



**Twenty-fourth Session of the
SOUTH EAST EUROPEAN CLIMATE OUTLOOK FORUM
DRAFT
SEECOF-24 ONLINE MEETING**

**ANALYSIS AND VERIFICATION OF THE SEECOF-23 CLIMATE OUTLOOK
FOR THE SUMMER OF 2020 FOR SOUTH-EAST EUROPE (SEE)**

As stated in the SEECOF-23 Consensus Statement on the Seasonal Climate Outlook for the 2020 Summer Season over South-East Europe (document:

<http://www.seevccc.rs/SEECOF/SEECOF-23/STEP-3/Consensus%20Statement%20SEECOF-23.pdf>)

the observed sea surface temperature along the most of the Tropical Pacific was slightly above normal (neutral El Nino conditions), with higher anomalies over the western part of the basin. Cold anomalies in subsurface suggested that development of La Nina event had started, which was supported by most of the models. However, the majority of models predicted normal conditions during period June-August 2020. Indian Ocean Dipole was neutral, but it was forecasted to become negative during summer. Atmospheric response was consistent over tropics, but less clear over North Atlantic and Europe, with differences among models. In general terms, they seemed to favour higher pressures over Central and Southern Europe, and more intense westerlies over Northern Europe. Some parts of Central Europe and the Balkan Peninsula had experienced significant drought over the previous few months, with soil moisture below normal in May. In case of anticyclonic situations, a dry soil could have enhanced the risk of the onset of heat waves.

Summer temperature was expected to be above-normal in the whole SEECOF region. Probability for the above-normal summer temperature was decreasing across the SEECOF region spanning from northern-northeastern toward southeastern parts. There was high probability for above-average summer temperature (zone 1 in Figure 1, left) relative to the continental parts of Turkey and South Caucasus region (zone 2 in Figure 1, left).

The uncertainty for precipitation was high for the South Caucasus region, most of the continental parts of Turkey and northern parts of Ukraine (zone 2 in Figure 2, right) –with approximately equal probabilities for below-, near-or above normal-averages of summer precipitation sums. In contrast, most of the SEECOF region was likely to experience a precipitation deficit (zone 1 in Figure 2, right).

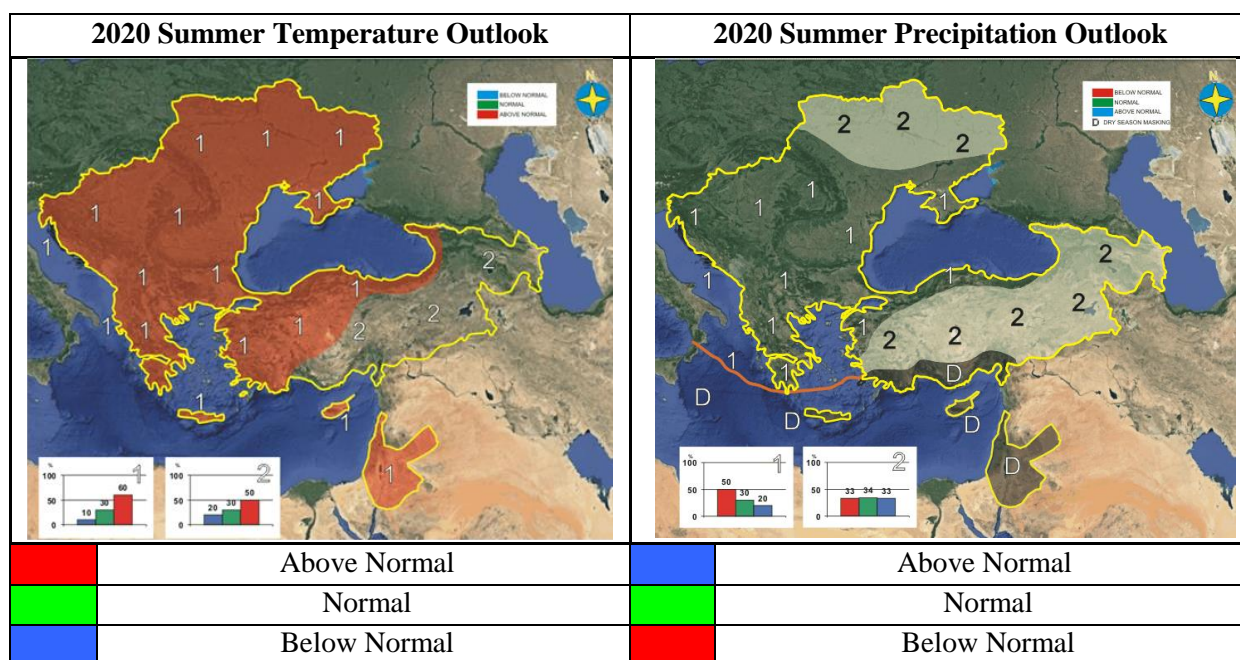


Figure 1. Graphical presentation of the Climate Outlook for the 2020 Summer Season for the SEE Region

ANALYSIS OF THE SUMMER 2020 FOR THE SEE REGION

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

- operational products of the RCC Node-CM (Regional Climate Centre on Climate Monitoring) provides maps for the World Meteorological Organization (WMO) Region VI (Europe and Middle East), http://rcccm.dwd.de/DWD-RCCCM/EN/products/europe/europe_node.html
- seasonal bulletin on climate in the WMO Region VI for the summer of 2020 (WMO RA VI RCC Node-CM, DWD), http://www.seevccc.rs/SEECOF/SEECOF-24/STEP-1/SEECOF_Verification_JJA_2020_RA%20VI_RCC-contribution.pdf
- Global Climate Bulletin (Meteo France), http://www.seevccc.rs/SEECOF/SEECOF-24/STEP-2/RCC_bulletin-Meteo-France-10-2020.pdf
- climate monitoring products of the South East European Virtual Climate Change Center – SEEVCCC (Member of the WMO RA VI RCC Node-CM), http://www.seevccc.rs/imgsrc/clim_mon/202008/
- National climate monitoring reports of the following SEECOF-23 participating countries: Armenia, Bosnia and Herzegovina/Federation of Bosnia and Herzegovina, Republic Srpska/BH, Bulgaria, Croatia, Cyprus, Georgia, Greece, Israel, Republic of North Macedonia, Republic of Moldova, Montenegro, Serbia, Slovenia, Turkey and Ukraine are available on: <http://www.seevccc.rs/SEECOF/SEECOF-24/STEP-1/>

Almost the entire SEECOF region, apart from some parts of the Balkans and Turkey, observed above-normal summer temperatures. Temperature anomalies reached up to +2°C above normal relative to the 1981-2010 base period in most of the SEECOF region. In northern Ukraine, they reached up to +3°C above normal. The summer temperature anomalies are shown in Figures 4 and 5 (left panel).

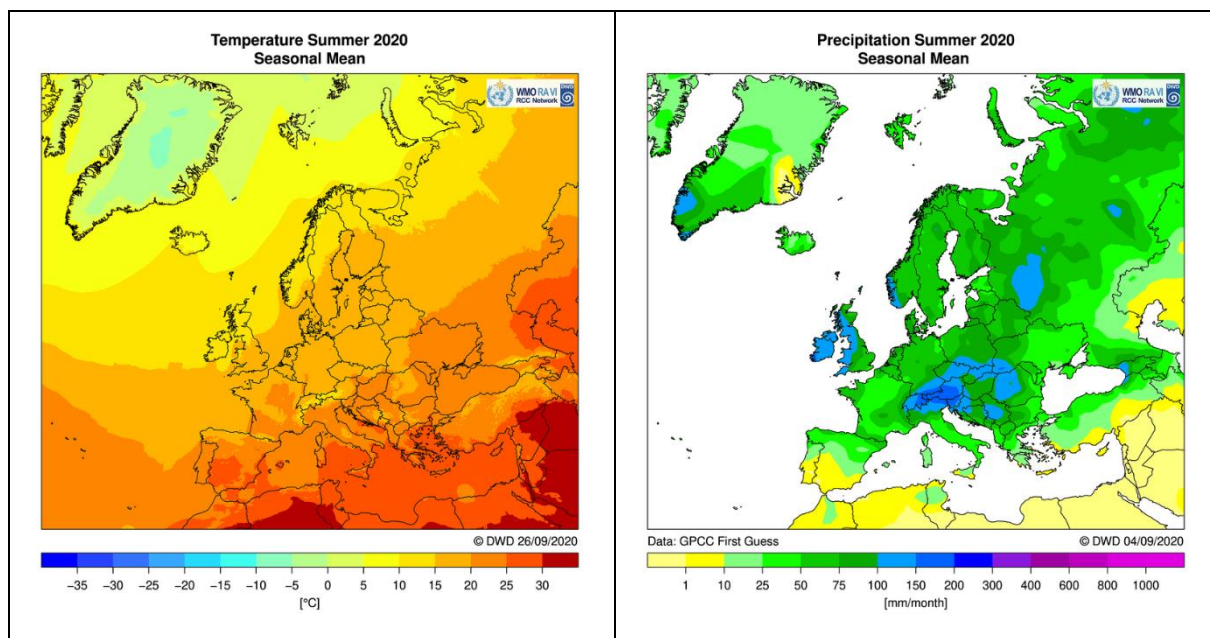


Figure 2. Summer season 2020, Europe – observed temperatures (left panel) and observed precipitation in mm per month (right panel). Source:

https://www.dwd.de/EN/ourservices/rccm/int/rccm_int_ttt.html (left panel)

https://www.dwd.de/EN/ourservices/rccm/int/rccm_int_rrr.html (right panel)

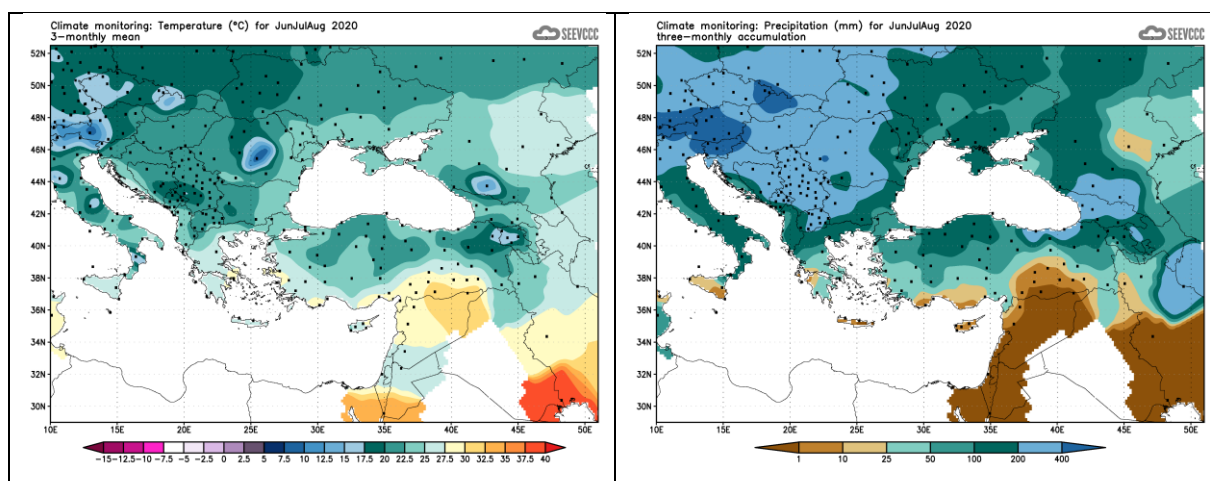


Figure 3. Summer season 2020, SEECOF region – observed temperature (left panel) and observed precipitation (right panel). Source: <http://www.seevccc.rs/?p=6>

Seasonal precipitation was characterized by positive anomalies (more than 125% of the long-term average) in central and southern Balkans, western and eastern Turkey, western Ukraine and Azerbaijan. It was drier than normal (less than 75% of the long-term average) in the western Balkans, Moldova, most of Ukraine, Cyprus, southern Turkey and some parts of the Middle East. The summer precipitation anomalies are presented in Figures 4 and 5 (right panel).

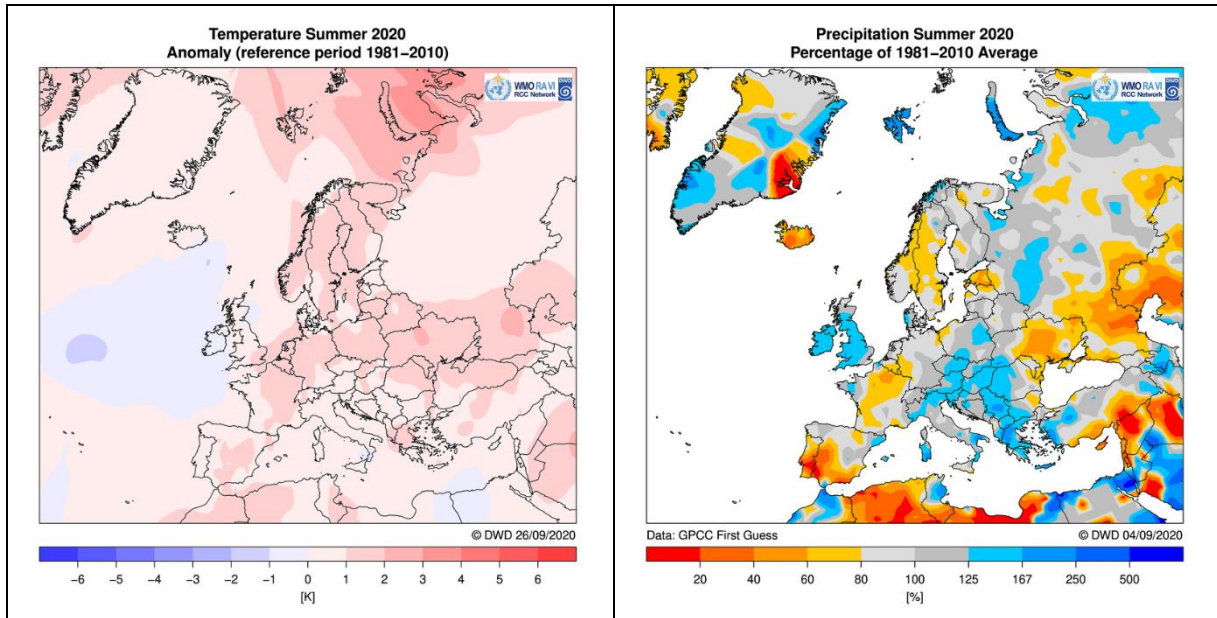


Figure 4. Summer season 2020, Europe – observed temperature anomalies (left panel) and observed precipitation anomalies in percent of 1981-2010 normal (right panel). Source: https://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_ttt.html (left panel) https://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_rrr.html (right panel)

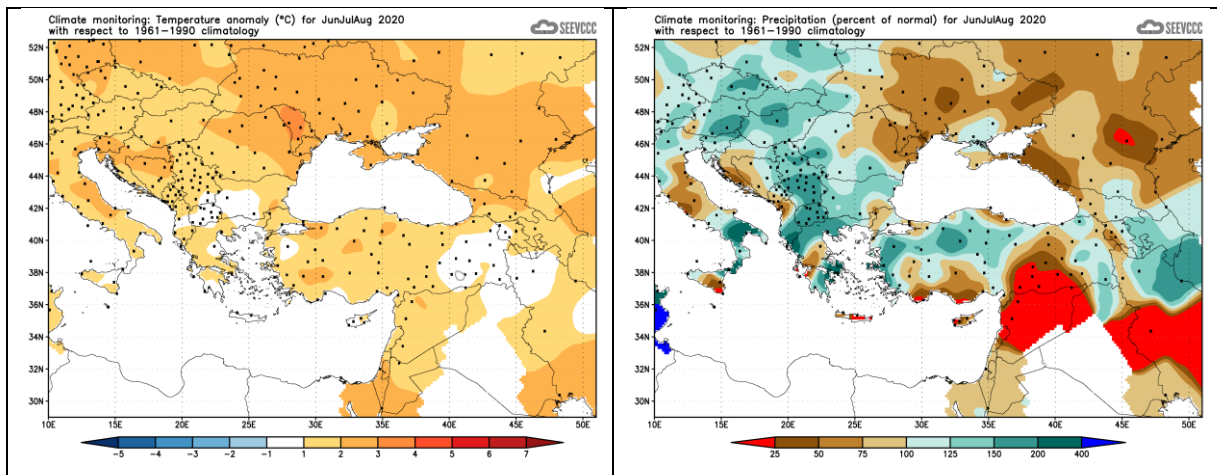


Figure 5. Summer season 2020, SEEVCC region – observed temperature anomalies (left panel) and observed precipitation anomalies in percent of 1961-1990 normal (right panel). Source: <http://www.seevccc.rs/?p=6>

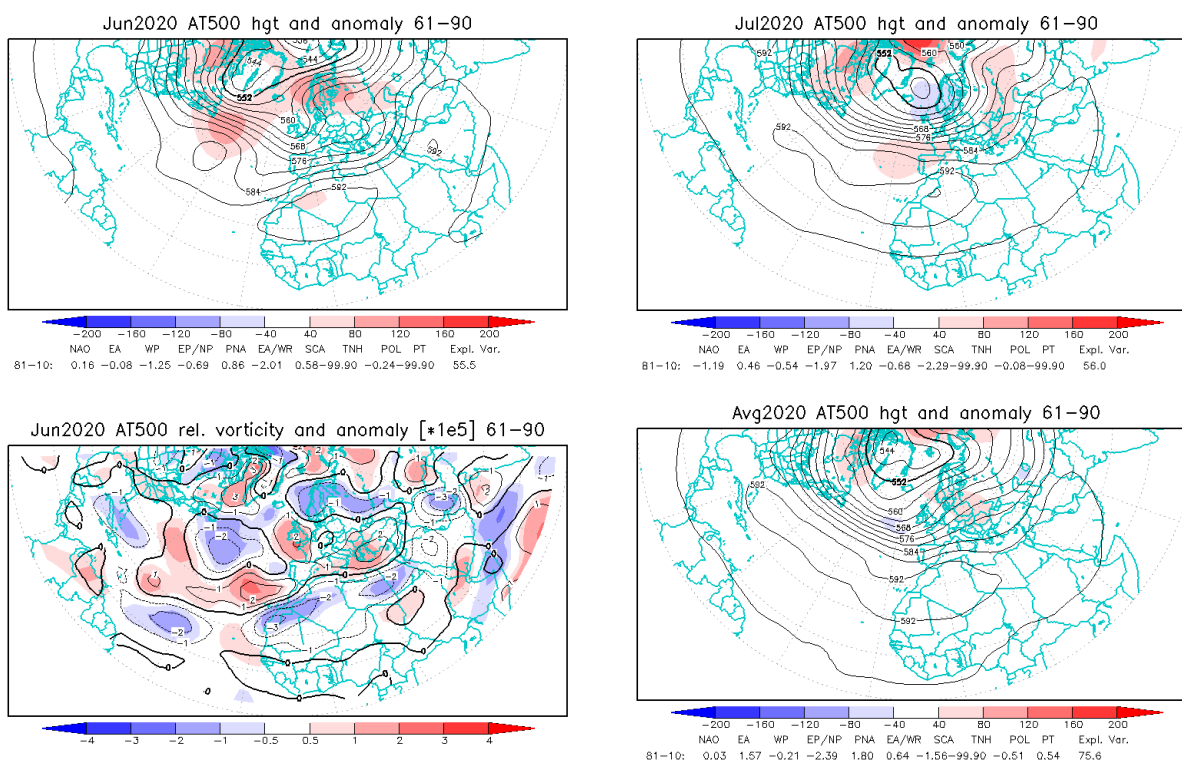


Figure 6. Geopotential height and its anomaly for 500 mb (upper left) and teleconnection indices in June, relative vorticity and its anomaly at 500 mb (lower left) in June, geopotential height and its anomaly for 500 mb (upper right) and teleconnection indices in July, geopotential height and its anomaly for 500 mb (lower right) and teleconnection indices in August 2020

Not a typical summer with high pressure dominant over northern and eastern Europe and lower than usual over the Balkans during early summer. Consequently, wetter conditions were over the Balkans and dry in Moldova and Ukraine.

VERIFICATION OF CLIMATE OUTLOOK FOR THE 2020 SUMMER

Summer 2020 temperature was in the above-normal category in almost entire SEECOF region, consequently, the outlook was correct. The exceptions are some parts of the Balkans and Turkey, where observed summer temperature was within the normal category, up to +1°C above the average.

Regarding the summer precipitation anomalies, outlook was not correct for most parts of the SEECOF region. The outlook was correct for Ukraine, Moldova, Bulgaria, Cyprus, Georgia and some parts of Turkey, where below normal seasonal precipitation sums were indicated.

APPENDIX A: Analysis and verification of the SEECOF-23 climate outlook for the 2020 summer season:

Verification summary based on the national reports and contributions of the participants of Pre-COF of the SEECOF-24 meeting

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	SEECOF-23 climate outlook for temperature	Observed	SEECOF-23 climate outlook for precipitation	
Armenia (1)	Above normal	Above normal	Below normal (90 % of the norm)	No predictive signal	<p>Extreme precipitation (41mm/3hour) on 19th of June in Gekharquniq region, (51mm/4.5 hour) in Lori region, 81mm/3.25hour in Gyumri (13.VII), 34mm/5hour in Syuniq region was recorded.</p> <p>Hail: Unusual hail in Shirak region, Flooding in Gyumri: (https://www.youtube.com/watch?v=38FZUW1fywQ) Forest fires: On June, a large fire broke out in Khosrov reserve, burning specially protected areas.</p> <p>Cold wave: In August 21-28 a cold wave was registered, particularly severe in the south-eastern regions. The minimum temperature of 0°C was recorded in Ashotsk in those days, 1°C in Martini, - 1°C in Pushkin mountain pass, which are the lowest temperatures ever recorded in August in these areas.</p> <p>Drought: during summer, severe drought was observed in lowland areas. Wind storm: During summer strong wind above (25m/sec) was observed, in Vaanadzor it is unusual for summer time.</p>

Federation of Bosnia and Herzegovina, Bosnia and Herzegovina (1)	Above normal in almost entire Bosnia and Herzegovina (very warm and extremely warm)	Above normal (10, 30, 60) In Bosnia and Herzegovina)	Below normal southwest Bosnia; Normal and above normal Central, West, East and South Bosnia and Herzegovina.	Below normal (50,30,20)	- July 25 th : 63 mm – 1 hour. - August: Extremely warm for 60-70% territories
Republic of Srpska, Bosnia and Herzegovina	Normal to above	above	Normal to above	Bellow	No high impact events.
Bulgaria (1)	Near or above normal	Above normal	Near or below normal	below normal	Drought conditions in East Bulgaria are the most prominent particularity of summer 2020. June was actually wetter month and there were days with heavy rain and landslides, thunderstorms and hailstorms (9-10 and 14-15 June). July however was wet in West Bulgaria and very dry in East Bulgaria. There was an undergoing drought since the summer of 2019 and in July it re-emerged in East Bulgaria despite the rain in June. August was similar to July with rain in the west and rather dry conditions in the east of the country. The wildfire season strengthened in east Bulgaria in August due to the drought.

Croatia (1, 5)	Normal and Above normal	Above normal (10,30,60)	Normal (in the most part of Croatia) Below normal (part of Dalmatia) Above normal (part of the Istra, Gorski Kotar, northwestern and small part of eastern Croatia)	Below normal (50,30,20)	<p>Two heat waves were observed during summer – the first one at the end of July and the second one around the middle of August. Along the Adriatic coast the heat wave was mainly due to the high minimum temperature.</p> <p>There were no temperature records observed.</p> <p>In all three months convective related severe weather phenomena (thunderstorms, hail, heavy rains, flash floods, waterspouts) were observed mostly all over Croatia: - on June 8th, the maximum daily amount of precipitation was observed in Istra (82 mm of rain fell in just 5 hours in Pazin) - on July 24th the extreme 1 hour amount of precipitation was recorded at Zagreb Grič (58,9 mm).</p> <p>An urban flood occurred in Zagreb during the night (24/25 July). In the period from June 24th at 12 UTC to June 25th at 12 UTC the amount of precipitation exceeded multi-annual average in July (which is 77 mm) - on August 5th (at 06 UTC) high precipitation amounts (in 24 hours) were measured in almost whole Croatia.</p>
Cyprus (5)	June Normal July Normal to Above Normal August Normal to Above Normal	June Normal July Normal August Normal	June Below Normal July Below normal August Below Normal	June Below Normal July SWest part below Normal, NEast part above Normal August Below Normal but West and North part normal	<p>June</p> <p>Both maximum and minimum temperatures were around normal, suggesting that June was almost a normal month. Extremes were also recorded with great positive departures, like Athalassa station where the maximum for the station was 40.5°C departing 6.5°C from the normal (36°C), and at Achna station, where the maximum temperature of the station was 36.9°C, surpassing by 5.9°C of the normal of 31°C. For the period 27-29 of June EMMA yellow warnings were issued, concerning high temperature. July In a more detailed evaluation of the recorded temperatures, maximum (table below), was around and above normal. Concerning the</p>

					<p>minimum (table below), was around normal. Above normal daily maximum temperatures (deviating by 4°C or more from normal) were recorded, like the highest daily maximum temperature of Prodromos that was 34.5°C (with a normal of 27.9°C). Highest daily minimum temperatures were also recorded, with positive departures greater than 4°C, like the station of Polis Chrysochous where a minimum of 25.6°C was by 4.5°C above station's normal (21.1°C). It is especially useful to add that Athalassa station on July 2020 recorded the highest mean maximum temperature (39.7°C) since 1982. During July EMMA warnings with yellow awareness level were issued, concerning extreme high temperatures on 3, 4, 6, 11, 12, 13, 14, 15, 20, 21, 22, 24, 25, 27 and 28 of July and with orange awareness level on 5, 29, 30 and 31 of July</p> <p>On the 10th, 12th, 13th, 14th και 15th of July isolated showers resulted in accumulated precipitation of 29% of normal.</p> <p>August</p> <p>Almost all the mean daily maximum temperatures were above normal, whereas almost all of the mean daily minimum temperatures were around normal. It is noteworthy that during summer months, precipitation results mainly from thundery activity which has very localized characteristics and a quantitative judgment is very difficult due to model's limitations. Extremes were also recorded with positive departures greater than 4°C, like Athalassa station where the highest daily maximum temperature (44.5°C) was 7.6°C greater than normal (36.9°C) and Prodromos station, where the highest daily maximum temperature (37°C) was 9°C greater than normal (28°C). For the dates 1, 2, 4, 5, 13-19 and 29 of August EMMA yellow warnings were issued, while for</p>
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					the dates 6 and 30 EMMA orange warnings were issued and the 31st of August EMMA red warning was issued. All the above warnings concerned high temperatures. On the 3rd, 4th and 12th of August episodes of local showers resulted in accumulated precipitation of 0.3mm (15% of normal).
Georgia (1)	Above normal	Above normal	Near the normal and below the normal for all Georgia	No Signal	No high impact events
Greece (2, 5)	Above normal (relative to the period 1971-2000) for most of the country	Above normal for the whole area of Greece.	Above or near to normal values (1971-2000) for the most of the country with the greater values occurring in in west Macedonia, in the north Ionian Sea, in Attica and in the east Peloponnes.	Below normal for most of Greece.	Seven people including an 8- month-old baby lost their lives in heavy flooding caused by thunderstorms and torrential rains that swept the Greek island of Evia on 8th August 2020. The flooding blocked roads and damaged houses on the island, north-east of Athens. Dozens of people were evacuated from affected areas.
Israel (5)	Above normal	Above normal (10, 30, 60)	Dry seasonal mask	Dry seasonal mask	No high impact events
Republic of North Macedonia	Normal	Above average (20, 30, 50)	Above normal - variable	No predictive signal (33, 34,	July - Exceeded daily precipitation 53.6mm on 5th in Bitola

(5)			precipitation regime	33)	
Montenegro (1,5)	Above normal	Above normal (10, 30, 60)	Below normal (dry in the central and southern area) Normal in most of the country Above normal (NW-NE belt of northern mountainous region)	Below normal (50,30,20)	<p>Pljevlja: new record of 175.6 mm in August 2020; 05.08.2020- Stormy wind and heavy precipitation in Podgorica and along the coast caused damages on the trees, streets were flooded and traffic was disrupted.</p> <p>https://www.kurir.rs/region/crna-gora/3509363/jako-nevreme-pogodilo-deo-crne-gore-u-podgorici-poplavljene-ulice-olujni-vetar-lomio-stabla-video</p>
Republic of Moldova (5)	Above normal	Above normal	Below normal	Below normal	<p>During the summer season, stinging meteorological phenomena were reported in the form of torrential rains and hail (June, July), which caused damage to crops and damage to the objects of the national economy.</p> <p>The exceptionally warm weather and significant deficit of precipitation, which was observed on the territory of the Republic of Moldova for most of the summer (July-August) contributed to the pedological and atmospheric drought.</p> <p>Due to the dry conditions, which were maintained during much of July and August in a large part of the country, unfavorable conditions were reported for the formation of corn, sunflower, sugar beet, as well as for the growth and development of vegetable crops and other crops.</p>

Serbia (1,5)	Above normal / Normal	Above-normal (10, 30, 60) in entire Serbia	Above normal in almost entire Serbia	Below-normal (50, 30 20) in entire Serbia	<p>* Summer 2020</p> <p>The 2nd wettest summer for Serbia in the last 70 years. The wettest summer for Nis and Kopaonik, 2nd wettest for Sjenica, Krusevac and Leskovac. Record-breaking daily precipitation sums for Kopaonik and Sjenica. Record-breaking number of summer days with the precipitation sums above 20 mm in Sjenica and Nis, and above 50 mm in Kraljevo and Kopaonik.</p> <p>* June Record-breaking daily precipitation sums in Kragujevac on June 11 and in Nis on June 16. Maximum number of days with precipitation above 20 mm exceeded at Zlatibor.</p> <p>* August Wettest August in Sjenica since record-keeping began.</p>
Slovenia (5)	Warmer than normal	Warmer than normal	wetter than normal, except in the central, east and parts of north-east where normal, and south-east where drier than normal	drier than normal	<ul style="list-style-type: none"> • Intense high precipitation supercell storm in Domžale (10 km north-east from Ljubljana) and surroundings on 29 July. Extreme rainfall at places (> 50 mm/hour), giant hail (hailstones larger than 5 cm in diameter, some pieces 10 cm or even more), • Fast moving (25 m/s) supercell storm caused damage in a long stretch in eastern Slovenia (area from Radeče to Ormož, around 46.25°N, 15.63°E) on 30 August. Medium to large size hail and severe wind gusts (Lisca officially 25.6 m/s, Rogaška Slatina 21,1 m/s; locally more than 28 m/s), • Brief, but intense hailstorm (5–10 minutes at places) in Kras (Tomaj and surroundings, about 45.76°N, 13.86°E) on 30 August. Verification of the SEECOF-23 Climate Outlook
Turkey (2)	Near and above normal	Above normal	Above normal at western and	No clear signal for most of the	On June 21, heavy rain and flood caused 6 casualties and also adversely affected agriculture areas in Bursa province

			<p>eastern Black Sea coast of the Turkey</p> <p>Below normal at southeastern part of the Turkey</p>	<p>country – Above normal northern part of the Turkey</p>	<p>(Wester part of Turkey - Marmara Region).</p> <ul style="list-style-type: none"> • On August 22, a flood occurred in Giresun province (Eastern Black Sea Region) and its districts. 10 casualties and many buildings were destroyed or damaged. • July 2020, was the sixth hottest July in the 50 years long term period (1971-2020).
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Ukraine (5)	Above normal	Above normal	below normal (56% stations) normal (23% stations) above normal (21% stations)	below normal 33% normal 34% above normal 33% south southwest above 50% normal 30% below 20%	<p>During June and July meteorological extraordinary phenomena were observed in many regions of the country. In June, heavy rains and showers (30-62 mm precipitation per 1-10 hours), squalls (speed 25-29 m/c) were recorded</p> <p>22-23/06 in Carpathian region were recorded long heavy rains 100-158 mm per 11-23 hours.</p> <p>During the rainy periods from 21 to 25 June, hydrological posts recorded the amount of precipitation in range from 100 to 400 mm. These rains caused catastrophic floods in Lviv, Ivano-Frankivsk, Chernivtsi, Zakarpattia regions, resulting with 3 casualties and flooding of 250 settlements. Agricultural lands were flooded, private houses, were destroyed and partially damaged farms, roads, bridges, shore protection, dams. In July, heavy rains (30-60 mm precipitation per 2-9 hours), heavy showers (30-56 mm per 1 hour, squall (speed 27 m/c) were recorded. Unfavorable weather conditions locally caused disruptions in power, telecommunications, utilities and transport.</p> <p>Summer was arid in the former regions of Ukraine, with the exception of the western regions, in the center were areas with the driest conditions from 1961.</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 the basic climatological period