

# **VERIFICATION OF THE SEECOF-5 SUMMER 2011 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA IN RELATION TO DIFFERENT CLIMATOLOGICAL REFERENCE PERIODS**

## **VERIFICATION OF THE SEECOF-5 SUMMER 2011 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA IN RELATION TO THE 1961-1990 CLIMATOLOGICAL PERIOD**

### **Temperature**

According to the SEECOF-5 outlook, in the northern part of Serbia, the summer of 2011 was expected to be warmer than normal (temperature in the third tercile) with 50% probability, normal with 40% probability and below normal with 10% probability, compared to the 1961-1990 climatological reference period.

In the rest of Serbia the normal temperature was expected with 40% probability, above normal with 40% probability and below normal with 20% probability.

Meteorological monitoring showed that temperature was above normal in the whole of Serbia (according to the tercile method).

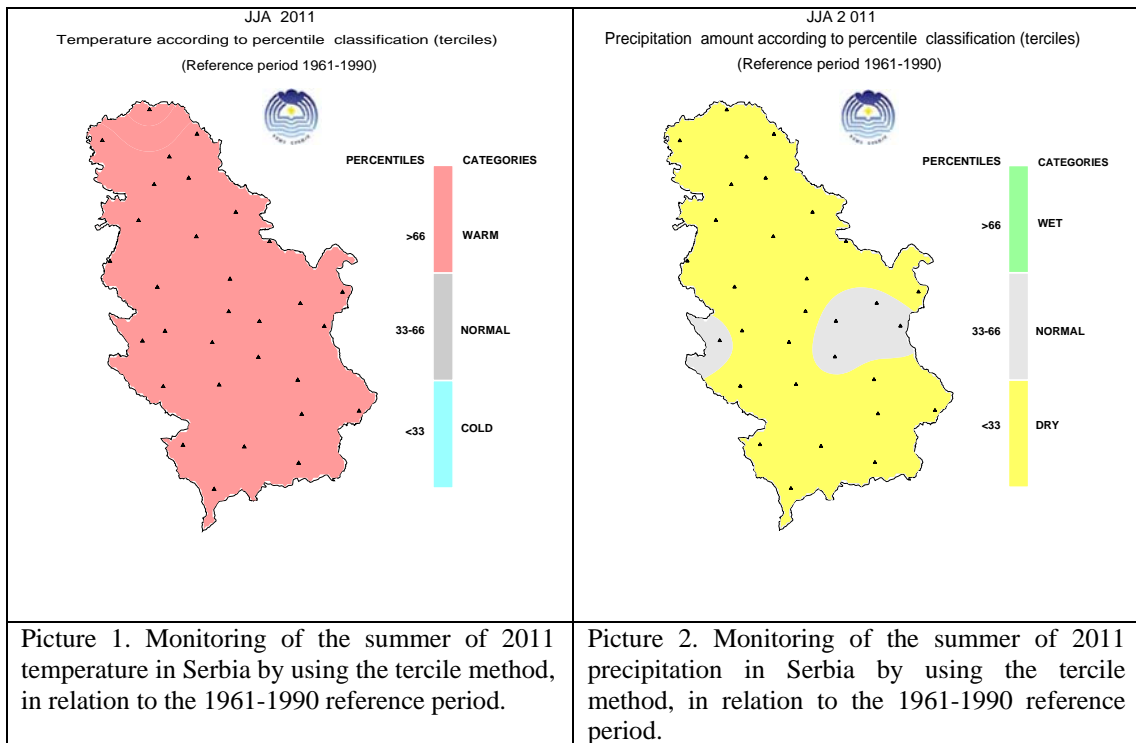
The outlook of a hot summer was more correct for the northern part of Serbia, than for the rest of the country. According to the outlook, the probability of a cooler summer was very low (10-20%), which also came true for the whole Serbia.

### **Precipitation**

The SEECOF-5 climate outlook for the summer of 2011 in Serbia did not show a clear signal concerning the precipitation over the country.

The monitoring of precipitation showed dry summer conditions in most parts of Serbia, with the exception of mountainous areas of western Serbia and the eastern part of central Serbia, where the summer was in the normal category.

The SEECOF 5 precipitation outlook did not suggest a dry summer in Serbia.

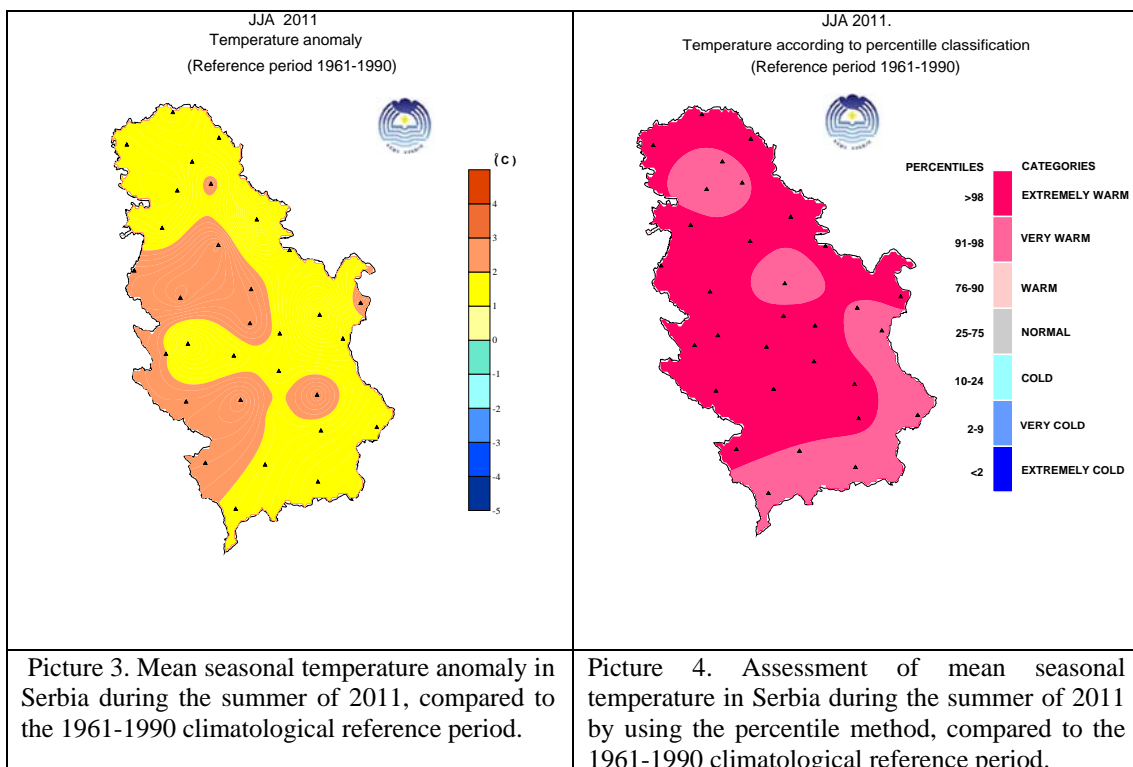


## Analysis of the 2011 summer season in Serbia compared to the 1961-1990 reference period

### Temperature

Mean summer temperature anomalies (compared to the 1961-1990 reference period) were positive in all of Serbia, and ranged from 1.1 to 2.4 °C.

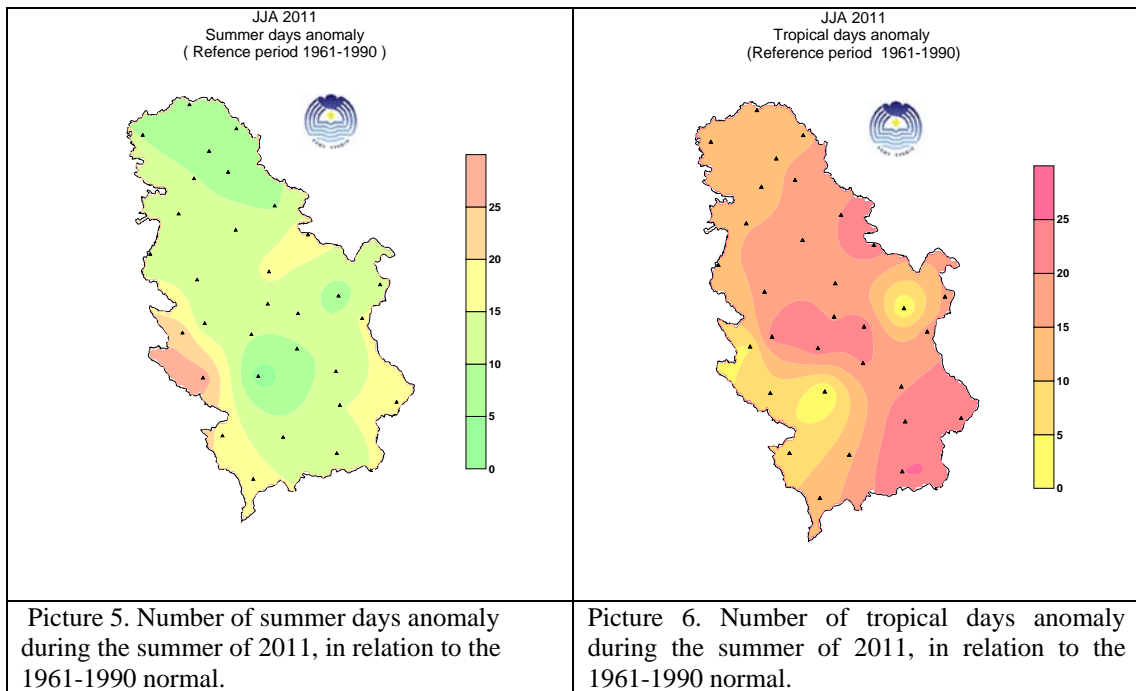
According to the percentile method, mean summer temperatures were in the extremely hot category in most parts of Serbia, except in certain areas where it was very warm.



The maximum daily temperature in Serbia during the summer of 2011 was measured in the country's far south, at the Leskovac station, and amounted up to 39.4° C, while the lowest daily temperature, measured at Mount Kopaonik (1710mnv) on June 26, was only 1.9° C.

During the summer of 2011, the number of summer days with maximum daily temperature above 25° C in Serbia was 9 to 15 days (in Sjenica, southwestern Serbia) higher than normal. The number of tropical days with maximum temperature above 30°C was 12 to 25 days (5 to 8 days at the mountains) larger than normal.

The number of tropical nights, with minimum temperature above 20° C, was above average in whole Serbia, except in the far southeast, where it was around normal. The largest anomalies occurred in the northern parts of the country (in Belgrade 15, and in Zrenjanin 13 tropical nights).

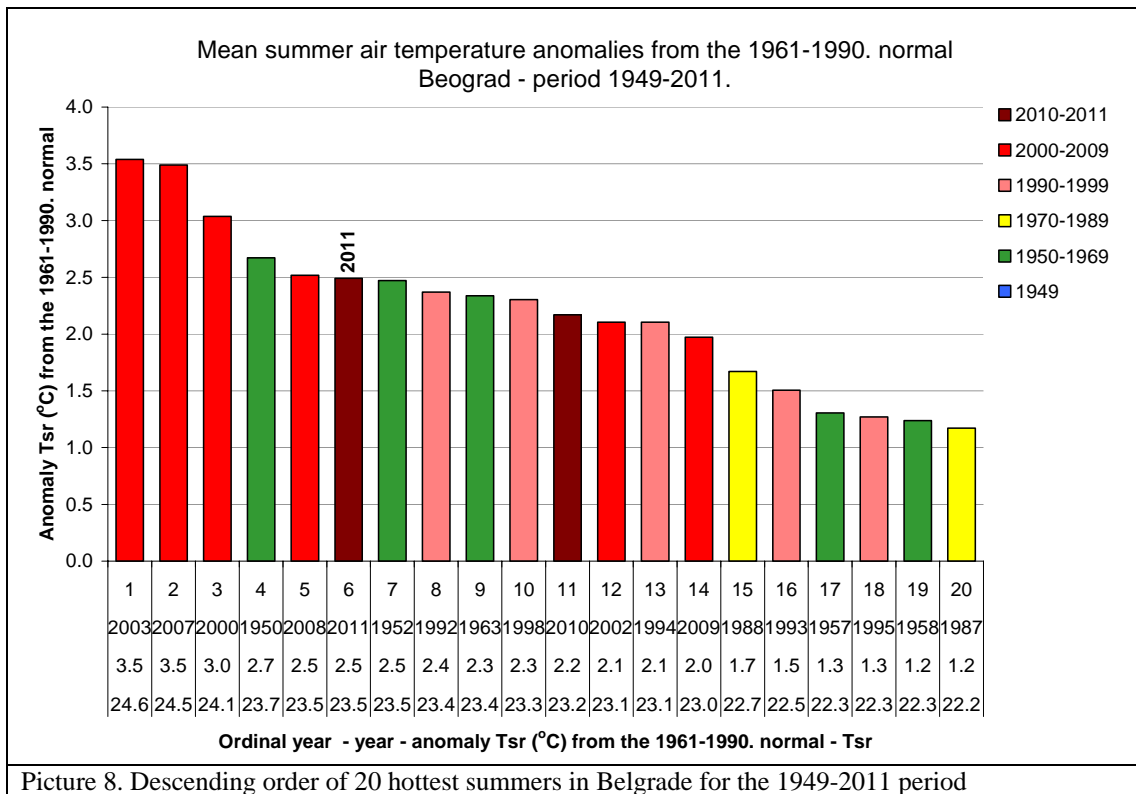


If the summer temperatures measured at stations in Serbia during the 1949-2011 period were sorted in descending order, the following table, showing that the summer of 2011 was one of the warmest in the order (its position ranging from the third to the twelfth place, with the exception of Zajecar, where it took the eighteenth place), would be obtained:

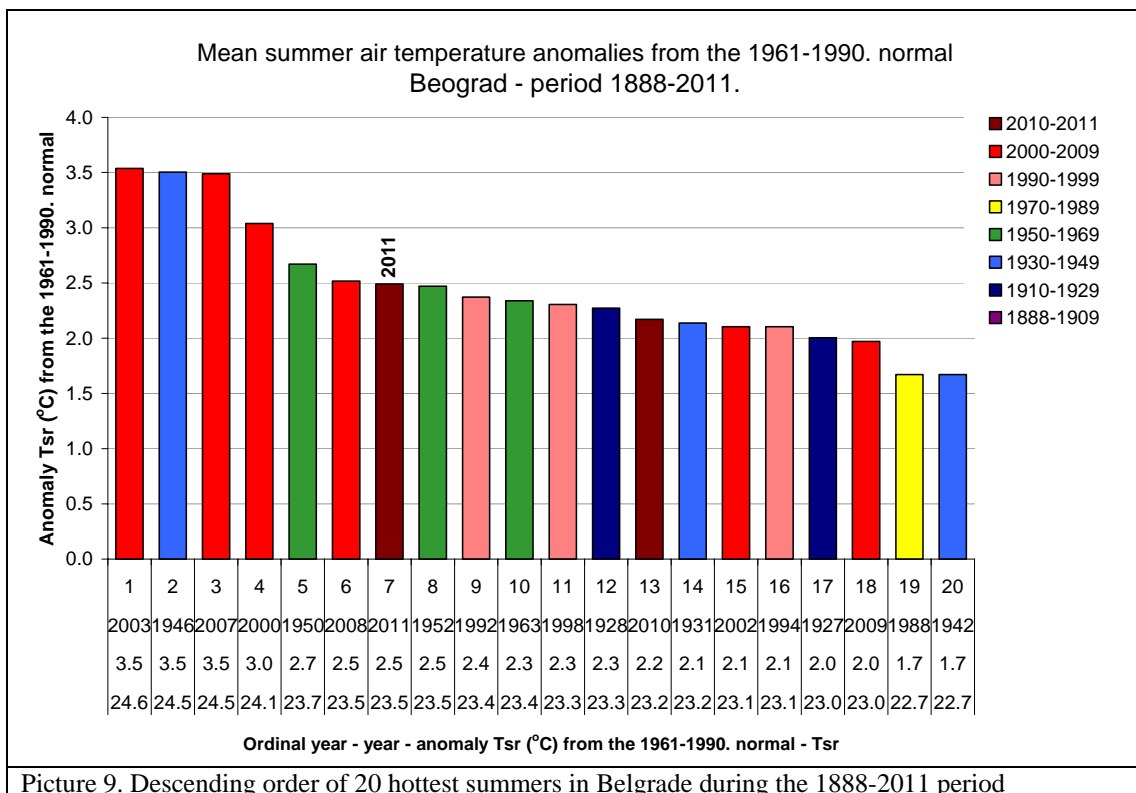
STATION	2011	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PALIC	9	2003	2007	1992	2002	1994	1952	1950	2000	2011	1998	2008	2009	1963	2010	1988	1995	1999	1993	1957	1951
SOMBOR	11	2003	1952	1950	2000	2007	1992	1994	2002	2008	2009	2011	1998	1963	2010	1988	1995	1951	1957	1993	2006
KIKINDA	12	2003	1992	2007	2000	1952	1950	2002	1994	1963	2008	2009	2011	2010	1998	1993	1957	1995	1951	2001	1988
BECEJ	3	2003	2007	2011	1992	2008	2009	2002	2000	1994	1998	1952	1950	2010	1999	2006	1963	1995	1951	2004	1957
NOVI SAD	10	2003	1950	1952	2000	2007	1992	1963	2002	1994	2011	1988	2008	2009	2010	1951	1998	1957	1958	1993	1971
ZRENJANIN	10	2003	1950	2007	1952	1992	2000	2002	1963	2008	2011	1994	2009	2010	1998	1957	1951	1988	1993	1958	2001
VRŠAC	8	2007	1952	2003	1950	2000	1992	1963	2011	2008	2002	1998	2010	2009	1994	1957	1953	1951	2001	1999	1988
LOZNICA	4	2003	2007	2000	2011	1992	1952	2008	2002	1994	1998	2010	1988	2009	1963	1950	2004	1999	2001	1957	1987
S.MITROVICA	8	2003	1952	1950	2000	2007	1992	1963	2011	1994	2002	2008	2010	1998	1957	2009	1951	1958	1999	1988	1960
VALJEVO	4	2003	2007	2000	2011	1952	2010	2008	1950	1998	1992	1963	2009	2002	1994	1988	1958	1987	1993	1957	2006
BEOGRAD	6	2003	2007	2000	1950	2008	2011	1952	1992	1963	1998	2010	2002	1994	2009	1988	1993	1957	1995	1958	1987
KRAGUJEVAC	7	2007	1950	2003	1952	2000	2008	2011	1963	2002	1998	2010	2009	1994	1993	1992	2001	1958	1996	1957	1951
SM.PALANKA	7	2007	2003	1952	1950	2000	1963	2011	1998	1992	2008	2002	1988	1994	2010	2009	1993	1958	1951	1953	1987
V.GRADISTE	9	2003	2007	1950	1952	2000	1963	2008	2002	2011	2010	1992	2009	1998	1953	1994	1958	1954	1988	1951	1957
NEGOTIN	7	2007	2003	2000	2002	2010	2008	2011	1988	2009	1993	1992	1952	1950	2001	1998	1996	1994	1999	1958	1987
ZLATIBOR	8	2007	2003	1952	1950	2000	1998	2008	2011	1992	2010	2009	1988	1994	1963	2002	1958	2001	1993	1954	1987
SJENICA	6	2007	2003	1952	1950	1998	2011	2000	2010	1988	2008	2009	2002	1999	1954	1994	1987	1963	1957	2001	1992
POZEGA	7	2003	2007	1952	2002	1998	2010	2011	2000	1963	2008	2009	1958	1988	1953	1957	1954	1999	2001	1994	1993
KRALJEVO	8	2007	2003	1952	1950	2000	1998	1963	2011	1958	2002	1993	2008	1994	2010	2009	1988	1954	2001	1951	1992
KURSUMLIJA	4	2007	2003	1952	2011	1963	2010	1988	2002	2000	2008	2009	1987	1958	1954	1998	2001	1992	1953	1996	1956
KRUSEVAC	8	2007	2003	1952	1950	2000	1998	2009	2011	1963	2008	2010	1958	2002	1994	1993	1951	1996	1953	2001	1988
CUPRIJA	8	1950	1952	2007	2003	2000	1963	1998	2011	2008	1992	2010	1951	1994	2002	1953	1958	1993	2009	1954	2001
NIS	7	2007	1952	2003	1950	1998	2000	2011	1963	2008	2010	1958	1993	1994	1953	1951	1992	1996	1954	2009	2002
LESKOVAC	9	2007	1952	2003	1950	1963	1958	2000	2010	2011	1998	2008	1996	1993	1951	1954	1957	1953	2002	1992	1972
ZAJECAR	18	2007	1950	2000	2003	1952	1998	2002	2010	1996	1988	1958	1994	2008	1992	1963	1993	1999	2011	2001	1987
DIMITROVGRAD	9	1950	1952	2007	2003	1958	1963	2000	2008	2011	1998	2010	1954	1951	1987	1996	1953	1993	1957	2002	1988
VRANJE	10	2007	1950	1952	2003	2000	1963	1998	1958	1993	2011	2008	1996	2010	1954	1988	1951	2001	1994	1992	1987

■ 1949 
 ■ 1950-1969 
 ■ 1970-1989 
 ■ 1990-1999 
 ■ 2000-2009 
 ■ 2010-2011

Picture 7. Descending order of hottest summers for the 1949-2011 period, measured at the stations in Serbia (20 warmest summers per each station)



Picture 8. Descending order of 20 hottest summers in Belgrade for the 1949-2011 period



Picture 9. Descending order of 20 hottest summers in Belgrade during the 1888-2011 period

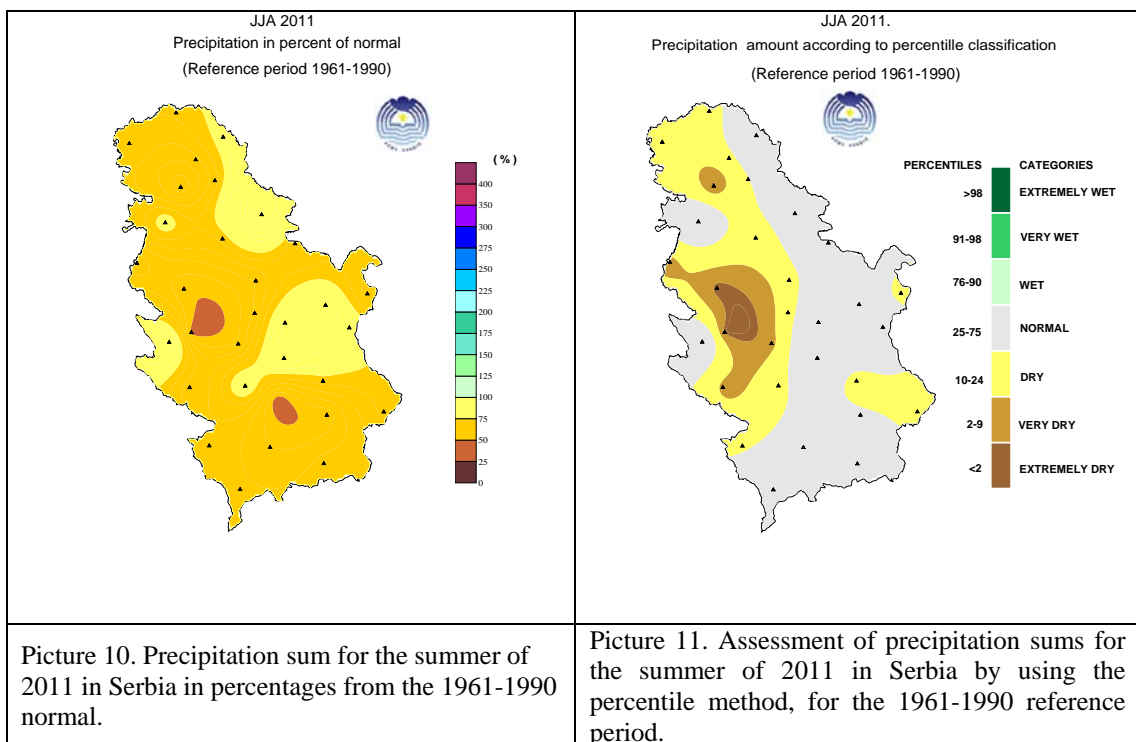
Two heat waves were recorded on the Serbian territory during the summer of 2011 (Heat wave definition: period of 6 or more consecutive days in which the maximum temperature is minimum 5.1 °C higher than the average maximum temperature for each of those days during the 1961-1990 period). The first heat wave, with a maximum duration up to 8 days, was recorded in the parts of northern and

central Serbia in the first half of July. The second heat wave was registered in the third decade of August, and its maximum duration was up to 13 days. In Vojvodina, the August heat wave lasted shorter, while it was not recorded at all in the far east of Serbia.

## Precipitation

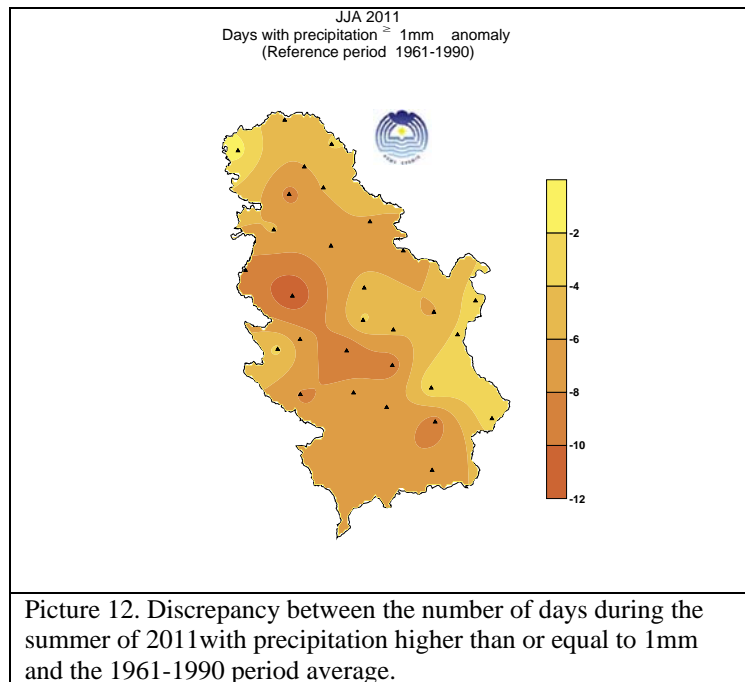
Summer precipitation sums in Serbia in 2011 were below the average value for the 1961-1990 normal period (the percentage achieved was from 45% to 98% of the average).

According to the percentile method, summer precipitation sums in northwestern, western and the parts of eastern Serbia were in dry to extremely dry categories, while in the other parts of the country, they were in the normal category.



The maximum daily precipitation of 82.1mm was measured on Crni Vrh Mountain (1037m), eastern Serbia, on July 30, 2011, thus exceeding the former July daily precipitation maximum for that station.

During the summer of 2011, the number of days with precipitation higher than or equal to 1mm was 1 to 12 days lower than the 1961-1990 period average. The biggest discrepancy of 12 days occurred in the parts of western Serbia.



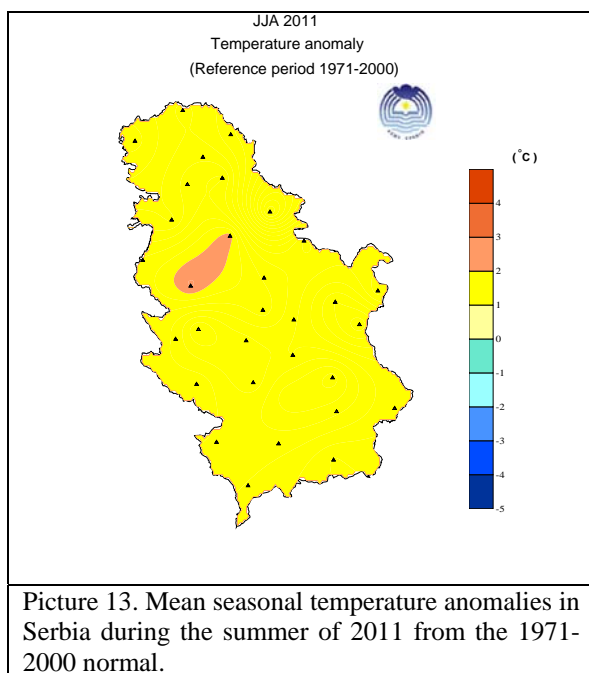
## **Analysis of the 2011 summer season for Serbia compared to the 1971-2000 climatological reference period**

### **Temperature**

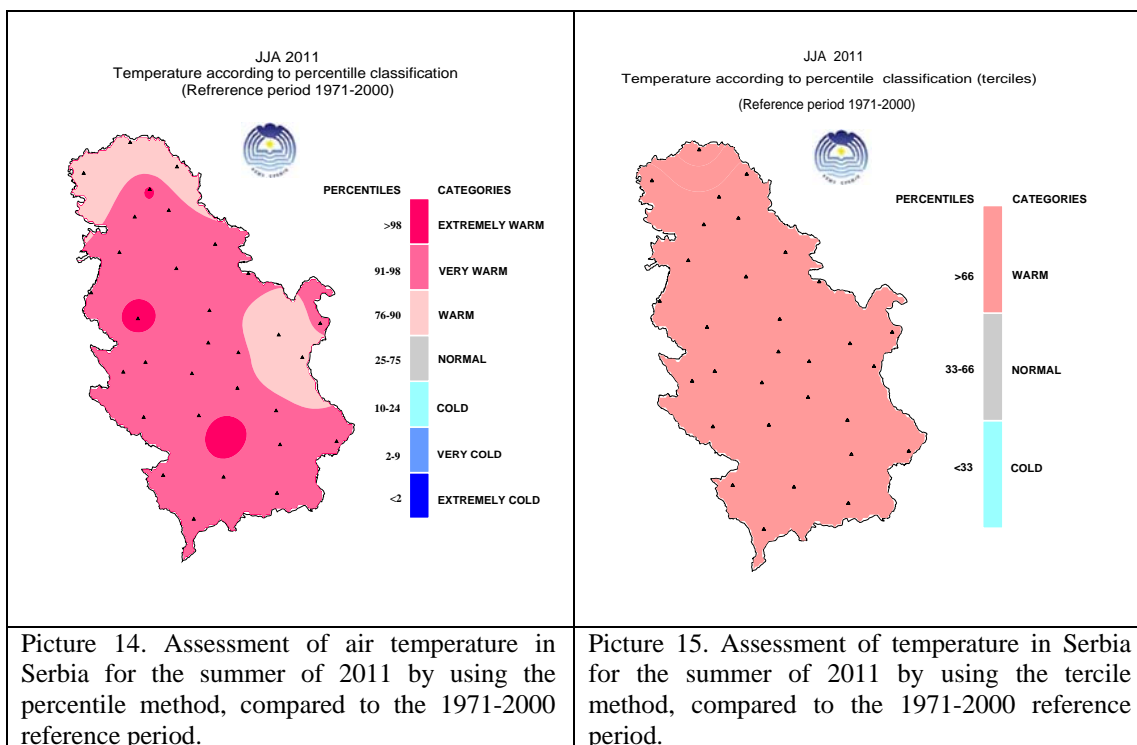
Anomalies of mean summer temperatures from normal (in relation to the 1971-2000 reference period) were positive in entire Serbia, and ranged from 1.1 to 2.1 °C (picture 13).

According to the percentile method (compared to the 1971-2000 reference period), most of the country was in the very hot category, parts of northern and eastern Serbia were in the hot category, while three stations were in the extremely hot category.

Monitoring according to the tercile method (for the 1971-2000 reference period, Picture 15) showed that temperature on the whole Serbian territory was in the hot category (just as for the 1961-1990 period).



Picture 13. Mean seasonal temperature anomalies in Serbia during the summer of 2011 from the 1971-2000 normal.



Two heat waves were recorded on the Serbian territory during the summer of 2011 (Heat wave definition: period of 6 or more consecutive days in which the maximum temperature is minimum 5.1 °C higher than the average maximum temperature for each of those days during the 1971-2000 period). The first heat wave was recorded at two stations in mid July, and it lasted 8 days. The second heat wave occurred in the third decade of August, and its maximum duration was up to 10 days. In Vojvodina (northern Serbia), the August heat wave lasted shorter, while it was not recorded at all in the far east of Serbia.

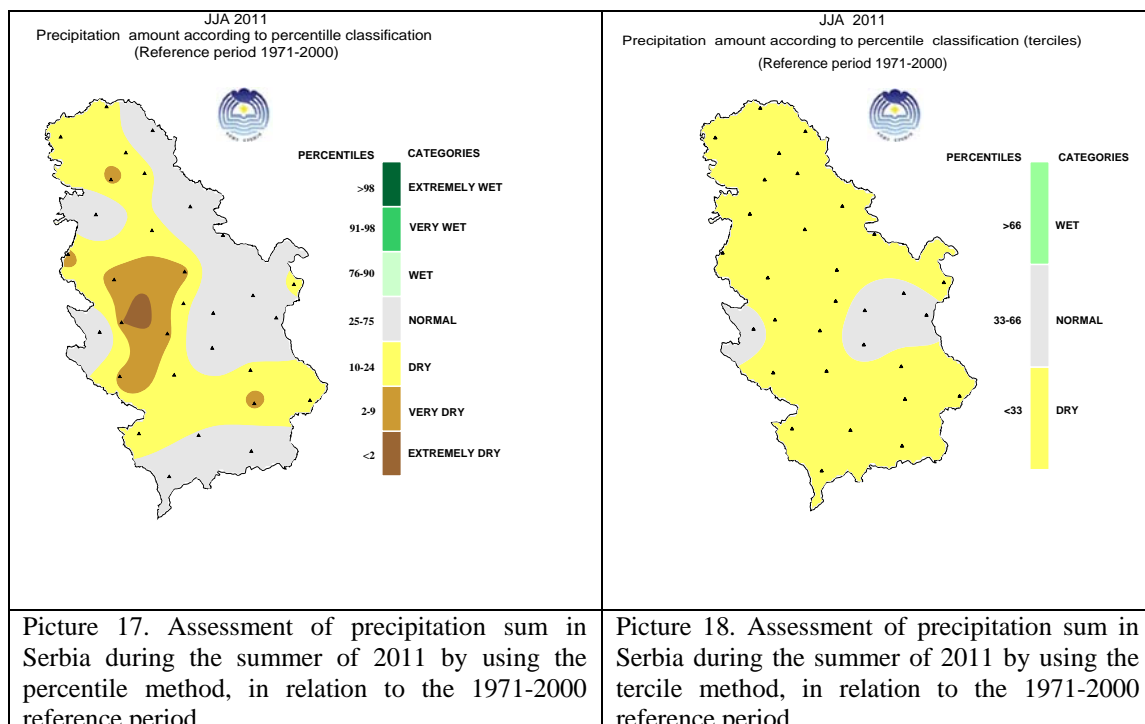
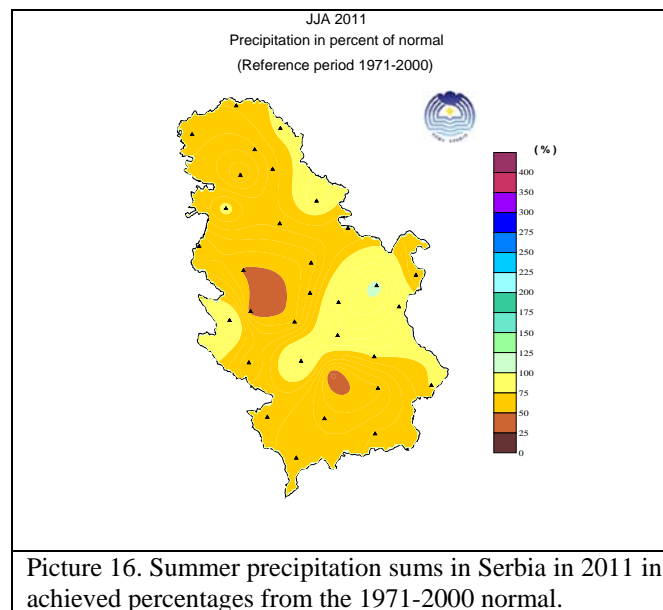


## Precipitation

Monitoring of the precipitation for the summer of 2011 by using the achieved percentage from the 1971-2000 normal method showed that there was a deficit of precipitation in almost entire Serbia (Picture 16).

The precipitation sum (for the 1971-2000 period) ranged from normal to extremely dry category, according to the percentile method (Picture 17).

The analysis of the summer precipitation by employing the tercile method (Picture 18) showed that it was dry in most part of the country, with the exception of the mountainous area of western Serbia and the eastern part of central Serbia, where precipitation was in the normal category (the same as in the 1961-1990 period).



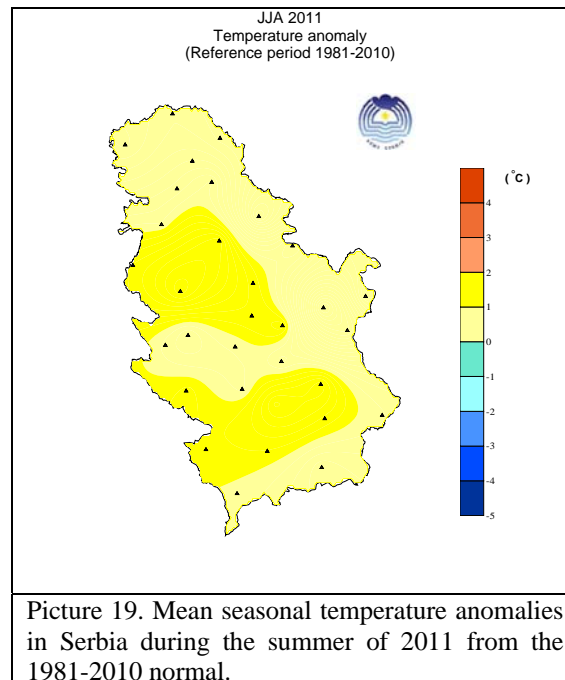
## Analysis of the 2011 summer season for Serbia compared to the 1981-2010 reference period

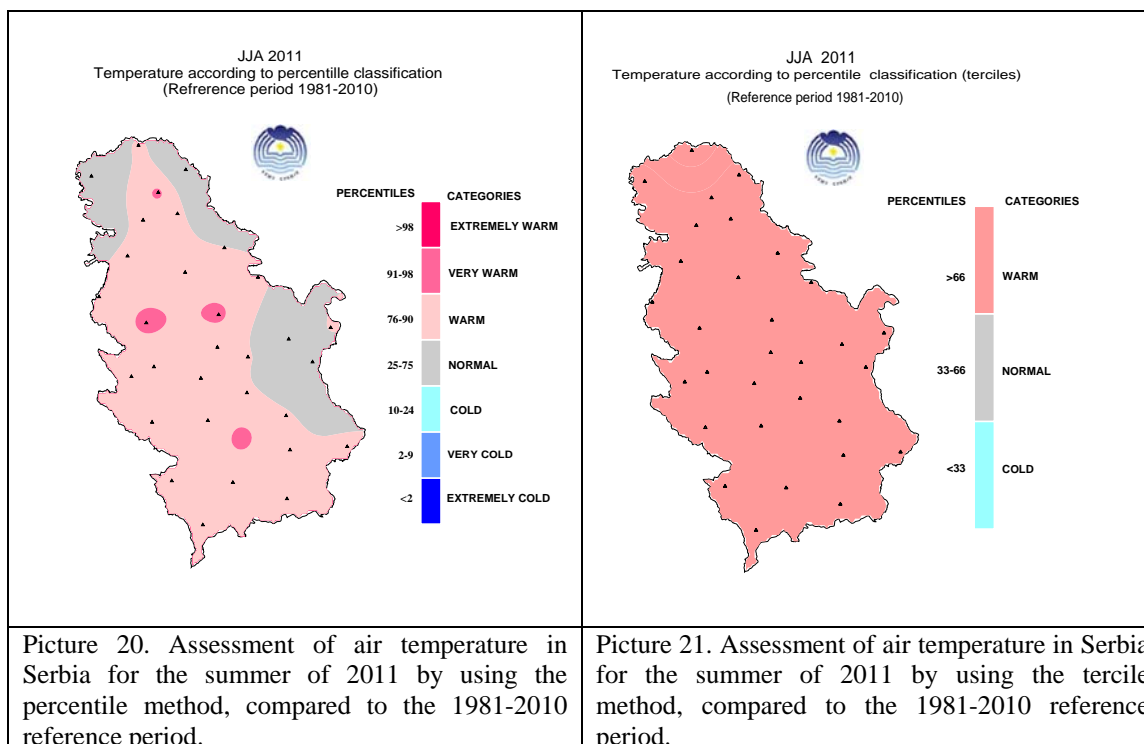
### Temperature

Anomalies of air temperatures during the summer of 2011 in relation to the 1981-2010 reference period were positive in entire Serbia and ranged from 0.1 to 1.4 °C (Picture 19).

According to the percentile method, most part of the country was in the hot or very hot category, while some parts of northern and eastern Serbia were in the normal category (Picture 20).

According to the tercile method (Picture 21), mean summer temperatures were in the hot category in entire Serbia (the same as in the 1961-1990 and 1971-2000 periods).





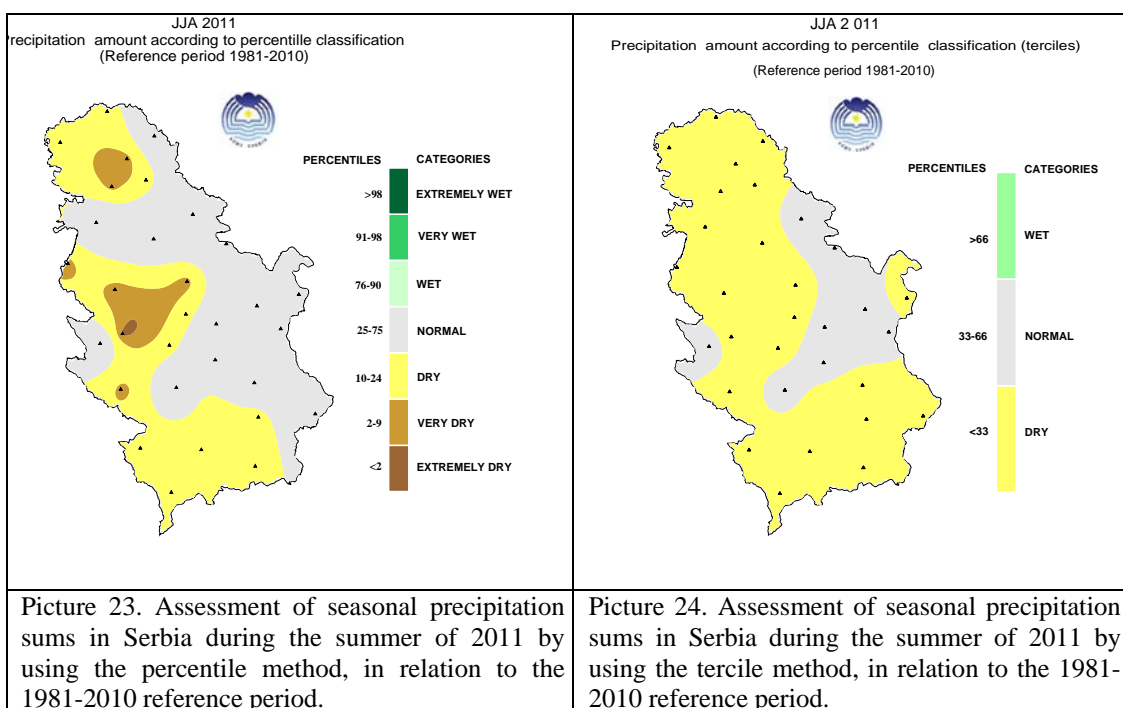
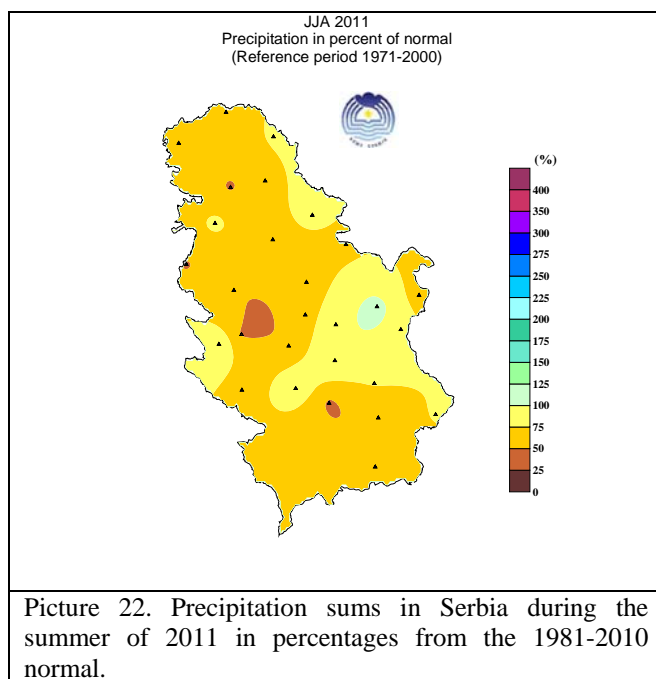
Two heat waves were recorded on the Serbian territory during the summer of 2011 (Heat wave definition: period of 6 or more consecutive days in which the maximum temperature is minimum 5.1 °C higher than the average maximum temperature for each of those days during the 1981-2010 period). The first heat wave was recorded at one station in the second decade of July, and it lasted 8 days. The second heat wave occurred in the third decade of August, it was recorded at three stations and lasted 6 days.

## Precipitation

Summer precipitation sums were below average value, just as in the 1961-1990 and 1971-2000 periods. Only one station in the east of the country recorded precipitation surplus (the same as for the 1971-2000 period) of 9% (Picture 22).

The percentile method analysis showed that a larger part of Serbia was within the normal limits (compared to the 1981-2010 reference period), while the other areas were below normal (Picture 23).

According to the tercile method analysis (in relation to the 1981-2010 period, Picture 24), a larger part of the country was in the dry category, while the area with normal values expanded (to the parts of central, eastern and northeastern Serbia) in comparison to the other two periods.



During the summer of 2011, there was no significant rise in water level of Serbian rivers. In August 2011, water levels of Serbian rivers varied within the domain of low and very low values. New historically lowest water levels were recorded in the Velika Morava river basin.