



Eighth Session of the SOUTHEASTERN EUROPE CLIMATE OUTLOOK FORUM

SEECOF-8 MEETING

DRAFT VERSION

ANALYSIS AND VERIFICATION OF SEECOF-7 CLIMATE OUTLOOK FOR 2012 SUMMER SEASON FOR SOUTH-EAST EUROPE (SEE)

CLIMATE OUTLOOK FOR 2012 SUMMER SEASON FOR THE SEE REGION

As stated in the SEECOF-7 Seasonal Climate Outlook for 2012 summer season over South-Eastern Europe Consensus Statement (document: <http://www.seevccc.rs/SEECOF/SEECOF7/STEP%203/Consensus%20Statement%20for%20the%20Climate%20outlook%20for%202012%20summer%20season.pdf>), in most of the SEECOF region (zone 1 in Figure 1) there was more likelihood for the above average summer season temperature, while in the western part of the Balkan Peninsula, eastern part of Turkey and southern parts of the Caucasus region (zone 2 in Figure 1), temperature was likely to be near- to above average. Uncertainties in regional predictions were larger for precipitation than for temperature. In the Pannonia Plain, most of the Balkan Peninsula, along the southern and western banks of the Black Sea and in the eastern part of the Caucasus region summer season precipitation totals were likely to be near or below average conditions (zone 1 in Figure 2). In the rest of the SEECOF region (zone 2 in Figure 2) uncertainty was large: probabilities for below-, near- or above-average conditions were approximately equal. It must be emphasized that it might have been possible that some parts, especially the mountainous areas, might locally have had above normal summer season totals, due to the episodes of the enhanced convection with high intensity rainfall. Climate outlook for the 2012 summer season for the SEE region is presented in Figure 1.

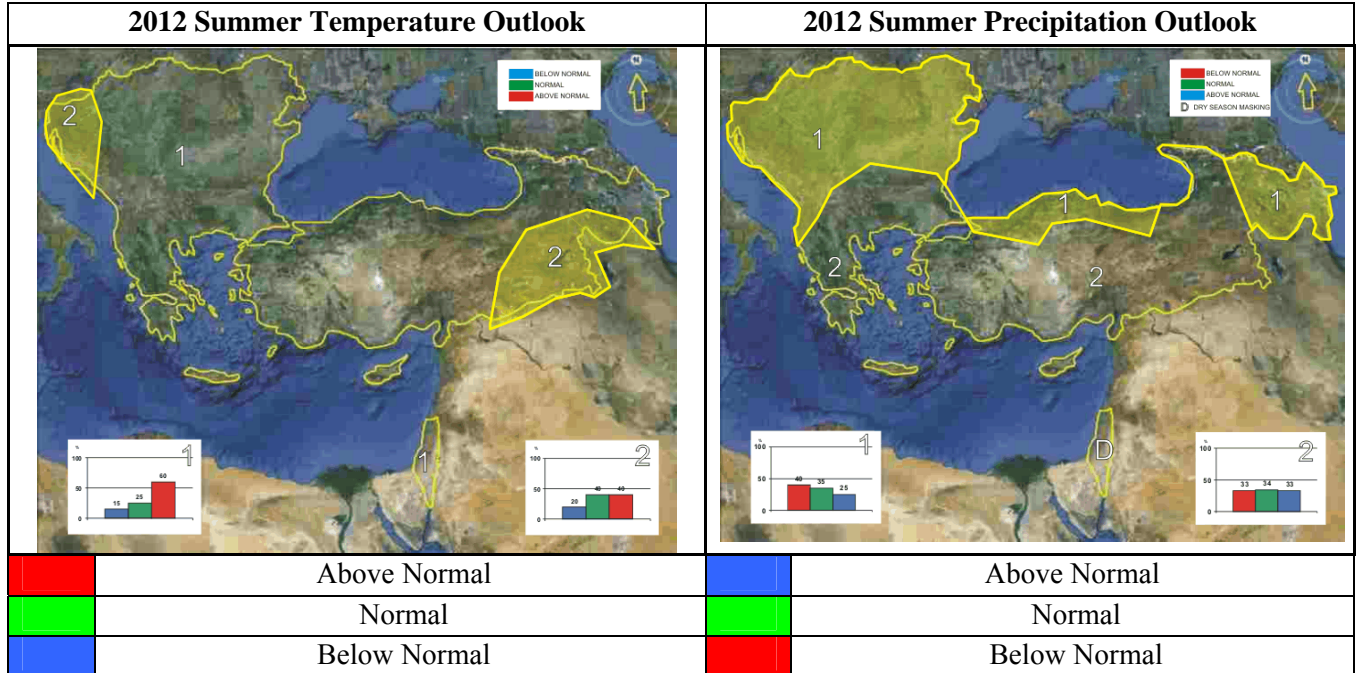


Figure 1. Graphical presentation of the climate outlook for 2012 summer season for the SEE region

SHORT ANALYSIS OF THE 2012 SUMMER SEASON FOR THE SEE REGION

Analyses of the summer season temperature and precipitation anomalies are based on:

- operational products of the European Climate System Monitoring – ECSM (the ECSM system is a technical platform of the DWD, WMO RA VI RCC Node on Climate Monitoring, <http://www.dwd.de/ecsm/>;
- seasonal bulletin on climate in the WMO region VI for the summer of 2012, (ECSM, DWD, WMO RA VI RCC Node on Climate Monitoring, <http://www.seevccc.rs/SEECOF/SEECOF-8/STEP1/Climate-Report-summer-season-2012-exp-RCC-CM.pdf> ,
- climate monitoring products of the South East European Virtual Climate Change Center - SEEVCCC (Member of the WMO RA VI Pilot RCC Node on Climate Monitoring, http://www.seevccc.rs/imgsrc/clim_mon/201208/ , and
- national climate monitoring reports of the following SEECOF-8 participating countries: Armenia, Azerbaijan, Bulgaria, Bosnia and Herzegovina (the Federation of Bosnia and Herzegovina and the Republic of Srpska), Croatia, Cyprus, Georgia, Greece, Israel, the FYR of Macedonia, the Republic of Moldova, Serbia and Turkey (documents available on: <http://www.seevccc.rs/SEECOF/SEECOF-8/STEP1/>).

In most of the Balkan Peninsula, except in Greece, summer 2012 has been among the top 5 hottest and driest summers in the last 60 years. In these areas, in the period from June 15th to August 31st, with a short break of 4 to 10 days, the summer was accompanied by the appearance of heat waves, and the number of summer days and tropical nights was surpassed in most places in the above mentioned region. During June, observed maximum air temperature in Moldova ranged between 37.2°C and 42.1°C, which happens once in every 30-60 years. The absolute maximum air temperature was recorded on August 07th in Falesti with the value of 42.4°C, while in Montenegro, in Podgorica, the recorded value of 43.9°C has been the second highest air temperature in the last 63 years. During July absolute maximum temperature was also recorded in Thission with the value of 36.9°C (in the series from 1897). In the rest of the SEECOF region summer 2012 was less warm and dry.

Summer season temperatures in the lowlands of most of the SEECOF area mostly ranged between 20°C and 25°C; along the coasts of the Mediterranean Sea and the seas surrounding the SEECOF area, as well as in the southern and in some parts of the central and eastern Balkans, in the eastern part of the Caucasus region and in Israel temperatures were between 25°C and 30°C, while they were below 15°C at some higher elevations. Summer season temperatures are presented in Figure 2 (left panel).

In most of the SEECOF region anomalies ranged between 1°C and 3°C; in the western and central parts of the Balkan Peninsula, as well as in some parts of the Carpathian region, anomalies were even higher, with values above 4°C. The exception occurred in the eastern part of Turkey, where anomalies ranged between -1 °C and 1°C.

The average number of summer days ($T_{max} \geq 25^{\circ}\text{C}$) was exceeded by 30 days in most of the Balkans, while in the central part of Romania and in eastern Bulgaria it was exceeded by 10-20 days. In most of the SEECOF region, the average number of tropical nights ($T_{min} \geq 20^{\circ}\text{C}$) was surpassed by 20 nights, and by even more than 40 nights in some parts of the north Adriatic, in Serbia, in the east of Romania and Bulgaria, in the south of Turkey and in Israel.

In most of the SEECOF region July was the hottest month during the summer season. In the almost whole Balkan Peninsula July mean monthly temperature anomalies were 4°C, with the values of mean temperature between 25°C and 30°C, and even higher, over 30°C, along the western coasts of the Aegean Sea. On the other side, in most of the Caucasus region and in the central and eastern Turkey, temperature was within normal values.

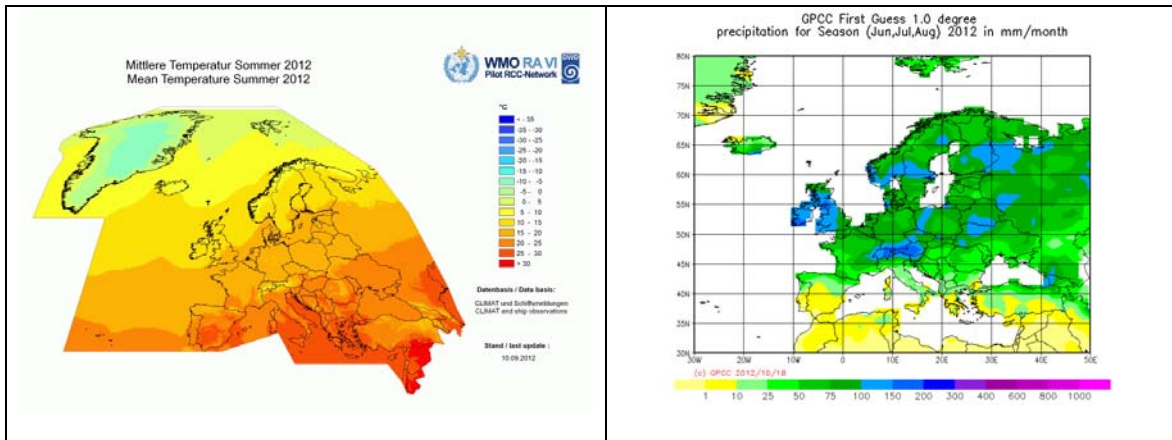


Figure 2. Summer season 2012 observed temperatures (left panel) and summer season observed precipitation in mm per month (right panel). Source: <http://www.dwd.de/ecsm>

The summer precipitation totals over the SEECOF region ranged from less than 10 mm in most of Greece and Turkey, in the central and eastern Mediterranean and in Israel, up to 100 mm in some parts of the Carpathian region, in the hinterland of the northeastern and eastern coasts of the Black Sea, and even much higher on local level. Precipitation anomalies were very diverse within the SEECOF area. It was considerably drier than normal (<75% of the long-term average) in most of the Balkans as well as in some parts in the northwest of Turkey, and drier than normal in the Caucasus region. In contrast, in some parts in the north and east of Turkey it was wet, while in the south of Greece, in the rest of Turkey, in Israel and in the central and eastern Mediterranean it was normally wet. Summer season precipitation anomalies are presented in Figure 3 (right panel).

During June in almost the whole SEECOF region it was considerably drier than normal, except in some parts of the western Balkans, along the southwestern coasts of the Aegean Sea and the northeastern coasts of the Black Sea. In July, the above mentioned precipitation tendency was the same in the greater part of the SEECOF region, while, in contrast to that, it was wet in some parts of Serbia, in most of the Caucasus region and in the eastern part of Turkey due to heavy rain events with thunderstorm and hail. August was also considerably dry in most of the Balkan Peninsula, in most of the Caucasus region, in the East Mediterranean and belonging coasts and in the south of the Turkey, while, due to convective activity, the exception to that were some parts in central Turkey and southern Greece, as well as the northeastern coasts of the Black Sea. During July and August several parts of Turkey and Azerbaijan were affected by floods.

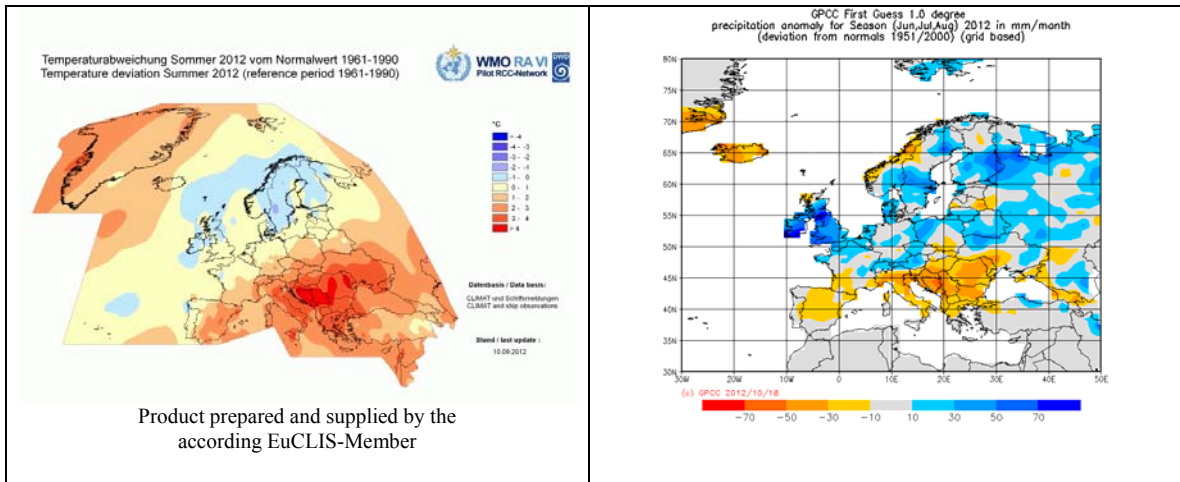


Figure 3. Summer season 2012 observed temperature anomalies (left panel) and summer season observed precipitation anomalies in mm per month (right panel). Source: <http://www.dwd.de/ecsm>

The whole Balkan Peninsula, influenced by a considerably warm and dry summer season, was affected by a huge number of forest fires which caused the loss of human lives and significant material damage. Huge material damage was also inflicted in the field of agriculture and water supply. For example, the estimation of total damage in Serbia caused in crop and livestock production ranged in the interval from one to two billion U.S. dollars. During summer, flows reached a very low level (the so-called biological minimum), so that unfavorable hydrological conditions in terms of water quality (high temperature), poor water supply conditions and unfavorable conditions in terms of irrigation and water storage in reservoirs prevailed in most rivers.

VERIFICATION OF CLIMATE OUTLOOK FOR 2012 SUMMER SEASON

The SEECOF-7 climate outlook for the 2012 summer season concluded that seasonal temperatures over most of the SEECOF region would be above normal, while in the western part of the Balkan Peninsula, eastern part of Turkey and southern parts of the Caucasus region, it would likely be near- to above normal. On the basis of the aforementioned regional, sub-regional and national climate monitoring products, it appeared that the monitored anomalies of mean summer season air temperatures were above normal over most of the SEECOF region, while they were clearly above normal in the far south-eastern part of Turkey. It means that climate outlook for summer season air temperature was correct.

According to SEECOF-7, the uncertainties in regional predictions should be larger for precipitation than for temperature. In the Pannonia Plain, most of the Balkan Peninsula, along the southern and western banks of the Black Sea and in the eastern part of the Caucasus region, summer season precipitation totals were likely to be near- or below-average conditions. In the rest of the SEECOF region the uncertainty was large: probabilities for below-, near- or above-average conditions were approximately equal. The monitored summer precipitation showed that most of these features were quite well

predicted. The exception to that were some parts on the southern banks of the Black Sea, where due to the episodes of the enhanced convection with high intensity rainfall, summer precipitation had values near- or above-normal conditions.

APPENDIX A: Contributors to the pre Pre-COF of SEECOF-8

- World Meteorological Organization
- Deutscher Wetterdienst, the Federal Republic of Germany
- South East European Virtual Climate Change Center hosted by the Republic Hydrometeorological Service of Serbia, the Republic of Serbia
- Royal Netherlands Meteorological Institute, the Netherlands
- Armenian State Hydrometeorological and Monitoring Service, the Republic of Armenia
- National Hydrometeorological Department, the Republic of Azerbaijan
- National Institute of Meteorology and Hydrology, the Republic of Bulgaria
- Meteorological and Hydrological Service, the Republic of Croatia
- Hellenic National Meteorological Service, the Republic of Greece
- Meteorological Service, the Republic of Cyprus
- Department of Hydrometeorology, the Republic of Georgia
- Israel Meteorological Service, the State of Israel
- Republic Hydrometeorological Institute, the Former Yugoslav Republic of Macedonia
- State Hydrometeorological Service, the Republic of Moldova
- Hydrological and Meteorological Service of Montenegro, the Republic of Montenegro
- Federal Hydrometeorological Service of the Federation of Bosnia and Herzegovina, the Federation of Bosnia and Herzegovina, Bosnia and Herzegovina
- Republic Hydrometeorological Service of the Republic of Srpska, Bosnia and Herzegovina
- Republic Hydrometeorological Service of Serbia, the Republic of Serbia
- Turkish State Meteorological Service, the Republic of Turkey

APPENDIX B: Analysis and verification of the SEECOF-7 climate outlook for the 2012 summer season:

Verification summary based on the national reports and contributions of the participants of Pre-COF of the SEECOF-8 meeting

Country	Seasonal temperature (JJA)		Seasonal precipitation JJA		High Impact Events
	Observed	SEECOF-7 climate outlook for temperature	Observed	SEECOF-7 climate outlook for precipitation	
Albania (1)		Above normal		Below normal to normal	No comment.
Armenia (1)	Above normal to normal	Above normal to normal	Below normal to normal Above normal (in mountainous parts)	Below normal to normal	No comment.
Azerbaijan (1)	Above normal	Above normal	Normal	Below normal to normal	<p>On June 15th mean daily temperature in Baku was 7.8°C above normal, while maximum air temperature measured 38.3°C, breaking the previous record of 36.0°C measured in 2010.</p> <p>On July 24th maximum air temperature in Baku reached 38.6°C, breaking the previous record of 36.8°C measured in 1966. During July heavy rainfalls caused flood in Terter and damaged infrastructure.</p> <p>During August maximum air temperatures were: in lowlands 37-42°C, in highlands 29-35°C, in Nakhchivan AR 36-43°C,</p>

					<p>in Baku and Absheron peninsula 35-40°C.</p> <p>On August 16th maximum air temperature in Baku reached 39.6°C breaking the previous record of 38.0°C, measured in 1913.</p>
<p>Federation of Bosnia and Herzegovina, Bosnia and Herzegovina (1)</p>	Above normal	<p>Above normal in the western part of the territory</p> <p>Above normal to normal in the eastern part of country</p>	Below normal	Below normal to normal	Summer 2012 was one of the four warmest and driest summers on record.
<p>Republic of Srpska, Bosnia and Herzegovina (1)</p>		<p>Above normal in the western part of the territory</p> <p>Above normal to normal in the eastern part of country</p>		Below normal To normal	No comment.
<p>Bulgaria (4)</p>	Above normal	Above normal	Below normal	No clear signal	<p>It should be said that the mean seasonal temperatures of summer 2012 are among the highest ever seen in Bulgaria at least since 1950.</p> <p>The month of July was also extremely hot in terms of mean monthly temperature, as well as monthly maximum</p>

					temperature. The dry and hot summer resulted in rather extreme fire weather conditions too. The fire season 2012 was very hard in Bulgaria. There was a large number of forest fires, some of which occurred in hard-to-access high mountain terrain.
Croatia (1)	Above normal	Above normal in the eastern and southern parts Above normal to normal in the rest of the territory	Below normal	Below normal to normal	No comment.
Cyprus (1)	Above normal	Above normal	Above normal	No clear signal	On June 21 st a severe tornado affected the area of Nicosia and Pyrgos Tillirias, while a severe hailstorm was recorded from Evrychou to Kakopetria and in Stavros Psokas. On June 24 th a storm with hail affected the areas of Odou and Farmakas, destroying tomato plantations, vineyards and fruits. On July 19 th a tornado affected the area of Psimolofou, causing damages to property. On August 8 th , severe rainfall with strong wind affected Nicosia, causing injuries and danger in some areas.
Georgia (1)	Above normal	Above normal	Near normal in the westernmost parts of the territory	No signal in the westernmost parts Below normal in the	On July 19 th and August 19 th heavy precipitation, hail and strong wind hit several regions of Georgia (Telavi 77 mm, Kvareli 57 mm), flooding streets and causing damage to buildings and agriculture.

			Below normal in the easternmost parts	easternmost parts of territory	
Greece (1)	Above normal	Above normal	Below normal	No clear signal	<p>In the area of Athens (the capital city of Greece), according to the Met. Station of Thission (WMO: 16714), mean Tmax=33.5°C (+3.7°C above normal) so that previous June was the second-hottest June in the series from 1897.</p> <p>For the area of Athens, in terms of mean maximum temperature, July 2012 was the hottest ever recorded. Specifically: at the Met. Station of Thission (WMO: 16714) mean Tmax=36.9°C (+4.6°C above normal), a record for this month in the series from 1897. Also, at the Met. Station of Hellinikon (WMO: 16716) mean Tmax=36.4°C (+4.8°C above normal), a record for this month in the series from 1955.</p> <p>Five heat wave episodes (Tmax ≥ 38°C) affected mainly the mainland, but also some islands. The heat wave episodes occurred during 13-14 June, 11-12 and 15-16 July, 6-9 and 23-27 August 2012.</p> <p>For example: a major 4-day heat wave episode occurred during period 6-9 August 2012, when many Met. Stations recorded daily Tmax above 42°C. Also, the period from 23-27 August 2012 was characterized by very high temperatures and many stations recorded daily Tmax = 40°C.</p> <p>June and July 2012 were very dry months with approximately zero rainfall for the most parts of Greece except for some specific areas over the northern mainland where the total amount of rainfall (due to thunderstorms and unstable weather conditions) was higher.</p>

Hungary (2)	Above normal	Above normal	Below normal	Below normal to normal	No comment.
Israel (5)	Above normal	Above normal	No comment	No clear signal	No comment.
FYR of Macedonia (1)	Above normal	Above normal	Below normal	Below normal	Maximum daily temperature for the FYR of Macedonia was recorded in Demir Kapija on August 7 th with the value of 43.9°C.
Republic of Moldova (1,2)	Above normal	Above normal	Below normal	Below normal to normal	In June, in most of the country, monthly mean air temperature was 2.9-4.4°C above normal with the values of 20.7-24.0°C, which is reported, in average, once every 30-60 years. Almost everywhere maximum air temperatures went up to 37.2-40.1°C, which was reported for the first time for June during the entire period of instrumental observations. The same situation occurred during July and the first decade of August. On August 7 th at meteorological station Falesti, the highest air temperature for Moldova for the entire period of instrumental observations was recorded, amounting 42.4°C, which was 0.9°C higher than the previous recorded maximum (2007). The quantity of rainfall during the summer period was basically from 70 mm to 145 mm (35-70% of the norm for both reference periods), values reported once in 5-15 years.
Montenegro (1)	Above normal	Above normal	Below normal	Below normal to normal	On a scale of highest summer temperatures, summer 2012 was the hottest in the larger part of Montenegro and the second in rank in Podgorica, in the coastal zone, and in Plav, where summer 2003 was the hottest on record. The temperature of 43.9°C recorded in Podgorica on August 7 th was the second highest temperature in the last 63 years. On a scale of lowest summer rainfall, summer 2012 was the driest in Kolasin, Zabljak, Cetinje and Berane, and second in rank in Bar, Pljevlja, Budva, Bijelo Polje and Plav, while in

					<p>other places it had the lowest amount of precipitation in the last ten years.</p> <p>The lack of rain has affected the water resources, and high temperatures contributed to the spread of fire, followed by a strong wind. The loss of 6,500 hectares of forests due to the fire was estimated at about 6 million Euros according to the information from the Ministry of Agriculture and Rural Development. The road Podgorica-Cetinje was periodically closed in order for fire trucks to come closer to the location of the fire in Dobrsko village.</p>
Romania (1,2)	Above normal	Above normal	<p>Above normal in southern and central parts</p> <p>Below normal over the western and eastern regions</p> <p>Normal elsewhere</p>	Below normal to normal	No comment
Slovenia (1)	Above normal to normal	Above normal to normal	Below normal	Below normal to normal	
Serbia (1,2,5)	Above normal	Above normal	<p>Below normal in most the of the country</p> <p>Normal</p>	Below normal to normal	<p>Summer 2012 was the warmest summer on record for 19 meteorological stations in Serbia, including Belgrade. Mean seasonal temperature ranged from 15.6°C on Kopaonik Mountain (central Serbia), up to 25.9°C in Belgrade, surpassing maximum mean summer temperatures on record for all meteorological stations. The number of summer days</p>

			<p>in the northeastern Serbia</p>	<p>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). The number of tropical days was also surpassed in the whole country. 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, which was 40 days above the average. The number of tropical nights 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.</p> <p>Summer 2012 was also one of the driest summers on record for Serbia. For example, in Belgrade it was the third driest summer in the history of instrumental measurements. The exception was the north-eastern part of Serbia, due to the fact that the absolute daily precipitation quantity maximum was surpassed in Veliko Gradiste on July 25th, by 152.8 mm.</p> <p>These unfavourable conditions caused total damages in crop and livestock production in the range from one to two billion U.S. dollars. There were also numerous forest fires, 20 of which were large ones. During the mentioned open fires, 16 people were killed, 79 people were injured, while 20238 hectares of forest, 8549 hectares of meadows and undergrowth, 260 hectares of orchards and vineyards and 1602 hectares of cereal crops were burned. Also, river flows reached a very low value (the so-called biological minimum), so that unfavourable hydrological conditions in terms of water quality (high temperature), poor water supply conditions and unfavorable conditions in terms of irrigation, energy sector and water supply prevailed in most rivers.</p>
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<p>Turkey (2)</p>	<p>Above normal in most of the territory</p> <p>Near normal in the eastern part of the territory</p>	<p>Above normal in most of the territory</p> <p>Above normal to normal in the south-east of the territory</p>	<p>Below normal in most of the territory</p> <p>Above normal in some parts in the south and along the coast of the Black Sea and in the hinterland country</p>	<p>No clear signal in most of the territory</p> <p>Below normal to normal along the coast of the Black Sea and in the hinterland</p>	<p>Absolute temperature maximum was recorded in June in Antakya (43.2°C), Osmaniye (42.6°C) and Kilis (42.5°C); in July in Elmali (39.2°C), Emirdag (40.7°C) and Aksehir (39.3°C); and in August in Akcakoca (36.6°C), Edirne (41.9°C) and Uzunkopru (41.2°C).</p> <p>During July heavy rain and thunderstorm caused floods in Samsun and Sinop with 9 casualties and heavy material damage. The situation was the same in August when floods caused heavy damage in Samsun Istanbul, Sinop, Erzurum and Mugla.</p>
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Note:

- 1 - Basic climatological period (1961-1990)
- 2 - Basic climatological period (1971-2000)
- 3 - Basic climatological period (1951-2000)
- 4 – Basic climatological period (1980-2009)
- 5 – Basic climatological period (1981-2010)
- 6 – No information about basic climatological period