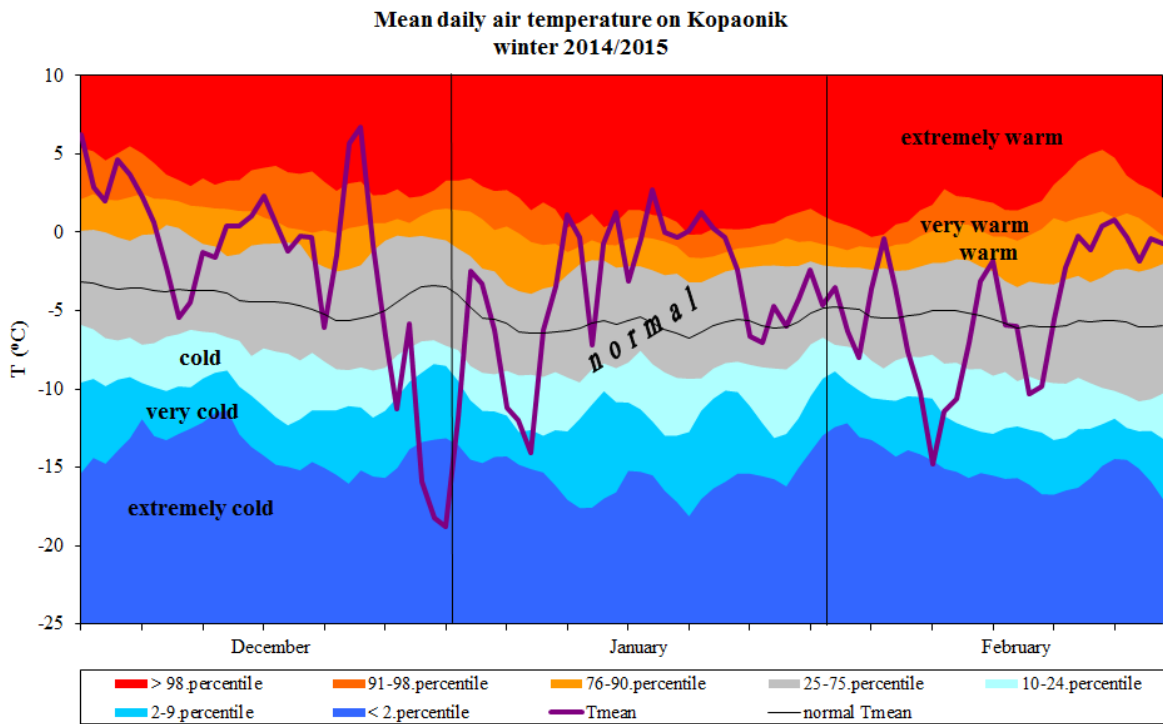


Figure 10. Three-month course of the mean daily air temperature on Kopaonik during winter 2014/15

Precipitation

The precipitation totals during winter in Serbia were within and slightly above the average compared to the normal for the 1961-1990 base period, ranging from 139.5 mm in Banatski Karlovac to 292.5 mm on Kopaonik. The precipitation sums compared to the normal were in a range from 103% in Banatski Karlovac up to 175% in Sombor (Figure 11).

According to the percentile method, precipitation sums during winter were in the rainy and very rainy categories in most of Serbia, and extremely rainy on Crni Vrh and Kopaonik (Figure 12).

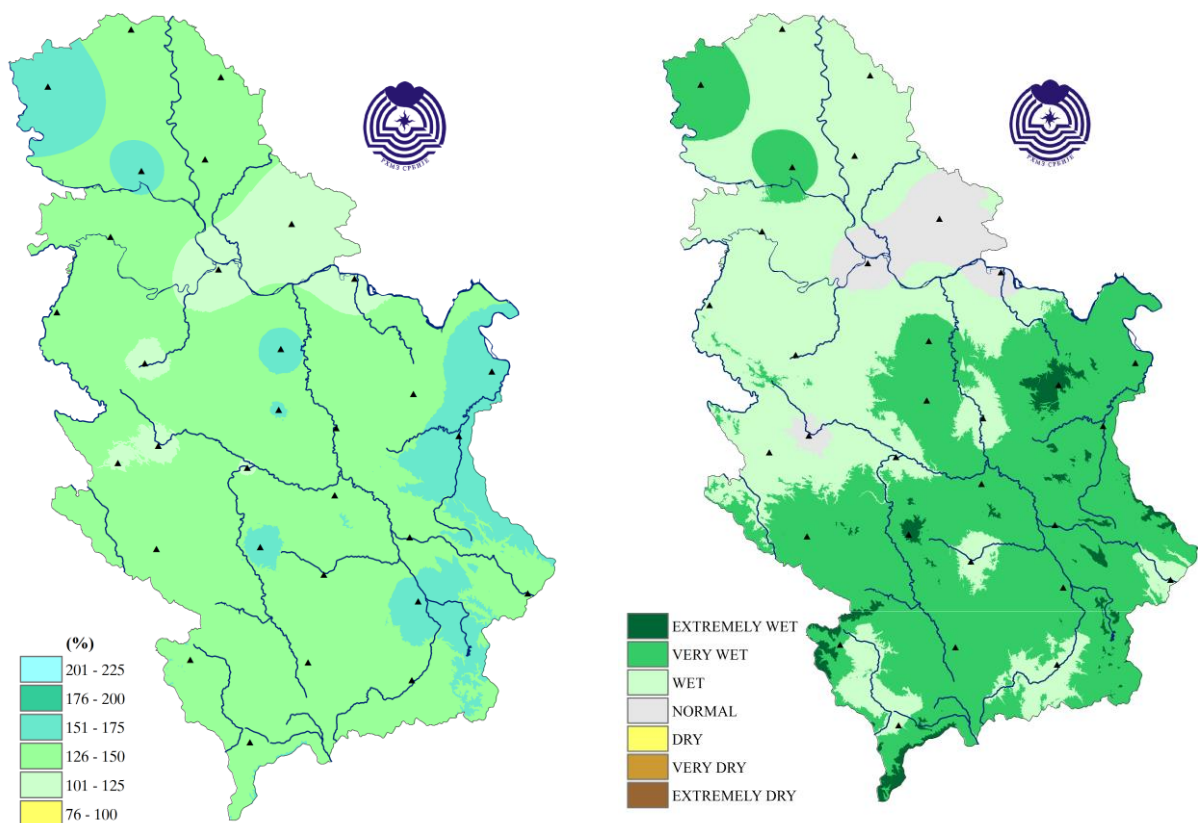


Figure 11. Spatial distribution of precipitation sums expressed in the percentages of normal during winter 2014/15

Figure 12. Assessment of the precipitation sums using percentile method during winter 2014/15 compared to the 1961-1990 base period

According to the tercile method, precipitation sums were above the average in most of Serbia and within the average in Belgrade and Veliko Gradiste (Figure 13).

The maximum daily precipitation amount was registered in Vranje on February 7, amounting to 39.8 mm.

The number of days with precipitation of 1 mm and above, during winter, ranged from 23 days in Kikinda to 38 days on Kopaonik. The recorded number of days with precipitation of 1 mm and above was 11 days above the average for the winter season (Figure 14).

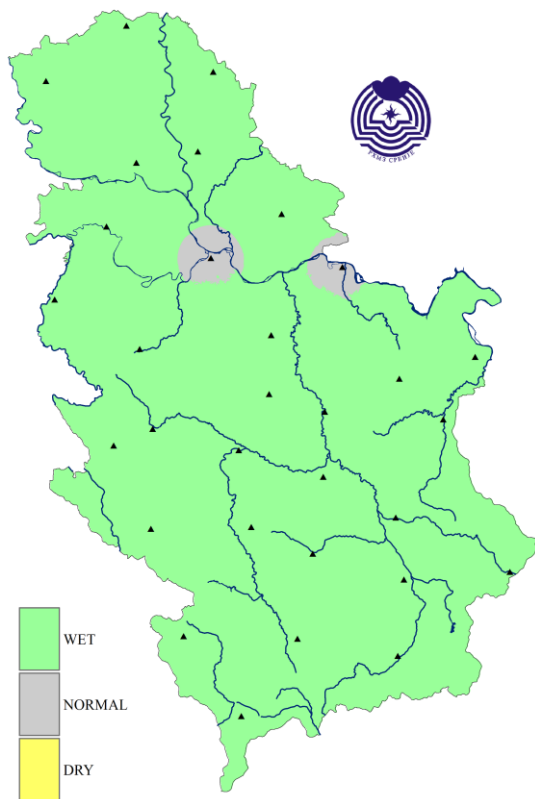


Figure 13. Assessment of the precipitation sums using tercile method during winter 2014/15 compared to the 1961-1990 base period

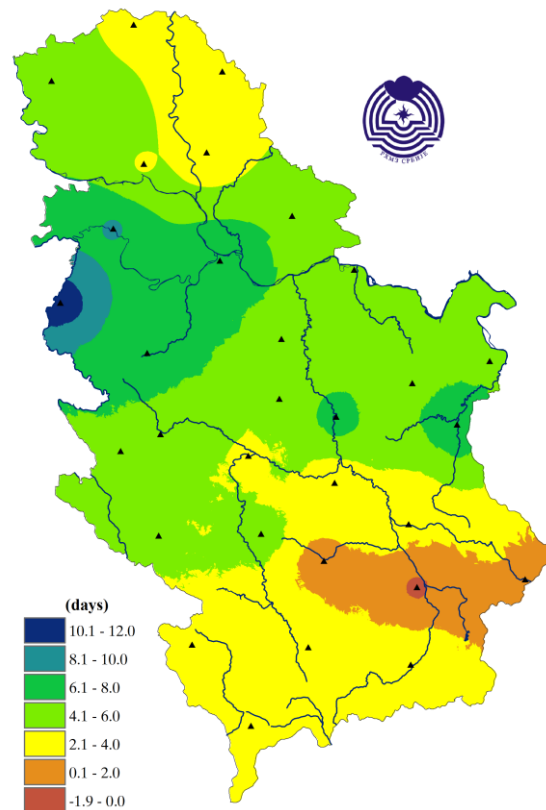


Figure 14. Deviation of the number of days with precipitation of 1mm and above during winter 2014/15

The number of days with the snow cover, in the low-lying areas, ranged from 12 days on Palic to 36 days in Dimitrovgrad. In the mountainous regions, the number of days with the snow cover ranged from 68 days in Sjenica to 86 days on Crni Vrh. The registered number of days with the snow cover was 10 to 30 days less than the average in most of the country during winter season (Figure 15). The maximum snow depth, reaching 117 cm was observed on Kopaonik on February 11.

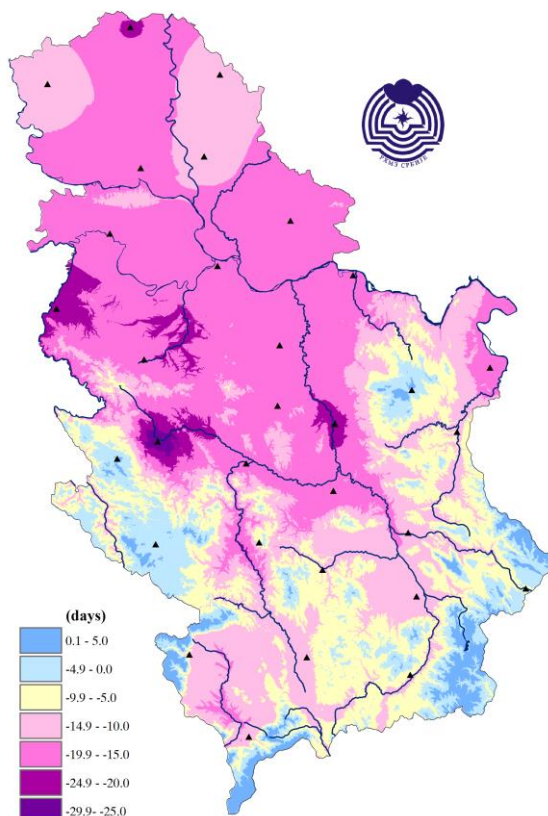


Figure 15. Deviations of the number of days with snow cover during winter 2014/15

Figures 16 and 17 show cumulative precipitation sums for Belgrade and Negotin per month compared to the average cumulative precipitation sums during winter.

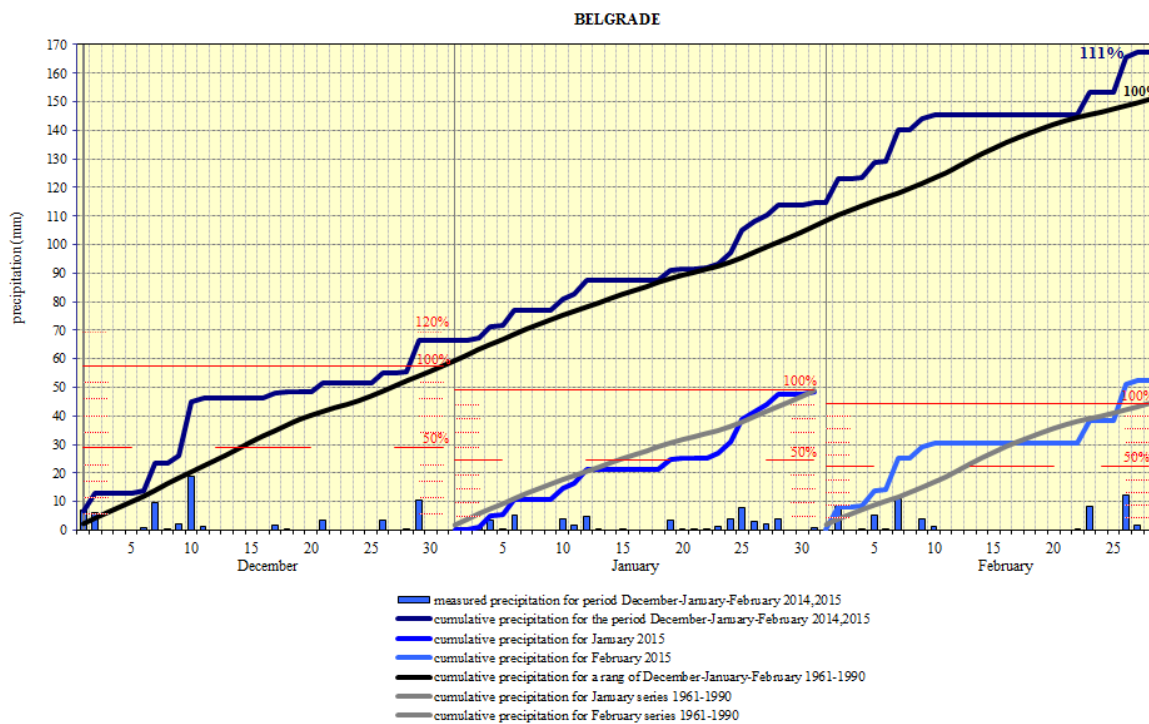


Figure 16. Cumulative precipitation sums for Belgrade

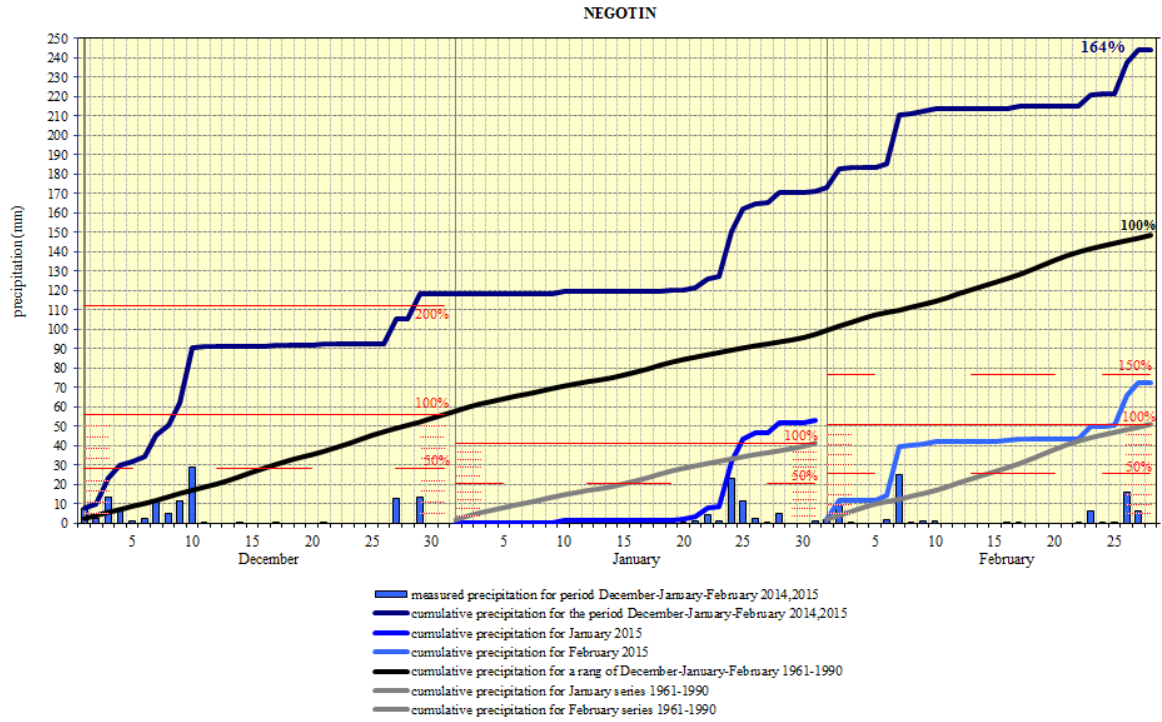


Figure 17. Cumulative precipitation sums for Negotin

Sunshine duration (insolation)

During winter, sunshine duration was within and slightly above the average in the entire Serbia, ranging from 185.2 in Pozega to 309.9 hours in Smederevska Palanka (Figure 18).

Compared to the normal for the 1961- 1990 base period, sunshine duration ranged from 84% in Zajecar up to 152% in Krusevac (Figure 19).

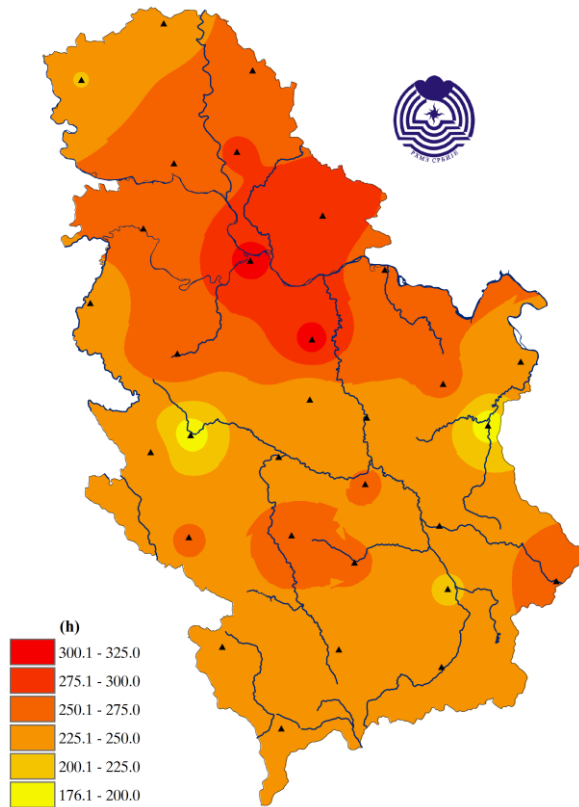


Figure 18. Insolation during winter 2014/15, expressed in hours

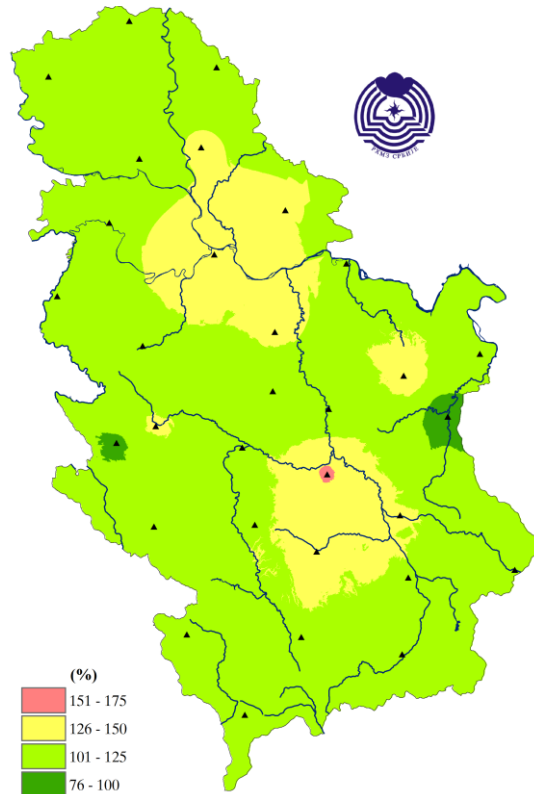


Figure 19. Insolation during winter 2014/15 expressed in the percentages of normal

Analysis of the 2014/15 winter season for Serbia compared to the 1971-2000 base period

Temperature

Departures of the mean air temperature from the normal for the 1971 – 2000 base period ranged from 0.5°C in Zajecar up to 2.1°C on Palic (Figure 20).

According to the percentile method, the mean air temperature was in the warm category in most of Serbia, very warm in northern areas and Pozega, and normal category in southeastern, parts of eastern and western Serbia (Figure 21).

According to the tercile method, mean air temperature was above the average in most of Serbia and within the average in Sjenica and Crni Vrh.

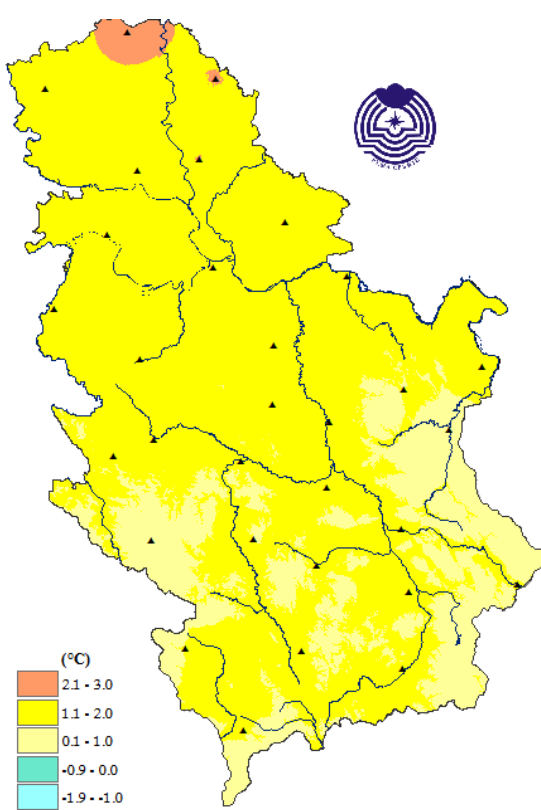


Figure 20. Seasonal mean air temperature anomaly compared to the 1971-2000 base period during winter 2014/15 in Serbia

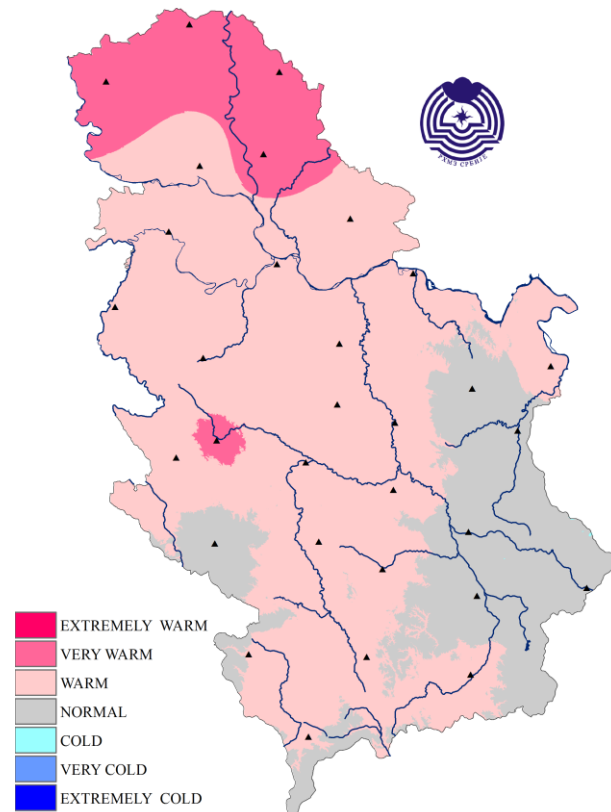


Figure 21. Assessment of the air temperature in Serbia during winter 2014/15 using percentile method compared to the 1971-2000 base period

Precipitation

During winter, in most of Serbia precipitation sums were above the average compared to the normal for the 1971 – 2000 base period. Precipitation sums ranged between 123% in Veliko Gradiste and 185% in Sombor (Figure 22).

According to the percentile method, precipitation sums were in the very rainy and extremely rainy categories in most of Serbia (Figure 23).

According to the tercile method, precipitation sums were above the average in the entire Serbia.

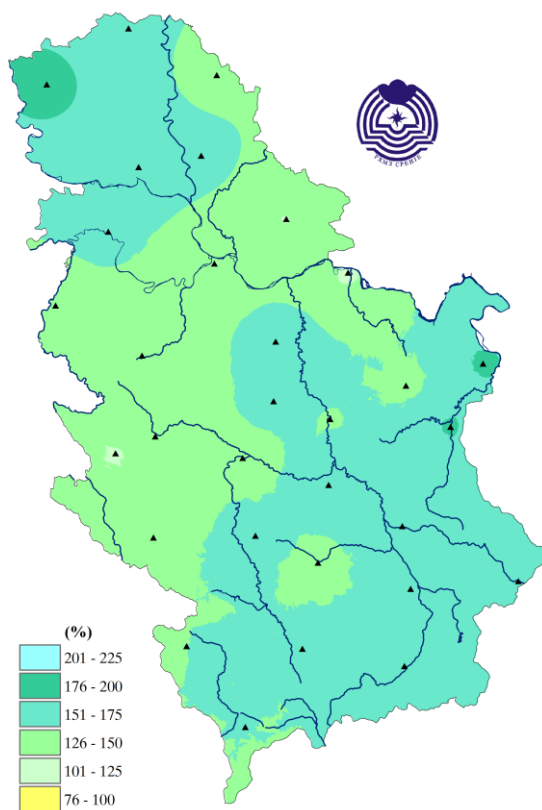


Figure 22. Spatial distribution of precipitation sums expressed in the percentages of normal during winter 2014/15 compared to the 1971-2000 base period

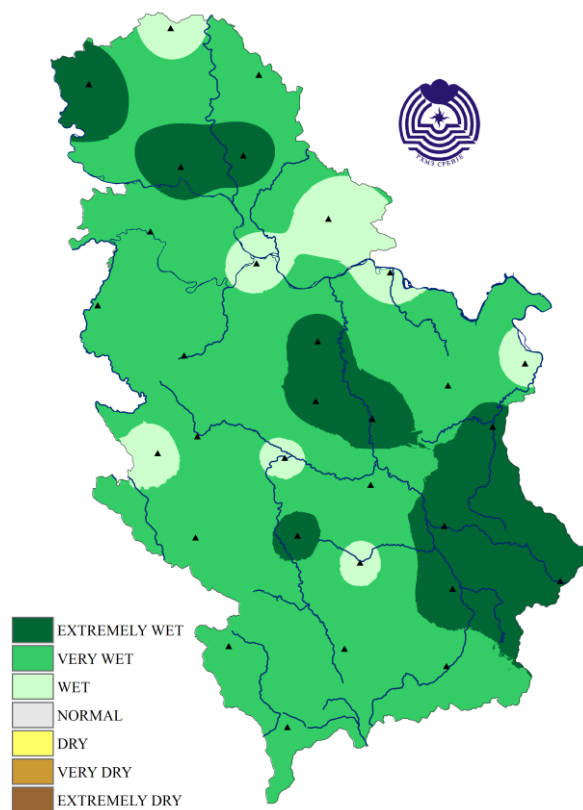


Figure 23. Assessment of the precipitation sums using percentile method during winter 2014/15 compared to the 1971-2000 base period

Analysis of the 2014/15 winter season for Serbia compared to the 1981-2010 base period

Temperature

Departures of the mean air temperature from the normal during winter, for the 1981-2010 base period ranged from 0.4°C in Zajecar up to 2.1°C on Palic (Figure 24).

According to the percentile method, the mean air temperature was in the warm category across most of Serbia, normal in parts of western, eastern and southeastern areas and very warm in Palic (Figure 25).

According to the tercile method, mean air temperature was above the average in most of Serbia aside from Zajecar where it was within the average.

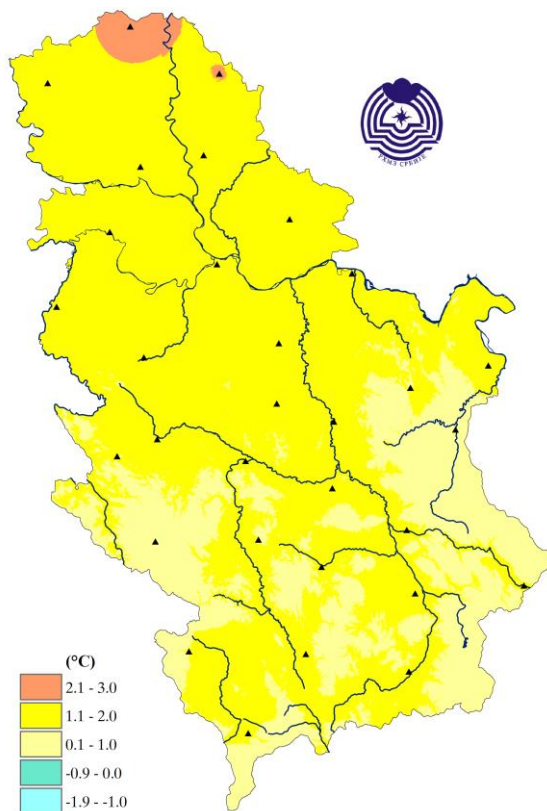


Figure 24. Seasonal mean air temperature anomaly compared to the 1981-2010 base period during winter 2014/15 in Serbia

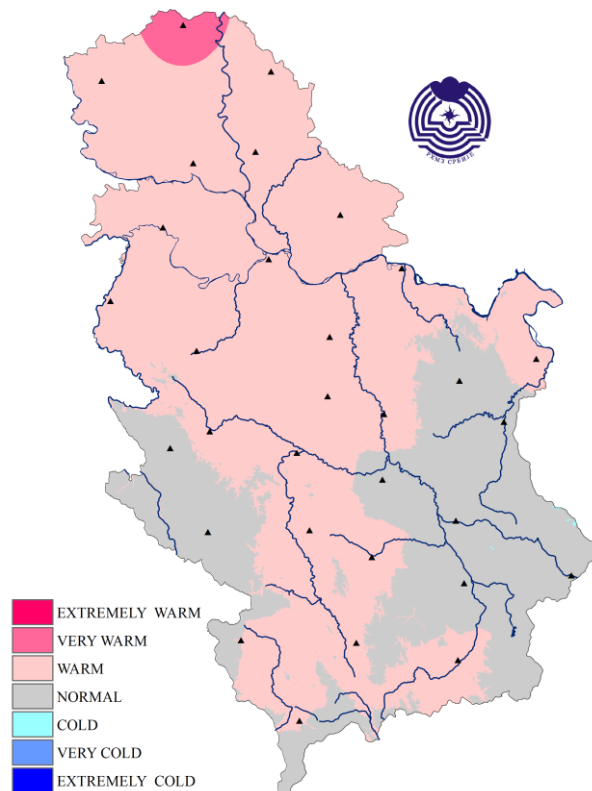


Figure 25. Assessment of the air temperature in Serbia during winter 2014/15 using percentile method compared to the 1981-2010 base period

Precipitation

During winter, in most of Serbia precipitation sums were above the average compared to the normal for the 1981-2010 base period. The precipitation sums ranged between 115% in Belgrade and 174% in Sombor compared to the normal (Figure 26).

According to the percentile method, precipitation sums were in the very rainy and rainy categories in most of Serbia and extremely rainy in Sombor (Figure 27).

According to the tercile method, precipitation sums were above the average in the entire Serbia.

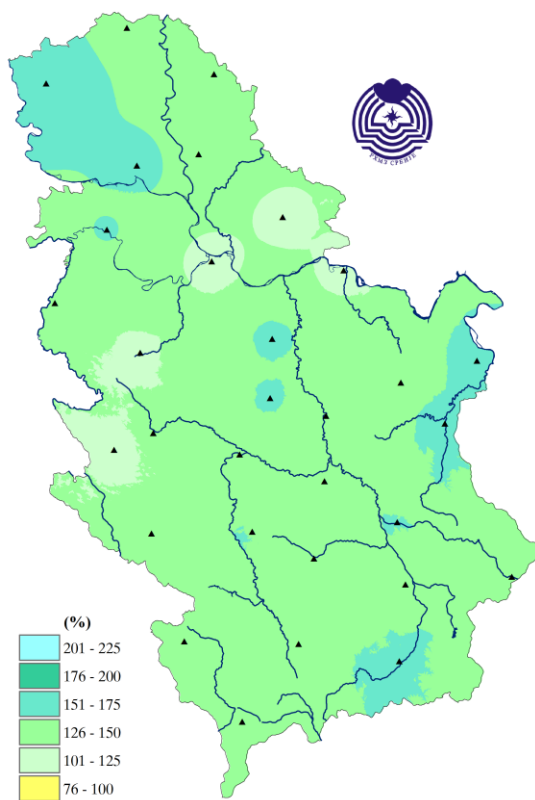


Figure 26. Spatial distribution of precipitation sums expressed in the percentages of normal during winter 2014/15 compared to the 1981-2010 base period

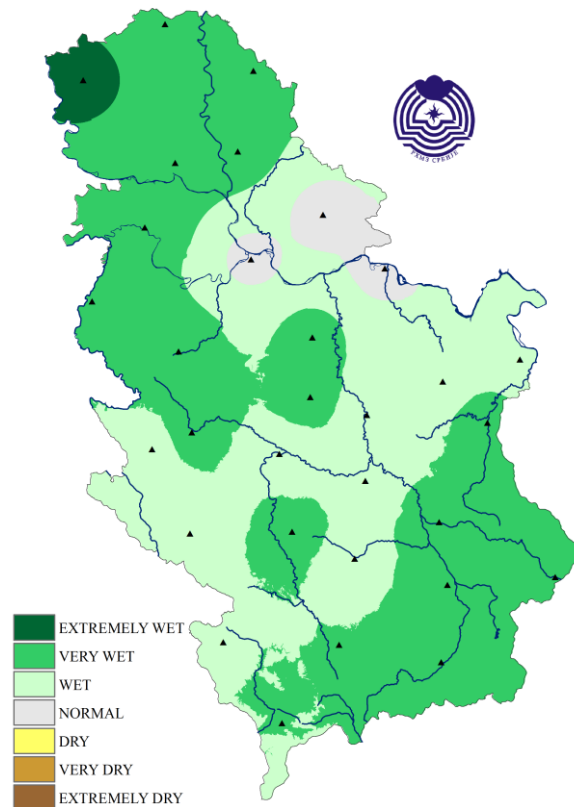


Figure 27. Assessment of the precipitation sums using percentile method during winter 2014/15 compared to the 1981-2010 base period

Winter 2014/2015			Air Temperature (°C)			
Station	Rank*	Rank**	33	50	66	Observed value
Beograd (1888-2015)	13	8	1.5	2.4	3.0	4.2
Palić (1946-2015)	6	5	-0.1	0.5	1.5	2.7
Sombor (1942-2015)	8	6	0.0	0.9	1.8	2.6
Novi Sad (1949-2015)	10	8	0.4	1.1	1.8	2.9
Zrenjanin (1944-2015)	9	6	0.3	1.0	1.8	3.0
Kikinda (1949-2015)	8	6	0.1	0.9	1.7	2.8
Banatski Karlovac (1986-2015)	7	-	0.7	1.4	2.0	2.7
Loznica (1923-2015)	11	8	0.7	1.8	2.5	3.4
Sremska Mitrovica (1926-2014)	13	7	0.4	0.9	1.6	2.7
Valjevo (1927-2015)	14	7	0.7	1.3	2.2	3.1
Kragujevac (1926-2015)	14	8	0.9	1.5	2.3	3.1
Smederevska Palanka (1940-2015)	13	8	0.7	1.5	2.1	3.1
Veliko Gradište (1927-2015)	13	7	0.4	1.0	1.6	2.6
Crni Vrh (1967-2015)	15	12	-3.6	-3.2	-2.1	-2.0
Negotin (1928-2015)	11	8	0.7	1.1	1.8	2.4
Zlatibor (1951-2015)	15	10	-2.2	-1.8	-0.8	-0.5
Sjenica (1947-2015)	21	12	-3.4	-2.5	-2.0	-1.9
Pozega (1953-2015)	9	6	-1.3	-0.7	0.3	0.9
Kraljevo (1927-2015)	16	9	0.5	1.1	2.1	2.5
Kopaonik (1950-2015)	13	10	-5.0	-4.6	-3.8	-3.5
Kursumlija (1953-2015)	13	9	0.3	1.0	1.5	2.1
Krusevac (1931-2015)	17	10	0.7	1.1	1.9	2.4

Cuprija (1949-2015)	13	8	0.4	1.2	1.7	2.4
Nis (1926-2015)	20	11	1.1	1.6	2.3	2.8
Leskovac (1949-2015)	22	12	0.3	0.9	1.7	2.1
Zajecar (1930-2015)	25	12	0.0	0.4	1.1	1.0
Dimitrovgrad (1946-2015)	22	11	-0.5	0.0	1.1	1.4
Vranje (1927-2015)	17	8	0.3	1.0	1.7	2.3

*Rank –period of stations work (warmest season)

**Rank – 1981-2015 period (warmest season)

Winter 2014/2015			Precipitation sums (mm)			
Station	Rank*	Rank**	33	50	66	Observed Value
Beograd (1888-2015)	39	11	129.8	152.3	158.3	167.3
Palić (1945-2015)	9	4	90.1	104.4	121.5	155.8
Sombor (1942-2015)	5	2	104.2	114.8	123.0	197.7
Novi Sad (1948-2015)	8	2	109.9	119.1	133.5	187.5
Zrenjanin (1946-2015)	16	5	106.5	115.7	127.0	159.9
Kikinda (1948-2015)	21	5	98.0	105.5	121.2	143.5
Banatski Karlovac (1946-2015)	24	11	108.3	122.7	132.5	139.5
Loznica (1925-2015)	13	6	166.4	171.6	201.4	230.0
Sremska Mitrovica (1925-2015)	18	2	103.0	115.9	130.1	169.1
Valjevo (1926-2015)	16	6	149.5	157.6	173.3	193.6
Kragujevac (1925-2015)	7	4	113.0	120.0	134.0	189.5
Smederevska Palanka (1939-2015)	4	3	121.8	132.7	157.6	209.3

Veliko Gradište (1926-2015)	28	12	120.8	147.9	161.3	163.6
Crni Vrh (1967-2015)	8	8	127.6	143.8	170.7	199.5
Negotin (1927-2015)	11	8	105.9	137.3	186.9	244.0
Zlatibor (1950-2015)	11	8	204.3	225.1	237.8	251.2
Sjenica (1946-2015)	11	8	140.9	151.4	177.6	206.1
Pozega (1952-2015)	20	6	124.3	147.5	157.6	180.6
Kraljevo (1926-2015)	19	9	126.9	137.3	156.8	200.3
Kopaonik (1950-2015)	2	2	158.1	204.0	232.1	292.5
Kursumlija (1952-2015)	20	9	123.5	150.9	174.5	187.6
Krusevac (1927-2015)	8	6	115.1	133.2	155.6	204.2
Cuprija (1948-2015)	11	7	127.5	148.1	163.1	201.5
Nis (1925-2015)	10	5	117.7	137.1	150.6	192.5
Leskovac (1948-2015)	8	4	127.3	150.4	161.8	207.1
Zajecar (1929-2015)	8	5	103.7	136.3	146.6	214.7
Dimitrovgrad (1945-2015)	11	4	111.6	120.4	143.9	185.8
Vranje (1926-2015)	11	3	111.7	126.9	137.1	193.6

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

** Rank – 1981-2015 period (highest seasonal precipitation)

Country	Seasonal temperature DJF		Seasonal precipitation DJF		High Impact Events*
	Observed	SEECOF-12 climate outlook for temperature	Observed	SEECOF-12 climate outlook for precipitation	
Serbia (1)	Above normal	Above normal to normal (20, 40, 40)	Above normal	No predictive signal (33, 34, 33)	No high impact events

* Events that had an impact on the society (events that caused great material damage to the society during previous season – on the basis of the assessment of the hydrometeorological service):