VERIFICATION OF THE SEECOF–10 WINTER 2013/2014 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA COMPARED TO THE 1981–2010 BASE PERIOD

Temperature

According to the SEECOF-10 outlook for the winter of 2013/2014 in Serbia, climatology is assigned for all three categories (above normal with 33% probability, normal with 34% probability and below normal with 33% probability), compared to the 1981–2010 climatological base period.
Meteorological monitoring showed that winter 2013/2014 was warm across entire Serbia with above normal temperature according to the tercile method (*Figure* 1).

Precipitation

The SEECOF–10 climate outlook for the winter 2013/2014 in Serbia didn't indicate any clear signal for precipitation (above normal with 33% probability, normal with 34% probability and below normal with 33% probability).
Monitoring of precipitation showed dry winter conditions in almost entire Serbia (*Figure* 2).

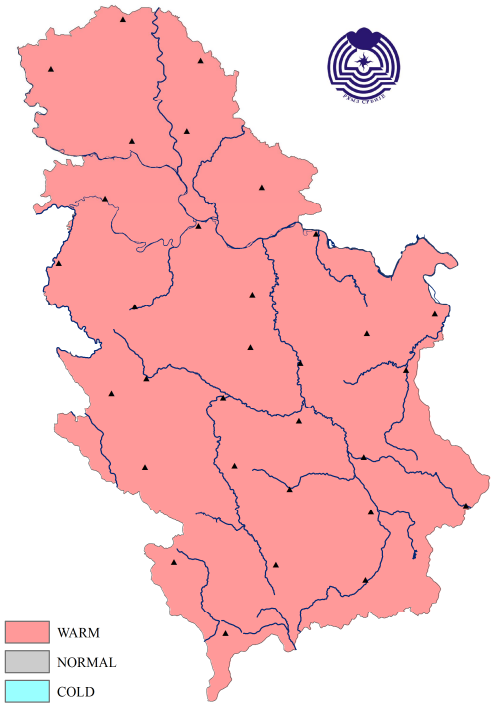


Figure 1. Monitoring of the winter 2013/2014 temperature in Serbia using the tercile method, compared to the 1981-2010 base period

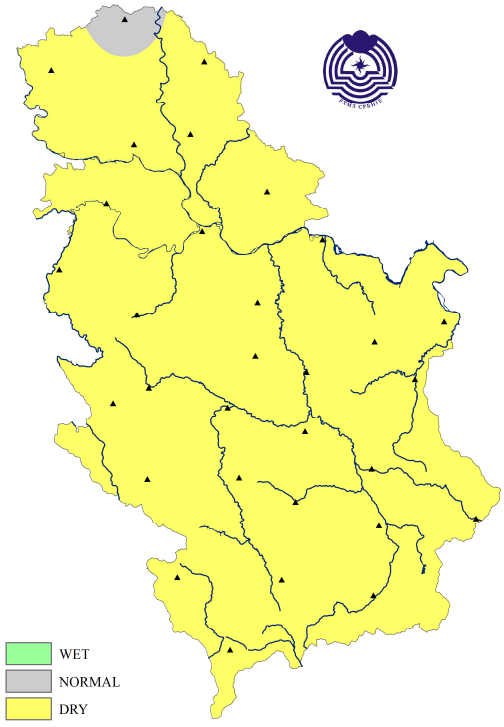


Figure 2. Monitoring of the winter 2013/2014 precipitation in Serbia using the tercile method, compared to the 1981-2010 base period

Winter 2013/14 was characterized by extremely warm and very dry conditions. It was the warmest winter in Serbia and the second warmest in Belgrade. Three heat waves were registered during this period.

Analysis of winter 2013/14 for Serbia compared to the 1961-1990 base period

Temperature

Mean air temperature during winter 2013/14 ranged between 1,3°C in Pozega and 5,4°C in Belgrade and on the mountains from -0,2°C on Crni Vrh to 2,3°C on Zlatibor (*Figure 1*).

Mean air temperature anomaly from the normal[1], for the 1961-1990 base period during winter 2013/14 was in a range between 1,3ºC in Zajecar and Negotin up to 3,6ºC in Zrenjanin, and in the higher lying areas from 2,9°C on Crni Vrh to 4,4°C on Kopaonik (*Figure 2*).

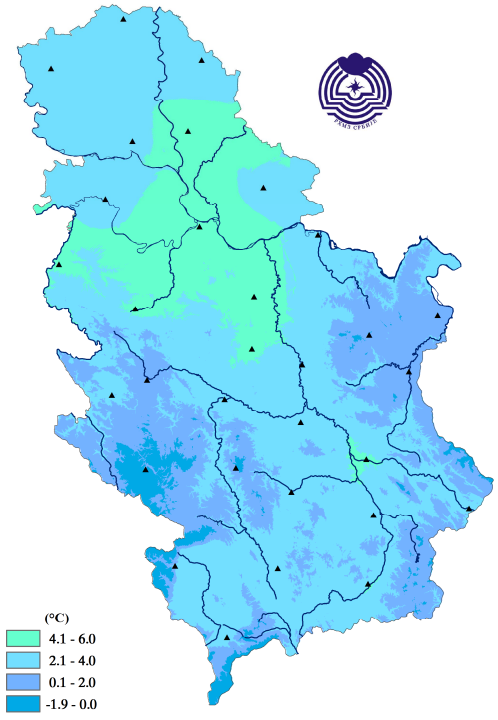


Figure 1. Spatial distribution of mean seasonal air temperature (°C) during winter 2013/14

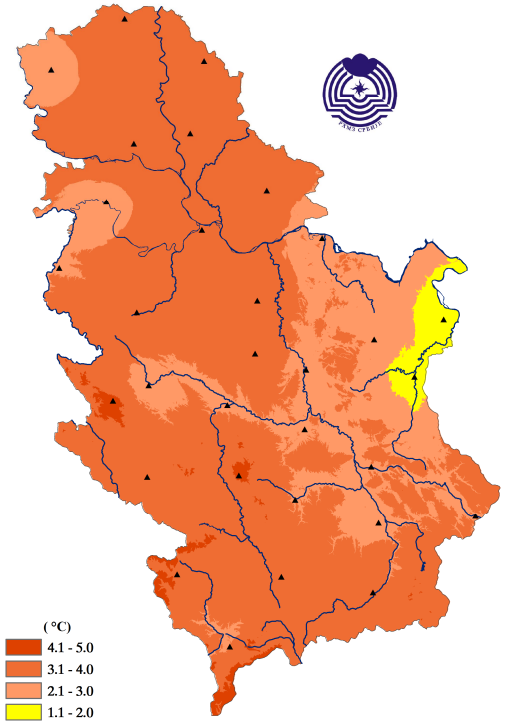


Figure 2. Mean seasonal air temperature anomaly in Serbia during winter 2013/2014 compared to the 1961-1990 base period

[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 method[2], mean air temperature during winter 2013/14 was in the extremely warm category in most of Serbia (*Figure 3*).

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

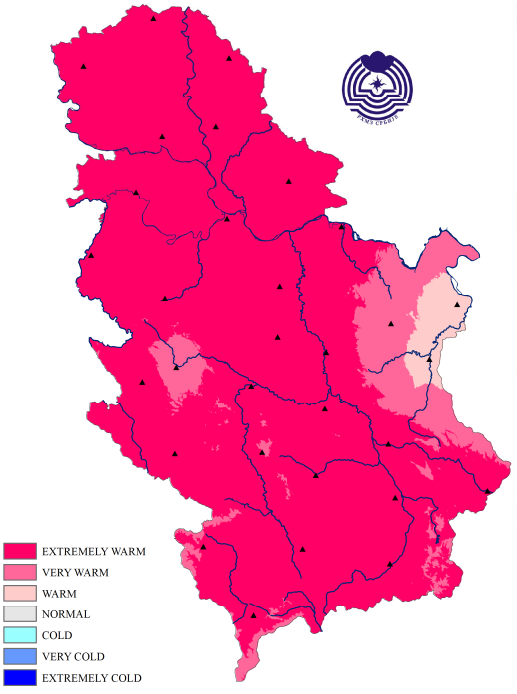


Figure 3. Assessment of the air temperature in Serbia during winter 2013/14 using percentile method compared to the 1961-1990 base period

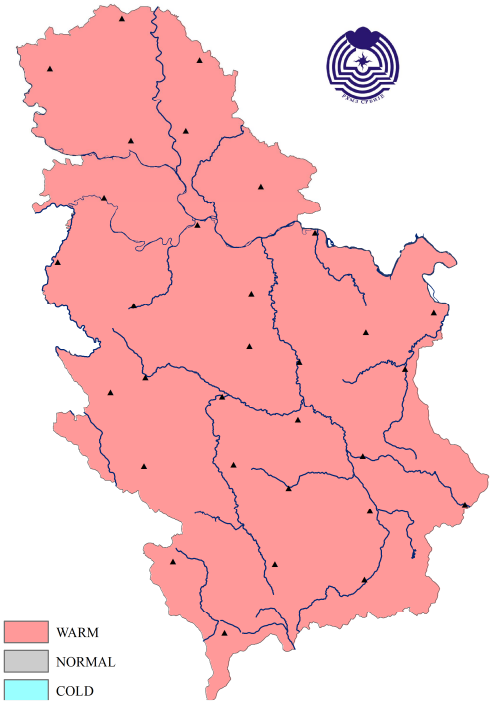


Figure 4. Assessment of the air temperature in Serbia during winter 2013/14 using tercile method compared to the 1961-1990 base period

The highest daily air temperature of 24,0°C, during winter was measured in Zajecar on February 17.

The number of ice days with maximum daily air temperature below 0˚C varied from 4 in Vranje and Belgrade to 18 in Negotin. The greatest number of ice days on the territory of Serbia, total of 23, was registered on Crni Vrh. *(Figure 5)*.

The number of frost day with minimum daily air temperature below 0°C ranged between 27 in Belgrade to 65 in Zajecar and on the mountains from 52 on Zlatibor to 75 days on Kopaonik. The greatest negative deviation of the number of frost days from the average (21 day) was recorded on Zlatibor (*Figure 6*).

[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

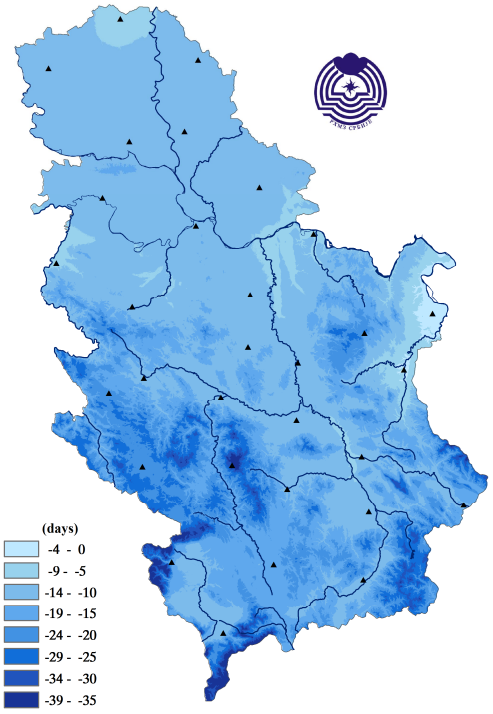


Figure 5. The deviation of the number of ice days during winter 2013/14 compared to the normal 1961-1990

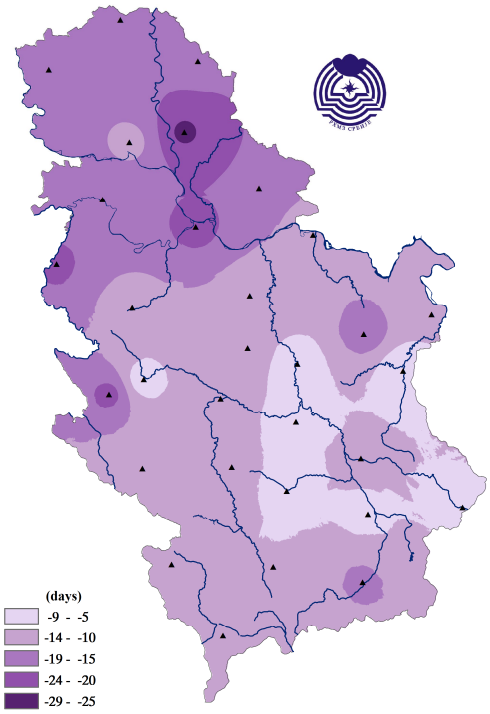


Figure 6. The deviation of the number of frost days during winter 2013/14 compared to the normal 1961-1990

On January 31, the lowest temperature during winter was observed on Crni Vrh, measuring -20,2°C.

Winter 2013/14 was the third warmest in Serbia in the period between 1951-2014 and the second warmest in Belgrade for the period 1888-2014 (*Figures 7 and 8).* The winter of 2007 was the warmest one. in both Serbia and Belgrade, with temperatures of 4,0°C and 3,5°C, respectively.

During most part of the winter period, mean, maximum and minimum air temperatures in Belgrade were above the multiannual average (*Figure 9*).

Three-month course of mean daily air temperature for Belgrade, Kopaonik and Nis during winter 2013/14 is shown in Figures 10, 11 and 12.

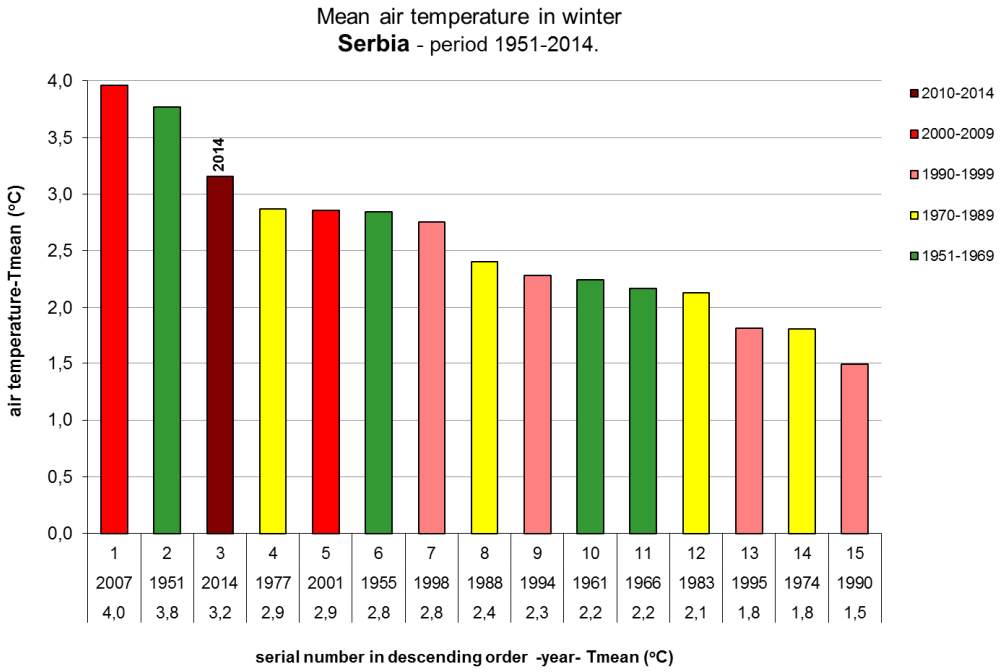


Figure 7. The top 15 warmest winters on record in Serbia for the period of 1951-2014

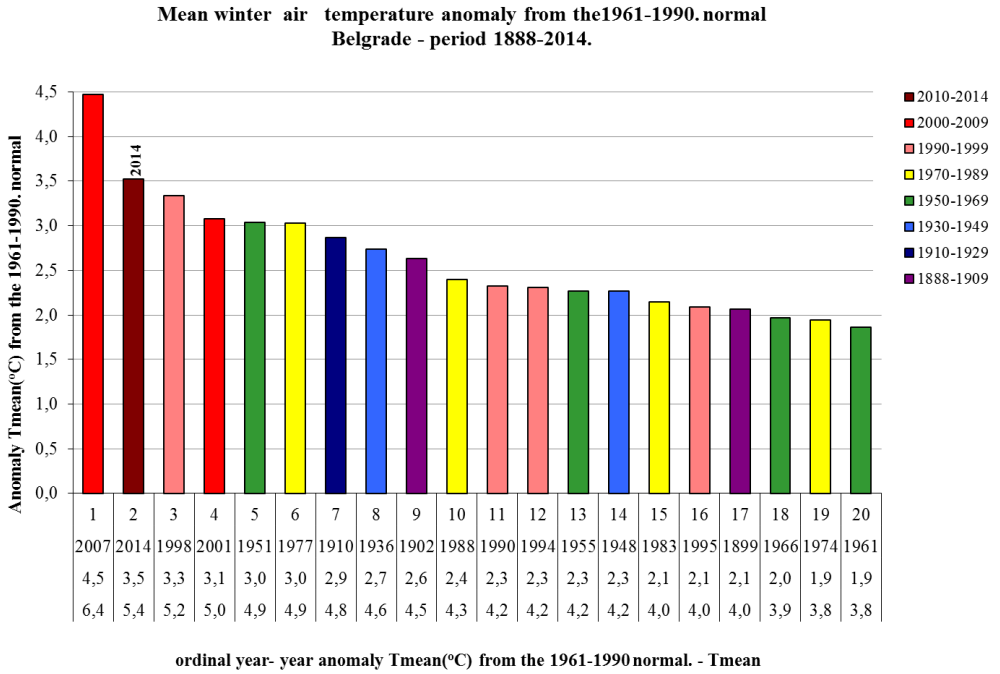


Figure 8. The top 20 warmest winters on record in Belgrade for the period of 1888-2014

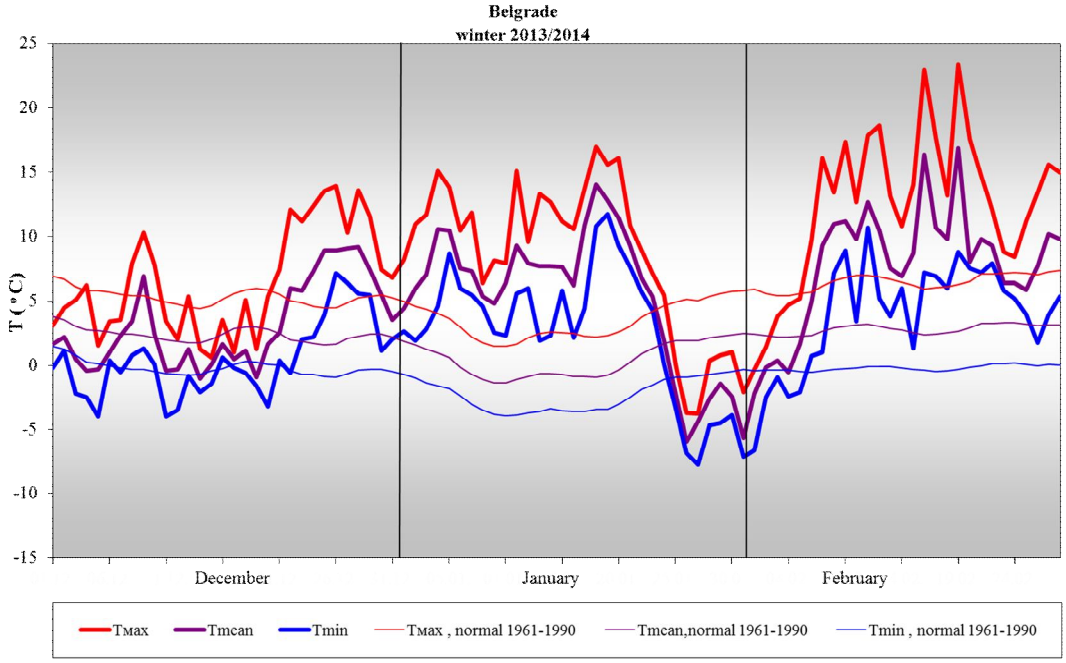


Figure 9. Three-month course of the mean, maximum and minimum air temperature in Belgrade during winter 2013/14

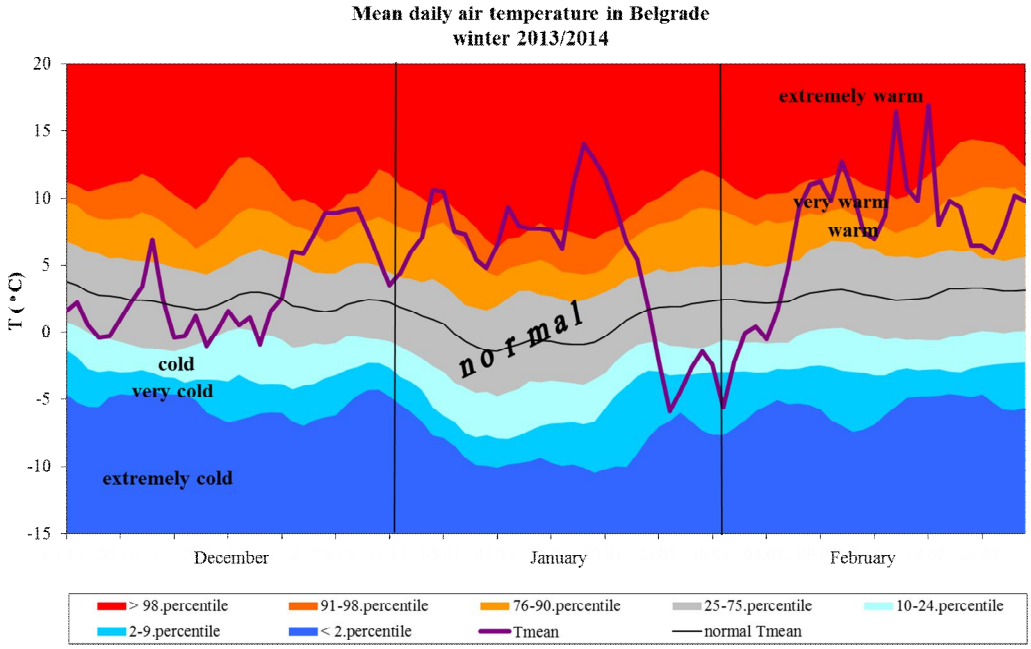


Figure 10. Three-month course of the mean daily air temperature in Belgrade during winter 2013/14

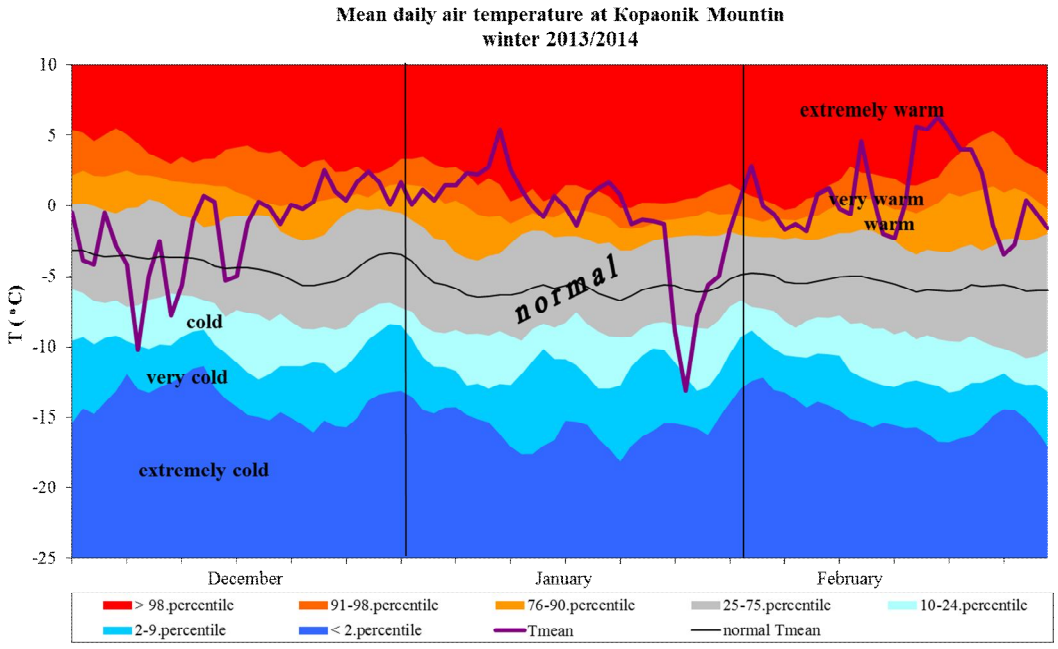


Figure 11. Three-month course of the mean daily air temperature on Kopaonik during winter 2013/14

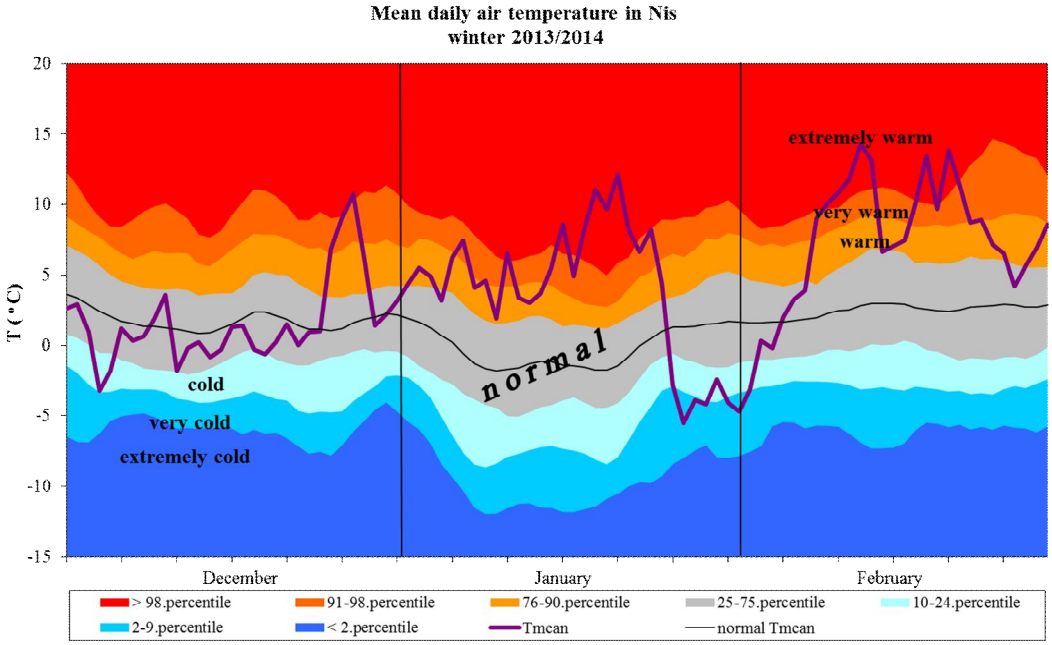


Figure 12. Three-month course of the mean daily air temperature in Nis during winter 2013/14

Precipitation

During winter 2013/14, precipitation sums in Serbia were below the average compared to the normal for the 1961-1990 base period, ranging from 40,4 mm in Novi Sad to 98,1 mm on Kopaonik. Precipitation sums compared to the normal were in a range between 27% in Kraljevo to 83% on Palic (*Figure 11*).

According to the percentile method, precipitation totals were in the very dry category in most of Serbia, whereas extremely dry was in central and western parts of the country (*Figure 12*).

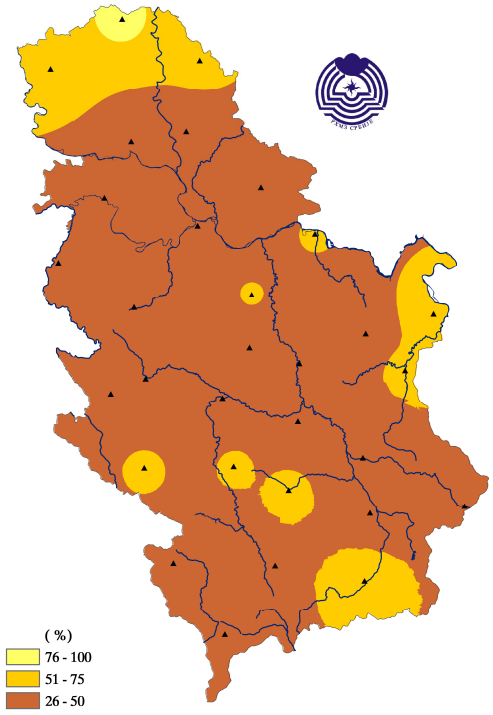


Figure 11. Spatial distribution of precipitation sums expressed in the percentages of normal during winter 2013/14

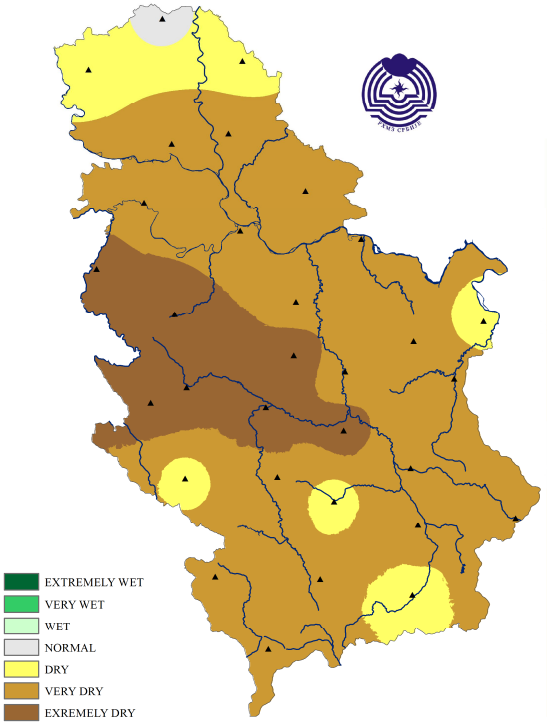


Figure 12. Assessment of the precipitation sums using percentile method during winter 2013/14 compared to the 1961-1990 base period

According to the tercile method, precipitation sums were below the average in most of Serbia (*Figure 13*).

The highest daily precipitation amount of 28,6 mm was registered in Kursumlija on January 25.

The greatest deviation of the number of days with precipitation from 1mm and more is recorded on Kopaonik Mountain (total of 23 days), which is 10 days below than the average for the winter season (*Figure 14*).

In the low-lying areas of Serbia, the number of days with snow cover was below the average (between 4 and 22 days) (*Figure 17*). In the mountain areas, the number of days with snow cover ranged from 41 on Zlatibor to 78 on Kopaonik. The maximum snow depth of 39 cm was observed on Crni Vrh on February 6.

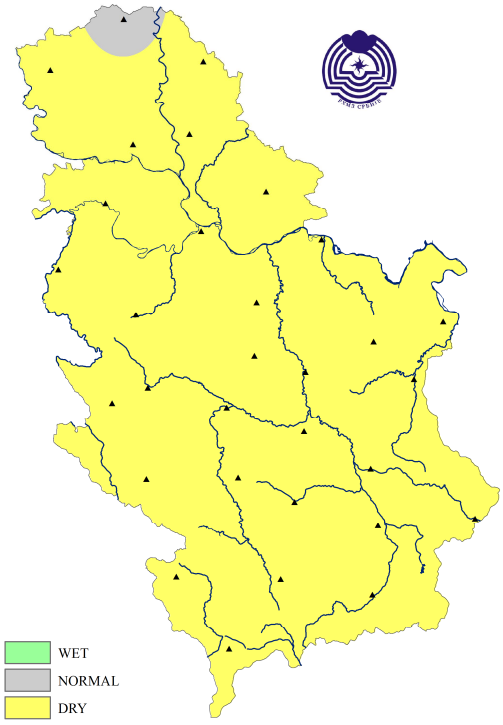


Figure 13. The assessment of the precipitation sums using tercile method during winter 2013/14 compared to the 1961-1990 base period

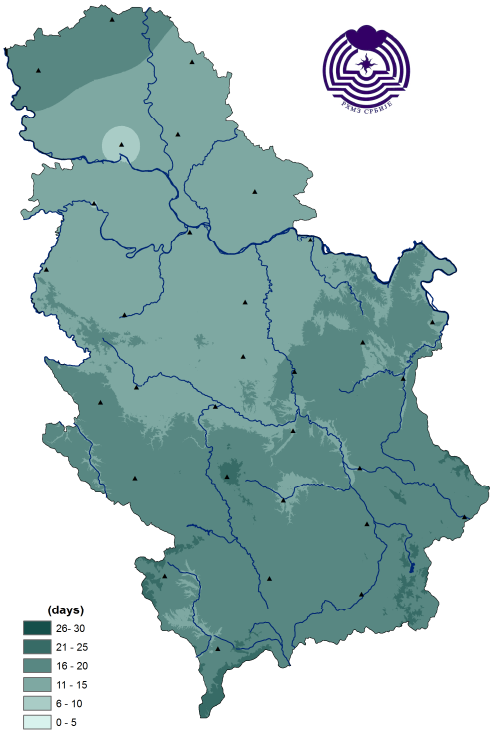


Figure 14. Deviation of the number of days with precipitation of 1mm and more during winter 2013/14

Winter of 2013/14 was the third with the lowest precipitation sums in Serbia for the period 1951-2014 and the sixth in Belgrade for the period of 1888-2014 (*Figures 15 and 16*).

Figure 17 depicts the cumulative precipitation totals for Belgrade per month during winter compared to the average cumulative precipitation totals.

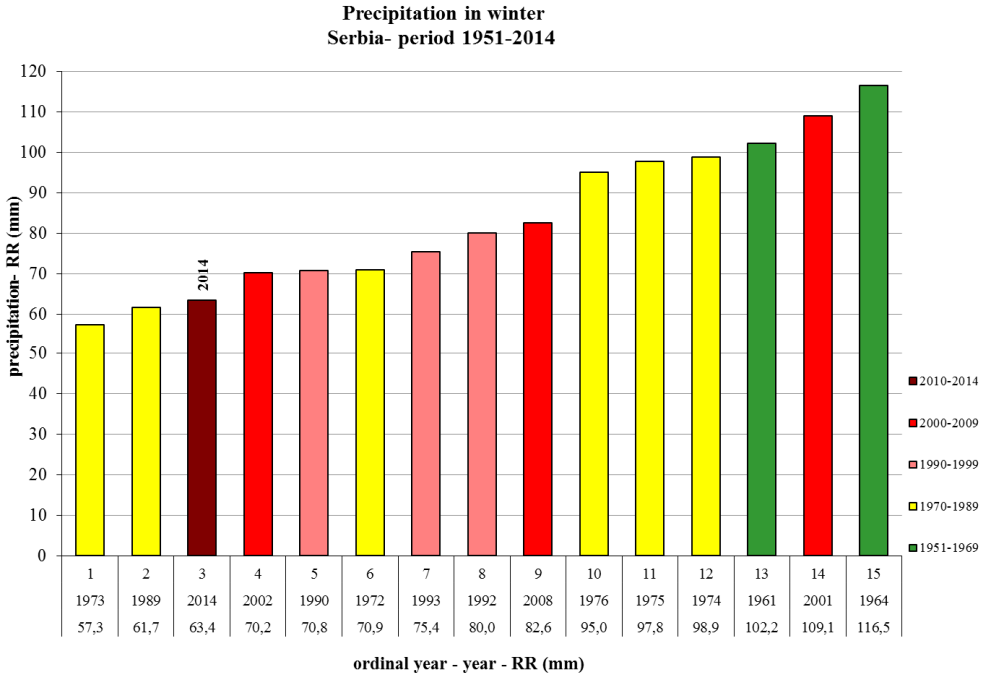


Figure 15. The top 15 winters with lowest precipitation totals on record in Serbia during 1951-2014

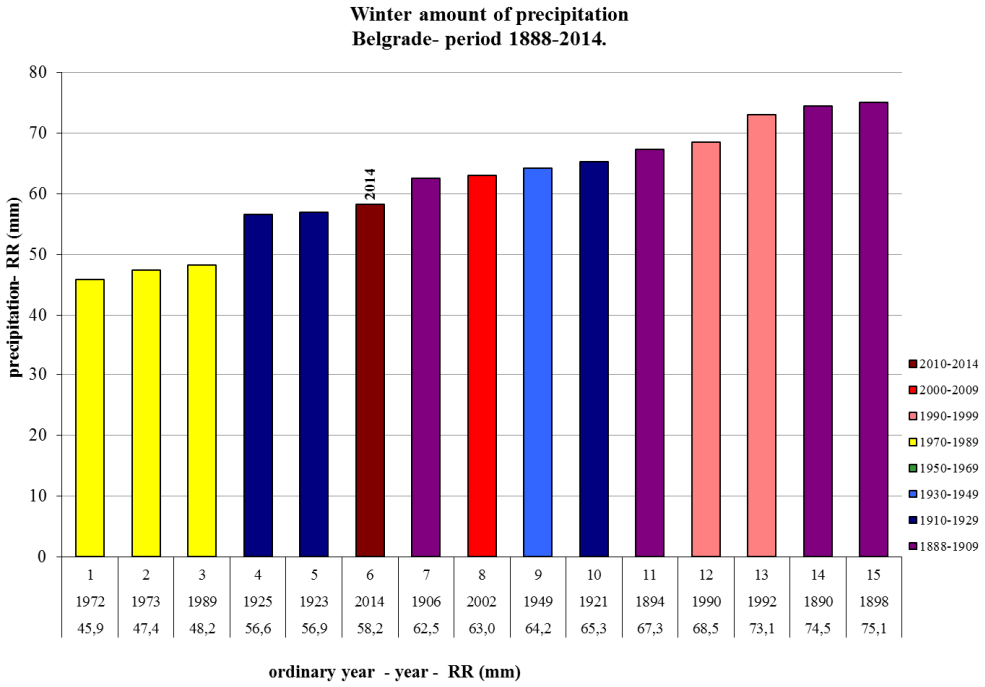


Figure 16. The top 15 winters with lowest precipitation totals on record in Belgrade for the period1888-2014

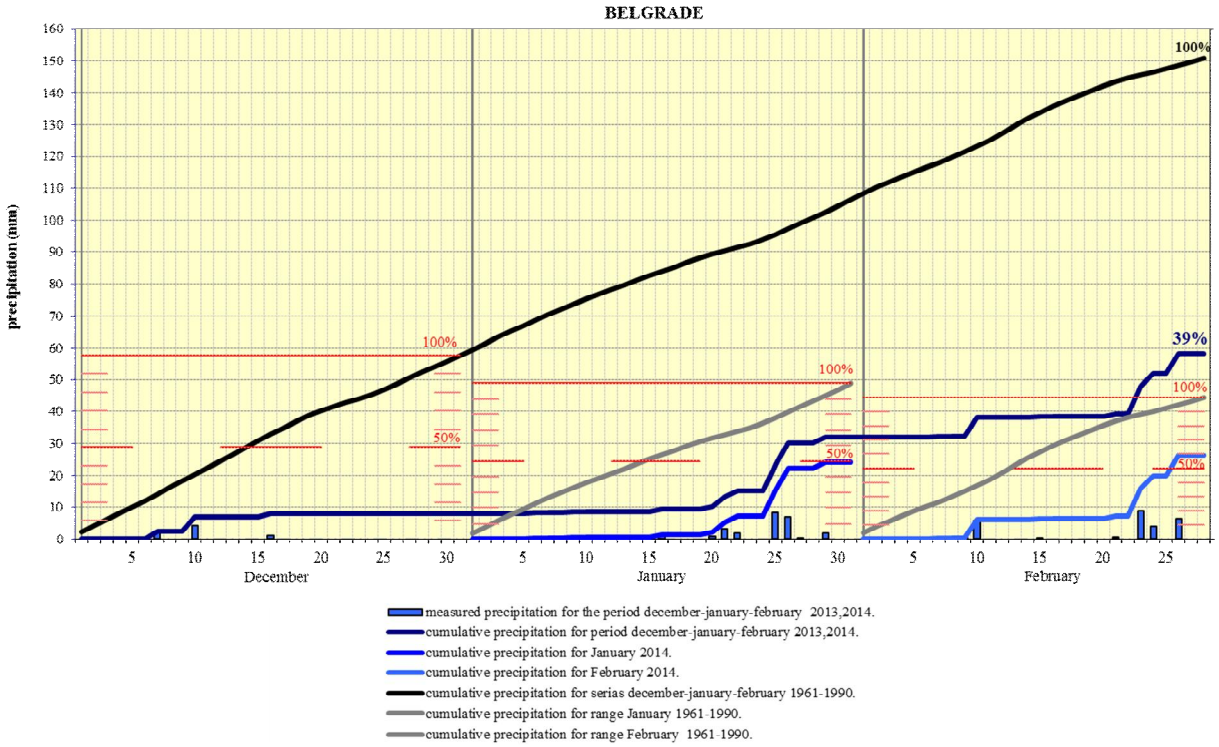


Figure 17. Cumulative precipitation totals for Belgrade

Sunshine duration (insolation)

During winter, sunshine duration was above the average across entire Serbia with values ranging from 161,7 in Pozega to 348,8 hours on Kopaonik (*Figure 17)*.

Compared to the normal for the 1961-1990 base period, insolation ranged between 88% on Palic and 173% in Krusevac (*Figure 18*).

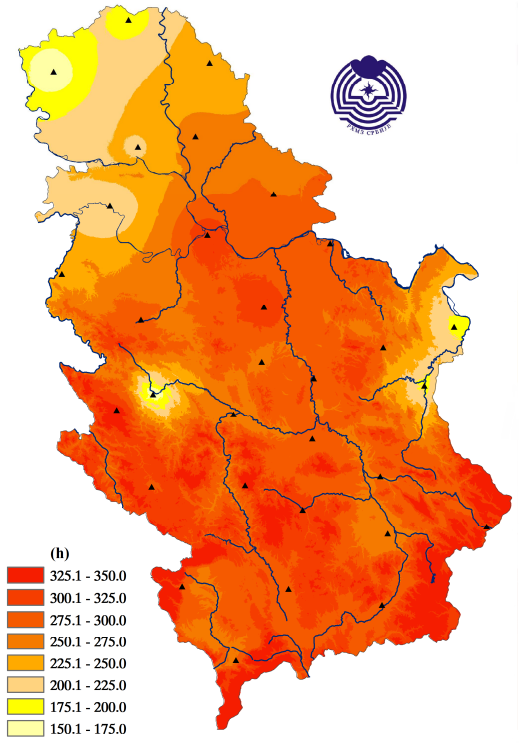


Figure 17. Insolation expressed in hours during winter 2013/14

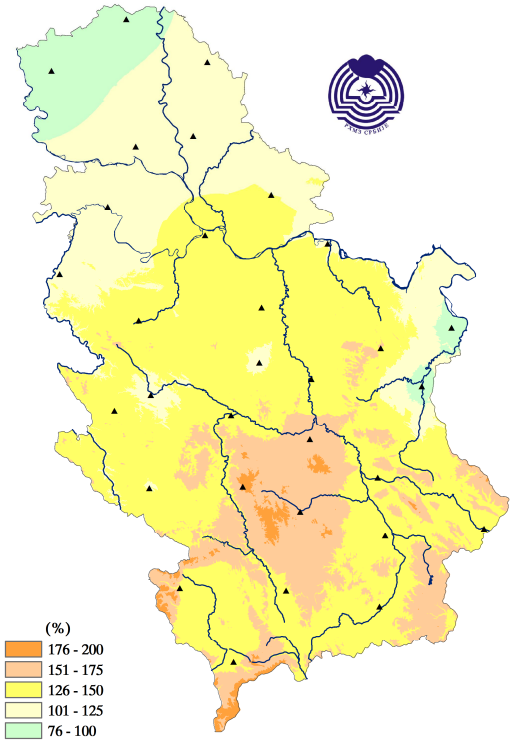


Figure 18. Insolation expressed in the percentages of normal during winter 2013/14

High impact events during winter 2013/2014

Heat wave

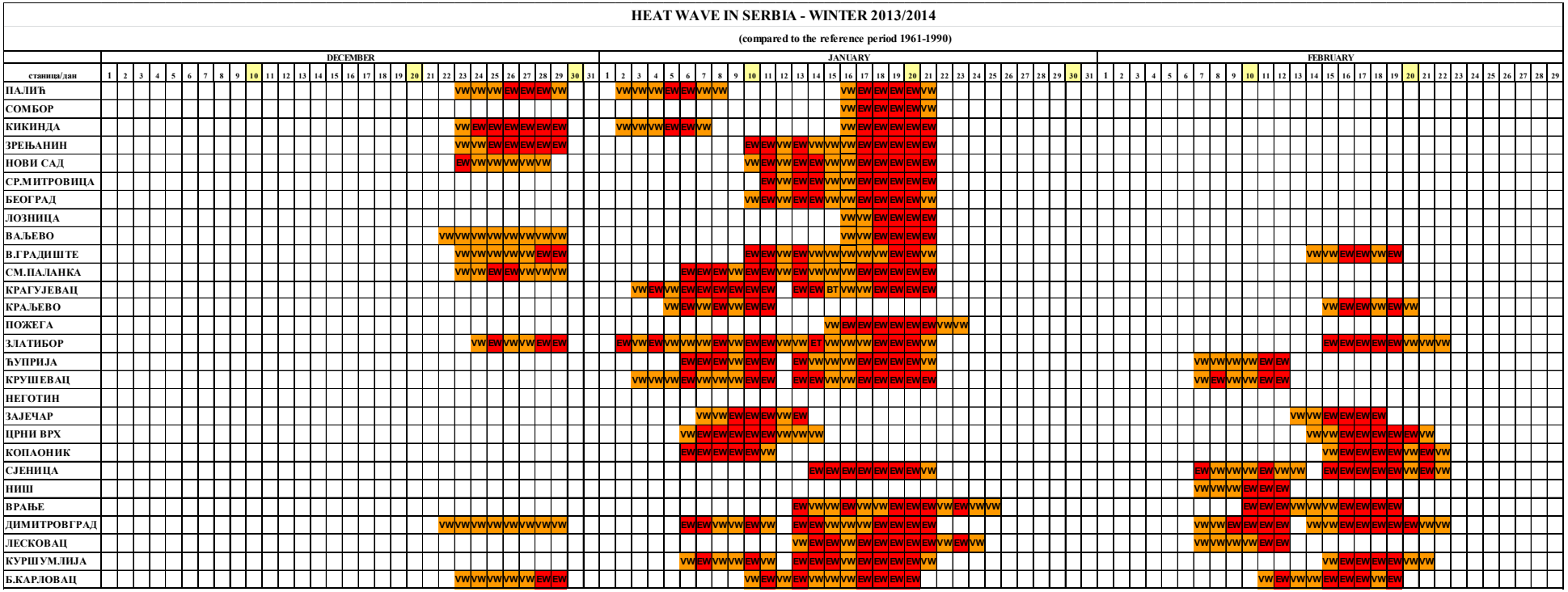
During winter 2013/14 on the territory of Serbia three heat waves[3] were registered. At the end of December, the majority of principal meteorological stations observed the onset of the first heat wave, lasting from December 23 to 29 2013. In most of Serbia, the second heat wave was recorded during the first two decades of January while the third one was registered at certain stations. The heat wave with the longest duration (20 days) occurred on Zlatibor, lasting from January 2 to 21. The next heat wave was observed at 13 principal meteorological stations during February. During winter 2013/14, Negotin didn't experience any heat waves (Chart 1).

Traffic difficulties

During February, on the territory of Serbia data on material damage caused by severe weather events are registered during the first week of the month. Strong kosava wind gusts led to formation of snowdrifts at portions of the highway as well as on the local roads. Portion of the highway E-75, between Subotica and Novi Sad was completely closed for traffic in the period between February 1st and 3rd in addition to number of local and magistral roads across northern Serbia. During this month, around 100 traffic accidents were recorded, with 13 people slightly injured. With regard to infrastructure, material damage caused by stormy weather was mostly negligible.

[3] Heat wave, according to the percentile method, is a period during which maximum daily air temperature is in the warm and very warm categories for 6 days or longer

Chart 1.



Legend: VW – very warm EW – extremely warm

Intensity[4] of the heat wave during winter 2013/14 in Serbia at the principal meteorological stations in Serbia is shown in Figure 19.

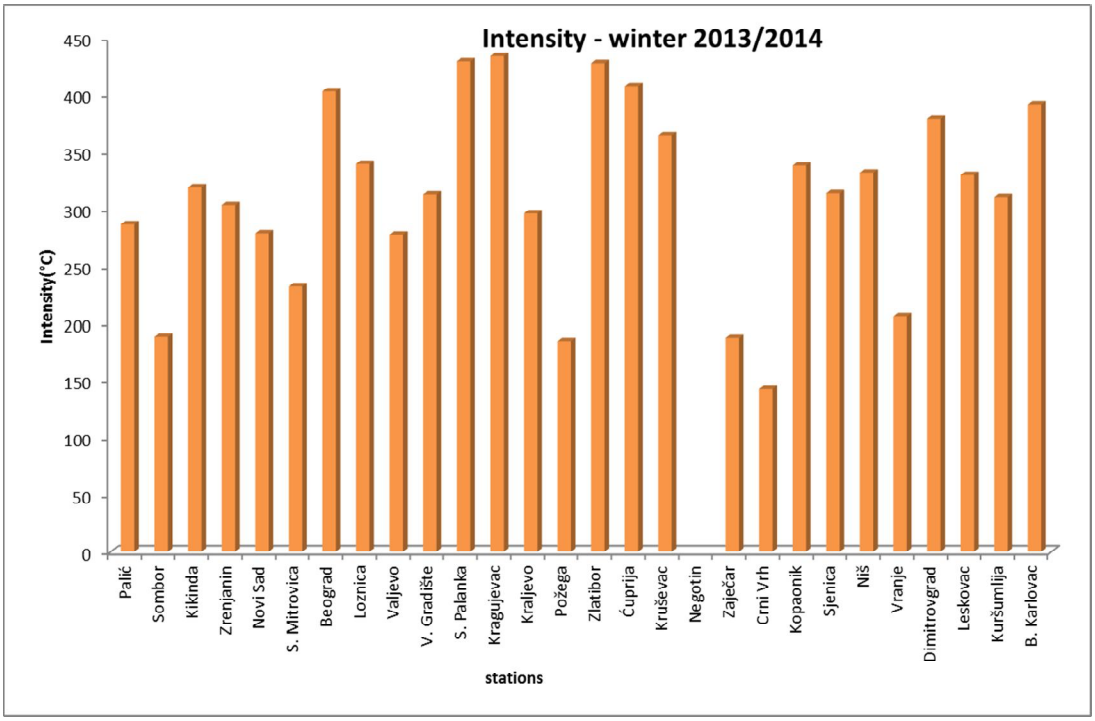


Figure 19. Intensity of the heat wave during winter 2013/14

Spatial distribution of the heat waves' intensity during winter 2013/14 in Serbia is shown in Figure 20. The highest intensity of heat wave was registered in the portions of central and northeastern Serbia.

[4] The intensity of the heat wave is defined as the total sum of maximum daily air temperature departures(for the days encompassed by that heat wave) from the mean maximum air temperature for the base period

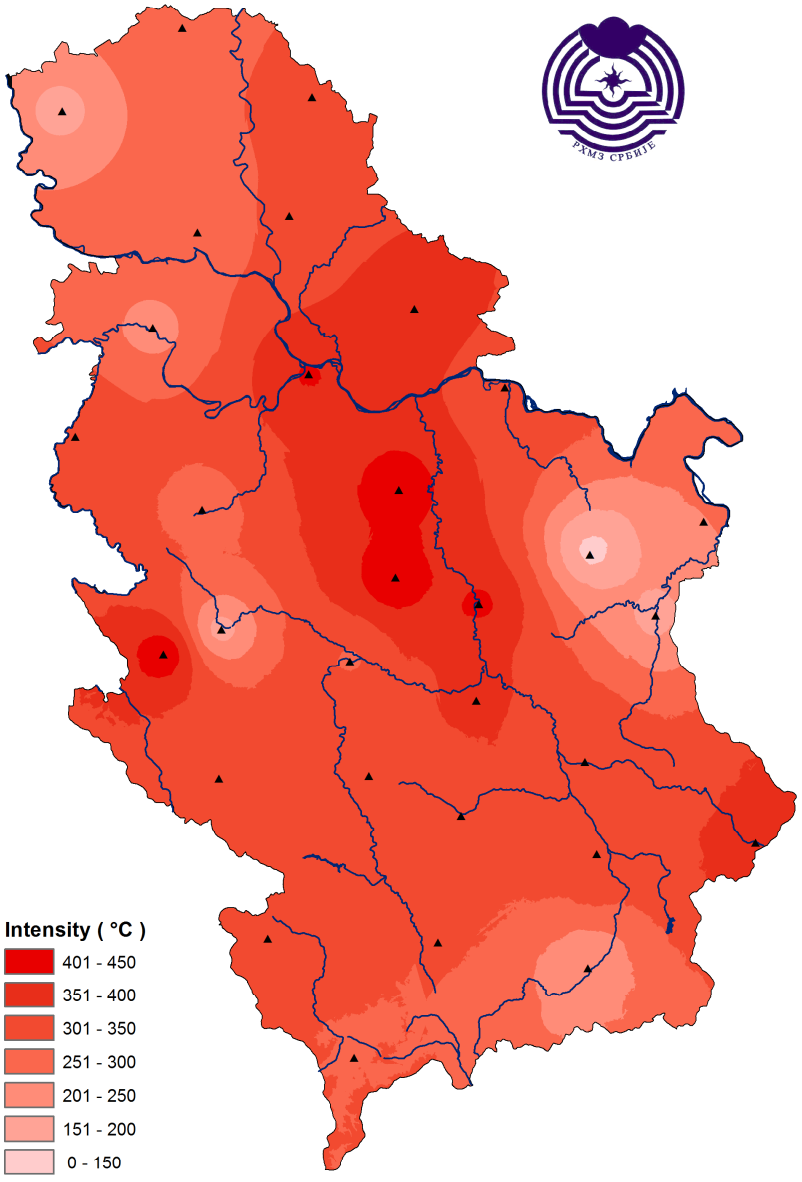


Figure 20. Spatial distribution of heat waves' intensity during winter 2013/14 in Serbia

Analysis of winter 2013/14 for Serbia compared to the 1971-2010 base period

Temperature

Departure of the mean air temperature from the normal, during winter, for the 1971–2000 base period, ranged from 0,9ºC in Negotin and Zajecar to 3,1ºC Zrenjanin, Belgrade and Smedrevska Palanka, and on the mountains between 2,7°C on Crni Vrh and 3,9°C on Kopaonik (*Figure 21*).

According to the percentile method, mean air temperature during winter was in the extremely warm category in most of Serbia, whereas in portions of the eastern Serbia it was within the normal one (*Figure 22*).

According to the tercile method, mean air temperature during winter was above the average across entire Serbia.

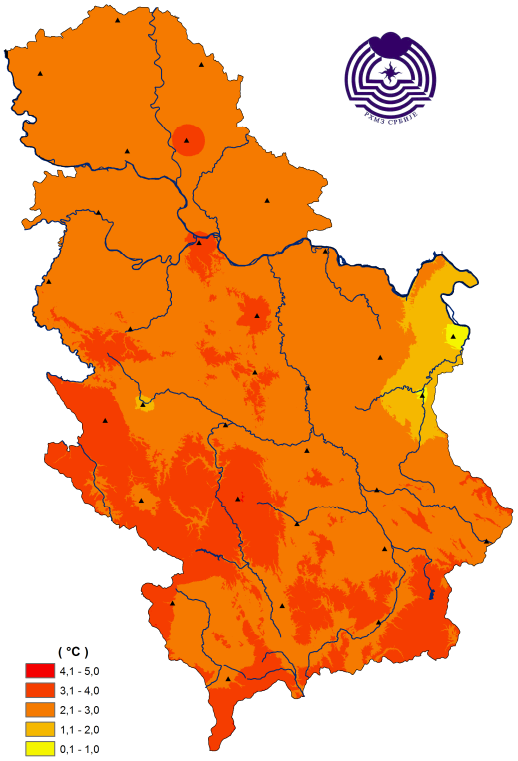


Figure 21. Mean seasonal air temperature anomaly in Serbia during winter 2013/14 compared to the 1971-2000 base period

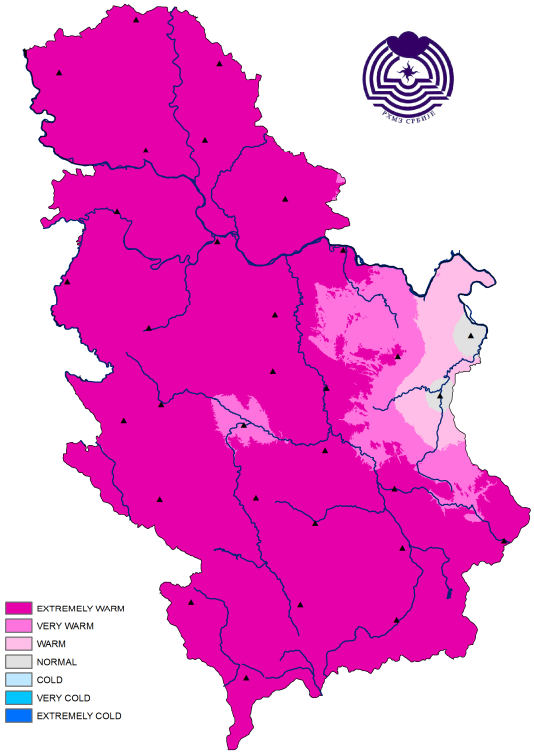


Figure 22. Assessment of the air temperature in Serbia during 2013/14 using percentile method compared to the 1971-2000 base period

Precipitation

During winter, in most of Serbia precipitation sums were below the average compared to the normal for 1971-2000 base period. Precipitation sums compared to the normal were in a range between 30% in Kraljevo and 92% on Palic *(Figure 23)*.

According to the percentile method, precipitation totals during winter were in the categories of very dry and dry in most of Serbia (*Figure 24*).

According to the tercile method, precipitation totals were below the average in most of Serbia with the exception from Palic where it was within the average.

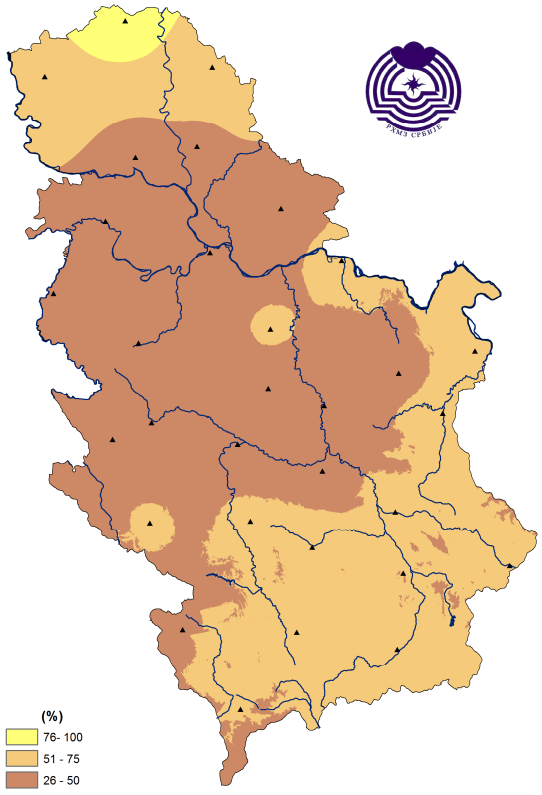


Figure 23. Spatial distribution of precipitation sums expressed in the percentages of normal during winter 2013/14 compared to the 1971-2000 base period

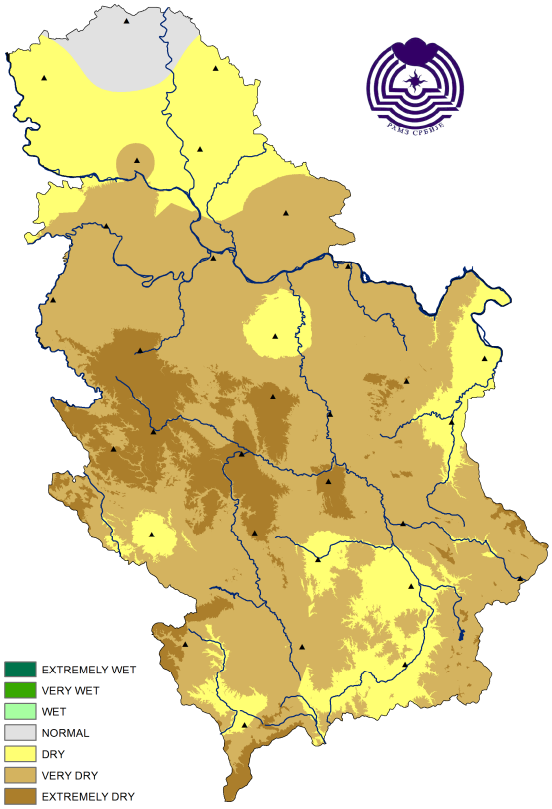


Figure 24. Assessment of the precipitation sums using percentile method during winter 2013/14 compared to the 1971-2000 base period

Analysis of winter 2013/14 for Serbia compared to the 1981-2010 base period

Temperature

During winter 2013/14, departures of the mean air temperature from the normal for the 1981–2010 base period ranged between 0,6ºC in Negotin and 3,0ºC in Zrenjanin, Belgrade, Smederevska Palanka and Kragujevac, and on the mountains from 2,7°C on Crni Vrh to 3,9°C on Kopaonik (*Figure 25*).

According to the percentile method, mean air temperature was in the very warm category in most of Serbia and extremely warm category in southern parts of the country (*Figure 26*).

According to the tercile method, mean air temperature was above the average across entire Serbia.

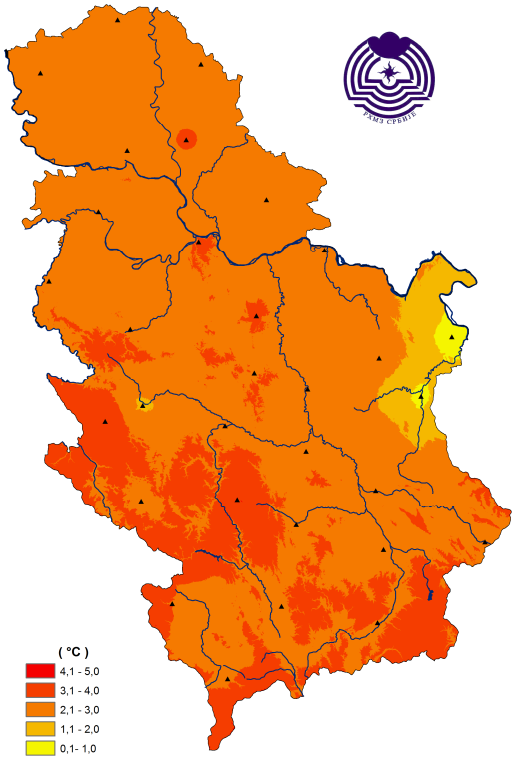


Figure 25. Mean seasonal air temperature anomaly in Serbia during winter 2013/14 године compared to the 1981-2010 base period

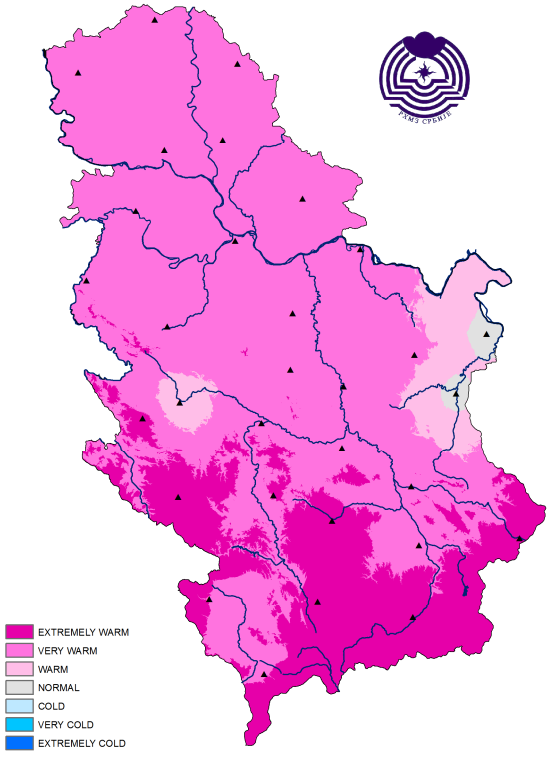


Figure 26. Assessment of the air temperature in Serbia during winter 2013/14 using percentile method compared to the 1981-2010 base period

Precipitation

During winter, in most of Serbia precipitation sums were below the average compared to the normal for the 1981-2010 base period. Precipitation sums ranged between 29% in Valjevo to 87% on Palic compared to the normal (*Figure 27*).

According to the percentile method, precipitation sums during winter were in the categories of very dry and dry across much of Serbia (*Figure 28*).

According to the tercile method, precipitation sums were below the average across much of Serbia aside from Palic where totals were within the average.

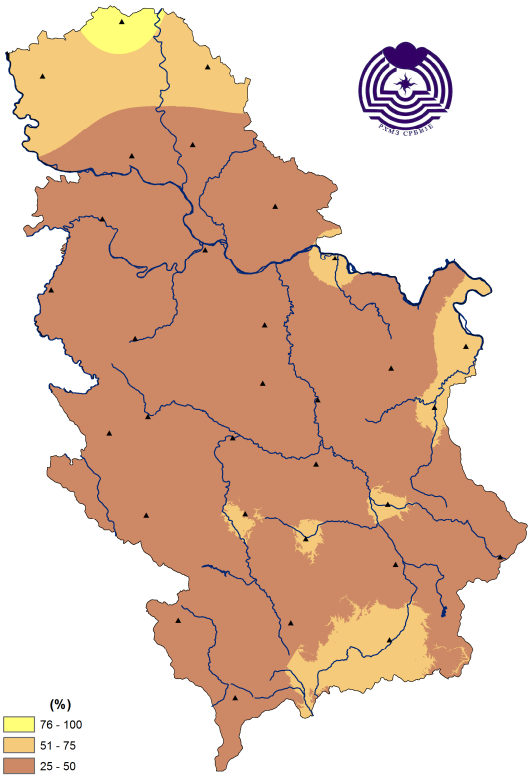


Figure 27. Spatial distribution of precipitation sums expressed in the percentages of normal during winter 2013/14 compared to the 1981-2010 base period

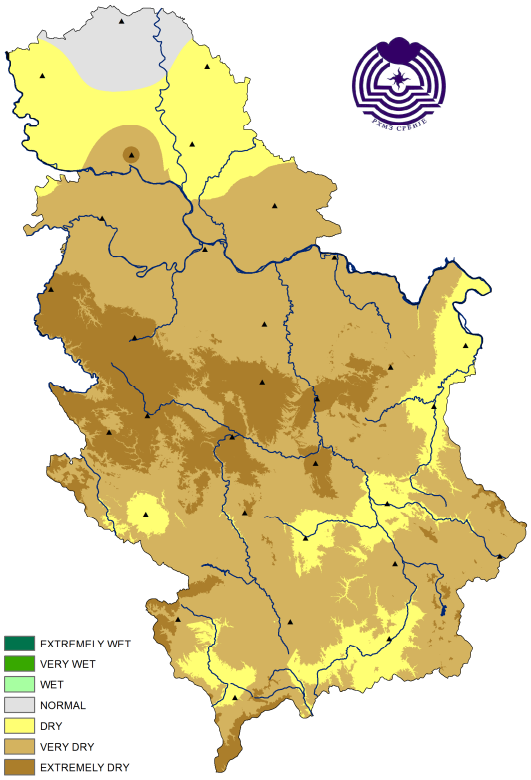


Figure28. Assessment of the precipitation quantities using percentile method during winter 2013/14 compared to the 1981-2010 base period