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# ANNUAL BULLETIN FOR SERBIA

# 2013

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***The year 2013 was marked by extremely warm weather conditions, the seventh warmest in the period between 1951 and 2013. Six heat waves were observed. Summer of 2013 was very warm and dry. The amount of precipitation recorded throughout 2013 was within the average values.***

On the territory of Serbia, the year 2013, with the mean air temperature of 11,6ºC, is the seventh-warmest in the period from 1951 until today and the fifth-warmest in Belgrade since the establishment of the meteorological station in 1888. The mean annual air temperature ranged between 4,7ºC and 9,0ºC in the mountain areas and from 10,7ºC to 13,8ºC in the low-lying areas. The departure of the mean annual air temperature compared to the 1961-1990 base period was in a range between 1,2ºC and 1,9ºC. According to the percentile method[1], the year 2013 was in the extremely warm category.

Over the course of 2013, the highest daily air temperature of 39,7ºC was measured in Veliko Gradiste on July 29. The greatest number of tropical days[2], total of 62, was recorded in Leskovac which is 30 days above the average number. Serbia observed 52 tropical days which is 27 days above the average.

The highest daily air temperature was exceeded at the following places, for January in Sjenica and Leskovac, for April at the majority of principal meteorological stations, for June in Negotin and Zajecar, for July in Zrenjanin and Veliko Gradiste, for August in Palic, Zlatibor and Sombor, for October in Loznica and Zlatibor and for November on Zlatibor and Sjenica.

The lowest daily air temperature of -19,5ºC was recorded in Sjenica on November 30. Belgrade experienced 29 tropical nights. Most of Serbia didn't observe days with severe frost[3], while their number reached 32 on the mountains.

During 2013, the number of ice days[4] varied from 3 to 15 and up to 59 days on the mountains, which is 8 to 20 days below the average number. Belgrade observed 4 ice days, which is 14 days below the average.

The precipitation amount during 2013 ranged between 533,3 mm in Zajecar to 1049,0 mm on Kopaonik Mountain. The percent of precipitation sums compared to the normal 1961-1990 was in a range between 83 (Zlatibor) and 128 (Novi Sad).

The highest daily precipitation amount of 70,5 mm was observed on Kopaonik Mountain on May 23, while the low-lying areas, that is Novi Sad received 66,9 mm on September 30, thereby breaking the previous daily precipitation record during the month of September for that principal meteorological station.

According to the percentile method, the precipitation sums during 2013 fell under the normal category across much of Serbia, rainy and very rainy in northern areas as well as in Kragujevac and Sjenica and dry in Valjevo, Pozega, Kraljevo and Zlatibor Mountain.

Over the course of 2013, the number of days with snow cover varied from 14 in Sombor and Nis to 153 on Kopaonik Mountain. Zajecar observed 36 days below the average number of 52. The highest snow depth was recorded on March 16 reaching 95 cm on Kopaonik

[1] **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
[2] Tropical day is defined as the day with maximum air temperature above 30 °C
[3] Day with severe frost is defined as the day with the minimum air temperature below -10°C
[4] Ice day is defined as the day with maximum air temperature below 0ºC

Mountain. As for the low-lying areas, the highest snow depth of 32 cm was registered in Valjevo on November 27 thereby breaking the previous snow depth record for the month of November.

## Cold spell and heat waves

Cold spell[5] was registered at the 5 principal meteorological stations in the period between March 23 and 29.

Over the course of 2013 Serbia observed 6 heat waves[6]. The first one was registered at the end of April and beginning of May, lasting approximately 12 days, with the longest duration of 20 days in Banatski Karlovac. The second heat wave, lasting 8 days, was observed in the middle of June. The next one was recorded between July 24 and 29 at several principal meteorological stations. The heat wave observed at the beginning of August lasted 8 days. The heat wave that occurred during October had the duration of 11 days, while the last one was observed on just a few meteorological stations, lasting from December 23 to 29.

The greatest intensity[7] of heat waves, occurring during 2013 was observed in Valjevo, while the weakest one was in Zajecar.

[5] Cold spell is defined as the range of 6 or more consecutive days with minimum daily air temperature in the categories of very cold and extremely cold according to the statistical percentile method

[6] Heat wave is defined as the range of 6 or more consecutive days with maximum daily air temperature in the categories of very warm and extremely warm

[7] Heat wave intensity represents departure sum of maximum air temperature (for the days encompassed by that heat wave) from the mean maximum air temperature for the base period

# Appendix

Chart 1.

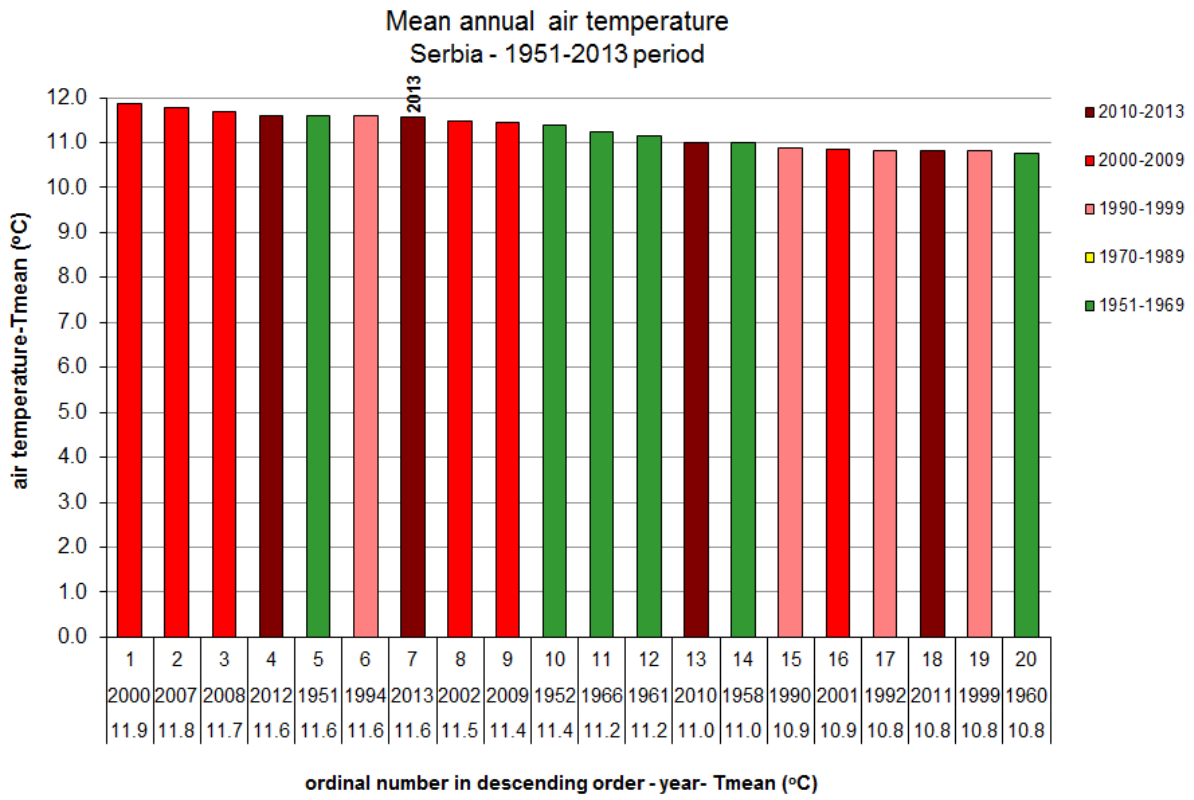
MEAN MONTHLY AIR TEMPERATURE (°C)

| station\month | January | February | March | April | May | June | July | August | September | October | November | December | year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Palic | 1.5 | 3.1 | 4.6 | 13.0 | 17.1 | 20.2 | 23.6 | 23.2 | 15.4 | 12.8 | 8.0 | 1.6 | 12.0 |
| Sombor | 2.0 | 3.1 | 4.9 | 12.7 | 16.8 | 20.3 | 23.3 | 22.9 | 15.6 | 12.9 | 7.6 | 1.2 | 12.0 |
| Novi Sad | 2.3 | 3.6 | 5.4 | 13.4 | 17.4 | 20.0 | 22.4 | 22.9 | 15.7 | 13.6 | 8.4 | 1.6 | 12.2 |
| Zrenjanin | 2.0 | 3.7 | 5.4 | 13.3 | 17.8 | 20.4 | 22.7 | 23.4 | 15.7 | 14.0 | 8.7 | 2.0 | 12.4 |
| Kikinda | 1.6 | 3.5 | 5.1 | 13.2 | 17.5 | 20.5 | 23.0 | 23.3 | 15.5 | 13.4 | 8.6 | 1.9 | 12.2 |
| B. Karlovac | 1.9 | 3.7 | 5.2 | 13.6 | 18.5 | 20.1 | 22.2 | 23.0 | 15.5 | 13.5 | 8.6 | 2.0 | 12.3 |
| Loznica | 3.5 | 3.8 | 6.5 | 13.4 | 17.2 | 20.2 | 22.8 | 23.4 | 16.4 | 13.6 | 8.4 | 1.7 | 12.6 |
| S. Mitrovica | 2.5 | 3.6 | 5.8 | 13.0 | 17.3 | 20.0 | 22.1 | 22.8 | 15.9 | 13.6 | 8.4 | 1.3 | 12.2 |
| Valjevo | 3.1 | 4.2 | 6.5 | 13.7 | 17.6 | 20.4 | 22.8 | 23.7 | 16.5 | 13.5 | 8.7 | 1.9 | 12.7 |
| Beograd | 3.3 | 4.6 | 6.6 | 15.1 | 19.1 | 21.3 | 24.5 | 25.3 | 17.0 | 15.3 | 10.1 | 3.1 | 13.8 |
| Kragujevac | 3.0 | 4.0 | 6.3 | 13.3 | 17.9 | 19.8 | 21.9 | 23.1 | 16.2 | 13.5 | 9.3 | 2.5 | 12.6 |
| S. Palanka | 2.8 | 3.9 | 5.8 | 13.3 | 18.0 | 20.1 | 22.4 | 24.0 | 16.0 | 13.7 | 9.2 | 2.5 | 12.6 |
| V. Gradiste | 1.8 | 4.0 | 5.4 | 13.2 | 18.5 | 20.2 | 22.8 | 23.7 | 15.5 | 13.5 | 9.4 | 1.9 | 12.5 |
| Crni Vrh | -2.8 | -2.3 | -1.0 | 9.0 | 13.0 | 14.8 | 17.9 | 19.2 | 11.6 | 9.4 | 4.0 | -0.8 | 7.7 |
| Negotin | 1.2 | 3.5 | 5.2 | 13.9 | 19.4 | 22.2 | 24.4 | 25.1 | 17.5 | 11.8 | 8.0 | 1.3 | 12.8 |
| Zlatibor | -0.4 | -0.3 | 2.5 | 9.9 | 13.2 | 15.6 | 18.3 | 19.7 | 13.1 | 11.4 | 5.4 | -0.3 | 9.0 |
| Sjenica | -1.3 | 0.1 | 2.8 | 9.0 | 12.5 | 14.8 | 16.5 | 17.4 | 11.8 | 8.9 | 4.4 | -5.0 | 7.7 |
| Pozega | 1.1 | 3.1 | 5.5 | 12.0 | 16.0 | 18.5 | 20.3 | 21.1 | 14.3 | 11.4 | 6.7 | -1.5 | 10.7 |
| Kraljevo | 2.6 | 4.1 | 6.5 | 13.7 | 17.8 | 19.9 | 22.5 | 23.8 | 16.4 | 13.6 | 9.0 | 1.3 | 12.6 |
| Kopaonik | -4.4 | -3.9 | -2.0 | 4.7 | 8.5 | 10.8 | 12.6 | 14.6 | 8.2 | 7.0 | 1.9 | -1.6 | 4.7 |
| Kursumlija | 1.8 | 4.0 | 5.7 | 12.3 | 17.2 | 18.7 | 20.8 | 22.3 | 15.3 | 12.2 | 8.1 | 1.1 | 11.6 |
| Krusevac | 2.6 | 4.1 | 6.5 | 13.4 | 18.3 | 20.1 | 21.9 | 23.9 | 16.3 | 13.1 | 9.0 | 1.2 | 12.5 |
| Cuprija | 2.1 | 3.8 | 5.7 | 12.5 | 18.1 | 19.8 | 21.5 | 23.4 | 15.3 | 13.0 | 8.8 | 1.5 | 12.1 |
| Nis | 2.9 | 4.9 | 7.0 | 14.0 | 18.7 | 20.6 | 22.8 | 25.1 | 17.3 | 13.9 | 9.5 | 1.6 | 13.2 |
| Leskovac | 2.2 | 4.8 | 6.4 | 13.2 | 18.1 | 20.1 | 21.6 | 24.1 | 16.5 | 12.2 | 8.6 | 1.1 | 12.4 |
| Zajecar | 0.6 | 2.8 | 4.6 | 12.9 | 18.0 | 20.4 | 22.6 | 23.6 | 15.8 | 11.1 | 7.4 | 0.3 | 11.7 |
| Dimitrovgrad | 1.1 | 3.3 | 5.2 | 11.8 | 16.8 | 18.1 | 20.0 | 21.9 | 15.2 | 12.0 | 8.1 | 1.0 | 11.2 |
| Vranje | 1.8 | 4.5 | 6.4 | 13.2 | 17.4 | 19.4 | 21.8 | 23.9 | 16.9 | 12.8 | 8.3 | 1.1 | 12.3 |

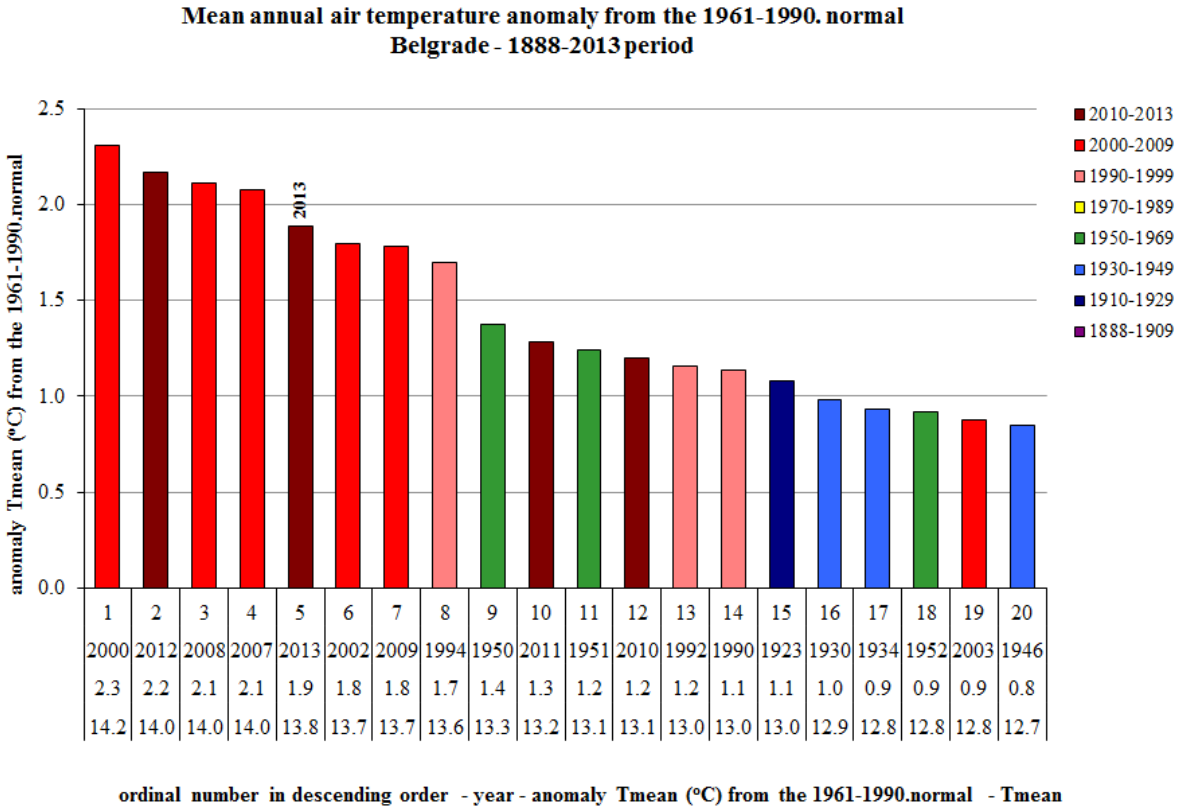
Chart 2.

MONTHLY AND ANNUAL PRECIPITATION (mm)

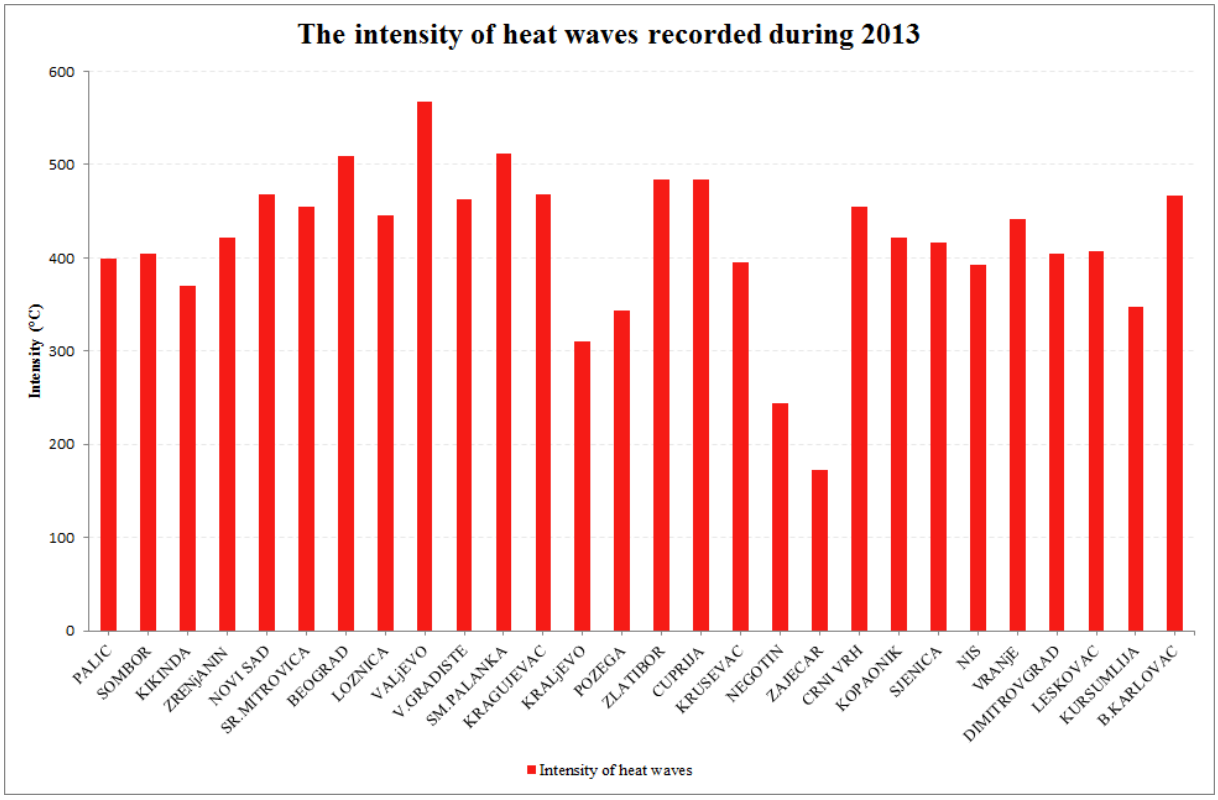
| station\month | January | February | March | April | May | June | July | August | September | October | November | December | year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Palic | 46.4 | 61.4 | 113.2 | 42.3 | 113.8 | 39.2 | 3.7 | 53.8 | 53.2 | 44.2 | 52.5 | 0.2 | 621.3 |
| Sombor | 46.7 | 64.5 | 92.0 | 37.5 | 127.7 | 57.8 | 18.3 | 62.1 | 83.1 | 59.5 | 47.2 | 1.0 | 697.4 |
| Novi Sad | 60.5 | 40.4 | 76.1 | 39.1 | 108.8 | 125.7 | 34.4 | 26.7 | 107.8 | 66.2 | 41.0 | 1.3 | 739.7 |
| Zrenjanin | 48.3 | 50.8 | 83.3 | 27.1 | 77.8 | 72.2 | 17.9 | 40.3 | 58.2 | 47.5 | 37.6 | 2.1 | 576.2 |
| Kikinda | 57.1 | 64.5 | 119.6 | 32.4 | 74.2 | 56.2 | 39.3 | 34.5 | 59.3 | 40.1 | 35.6 | 1.4 | 614.2 |
| B. Karlovac | 49.2 | 55.5 | 65.7 | 31.0 | 114.8 | 40.7 | 34.0 | 42.8 | 47.5 | 45.9 | 50.9 | 4.6 | 582.6 |
| Loznica | 57.2 | 97.1 | 92.0 | 38.3 | 160.5 | 60.5 | 27.6 | 43.4 | 67.5 | 66.4 | 63.5 | 0.9 | 779.8 |
| S. Mitrovica | 57.0 | 47.7 | 64.9 | 31.9 | 119.0 | 62.0 | 44.7 | 18.0 | 60.9 | 71.6 | 34.1 | 4.1 | 618.2 |
| Valjevo | 58.0 | 82.4 | 73.9 | 20.5 | 140.4 | 63.9 | 42.5 | 21.9 | 54.7 | 52.0 | 63.4 | 6.3 | 681.1 |
| Beograd | 76.9 | 53.4 | 95.3 | 18.4 | 104.4 | 50.1 | 2.9 | 42.6 | 58.7 | 52.0 | 40.0 | 7.9 | 607.1 |
| Kragujevac | 61.4 | 84.4 | 101.9 | 41.2 | 70.9 | 85.5 | 60.6 | 50.1 | 49.6 | 41.7 | 61.2 | 6.4 | 715.6 |
| S. Palanka | 79.9 | 79.0 | 94.3 | 36.7 | 102.3 | 78.3 | 7.4 | 31.0 | 52.1 | 82.9 | 59.7 | 7.8 | 696.4 |
| V. Gradiste | 65.7 | 36.9 | 123.7 | 45.3 | 86.4 | 34.1 | 35.6 | 27.6 | 69.1 | 43.6 | 67.0 | 12.1 | 650.1 |
| Crni Vrh | 39.2 | 96.3 | 86.3 | 46.3 | 96.7 | 35.8 | 15.2 | 32.6 | 93.3 | 67.7 | 69.8 | 6.4 | 694.0 |
| Negotin | 37.3 | 169.7 | 72.9 | 42.4 | 75.2 | 44.5 | 23.3 | 18.0 | 82.2 | 64.0 | 70.8 | 3.4 | 700.2 |
| Zlatibor | 84.6 | 110.3 | 85.1 | 30.7 | 148.7 | 48.7 | 23.6 | 22.5 | 86.1 | 74.2 | 74.2 | 12.9 | 799.2 |
| Sjenica | 90.7 | 80.5 | 80.5 | 28.1 | 137.7 | 92.7 | 92.6 | 46.9 | 39.8 | 67.0 | 52.8 | 19.5 | 829.0 |
| Pozega | 53.2 | 77.8 | 78.0 | 28.5 | 91.6 | 91.5 | 12.4 | 38.9 | 71.6 | 36.8 | 47.3 | 6.3 | 638.0 |
| Kraljevo | 56.1 | 75.0 | 81.5 | 41.1 | 122.4 | 94.8 | 23.2 | 23.0 | 48.6 | 50.7 | 57.8 | 7.6 | 681.8 |
| Kopaonik | 104.3 | 81.9 | 140.5 | 43.8 | 204.5 | 128.8 | 48.9 | 35.6 | 68.9 | 68.6 | 78.4 | 40.2 | 1049.0 |
| Kursumlija | 70.0 | 89.3 | 73.7 | 26.1 | 53.3 | 74.5 | 28.4 | 14.0 | 35.2 | 67.6 | 48.9 | 22.9 | 601.3 |
| Krusevac | 43.5 | 76.5 | 78.4 | 54.5 | 101.8 | 44.0 | 6.0 | 14.4 | 53.5 | 48.9 | 58.2 | 18.0 | 612.6 |
| Cuprija | 66.9 | 86.8 | 103.7 | 37.8 | 60.2 | 75.7 | 21.4 | 25.3 | 56.9 | 69.3 | 72.3 | 16.1 | 694.9 |
| Nis | 43.3 | 72.0 | 90.6 | 39.2 | 51.8 | 48.0 | 20.0 | 37.6 | 35.9 | 67.3 | 59.1 | 15.3 | 581.5 |
| Leskovac | 48.2 | 69.2 | 66.7 | 24.4 | 85.0 | 36.8 | 61.6 | 8.6 | 33.1 | 58.9 | 56.4 | 21.4 | 578.9 |
| Zajecar | 52.8 | 75.8 | 88.5 | 32.3 | 66.8 | 23.9 | 5.0 | 7.0 | 63.4 | 47.1 | 62.2 | 3.0 | 533.3 |
| Dimitrovgrad | 56.4 | 89.9 | 65.6 | 42.8 | 67.1 | 107.9 | 25.7 | 1.3 | 28.7 | 54.4 | 45.3 | 21.2 | 607.0 |
| Vranje | 51.0 | 106.0 | 59.3 | 34.9 | 97.7 | 41.8 | 44.5 | 3.9 | 38.3 | 40.4 | 65.0 | 17.2 | 602.4 |




Graph 1. Number of the warmest years in descending order for the period 1951-2013 in Serbia




Graph 2. Number of the warmest years in descending order for the period 1888-2013 in Belgrade




Graph 3. Intensity of the heat wave registered during 2013

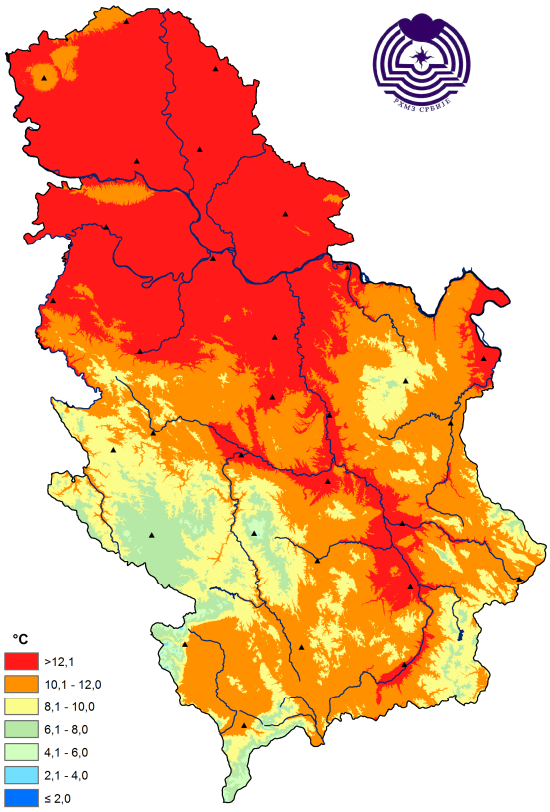



Figure 1. Spatial distribution of the mean annual temperature (°C) during 2013

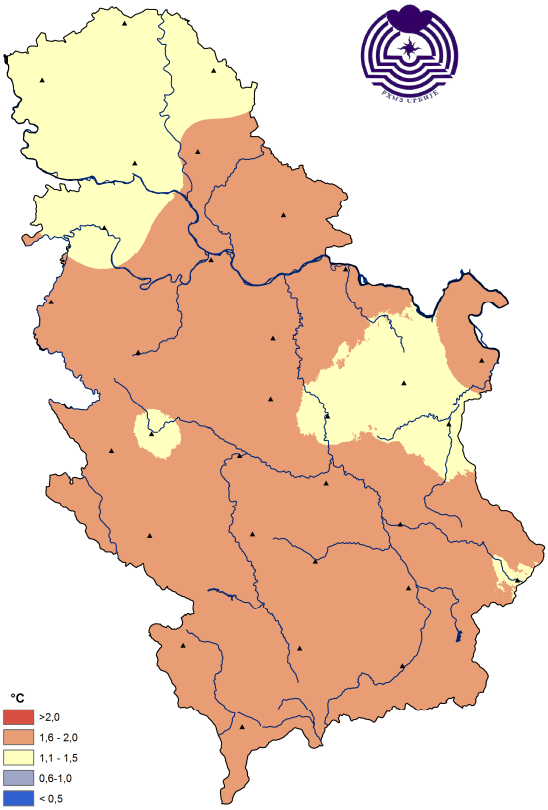



Figure 2. Spatial distribution of the mean annual temperature anomaly (°C) during 2013

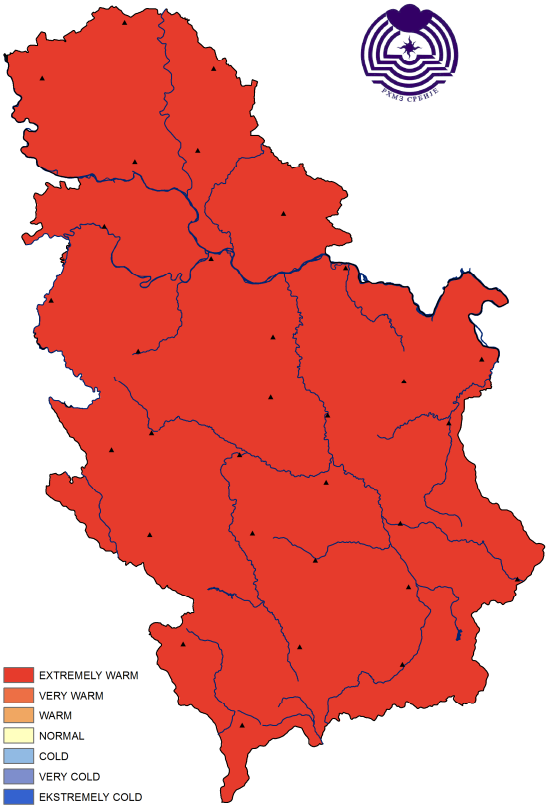



Figure 3. Spatial distribution of the mean annual temperature using percentile method during 2013

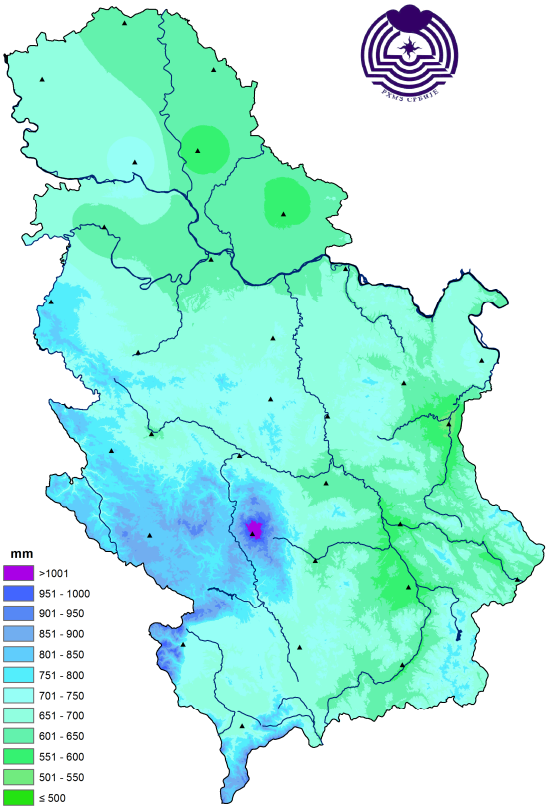



Figure 4. Spatial distribution of annual precipitation sums (mm) during 2013

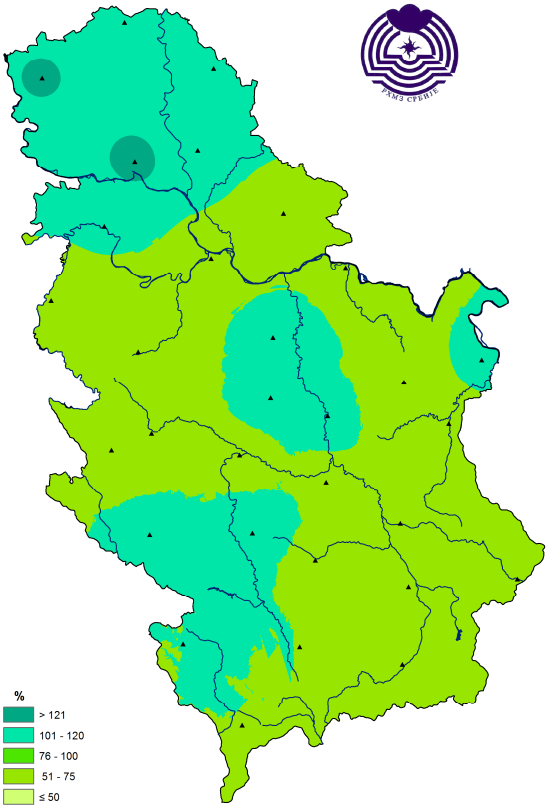



Figure 5. Spatial distribution of annual precipitation sums in the percentages of normal for the 1961-1990 base period during 2013

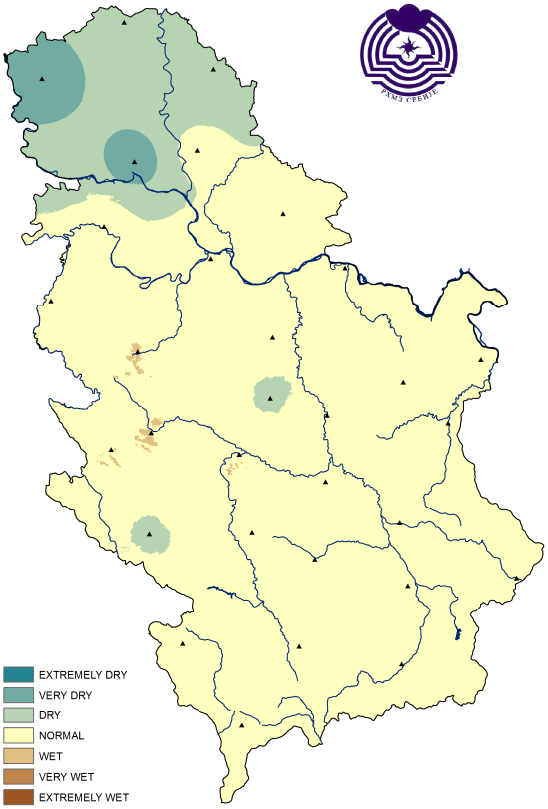



Figure 6. Spatial distribution of annual precipitation sums using percentile method during 2013

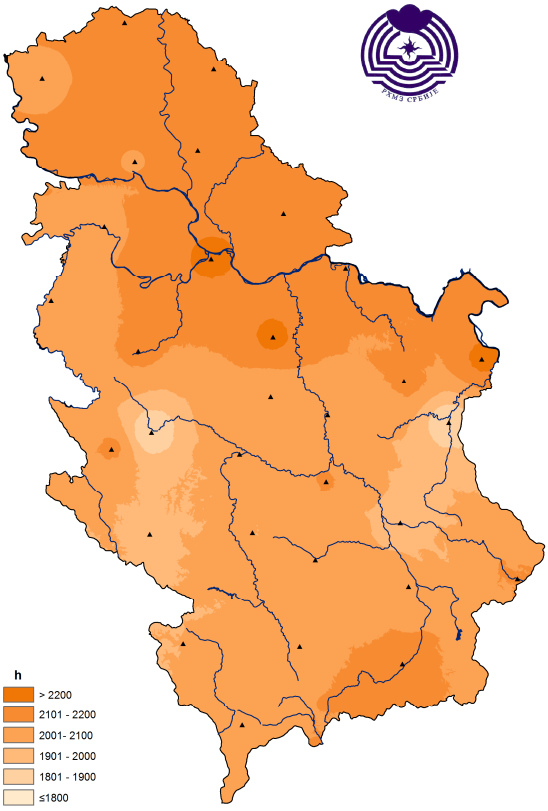



Figure 7. Insolation, expressed in hours during 2013

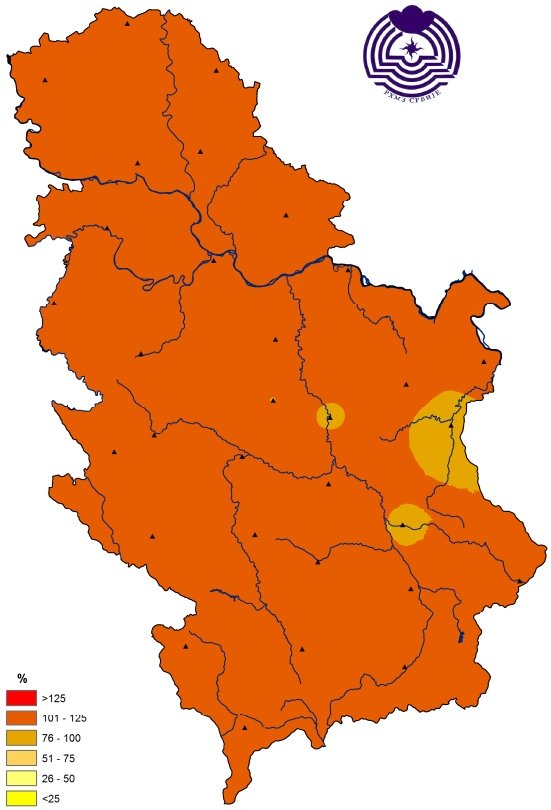



Figure 8. Insolation, expressed in the percentages of normal during 2013

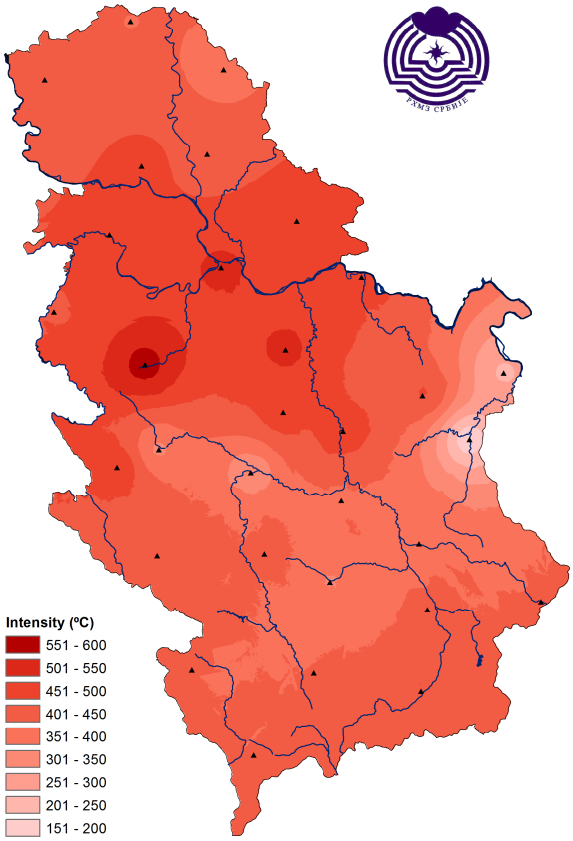



Figure 9. Spatial distribution of heat waves intensity registered during 2013 in Serbia