

VERIFICATION OF THE SEECOF-9 SUMMER 2013 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA COMPARED TO THE 1961-1990 BASE PERIOD

Temperature

According to the SEECOF-9 outlook, the summer of 2013 in Serbia was expected to be: warmer than normal (temperature in the upper tercile) with 40% probability, normal with 40% probability and below normal with 20% probability, compared to the 1961-1990 climatological base period.

Meteorological monitoring showed that summer 2013 was warm across entire Serbia with above normal temperature according to the tercile method (*Figure 1*).

The outlook for a warm summer was correct though with the less confidence.

Precipitation

The SEECOF-9 climate outlook for the summer 2013 in Serbia indicated below, near or above-average conditions with approximately equal probability (precipitation in lower and middle tercile with 35% probability).

Monitoring of precipitation showed dry summer conditions across entire Serbia (*Figure 2*).

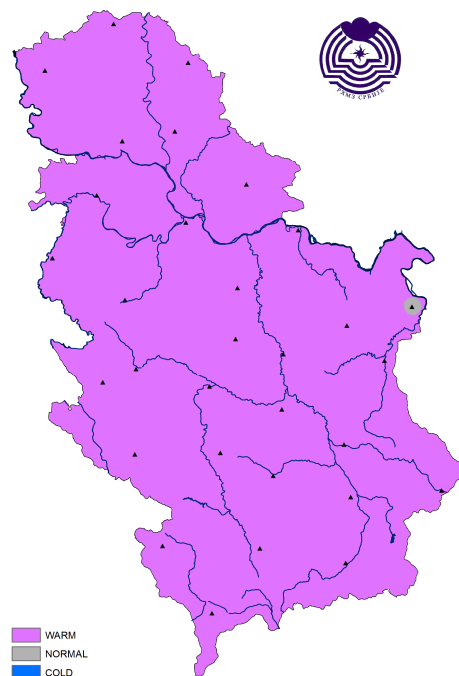


Figure 1. Monitoring of the summer 2013 temperature in Serbia using the tercile method, compared to the 1961-1990 base period

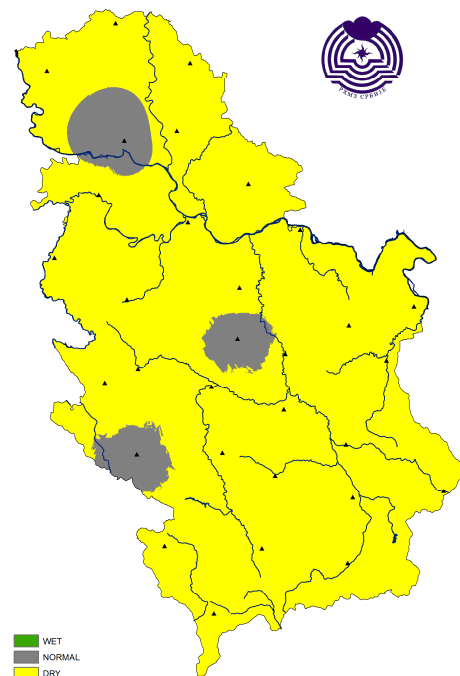


Figure 2. Monitoring of the summer 2013 precipitation in Serbia using the tercile method, compared to the 1961-1990 base period

The summer of 2013 was marked by very warm and dry weather across most of Serbia. Serbia experienced two heat waves, at certain places in northern and eastern parts even three occurred

Analysis of the 2013 summer season compared to the 1961-1990 base period in Serbia

Temperature

During summer 2013, mean air temperature ranged from 20,0 °C in Dimitrovgrad up to 23,7 °C in Belgrade and in the mountain areas from 12,6 °C on Kopaonik up to 17,9 °C on Zlatibor (Figure 1).

Mean air temperature departures from the normal¹ for the 1961–1990 base period during summer 2013 were in a range from 1,3 °C in Novi Sad up to 2,7 °C in Belgrade and Negotin and in high-lying areas from 1,6 °C in Sjenica up to 2,2 °C on Zlatibor mountain (Figure 2).

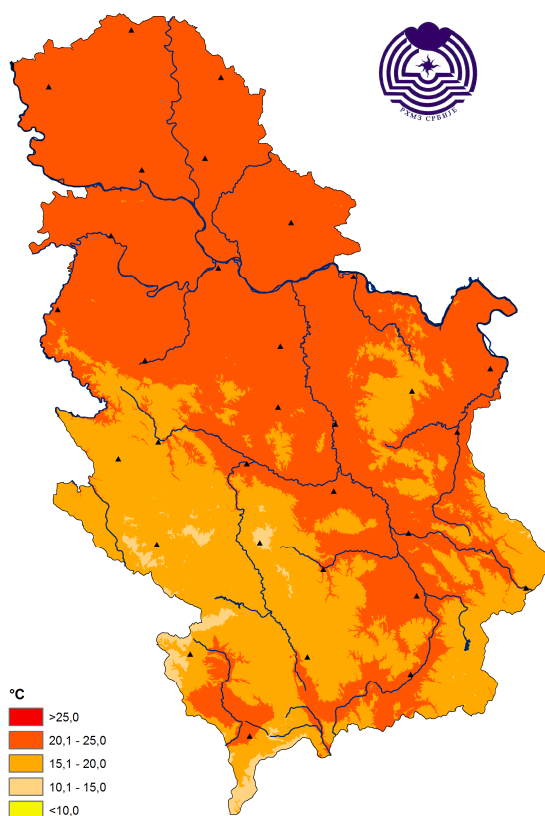


Figure 1. Spatial distribution of the mean seasonal air temperature (°C) during summer 2013

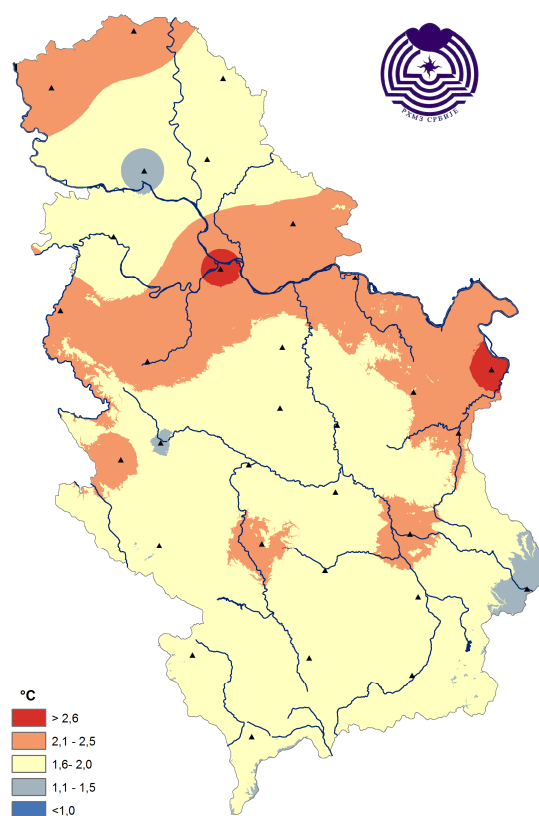


Figure 2. The mean seasonal air temperature departure from the normal for the 1961-1990 base period during summer 2013

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 percentile² method, the mean air temperature during summer 2013 was in the categories of extremely warm in Serbia (Figure 3).

According to the tercile method, the mean air temperature during summer 2013 fell under the warm category throughout entire Serbia (Figure 4).

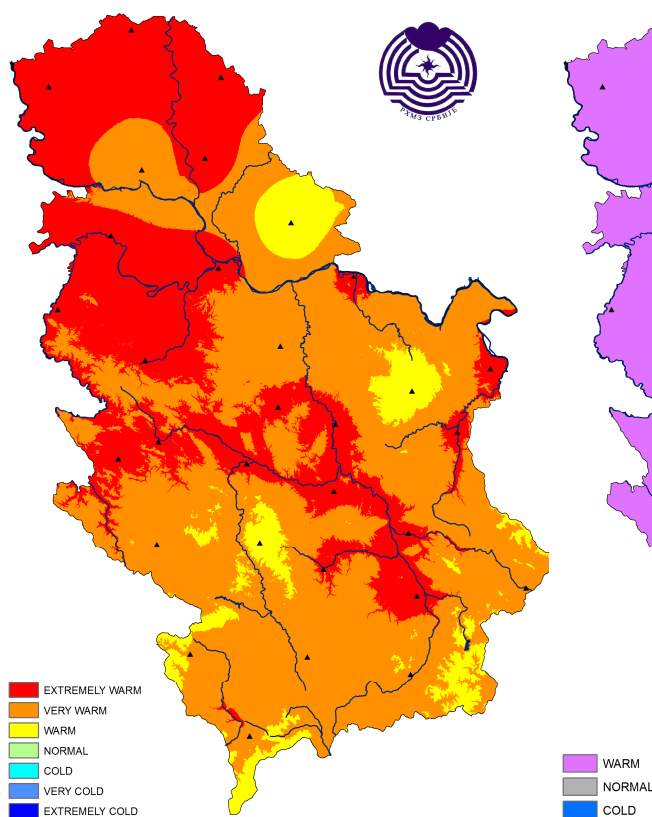


Figure 3. Assessment of the air temperature in Serbia during summer 2013 using the percentile method compared to the 1961-1990

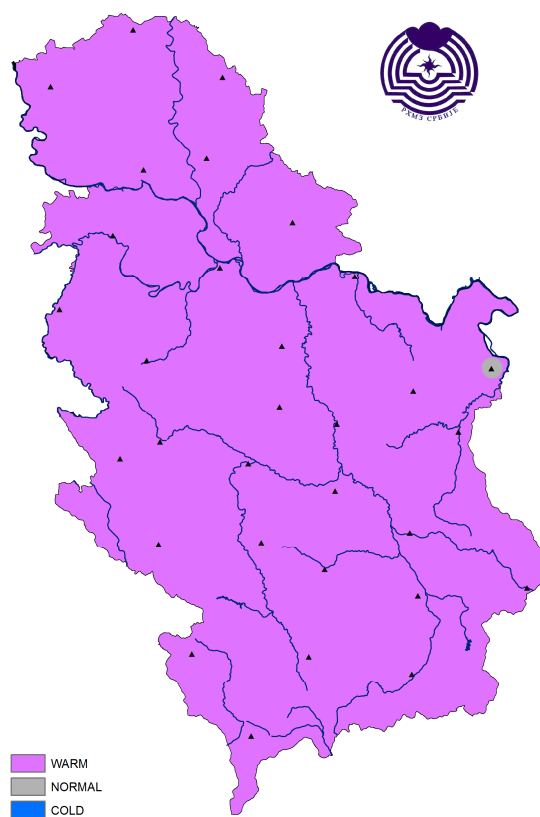


Figure 4. Assessment of the air temperature in Serbia during summer 2013 using the tercile method compared to the 1961-1990

The highest daily air temperature observed during summer, measuring 39,7 °C was registered in Veliko Gradiste on July 29 thereby breaking the previous record of 39,3°C set on July 6 1988. The record-breaking air temperature during summer was observed in Palic on August 8 and it amounted to 37,5°C (the previous record of 37,4 °C was registered on August 10 1961).

The number of summer days with maximum daily air temperature exceeding 25 °C was in a range from 66 in Pozega up to 80 in Zajecar. In the mountain areas that number was ranging from 1 on Kopaonik up to 36 on Zlatibor. The highest positive deviation from the average

² nth 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

number of summer days was registered in northern and parts of eastern and western Serbia (Figure 5).

All of Serbia, apart from Kopaonik Mountain experienced tropical days with maximum air temperature exceeding 30 °C, ranging from 33 in Novi Sad up to 50 days in Negotin. The highest positive deviation from the average number of tropical days, total of 26 days, was recorded in Veliko Gradiste (Figure 6).

During summer 2013, tropical nights were recorded in nearly entire Serbia with the exception from the southeastern and southwestern parts of the country. The highest number of tropical nights with the minimum air temperature exceeding 20 °C was observed in Belgrade, amounting to 27 days.

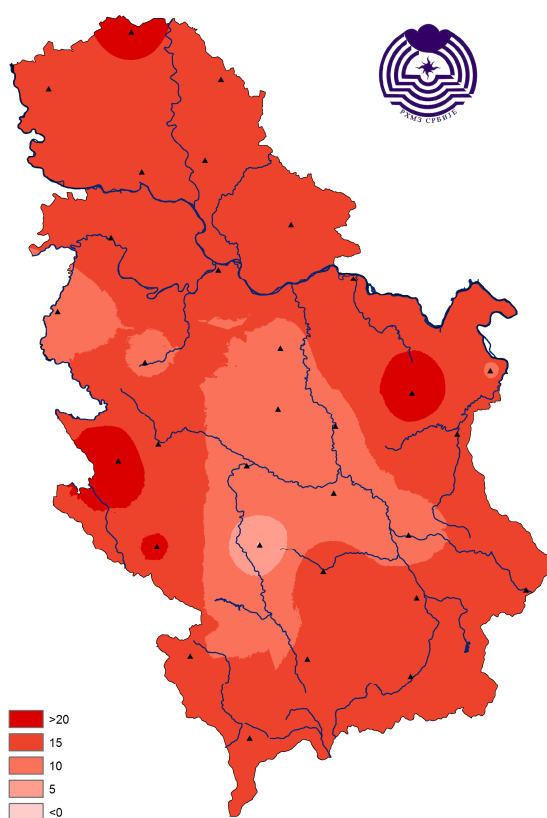


Figure 5. Deviation of the number of summer days compared to the normal 1961-1990 during summer 2013

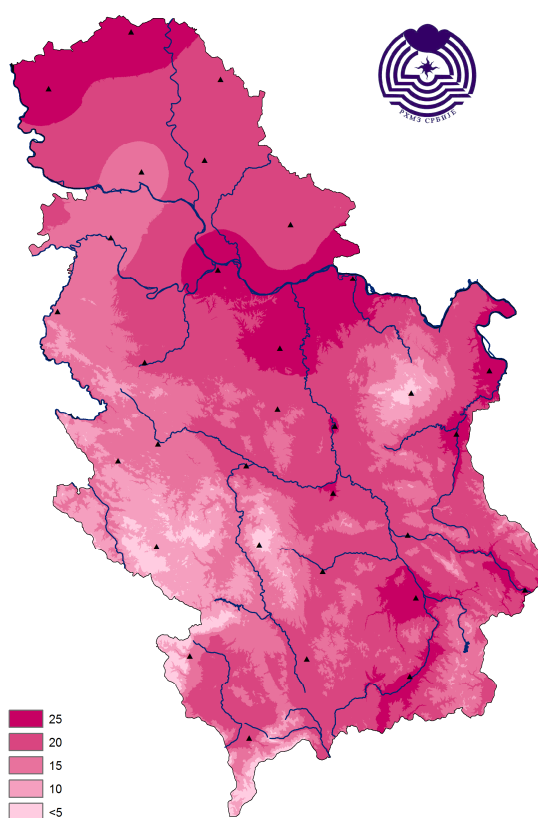


Figure 6. Deviation of the number of tropical days compared to the normal 1961-1990 during summer 2013

The summer's lowest temperature of 1,3 °C was measured on Kopaonik Mountain on June 2.

The mean, maximum and minimum air temperatures in Belgrade were above the multi-annual average during most of the summer season (Figure 7).

Three-month course of the daily air temperature in Belgrade, on Kopaonik Mountain and Nis during summer 2013 is shown in Figures 8, 9 and 10.

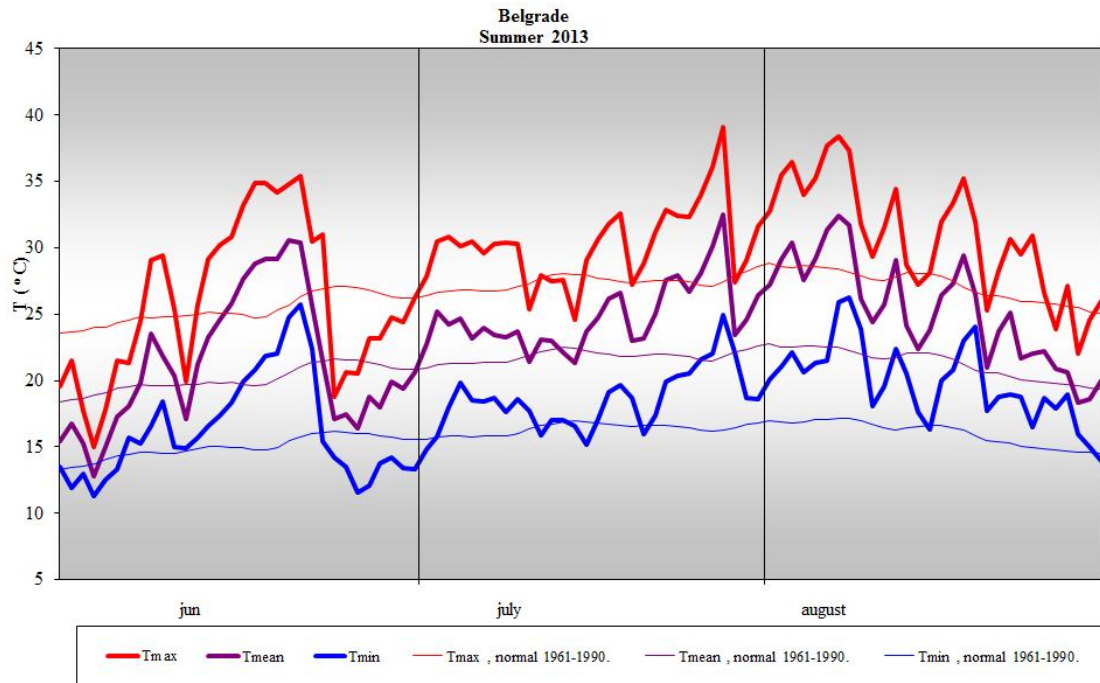


Figure 7. Three-month course of the mean, maximum and minimum daily air temperature in Belgrade during summer 2013

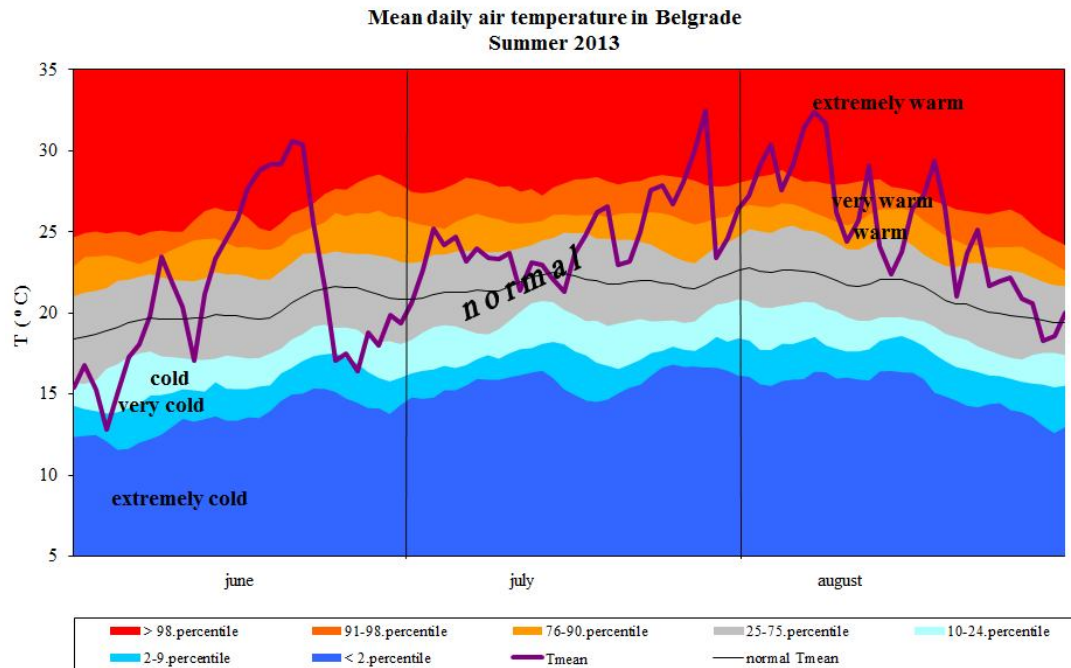


Figure 8. Three-month course of the mean daily air temperature in Belgrade during summer 2013

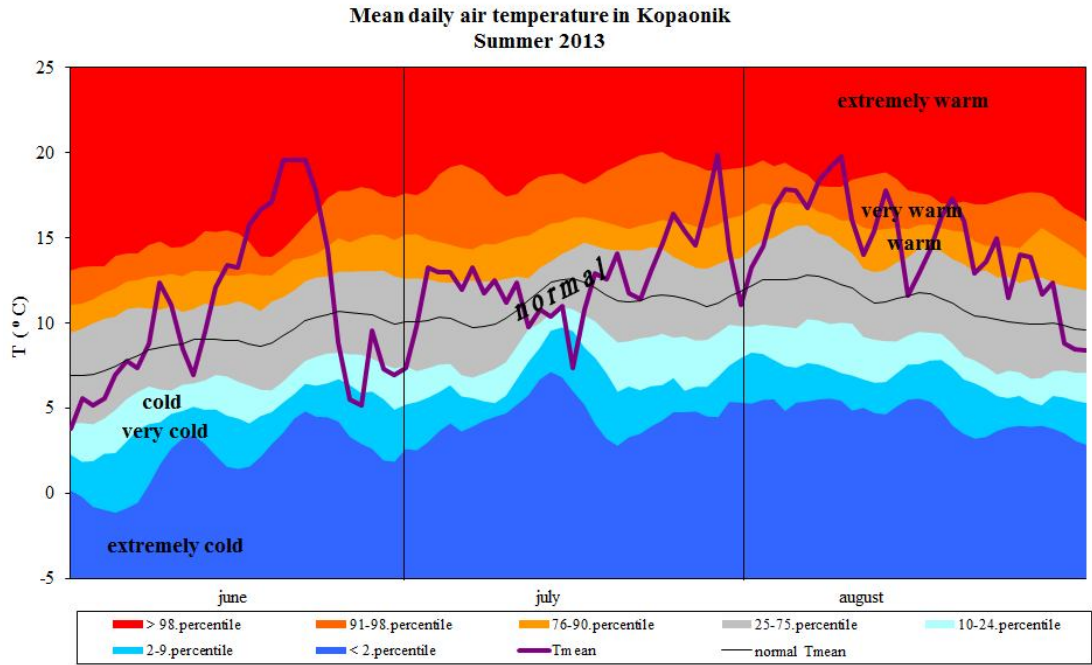


Figure 9. Three-month course of the mean daily air temperature on Kopaonik Mountain during summer 2013

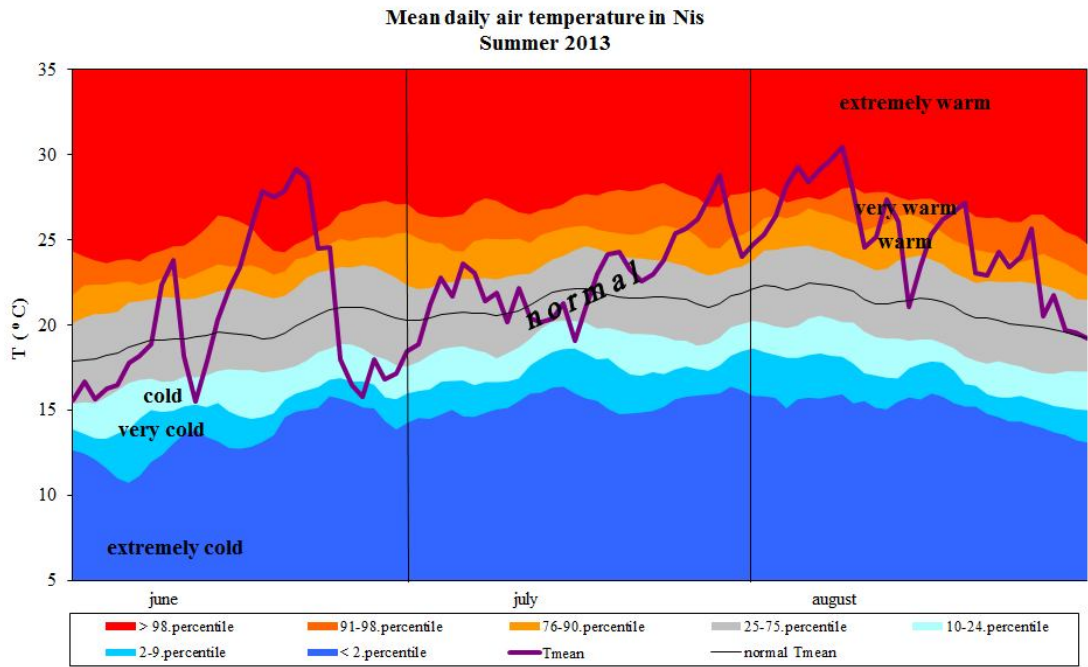


Figure 10. Three-month course of the mean daily air temperature in Nis during summer 2013

Precipitation

During summer 2013, most of Serbia received below average precipitation compared to the normal for the 1961-1990 base period. Precipitation sums ranged from 22% in Zajecar up to 105% in Sjenica compared to the normal (*Figure 11*).

According to the percentile method, precipitation sums during summer 2013 were in the dry and very dry category whereas in western and eastern Serbia those amounts were classified as extremely dry (*Figure 12*).

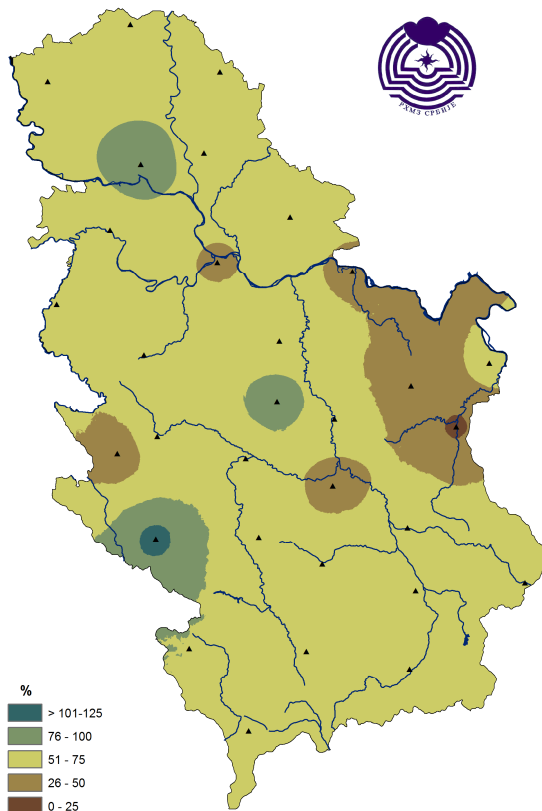


Figure 11. Spatial distribution of precipitation sums expressed in the percentages of normal during summer 2013

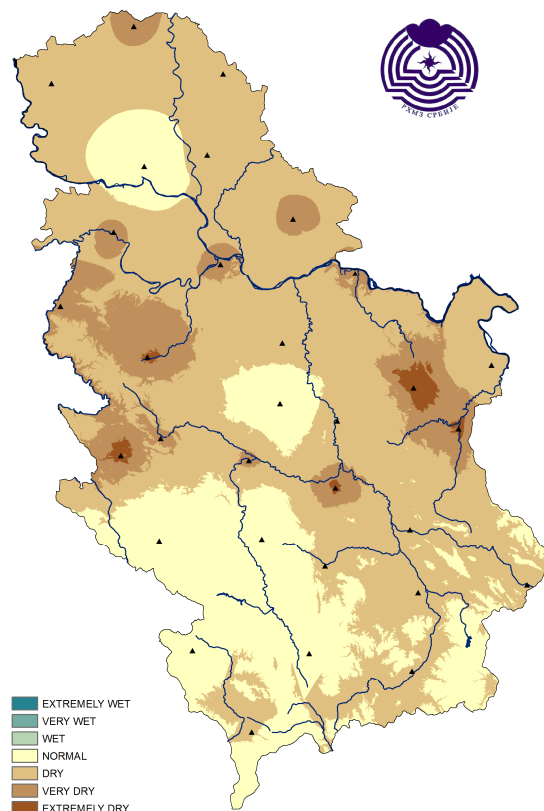


Figure 12. Assessment of the precipitation sums during summer 2013 using percentile method compared to the 1961-1990 base period

According to the tercile method, precipitation sums were below average across most of Serbia and within the multi-annual average in Novi Sad, Kragujevac and Sjenica (Figure 13).

The highest daily precipitation amount of 49.1mm was recorded in Novi Sad on June 8.

The highest deviation of the number of days with precipitation of 1mm and more was registered in Belgrade, Zajecar and Zlatibor Mountain, which is 11 days less than the average for the summer (Figure 14).

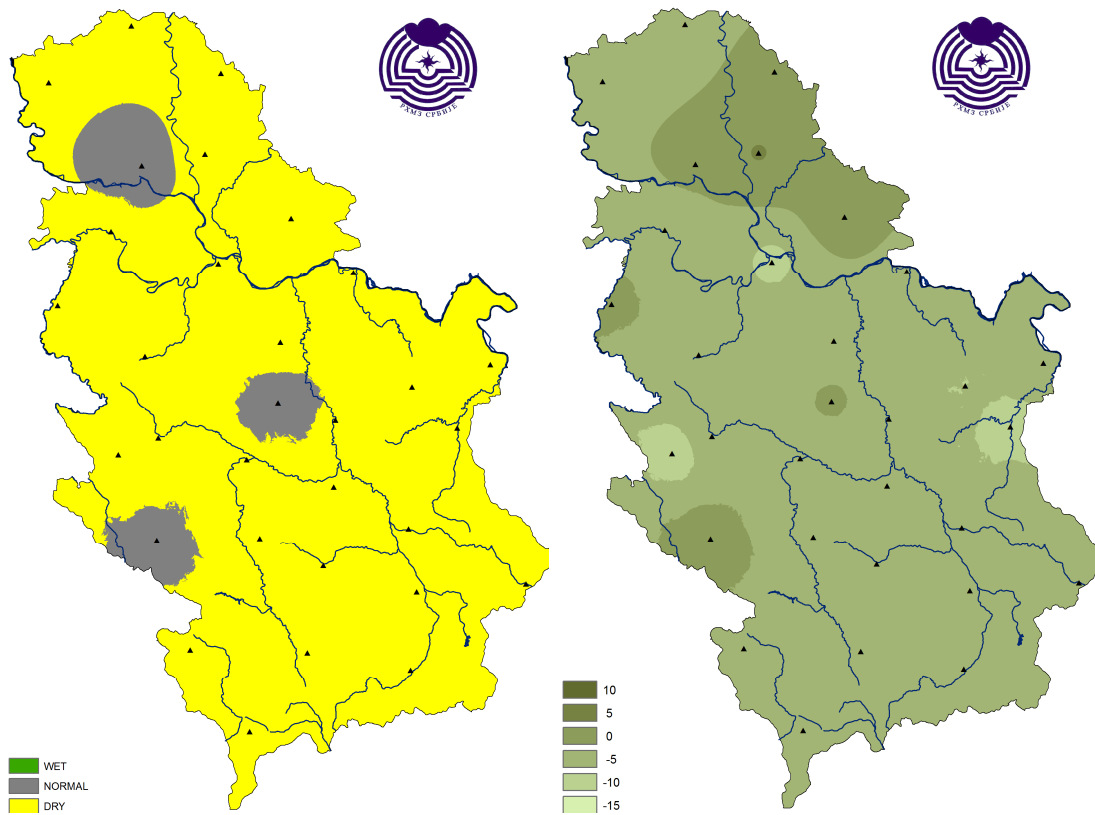


Figure 13. Assessment of the precipitation sums during summer 2013 using tercile method compared to the 1961-1990 base period

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

Figures 15 and 16, for Belgrade and Novi Sad show cumulative precipitation totals per month during spring 2013 compared to the average cumulative precipitation sums.

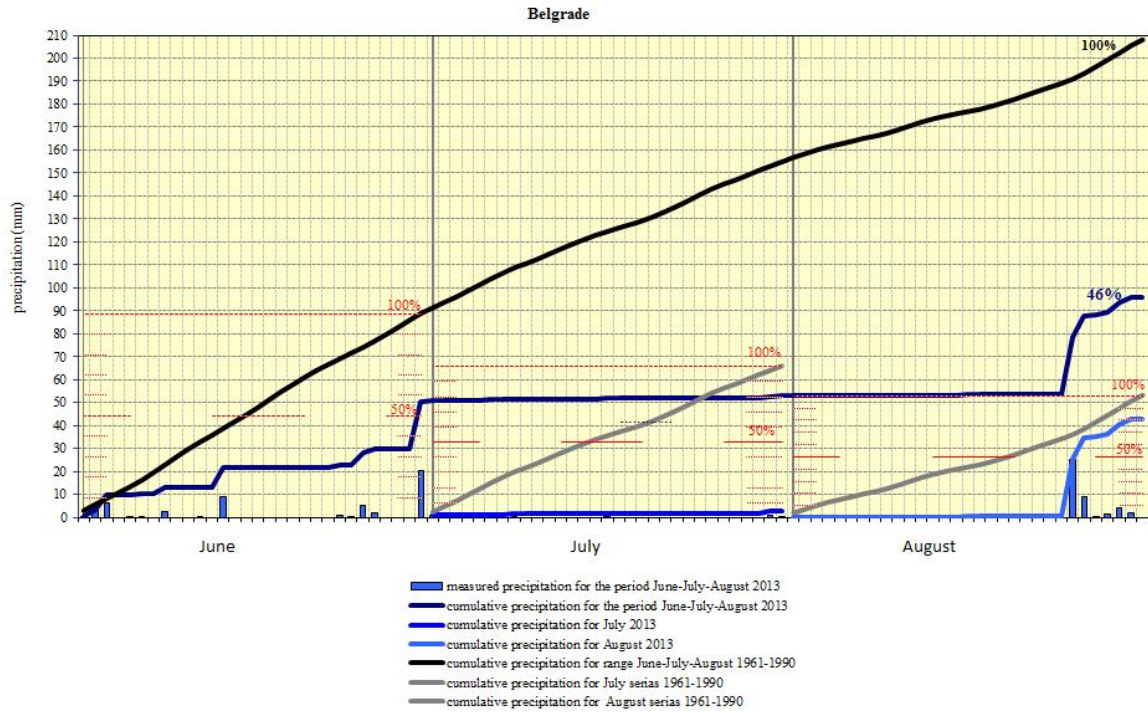


Figure 15. Cumulative precipitation sums for Belgrade

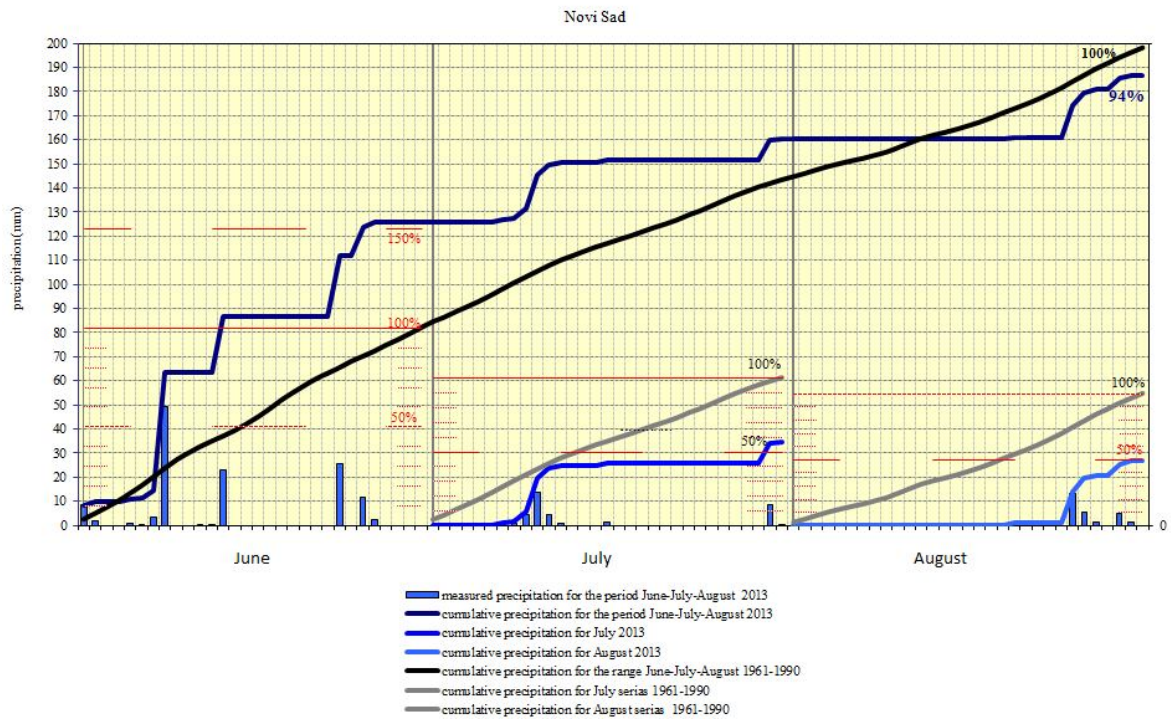


Figure 16. Cumulative precipitation sums for Novi Sad

Sunshine duration (insolation)

During summer 2013, sunshine duration was above average across entire Serbia with the values ranging from 745,7 in Sjenica up to 955,5 hours in Sombor (*Figure 17*).

Compared to the normal for the 1961-1990 base period, insolation was in a range between 96% in Zajecar up to 128% in Kursumlija (*Figure 18*).

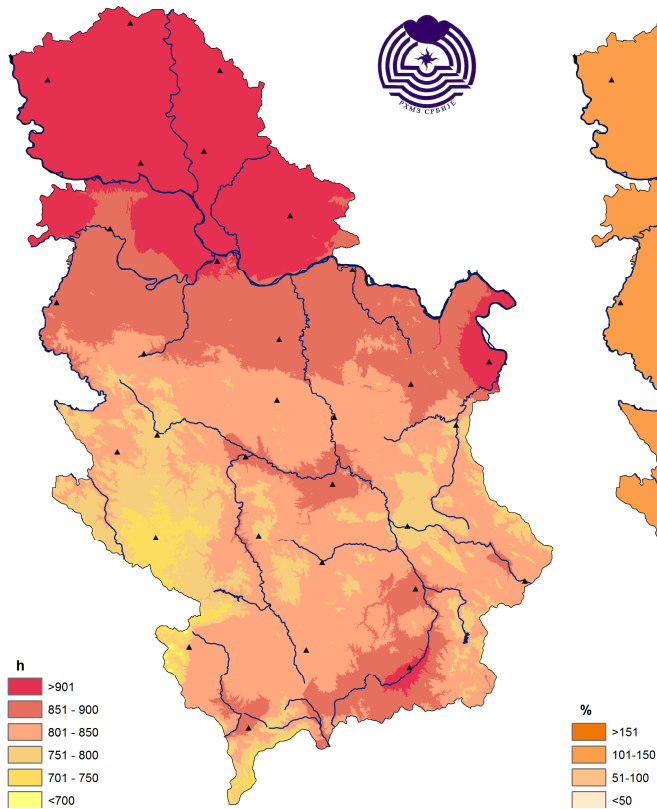


Figure 17. Insolation during summer 2013, expressed in hours

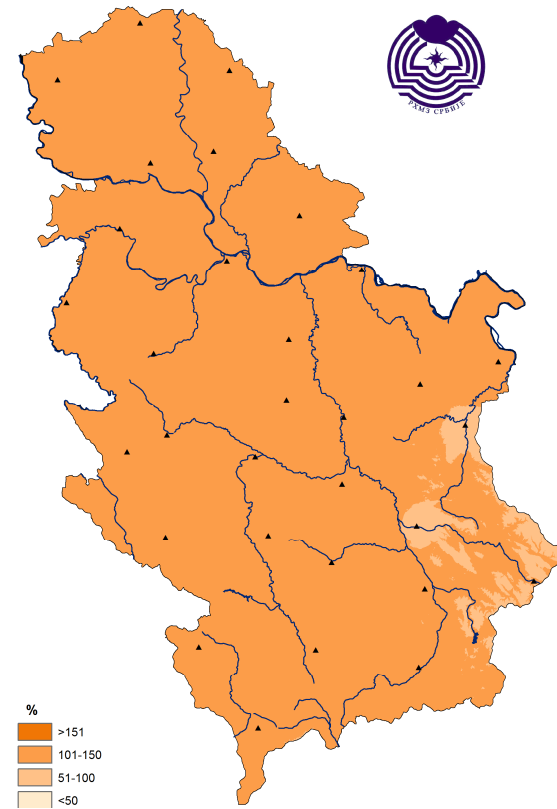


Figure 18. Insolation during summer 2013, expressed in the percentages of normal

Heat waves during the summer of 2013

Since the beginning of June, entire Serbia observed two heat waves³, at certain places in northern and eastern parts of the country even three heat waves occurred (Chart 1). The first heat wave was recorded in the second half of the month, lasting from June 16 – 22 in most places. The second heat wave was registered at 7 primary meteorological stations with the duration from July 24 till 29. The third heat wave was observed in all of Serbia at the beginning of August, lasting from August 3-9. The primary meteorological station Zajecar experienced the fourth heat wave with the onset on August 18, lasting till August 23.

Intensity⁴ of the heat waves during summer 2013 at primary meteorological stations in Serbia is shown in Figure 19.

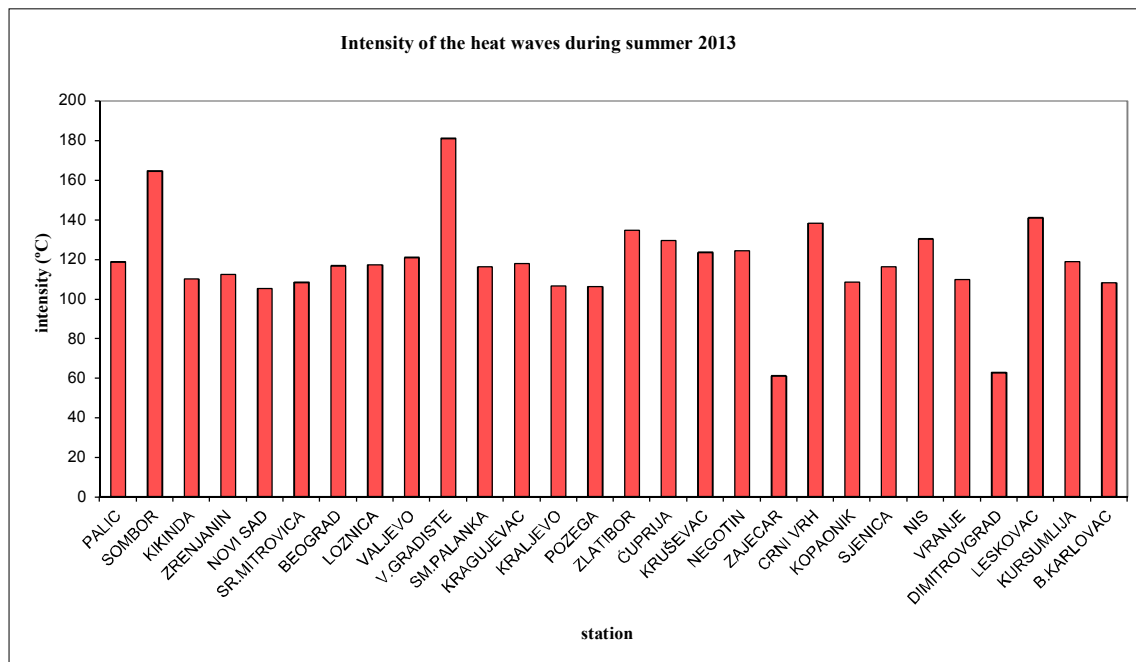


Figure 19. Intensity of the heat waves during summer 2013

³ Heat wave is defined as a period of at least 5 consecutive days in which the maximum temperature falls under the very warm and extremely warm category.

⁴ Heat wave intensity is the sum of departure of maximum daily air temperature (for the days belonging to that heat wave) from the mean maximum air temperature for the climatological base period

Spatial distribution of heat waves intensity during summer 2013 in Serbia is shown in Figure 20. The heat wave of highest intensity was registered in Veliko Gradiste and Sombor while Zajecar and Dimitrovgrad experienced the lowest one.

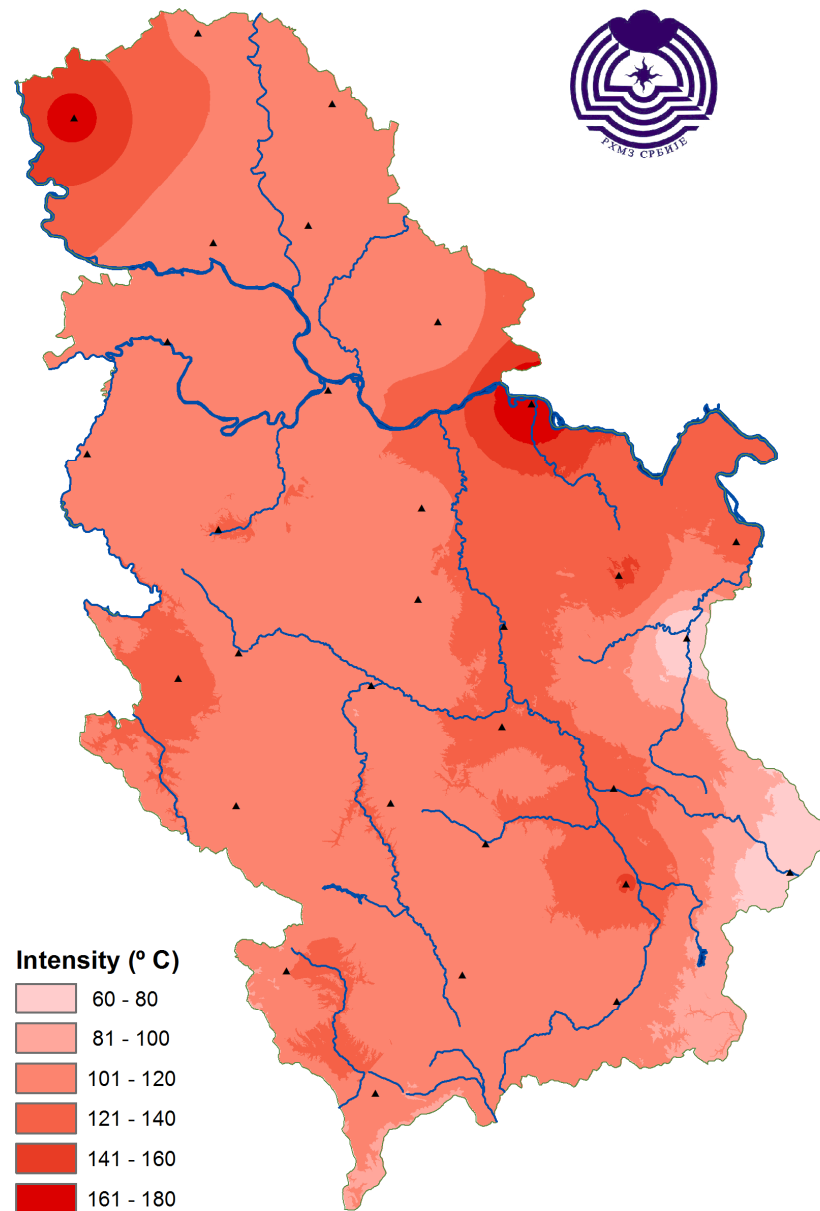


Figure 20. Spatial distribution of heat waves intensity during summer 2013 in Serbia

Analysis of the 2013 summer season compared to the 1971-2000 base period in Serbia

Temperature

Mean air temperature departures from the normal for the 1971–2000 base period during summer 2013 were in a range from 1,1 °C in Novi Sad up to 2,3 °C in Negotin and in the mountain area from 1,2°C on Kopaonik up to 1,8°C on Zlatibor (*Figure 21*).

According to the percentile method, mean air temperature fell under the very warm category across most of Serbia, while in Valjevo, Veliko Gradiste, Negotin and Kursumlija it was classified as extremely warm (*Figure 22*).

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

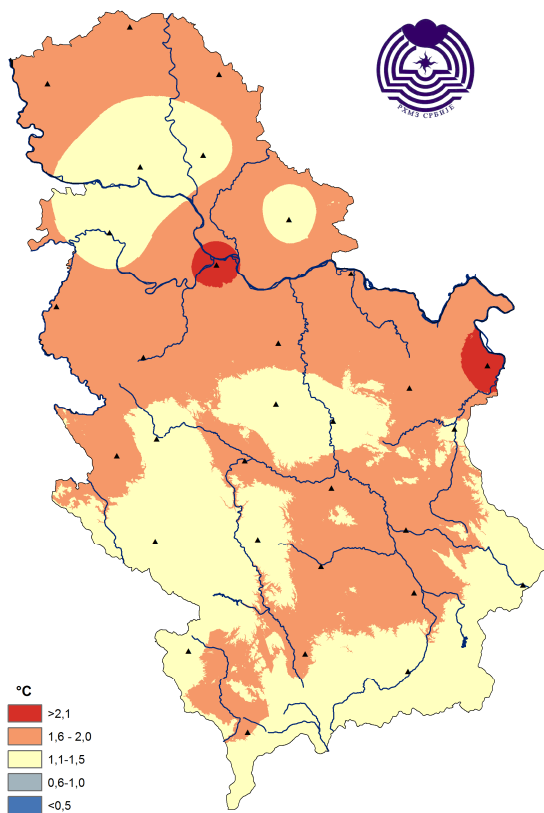


Figure 21. Departure of the mean seasonal air temperature in Serbia during summer 2013 compared to the 1971-2000 base period

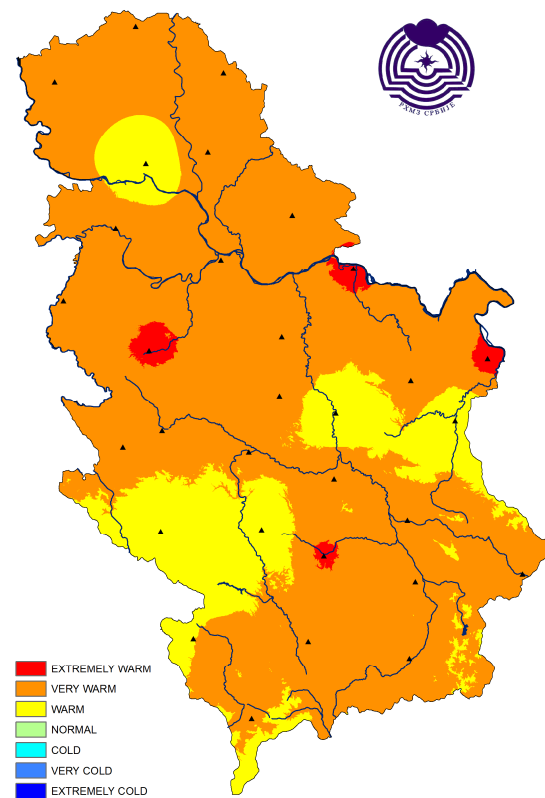


Figure 22. . Assessment of the air temperature in Serbia during summer 2013 using the percentile method compared to the 1971-2000 base period

Precipitation

During summer 2013, entire Serbia received below average precipitation compared to the normal for the 1971-2000 base period with Sjenica as the only exception where totals were within the average. Precipitation sums ranged from 23% up to 103% compared to the normal (Figure 23).

According to the percentile method, precipitation sums during summer 2013 were in the dry and very dry category in most of Serbia and extremely dry at several stations (Figure 24).

According to the tercile method, precipitation totals were below the average across the entire Serbia.

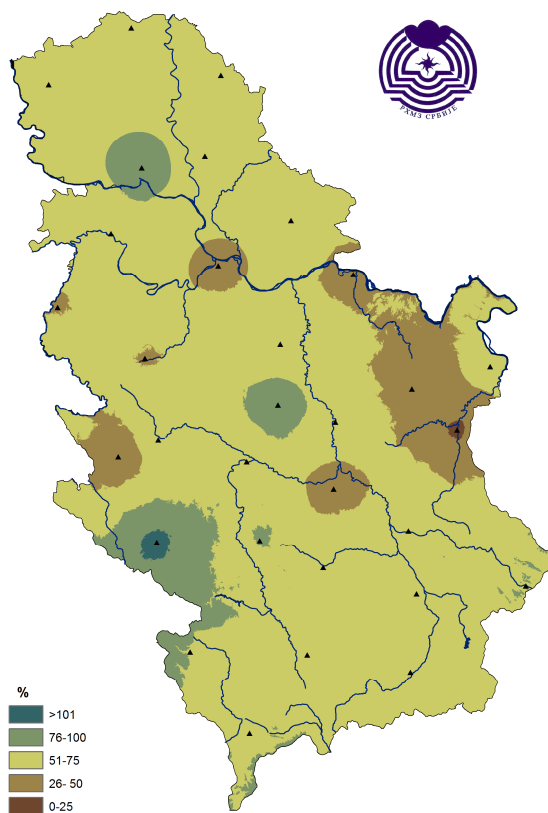


Figure 23. Spatial distribution of precipitation sums expressed in the percentages of normal during summer 2013 compared to the 1971-2000 base period

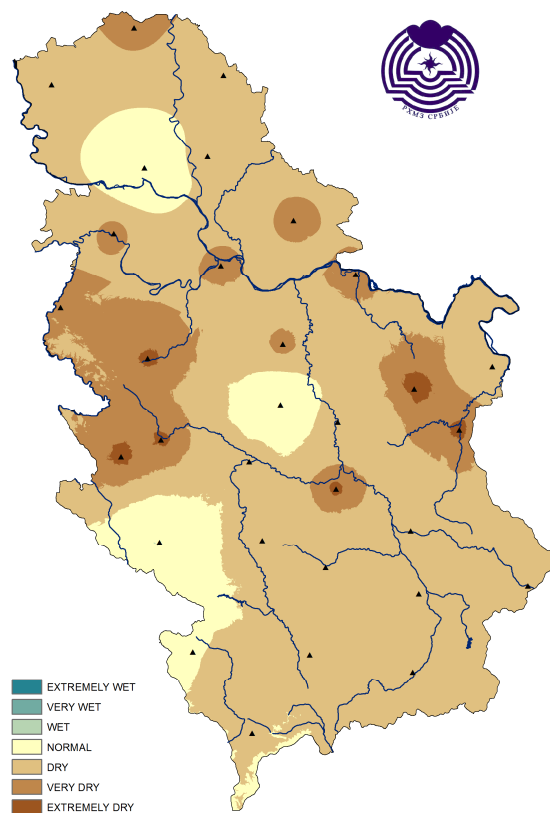


Figure 24. Assessment of precipitation sums using the percentile method during summer 2013 compared to the 1971-2000 base period

Analysis of the 2013 summer season compared to the 1981-2010 base period in Serbia

Temperature

Mean air temperature departures from the normal for the 1981–2010 base period during summer 2013 were in a range from 0,3 °C in Banatski Karlovac up to 1,5 °C in Belgrade and on the mountains from 0,6 °C on Kopaonik up to 1,1 °C on Zlatibor and Crni Vrh (Figure 25).

According to the percentile method, mean air temperature was in the categories of normal and warm, while in Valjevo, Belgrade, Negotin and Kursumlija it was classified as extremely warm (Figure 26).

According to the tercile method, mean air temperature was above average in most of Serbia, with the exception from Banatski Karlovac where it was within the average.

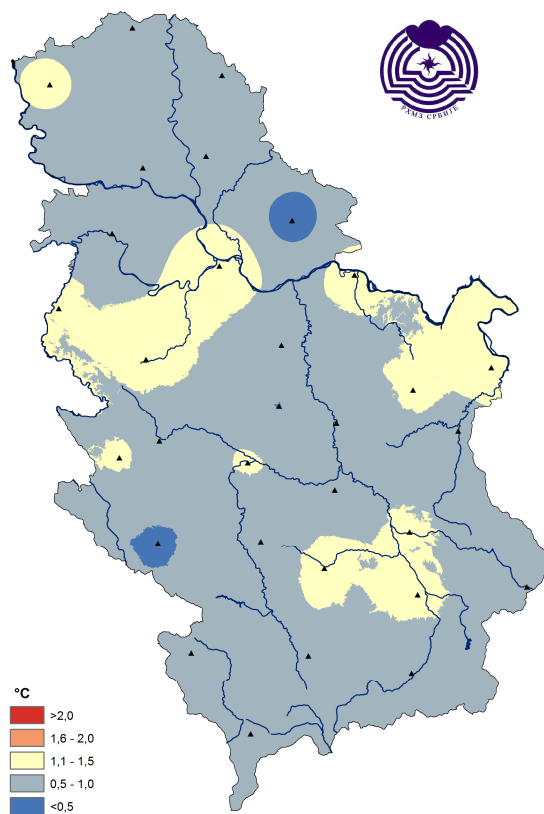


Figure 25. Departure of the mean seasonal air temperature in Serbia during summer 2013 compared to the 1981-2010 base period

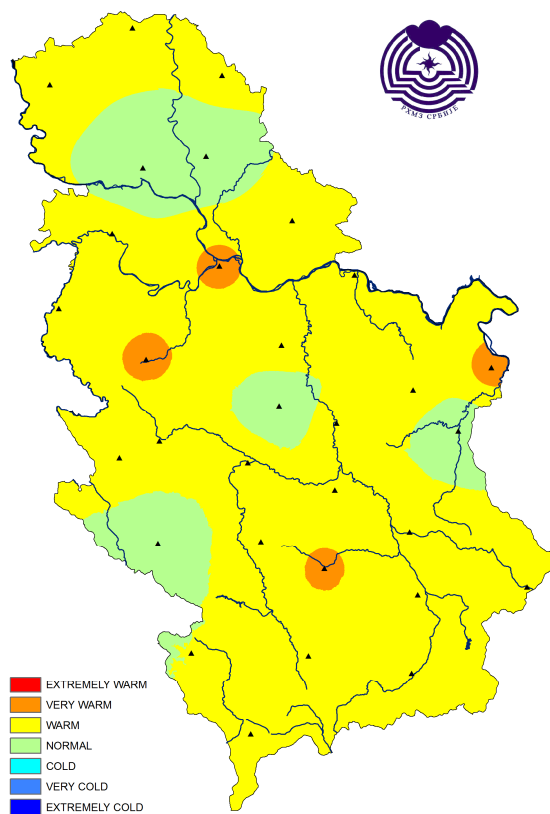


Figure 26. Assessment of the air temperature in Serbia during summer 2013 using the percentile method compared to the 1981-2010 base period

Precipitation

During summer 2013, nearly entire Serbia received below average precipitation compared to the normal for the 1981-2010 base period. Precipitation sums ranged from 23% in Zajecar up to 112% in Sjenica compared to the normal (*Figure 27*).

According to the percentile method, precipitation sums during summer 2013 were in the dry and very dry category in most of Serbia (*Figure 28*).

According to the tercile method, precipitation totals were the following: below average throughout almost entire Serbia, above the average in Sjenica and within average in Banatski Karlovci.

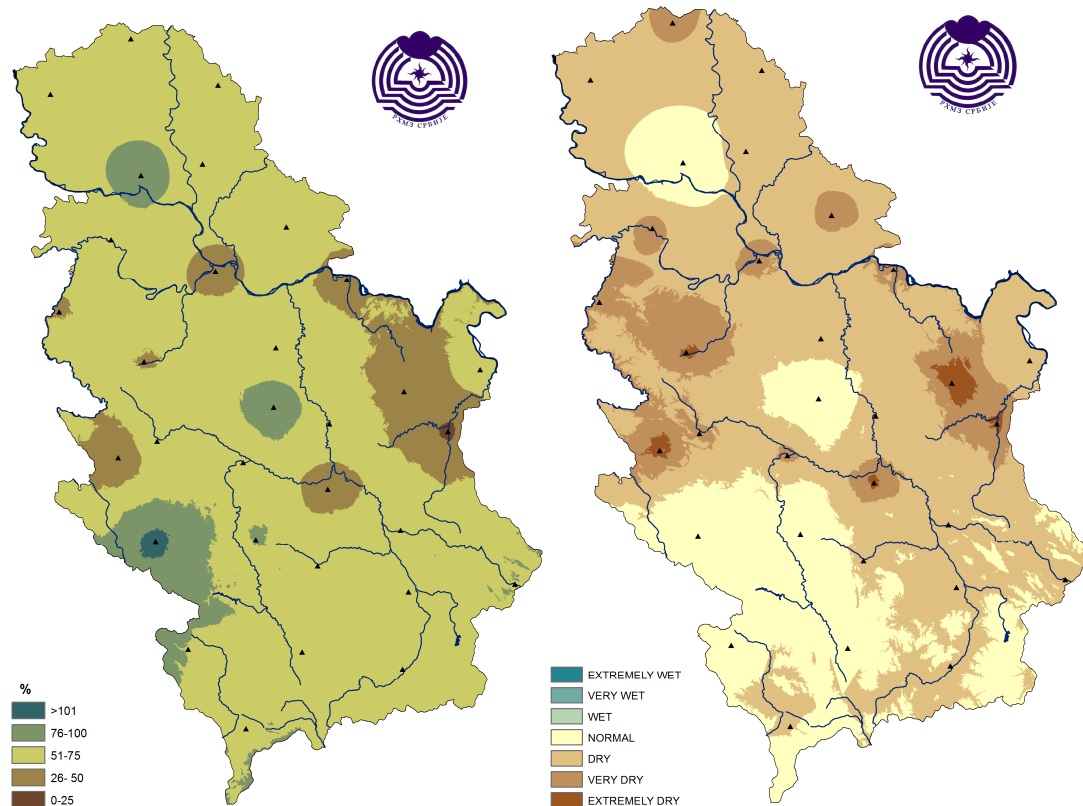


Figure 27. Spatial distribution of precipitation sums expressed in the percentages of normal during summer 2013 compared to the 1981-2010 base period

Figure 28. Assessment of precipitation sums using the percentile method during summer 2013 compared to the 1981-2010 base period