

VERIFICATION OF THE SEECOF-7 SUMMER 2012 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA IN RELATION TO DIFFERENT CLIMATOLOGICAL REFERENCE PERIODS

VERIFICATION OF THE SEECOF-7 SUMMER 2012 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA IN RELATION TO THE 1961-1990 CLIMATOLOGICAL PERIOD

Temperature

According to the SEECOF-7 outlook, in entire Serbia, the summer of 2012 was expected to be warmer than normal (temperature in the upper tercile) with 60% probability, normal with 25% probability and below normal with 15% probability, compared to the 1961-1990 climatological reference period.

Meteorological monitoring showed that summer 2012 was the warmest summer on record for 19 stations in Serbia from the beginning of meteorological measurements. Temperature was above normal in whole Serbia (according to the tercile method) (*Figure 1*).

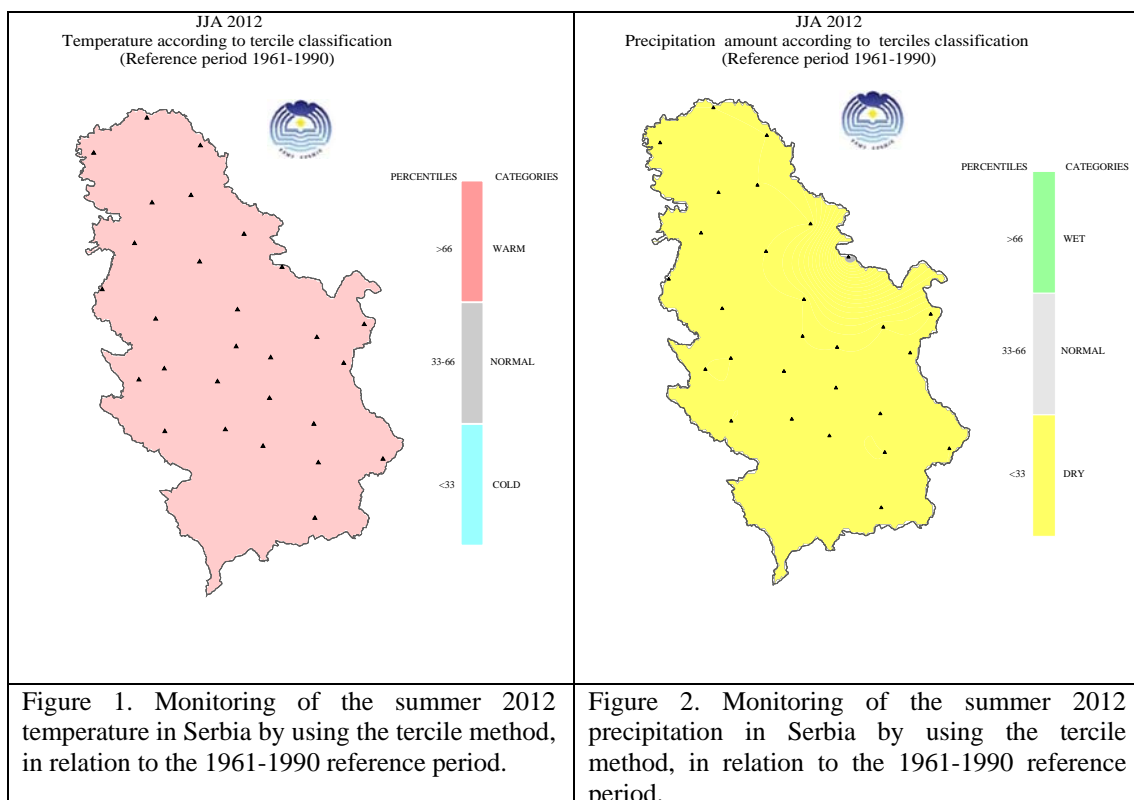
The outlook for a warm summer was correct for Serbia.

Precipitation

The SEECOF-7 climate outlook for the summer of 2012 in Serbia indicated near- or below- average conditions (precipitation in lower tercile with 40% probability) .

Monitoring of precipitation showed extremely dry summer conditions in entire Serbia, with the exception of one station in north-eastern Serbia, where summer was in the normal category (*Figure 2*).

The outlook for a dry summer was correct for most parts of Serbia.



Analysis of the 2012 summer season in Serbia compared to the 1961-1990 reference period

Temperature

Summer 2012 was the warmest summer on record for 19 meteorological stations in Serbia.

During summer 2012, mean seasonal temperature ranged from 15.6°C on Kopaonik Mountain (central Serbia), up to 25.9°C in Belgrade, surpassing maximum mean temperatures on record for all meteorological stations.

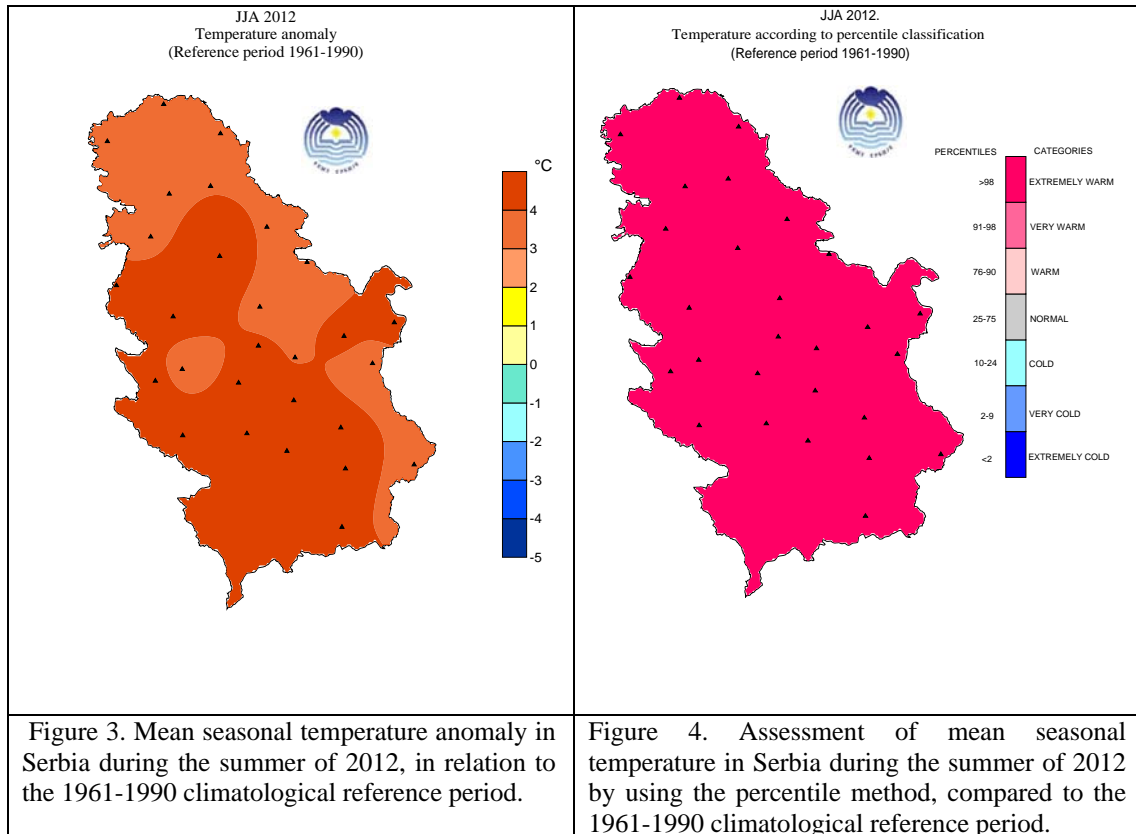
Mean summer temperature anomalies (compared to the 1961-1990 reference period) were positive in the entire Serbian territory and ranged from 3.1°C in Veliko Gradiste (north-eastern Serbia) up to 5.0°C on Kopaonik Mountain (central Serbia) (*Figure 3*).

Mean maximum summer temperature anomalies ranged from 4 to 5°C, and up to 6°C on mountains. During summer 2012, maximum daily temperature for Serbia was recorded in Cuprija (central Serbia) on July 15, and it measured 41.5 °C.

Mean minimum summer temperature anomalies ranged from 2 up to 4°C. Minimum daily temperature of 2.6°C was recorded on Kopaonik Mountain (central Serbia) on June 26, and in Sjenica (south-western Serbia) on August 29.

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

According to the tercile method, mean summer air temperature was in the warm category for entire Serbia.



The number of summer days with maximum daily air temperature above 25°C was surpassed at all meteorological stations in Serbia. A total of 88 summer days was recorded in Belgrade, surpassing the average by 26 days. The largest number of summer days (91) was recorded in Nis, Leskovac (south-eastern Serbia) and Zajecar (eastern Serbia) (*Figure 5*).

The number of tropical days with maximum daily air temperature above 30°C was surpassed in entire Serbia. The largest number of tropical days was recorded in Leskovac (south-eastern Serbia) (73), surpassing the average by 47 days, while 62 tropical days were recorded in Belgrade, 40 days above the average (*Figure 6*).

The number of tropical nights with minimum temperature above 20°C was surpassed in most of Serbia. A total of 52 tropical nights was recorded in Belgrade, which is the largest number of tropical nights on record for Belgrade.

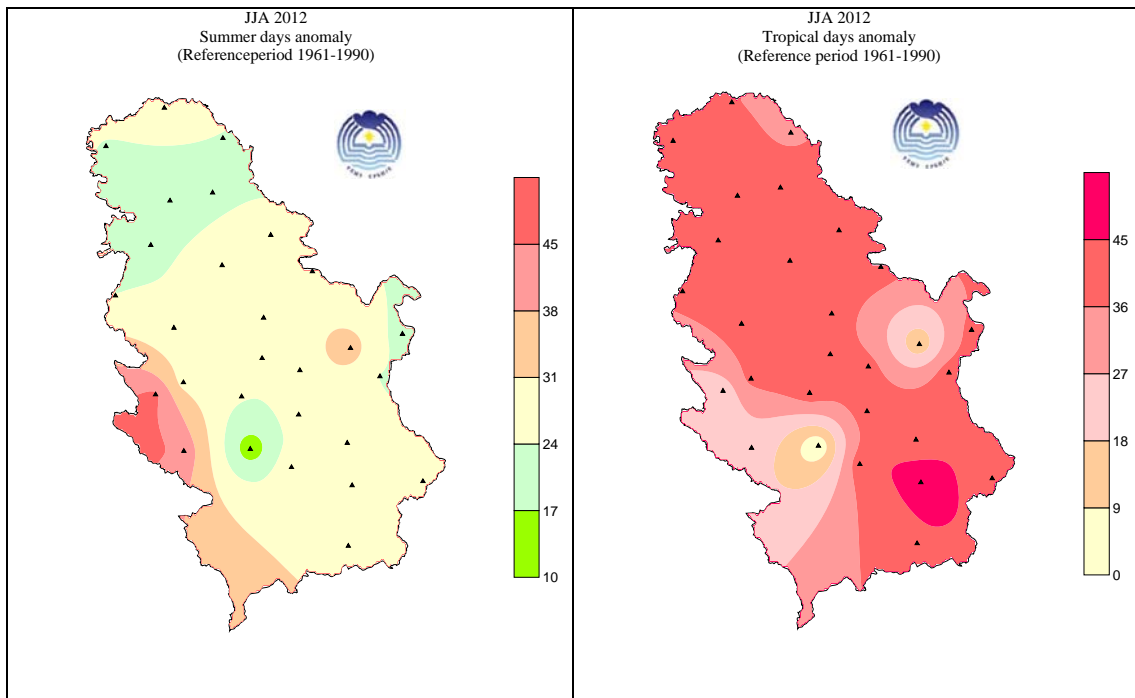


Figure 5. Anomaly of the number of summer days during the summer of 2012 in relation to the 1961-1990 normal.

Figure 6. Anomaly of the number of tropical days during the summer of 2012 in relation to the 1961-1990 normal.

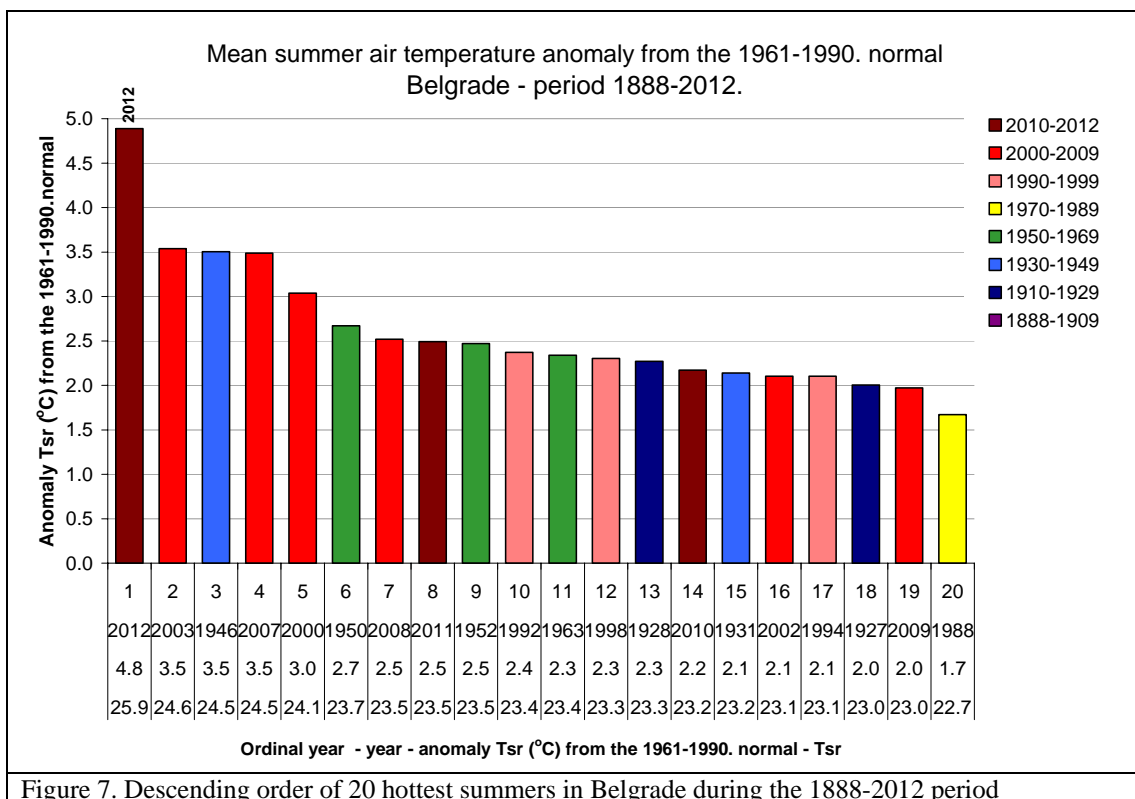


Figure 7. Descending order of 20 hottest summers in Belgrade during the 1888-2012 period

Three heat waves were recorded on the whole Serbian territory during the summer of 2012, and in some parts four or five (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 was recorded between 16 to 24 June, the second from 29 June to 15 July and the third from 19 to 26 August. Maximum daily temperature anomalies from normal (reference period 1960-1990) were up to 14.7°C.

Precipitation

Summer 2012 was one of the driest summers on record for Serbia.

Summer precipitation sum for 2012 was, in relation to the 1961-1990 reference period, below average in almost entire Serbia, exception is one station in north-eastern Serbia (Veliko Gradiste), where it was around normal (*Figure 9*).

According to the percentile method, summer precipitation sum was in the extremely dry, very dry and dry categories in almost entire Serbia. The exception to that were two stations in north-eastern and south-eastern Serbia respectively, where precipitation was in the normal category (*Figure 10*).

According to the tercile method, summer precipitation sum was below normal in entire Serbia, with the exception of one station in north-eastern Serbia, where it was within the range of normal values.

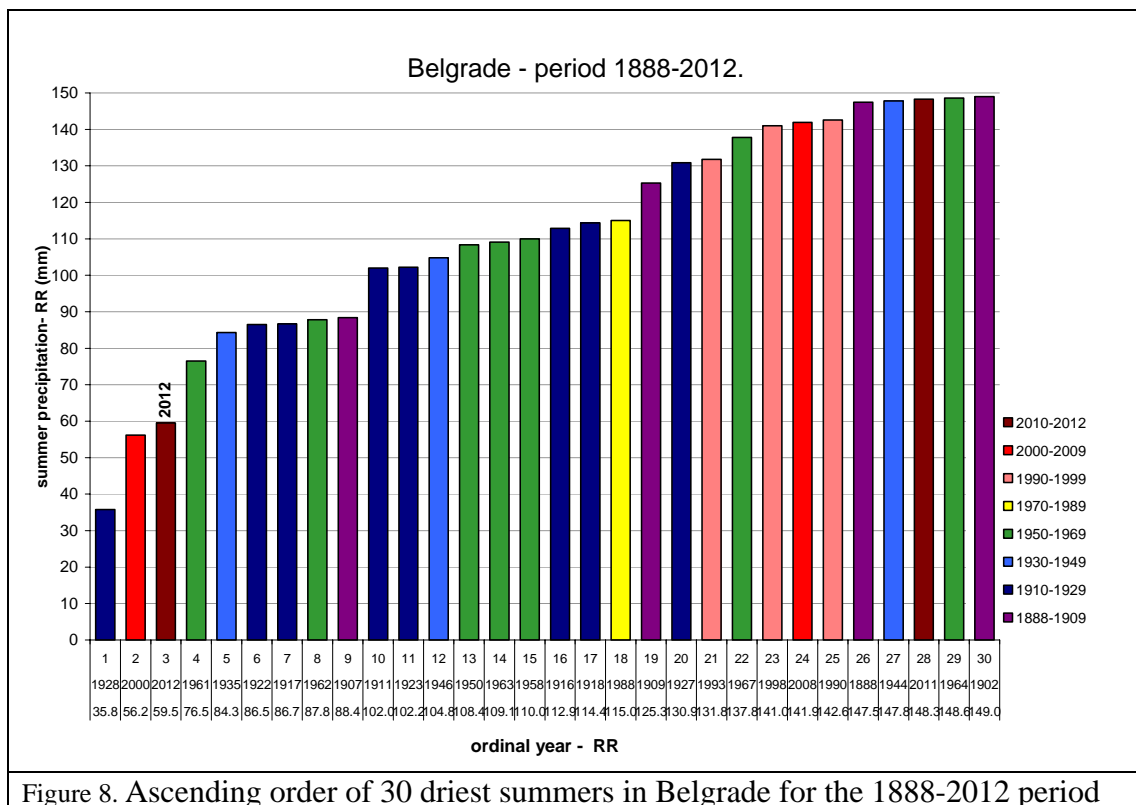
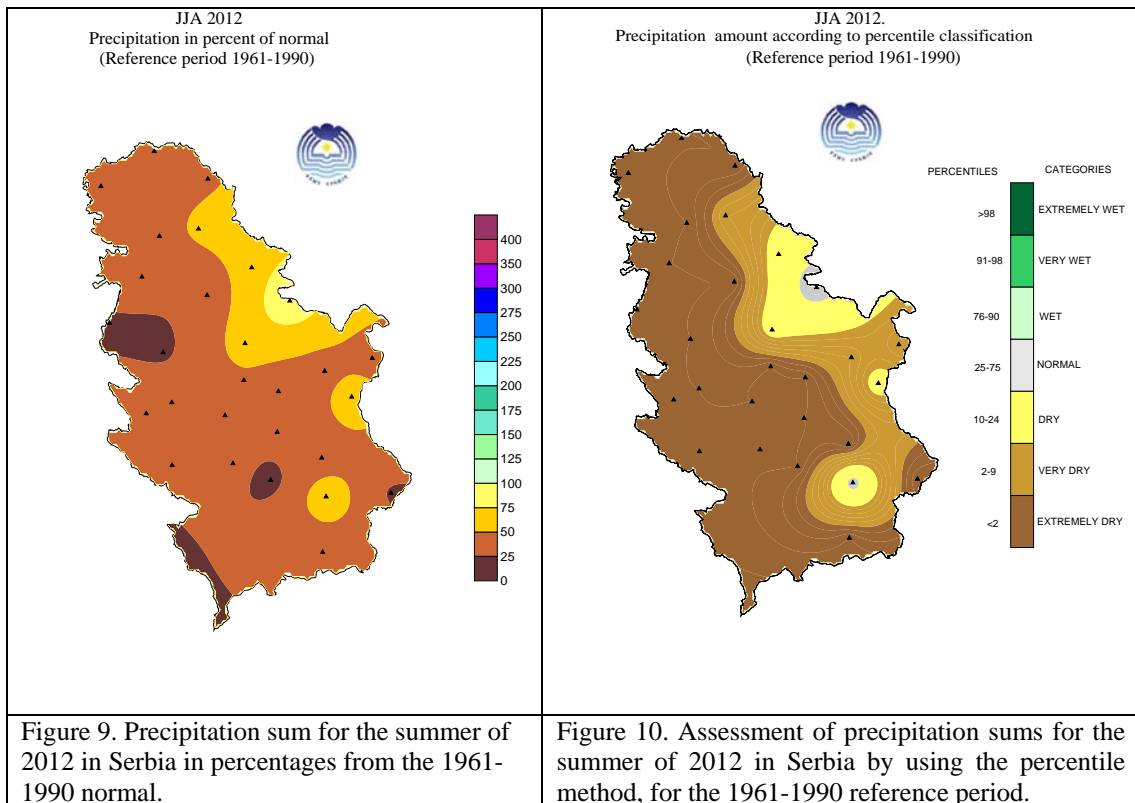
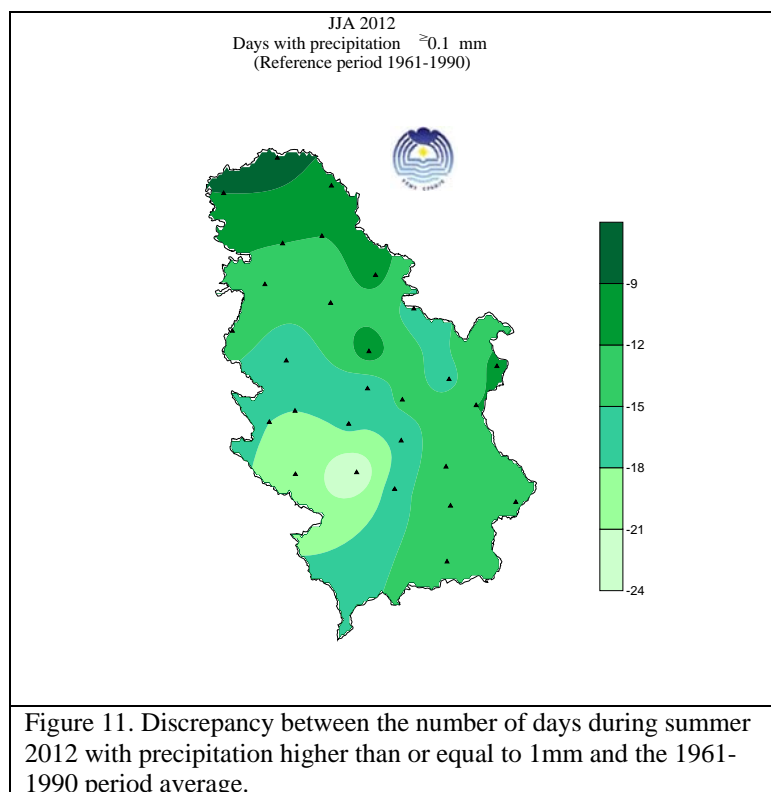


Figure 8. Ascending order of 30 driest summers in Belgrade for the 1888-2012 period



Absolute daily precipitation quantity maximum was surpassed in Veliko Gradiste (north-eastern Serbia) on July 25, amounting 152,8 mm. Precipitation quantity measuring above 50 mm was also recorded in Leskovac (south-eastern Serbia) on July 26 (55,8 mm).



The number of days with precipitation of 1 mm and above was 24 days below normal on Kopaonik Mountain (central Serbia), and 7 days below normal in Palic (northern Serbia) (*Figure 11*).

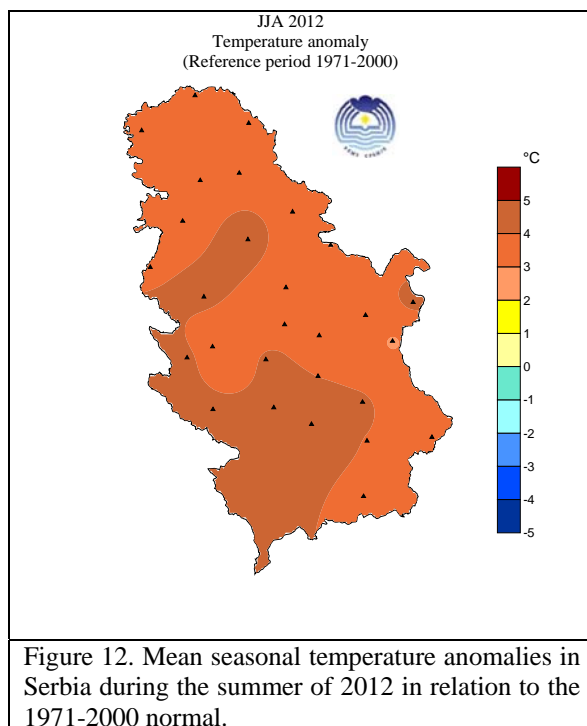
Analysis of the 2012 summer season for Serbia compared to the 1971-2000 climatological reference period

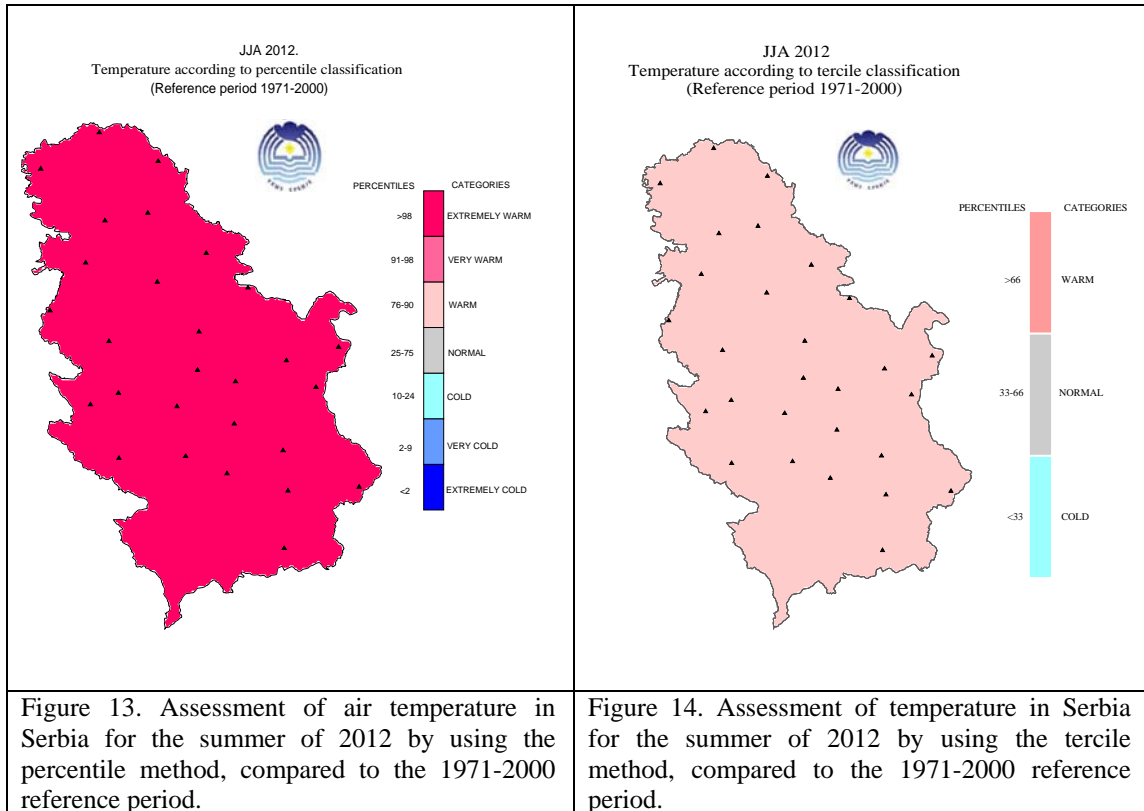
Temperature

Mean summer temperature anomalies (compared to the 1971-2000 reference period) ranged from 2.8°C in Zajecar (eastern Serbia) up to 4.4°C in Belgrade (*Figure 12*).

According to the percentile method, air temperature was in the extremely warm category in most of Serbia (compared to the 1971-2000 reference period) (*Figure 13*).

According to the tercile method, air temperature was in the warm category in entire Serbia (*Figure 14*).





Precipitation

Summer precipitation sum for 2012 was, in relation to the 1971-2000 reference period, below average in almost entire Serbia. The only exception was one station in north-eastern Serbia, where precipitation sum was within the range of normal values (*Figure 15*).

According to the percentile method, summer precipitation sum was in the extremely dry, very dry and dry categories in most of Serbia. The exception to that were some parts of eastern Serbia where precipitation sum was in the normal category (*Figure 16*).

According to the tercile method, precipitation sum was below normal in entire Serbia, except at one station in north-eastern Serbia, where it was within the range of normal values (*Figure 17*).

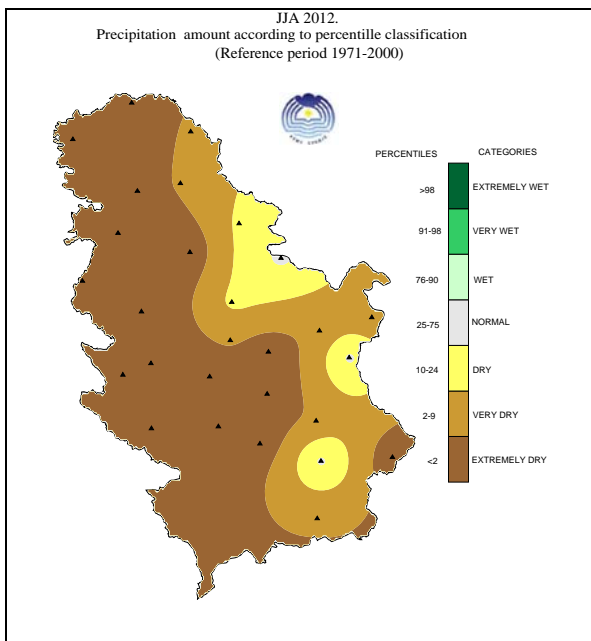
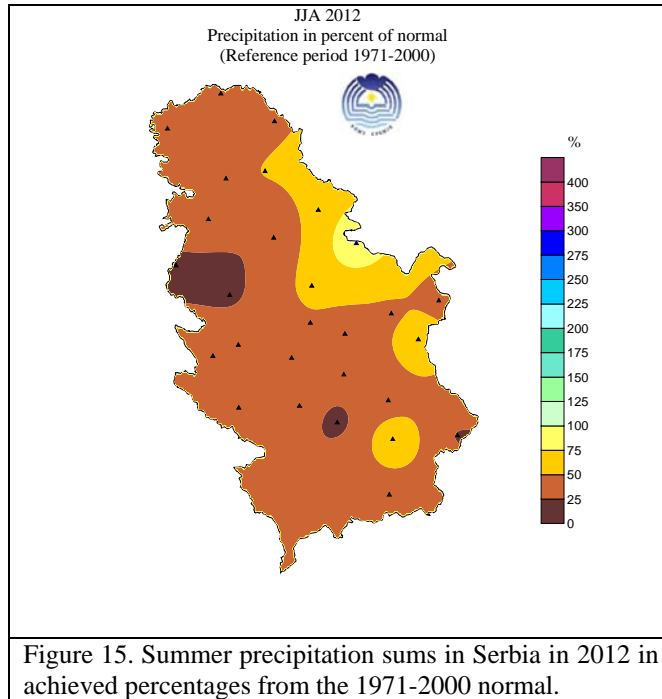


Figure 16. Assessment of precipitation sum in Serbia during the summer of 2012 by using the percentile method, in relation to the 1971-2000 reference period.

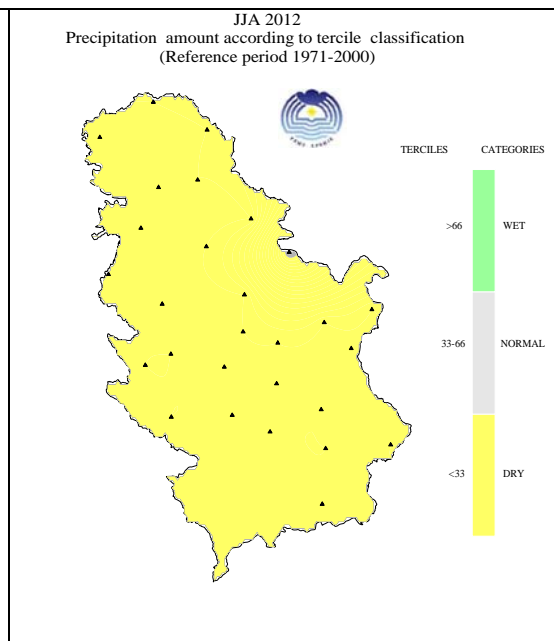


Figure 17. Assessment of precipitation sum in Serbia during the summer of 2011 by using the tercile method, in relation to the 1971-2000 reference period.

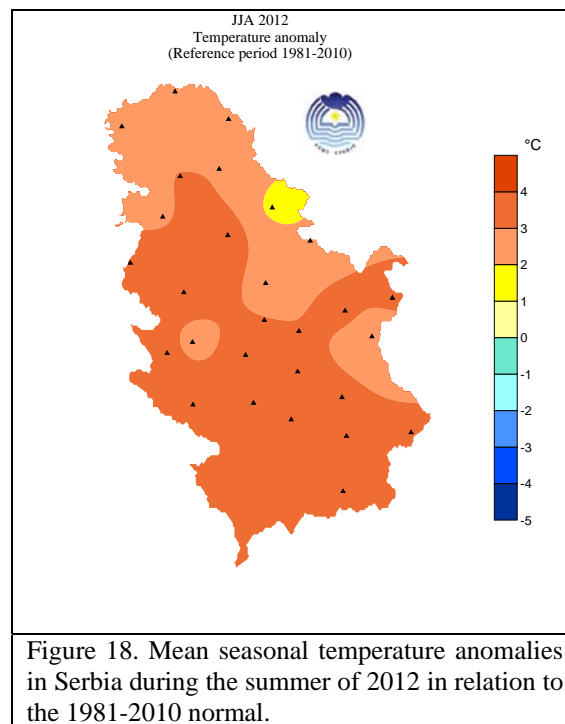
Analysis of the 2012 summer season for Serbia compared to the 1981-2010 reference period

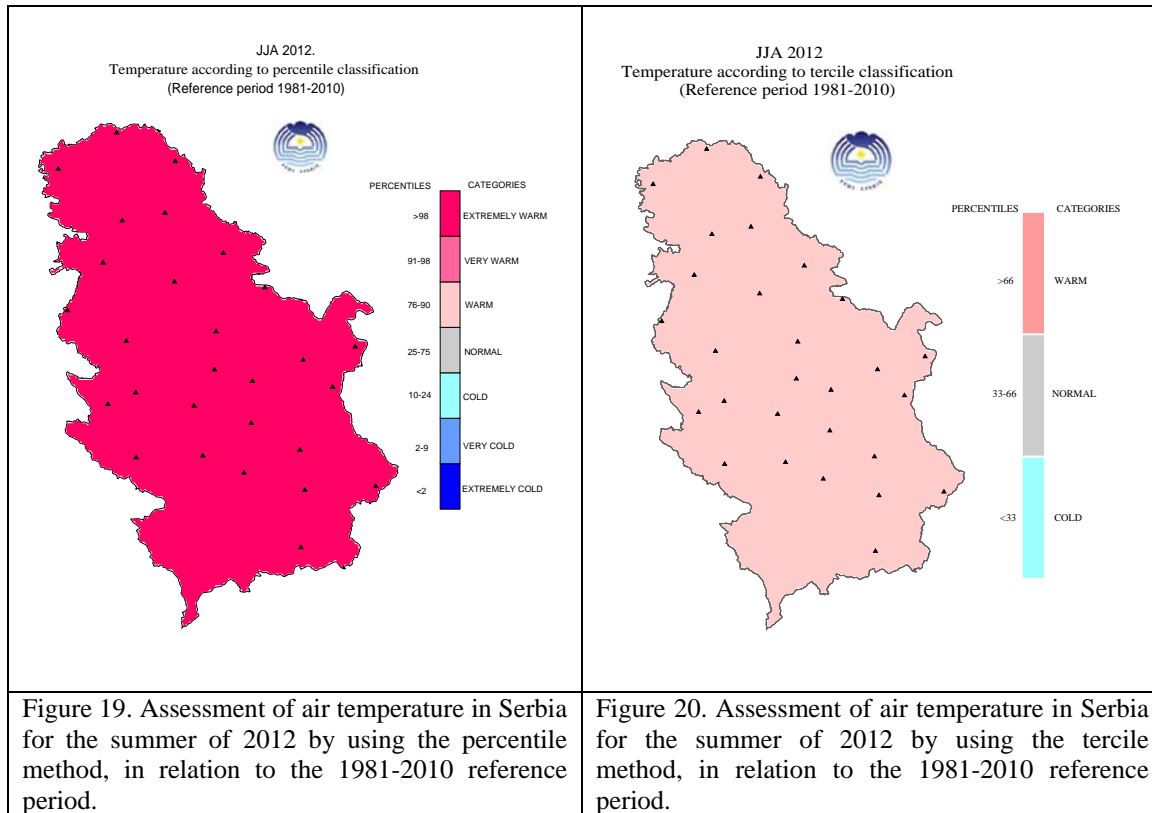
Temperature

Mean summer temperature anomalies (compared to the 1981-2010 reference period) ranged from 1.7°C in Banatski Karlovac (north-eastern Serbia) up to 3.7°C in Belgrade and Kursumlija (south-eastern Serbia) (*Figure 18*).

According to the percentile method, air temperature was in the extremely warm category in entire Serbia (compared to the 1981-2010 reference period) (*Figure 19*).

According to the tercile method, air temperature was in the warm category in entire Serbia (*Figure 20*).



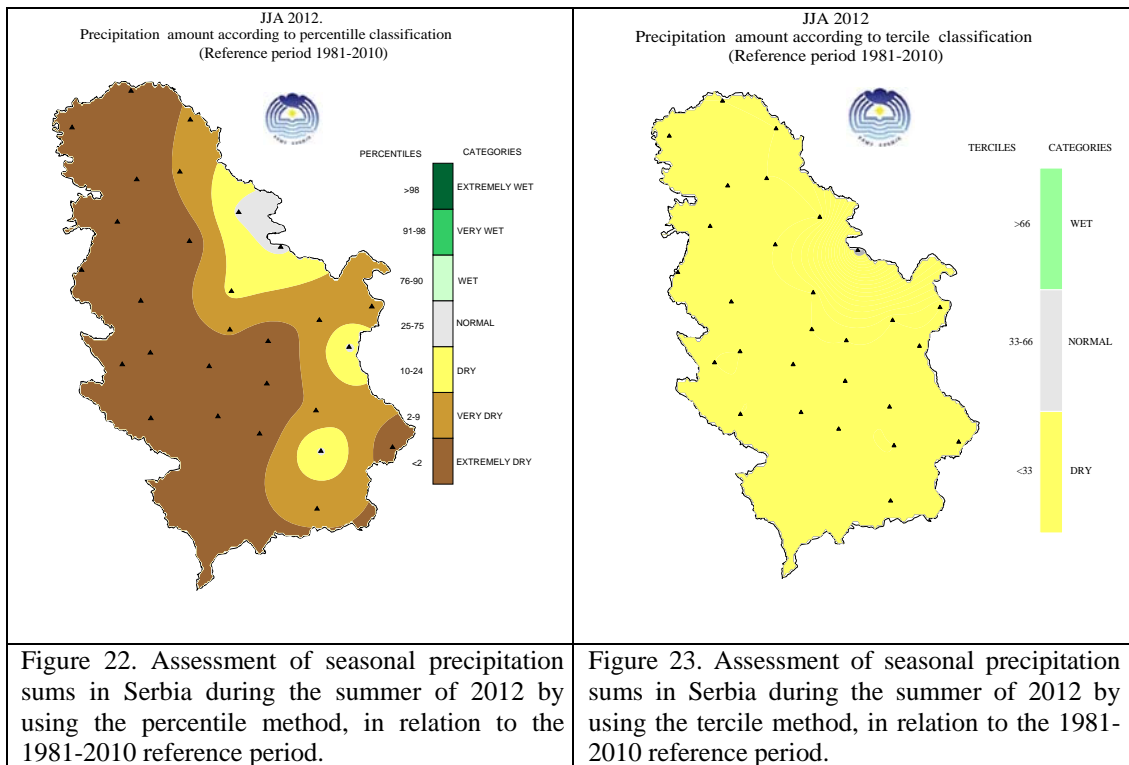
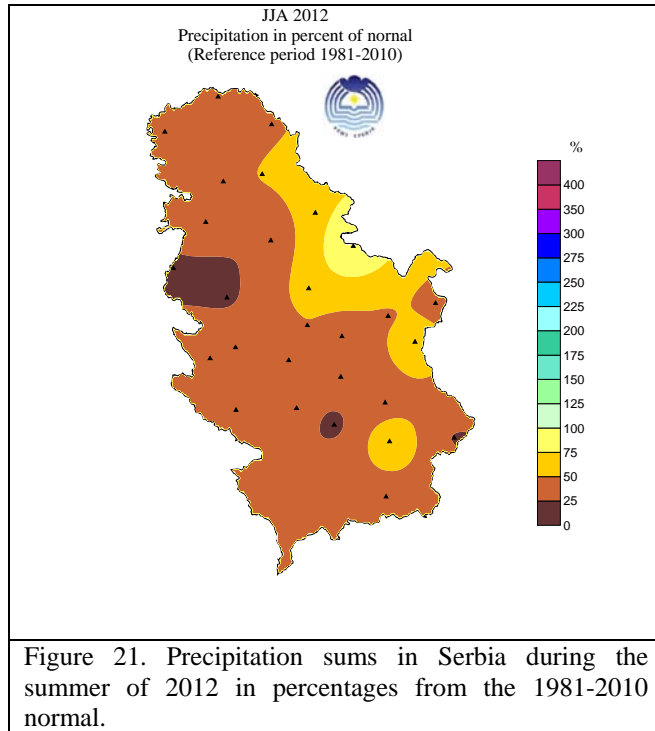


Precipitation

Summer precipitation sum for 2012 for Serbia was below average in relation to the 1981-2010 reference period. The only exception was one station in north-eastern Serbia, where precipitation sum was within the range of normal values (*Figure 21*).

According to the percentile method, summer precipitation sum was in the extremely dry, very dry and dry categories in most of Serbia. The exception to that were some parts in eastern and southern Serbia (*Figure 22*).

Analysis of summer precipitation according to the tercile method shows that precipitation sum was in the dry category in entire Serbia, with the exception of one station in north-eastern Serbia, where precipitation sum was in the normal category (*Figure 23*).



Drought in the year 2012 and its consequences

Very high air temperatures in June, July and August 2012, heat waves, and huge deficit of rainfall caused severe to extreme drought conditions on the territory of the Republic of Serbia. The areas most prolonged to drought were Vojvodina and central Serbia, except for a small part on the east of the country (South Banat and Branicevo) who had near normal moisture conditions (Figure 24).

The estimated yield crops, conducted by the Statistical Office of the Republic of Serbia, shows that the production of maize in the year 2012 decreased by 46% compared to the production in the previous year, 42% for soybeans, sunflower and sugar beet for about 23% and 32% for potatoes. Wheat production fell by 7% and forecasted decrease in fruit production by 40% for apple and 37% for plum. Grape production decreased by 12%. Total damages caused in crop and livestock production range in the interval from one to two billion U.S. dollars.

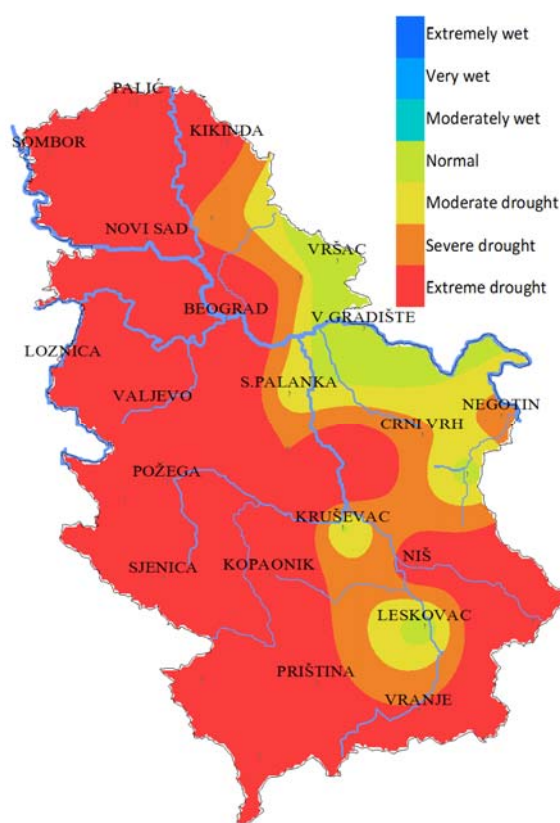


Figure 24. Three monthly Standardized Precipitation Index (SPI-3) for the period June-August 2012

Brief description of hydrological phenomena on rivers in Serbia during the summer 2012 (01st June – 31st August 2012)

Drought and heat waves during June-August 2012 was reflected in the hydrological situation in Serbia. Since mid-June, water levels in most rivers in the country were in decline, and by the end of June and beginning of July to the middle and lower basin water levels have crossed into the domain of low and very low for this time of year. Such hydrological situation remained until the end of August for most of the streams in the country.

During this period, flows have reached a very low value (so-called biological minimum), so that in most rivers unfavorable hydrological conditions prevailed from the standpoint of water quality (high temperature), poor water supply conditions and unfavorable conditions in terms of irrigation and water storage in reservoirs. The worst situation was in the watersheds of the Kolubara, Ljig, Lim, Lugomir, Banat rivers, Beli Timok, Vlasini, Veternica and Jablanica. During August, the Sava and the Danube water levels were below the low-level for navigation, which has greatly affected the navigation making it very difficult.

RHMS of Serbia has given timely notice of extreme hydrological phenomena, and during periods of low water levels all the necessary data, forecasts, warnings and outlooks were regularly submitted to all relevant institutions in the country, the media and general public.

Forest fires

The high temperature and rainfall deficits have caused very bad hydrological situation and the numerous forest fires during the summer.

In 2012, 18,115 fires were recorded in the open air, of which 20 large fires. During the above mentioned fires, 20238 hectares of forest, 8549 hectares of meadows and undergrowth, 260 hectares of orchards and vineyards and 1602 hectares of cereal crops were burned.

Approximately 700 firefighters were engaged in putting out fires every day.

In the open fires, 16 people died and 79 people were injured.