



Twenty-second Session of the SOUTH EAST EUROPEAN CLIMATE OUTLOOK FORUM

SEECOF-23 ONLINE MEETING

ANALYSIS AND VERIFICATION OF THE SEECOF-22 CLIMATE OUTLOOK FOR THE WINTER OF 2019/2020 FOR SOUTH-EAST EUROPE (SEE)

CLIMATE OUTLOOK FOR 2019/2020 WINTER SEASON FOR THE SEE REGION

As stated in the SEECOF-22 Consensus Statement on the Seasonal Climate Outlook for the 2019/2020 Winter Season over South-East Europe (document:

http://www.seevccc.rs/SEECOF/SEECOF-22/COF/Consensus_Statement-SEECOF-22.pdf)

The observed sea surface temperatures and forecast for the coming three months showed neutral ENSO conditions with most models showing high agreement for ocean evolution. The Indian Ocean Dipole (IOD) was main driver showing a clear signal with strong positive phase (warm anomalies over western tropical Indian Ocean and cold anomalies over the East), influencing the atmospheric circulation. Consequently, this positive phase translates to drier than normal signal over the Maritime Continent and Australia and wetter than normal conditions over eastern Africa. Most models tended to show teleconnections with IOD foreseen towards Middle East and Central Asia. As continuation of previous forecasts, models showed good agreement on favour of positive phases of East Atlantic (EA) and North Atlantic Oscillation NAO (which are two main modes of variability over the Atlantic), possibly linked with the strong IOD positive signal.

Winter temperature was expected to be above-normal in the whole SEECOF region. Probabilities for the above-normal conditions were higher in the Pannonian Plain, Carpathian region, Western and Central Balkans, Greece, along the coasts of Adriatic and Ionian Sea, as well as Eastern Mediterranean, (zone 1 in Figure 1, left).

In most of the SEECOF region (zone 1 in Figure 1, right) the uncertainty for precipitation was high, i.e. probabilities for below-, near-or above-average conditions were approximately equal. Winter precipitation totals were expected likely to be below-normal (zone 2 in Figure 1, right) in the eastern Balkan Peninsula and southern Ukraine. Near-normal to above-average seasonal precipitation sums (zone 3 in Figure 1, right) were expected in the South Caucasus region and northeastern Turkey.

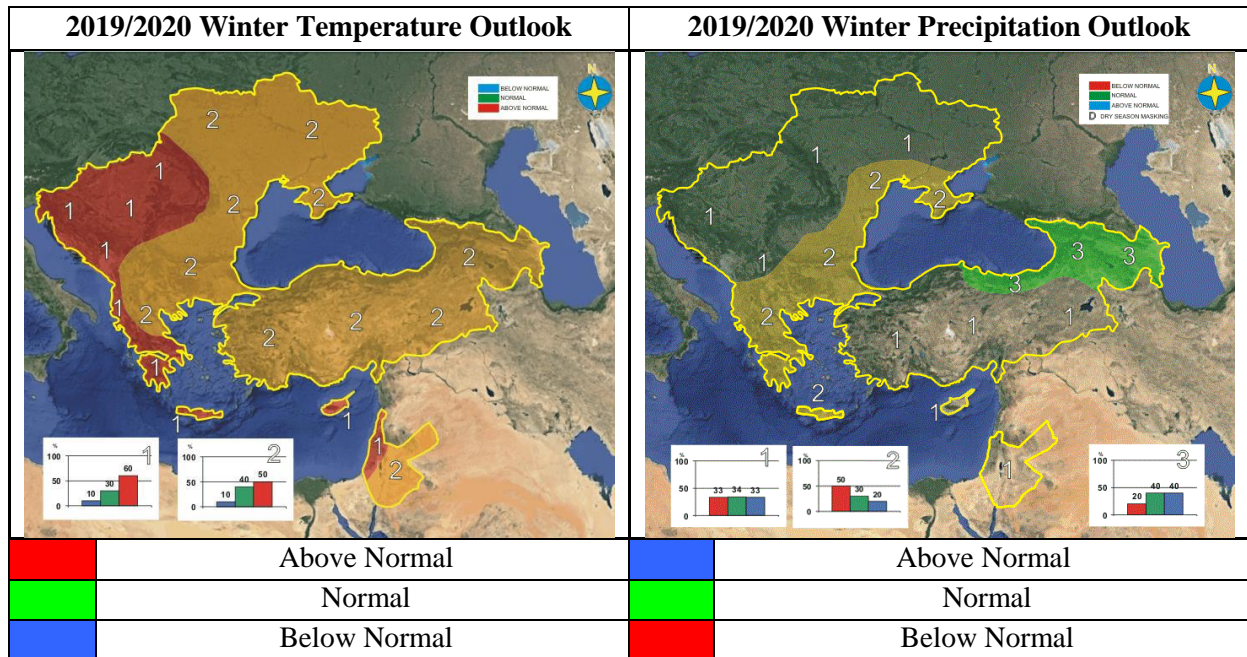


Figure 1. Graphical presentation of the Climate Outlook for the 2019/2020 Winter Season for the SEE Region

ANALYSIS OF THE WINTER 2019/2020 FOR THE SEE REGION

Analyses of the winter 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 winter of 2019/2020 (WMO RA VI RCC Node-CM, DWD), http://www.seevccc.rs/SEECOF/SEECOF-23/STEP-1/Analyses-Verification-of-the-SEECOF-22-Climate-outlook-for-winter-season-2019-20-RA%20VI_RCC-on-CM.pdf.pdf
- Global Climate Bulletin (Meteo France), <http://www.seevccc.rs/SEECOF/SEECOF-23/STEP-2/RCC-Bulletin-Meteo-France-21-04-2020.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/202002/
- National climate monitoring reports of the following SEECOF-23 participating countries: Armenia, Bulgaria, Bosnia and Herzegovina/Federation of Bosnia and Herzegovina, Croatia, Cyprus, Georgia, Greece, Israel, Republic of North Macedonia, Republic of Moldova, Serbia, Slovenia, Turkey and Ukraine are available on: <http://www.seevccc.rs/SEECOF/SEECOF-23/STEP-1/>

Almost the entire SEECOF region, apart from southern Greece, western Turkey, Cyprus and Middle East, observed above-normal winter temperatures. Temperature anomalies reached up to +4°C above normal relative to the 1981-2010 base period in most of the SEECOF region. In northern Ukraine, they were up to +6°C above normal. The winter temperature anomalies are shown in Figures 4 and 5 (left panel).

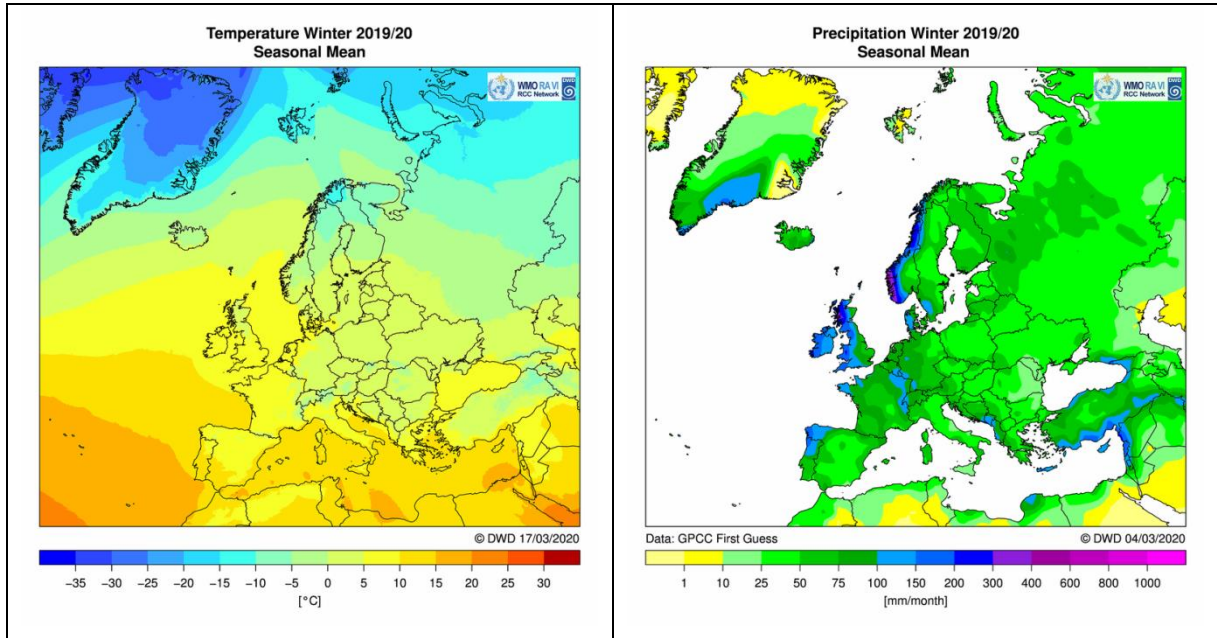


Figure 2. Winter season 2019/2020, Europe – observed temperatures (left panel) and observed precipitation in mm per month (right panel). Source: https://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_ttt.html (left panel) https://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_rrr.html (right panel)

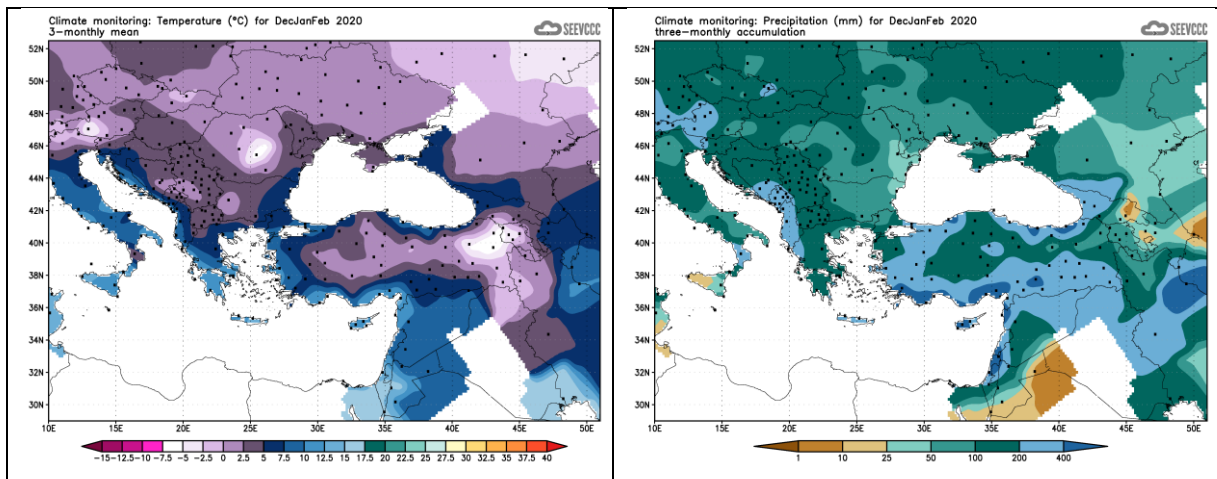


Figure 3. Winter season 2019/2020, SEECOF region – observed temperature (left panel) and observed precipitation (right panel). Source: <http://www.seevccc.rs/?p=6>

Seasonal precipitation was characterized by positive anomalies (more than 125% of the long-term average) in Cyprus, Israel, northwestern Jordan, southern and eastern Turkey. It was drier than normal (less than 75% of the long-term average) in the western and eastern Balkans, Moldova, Ukraine, western and northeastern Turkey, and especially dry (less than 25% of the long-term average) in Georgia, Azerbaijan and eastern Jordan. The winter precipitation anomalies are presented in Figures 4 and 5 (right panel).

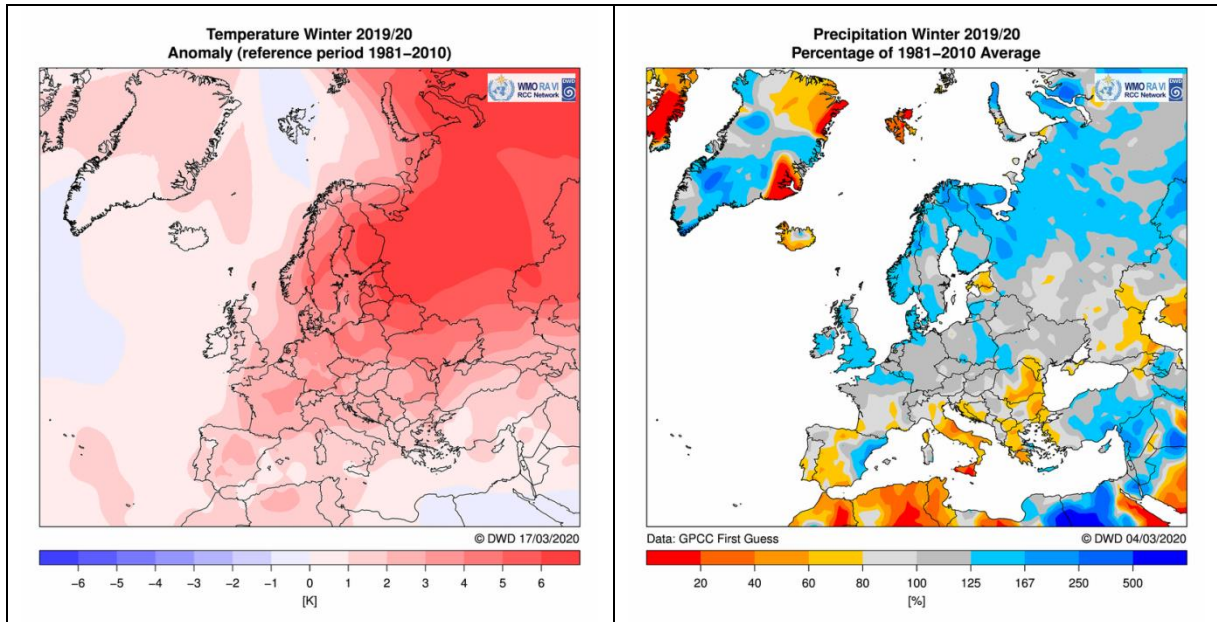


Figure 4. Winter season 2019/2020, Europe – observed temperature anomalies (left panel) and observed precipitation anomalies in percent of 1981-2010 normal (right panel). Source: https://www.dwd.de/EN/ourservices/rccm/int/rccm_int_ttt.html (left panel) https://www.dwd.de/EN/ourservices/rccm/int/rccm_int_rr.html (right panel)

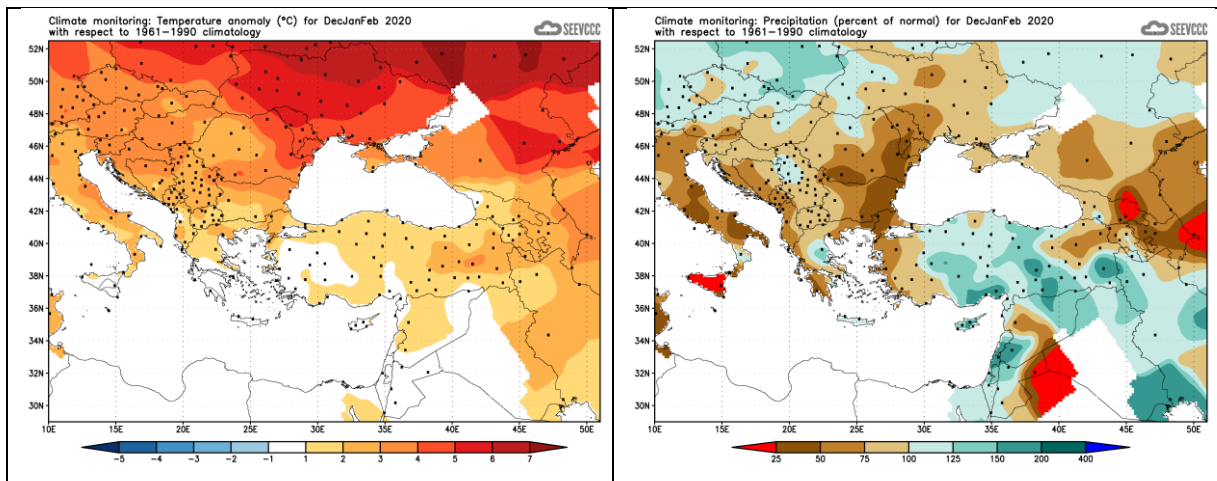


Figure 5. Winter season 2019/2020, SEECOF region – observed temperature anomalies (left panel) and observed precipitation anomalies in percent of 1961-1990 normal (right panel). Source: <http://www.seevccc.rs/?p=6>

VERIFICATION OF CLIMATE OUTLOOK FOR THE 2019/2020 WINTER

The expected general circulation patterns and teleconnection indices in the SEECOF-22 Climate outlook for the winter 2019/2020, with positive phases of both NAO and EA (Tab. 1) developed as indicated resulting with anticyclonic geopotential anomaly over the Balkans.

Table 1: Circulation indices of NOAA CPC patterns for the winter months 2019/20. Source: ftp://ftp.cpc.ncep.noaa.gov/wd52dg/data/indices/tele_index.nh

yyyy	mm	NAO	EA	WP	EP/NP	PNA	EA/WR	SCA	TNH	POL	PT	Expl.Var
2019	12	1.02	0.81	0.74	-99.9	-0.12	0.15	0.84	-0.22	-0.43	-99.9	63.0
2020	1	1.05	1.74	0.69	-0.60	-0.95	0.66	-0.55	-0.87	0.16	-99.9	84.9
2020	2	0.98	1.38	1.46	-1.79	-0.07	-0.06	-2.69	1.69	-0.39	-99.9	81.3

Winter 2019/2020 temperature was in the above normal category in almost entire SEECOF region, consequently, the outlook was correct. The exceptions are Israel, Jordan and some parts of Turkey, where observed winter temperature was within the normal range.

Regarding the winter precipitation anomalies, outlook was correct in some parts of the SEECOF region. The outlook indicated below normal seasonal precipitation sums for the southern and eastern Balkans, also mostly normal or above-normal seasonal precipitation totals for northeastern Turkey and South Caucasus, as well as winter precipitation within the normal range for Ukraine.

APPENDIX A: Analysis and verification of the SEECOF-22 climate outlook for the 2019/2020 winter season:

Verification summary based on the national reports and contributions of the participants of Pre-COF of the SEECOF-23 meeting

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	SEECOF-22 climate outlook for temperature	Observed	SEECOF-22 climate outlook for precipitation	
Armenia (1)	Above normal	Above normal (10, 40, 50)	Below normal	Below normal (40, 40, 20)	2019/2020 was sixth warmest winter for Armenia. Heat waves were observed. Snow cover was not recorded in lowland areas of Armenia at all. 01-09, 11-12, 21, 23, 24-25,27-28 of February strong wind (5-20m/sec,with the gusts of 15-28m/sec observed in: Dans fog (visibility ≤50 m) observed in Ararat and Shirak regions as well as during different periods of the season.
Federation of Bosnia and Herzegovina, Bosnia and Herzegovina (1)	Above normal in almost entire Bosnia and Herzegovina (extremely warm and very warm)	Above Normal (10, 30, 60) in entire Bosnia and Herzegovina)	Normal north east Bosnia; Below normal west, south, south east and central Bosnia and Herzegovina	No predictive signal (33, 34, 33)	In the winter of 2019-2020 heavy storms were recorded in December and February causing damage to buildings and cars. In the basins of central Bosnia, heavily polluted air was registered in December. Unusually low snow cover was registered in the mountains.
Bulgaria (1)	Above normal	Near or above normal	Near or below normal	Near or below normal	Drought conditions dominated the weather in Bulgaria since the middle of the summer of 2019. They continued in autumn and winter. Only in February,weather pattern returned to wetter type. The drought brought water reservoirs in Western Bulgaria to critically low levels and special measures had to be taken to tackle the water shortage in cities.

Croatia (1, 5)	Above normal	Above normal (10,30,60)	Below normal (Eastern Croatia, the wider areas of the towns of Sisak and Ogulin, Lika region, part of the Northern and Middle Adriatic and their hinterland) Above normal (the wider areas of the town of Varaždin)	No predictive signal (33,34,33)	Winter 2019/2020 – a few episodes (in December and February) with hurricane strong bora wind (NE wind along the Adriatic coast) were recorded. Sea and road traffic between continental part and Adriatic coast was completely disrupted.. The measured wind gusts along the coast, on the Pag and Maslenica bridge on February 5 th were around 200 km/h. On the same day very windy was also in the continental part of Croatia. There was a lot of damage on the roofs in Zagreb, the capital of Croatia, and the fallen trees made damages on cars.
Cyprus (5)	December Normal to Above Normal January Normal February Normal to Above Normal	December Above Normal mainly over coastal areas January Above Normal February Above Normal mainly over coastal areas	December Well above Normal January Well above Normal February Slightly below Normal	December Below Normal January Below Normal February Below Normal	December Extremes (deviating by 4°C or more from normal) were also recorded at a numerous of selected meteorological stations. As an example note the recorded maximum of Prodromos that was 18.7°C (with a normal of 8.3°C) and the maximum of Athalassa that was 25.8°C (with a normal of 17.3°C). Concerning the mean daily minimum temperatures note the recorded minimum of Pafos that was 16.3°C (with a normal of 10°C) and the minimum of Larnaka that was 14.7°C (with a normal of 9.2°C). As regarding the accumulated precipitation, December was a very wet month, as presented from the table above. From the distribution (provisional accumulated precipitation chart) of the accumulated precipitation of December is evident that the surface distribution was well above normal reaching 176,3mm (188% of normal). On the 1 st , 4 th , 6 th and during the periods 8-15 and 23-31 of December local showers and thunderstorms were recorded. Also, for the periods 13-14, 23-26 and 29-30 of December EMMA of yellow level warnings for showers, thunderstorms and wind were

				<p>issued.</p> <p>Based on the provisional data, hail was recorded on the 13, 14 and 29 th of the month. Snowfalwas recorded on the 9 th and during the period 24-31 of the month.</p> <p>January</p> <p>The accumulated precipitation of January is evident from the surface distribution that was well above the expected, but also the months normal, reaching 147,8mm (178% of normal).</p> <p>For the periods 1- 9, 14- 20, 23 and 28- 31 local showers, sometimes accompanied with thunderstorms and hail as on the 7 and 14 of January. Snow was also recorded apart from the higher Troodos peaks over the higher mountainous area on the 7, 20 and 23 of the month. On the periods 2- 3 EMMA yellow level warnings were issued concerning precipitation, 5- 6 EMMA yellow level warnings were issued concerning precipitation and wind, on the 7th and 16th EMMA yellow level warnings were issued concerning precipitation and on the 23rd of January EMMA yellow level warnings were issued concerning precipitation and wind.</p> <p>February</p> <p>Extremes (deviating by 4°C or more from normal) were also recorded at a numerous of selected meteorological stations. As an example note the recorded maximum of Prodromos that was 15.6°C (with a normal of 6.7°C) and the maximum of Polis Chrysochous that was 22.9°C (with a normal of 16.3°C). Concerning the mean daily minimum temperatures note the recorded minimum of Larnaka that was 14.7°C (with a normal of 7.1°C) and the minimum of Pafos that was 15.5°C (with a normal of 8.1°C).</p> <p>The accumulated precipitation was very high as presented in the table above. From the distribution (provisional accumulated precipitation chart) of the accumulated precipitation inFebruary is evident that the surface distribution was well above the expected reaching 60mm (87% of normal).</p>
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					<p>For the periods 3-8, 11-13, 15, 17-24 and 28-29 of February local showers, accompanied with thunderstorms most of the times, were recorded. It is worth mentioning that on the 17 th of February hail was reported and snowfall was recorded during the periods 6-8, 11, 18, 21, 23 and 29 of February.</p> <p>On the 7 th and 21 st of February EMMA yellow level warnings were issued concerning rain, wind and thunderstorms. For the period 8-10 of February a yellow and on orange warning were issued concerning low temperatures. On the 12 th of February a yellow warning was issued concerning low visibility due to fog.</p>
Georgia (1)	Above normal	Above normal	<p>Near the normal for west Georgia</p> <p>Below normal for east Georgia</p>	Near or below normal over all Georgia	No high impact events
Greece (2, 5)	Above normal	<p>Above normal in the southern, central, and western parts of Greece (10, 30, 60). Above normal in the eastern and northern parts of Greece (10, 40, 50)</p>	<p>Below normal in most of parts, mainly in the west and north areas, and the east Aegean islands.</p> <p>Above normal in the central and eastern areas, including Thessaly, Sporades islands, Attica, and Evvoia.</p>	<p>20 % Above normal</p> <p>30% Normal</p> <p>50% Below normal</p>	No high impact events

Israel (5)	Normal	Above normal (10, 30, 60)	Above normal	No predictive signal (33, 34, 33)	No high impact events
Republic of North Macedonia (5)	Above normal	Above normal	Normal for most of the country	Below normal (50, 30, 20)	No high impact events
Republic of Moldova (5)	Above normal	Above normal	75% of the territory – below normal 25% of the territory – near normal	Below, near or above normal (33%,33%,33%)	Complicated weather conditions were observed on 5 th and 6 th of February. On these days, the entire country reported wind gusts up to 15-23 m/s, and most of the territory observed heavy rainfall in form of rain, snow and sleet, with the formation of snow cover. As a result of the strong wind, electricity wires were damaged. The fallen snow, blizzard and black ice on the roads disrupted road traffic. On February 24, most of the territory observed wind gusts up to 19-25 m/s, isolated - dust storm. In some districts, wind speed reached 26-27 m/s (MS Cornești, Baltata, Stefan-Voda, Comrat, Cahul), which is considered an extreme phenomenon. Strong wind, caused damage the to the electricity wires, the objects of the national economy and the agricultural lands. Also during the winter season fog, thunderstorms, hail, rime and glazed ice, blizzard and black ice on roads were observed.
Serbia (1,5)	Above normal in entire Serbia	Above normal (10, 30, 60) in entire Serbia	Normal and below normal in most of Serbia	No predictive signal (33, 34, 33) in entire Serbia	Fifth warmest winter 2019/2020 for Serbia since 1951, and fifth warmest for Belgrade since 1888 Second warmest winter for Negotin, third warmest for Loznica, Cuprija, Zajecar and Crni Vrh Second warmest winter for Serbia based on the maximum air temperature Snow cover wasn't recorded in Sombor, Zrenjanin, Banatski Karlovac and Palic, and for the first time snow wasn't registered in Negotin and Kikinda

					Record late occurrence of snow cover in Belgrade Fifth driest winter in Negotin
Slovenia (5)	Warmer than normal	Warmer than normal	Drier than normal mostly in south-east, Normal mostly in west, north and north-east	No clear signal	Temperature above average (among the three warmest since 1961), Precipitation below average, wet December and dry January and February, Very warm February (second warmest since 1961), Very dry January (among the eight driest since 1961).
Turkey (2)	Near and above normal	Near and above normal	Above normal at inner and southeast Mediterranean coast of Turkey Below normal at western and north east part of Turkey	No clear signal for most of the country Above normal northern east cost of Black Sea Region of Turkey	December 2019, was the sixth hottest December in the long term period (1971-2019). Turkey December - Mean temperature is 4.6°C, December 2019 mean temperature was 6.5°C. 1 station reached new monthly maximum temperature record in December 2019. 1 station reached new monthly maximum temperature record and 1 station reached new monthly minimum temperature record in February 2020. In January 2020, 2 casualties due to flood in Mersin (in Eastern Mediterranean Region). In February 2020, 5 casualties due to avalanche and unfortunately 36 casualties due to second avalanche while rescue operation in Van (Eastern Anatolian Region).

Ukraine (5)	Above normal	Above and normal (40%) Below (20%)	Above normal (32% stations) Normal (52% stations) Below normal (16% stations)	Above normal (20%) Normal and below (40%)	<p>Warmest on record winter since 1961 for most stations in Ukraine.</p> <p>Meteorological extraordinary phenomena were observed on January 29-30, heavy snowfalls (26-27 mm precipitation per 12 hours) and strong blizzard (for 18 hours with wind gust of 18 m/s) in Chernihiv and Symy regions.</p> <p>On February 4-6 heavy snowfalls (20-28 mm precipitation per 6-12 hours) in Zakarpattia, Ivano-Frankivsk, Chernivci, Odesa, Zaporizhzhia, Dnipro, Doneck regions, strong wind (25-28 m/s) in Odesa, Kherson regions, in highland of Carpathians 40 m/s were recorded.</p> <p>On 10 th of February strong wind (25-34 m/s) was recorded in Lviv, Ivano- Frankivsk and in highland of Carpathians 40 m/s.</p> <p>On 24 th of February strong wind (25-32 m/s) was recorded in Lviv, Ivano- Frankivsk, Odesa, Mykolaiv, Kherson regions.</p> <p>Unfavorable weather conditions caused power outage, and disruption in telecommunications, utilities and transport.</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