Nineteenth Session of
SOUTH EAST EUROPEAN CLIMATE OUTLOOK FORUM

SEECOF-19 ONLINE MEETING

DRAFT VERSION

ANALYSIS AND VERIFICATION OF THE SEECOF-18 CLIMATE OUTLOOK FOR WINTER OF 2017/2018 FOR SOUTH-EAST EUROPE (SEE)

CLIMATE OUTLOOK FOR 2017/2018 WINTER SEASON FOR SEE REGION

As stated in the SEECOF-18 Consensus Statement on the Seasonal Climate Outlook for the 2017/2018 Winter Season over South-East Europe (document: http://www.seevccc.rs/SEECOF/SEECOF-18/COF/Consensus_Statement-SEECOF-18.pdf) above normal thermal anomalies were expected to dominate the entire SEECOF region in the last winter. Chances for warmer than normal conditions were predicted over the Balkan Peninsula, Eastern Mediterranean coast and hinterland regions (zone 2 in Figure 1). The probabilities for above-normal temperature were forecasted to slightly attenuate in the North-Eastern part of the SEECOF domain (zone 1 in Figure 1). Precipitation uncertainties are generally higher than for temperature. The main feature of the precipitation was a North/South gradient favouring wetter-than-normal conditions over northernmost part of SEECOF region (zone1 in Figure 2). The drier-than-normal conditions were expected to prevail on Southernmost of the Balkan Peninsula, along the coasts of the Eastern Mediterranean, Ionian, as well as the coasts of central and Southern Adriatic Sea (zone 3 in Figure 2). In the remainder of the SEECOF domain there was no clear signal for precipitation (zone 2 in Figure 2).

Seasonal averages cannot provide details on short spells of weather during the season. It was suggested that even in an average season, spells of severe wintry weather (for example: winter storms, very cold episodes, very wet spells) may occure leading to significant local socio-economic impacts.

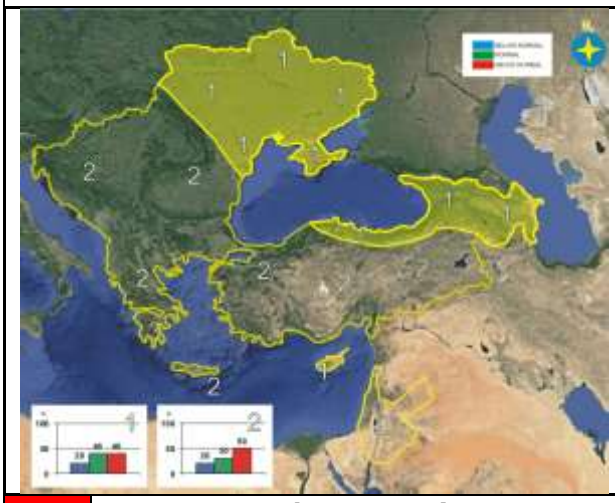
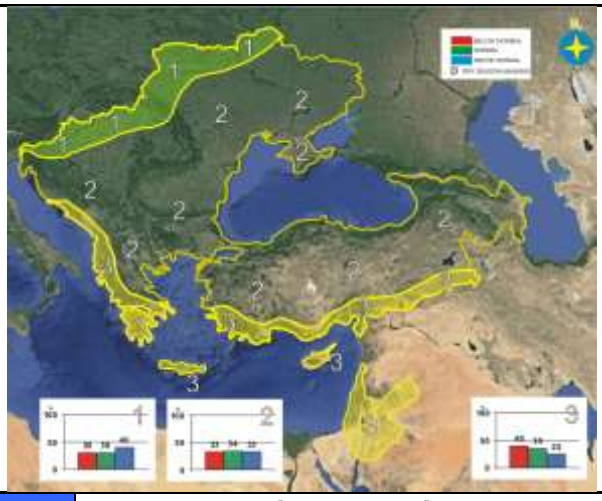
2017/2018 Winter Temperature Outlook		2017/2018 Winter Precipitation Outlook	
			
	Above Normal		Above Normal
	Normal		Normal
	Below Normal		Below Normal

Figure 1. Graphical presentation of the Climate Outlook for the 2017/2018 Winter Season for the SEE Region

ANALYSIS OF WINTER 2017/2018 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 2017/2018 (WMO RA VI RCC Node-CM, DWD), http://www.seevccc.rs/SEECOF/SEECOF-19/STEP-1/RCC_CM_DWD_SeasonalClimReport_2017_2018_DJF.pdf ;
- Global Climate Bulletin (Meteo France), http://www.seevccc.rs/SEECOF/SEECOF-19/STEP-2/RCC_Bulletin-Meteo-France-04-2018.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/201802/, and
- National climate monitoring reports of the following SEECOF-19 participating countries: Armenia, Bulgaria, Bosnia and Herzegovina/Federation of Bosnia and Herzegovina, Bosnia and Herzegovina/Republic Srpska, Croatia, Cyprus, Georgia, Greece, Israel, the Former Yugoslav Republic of Macedonia, Republic of Moldova, Montenegro, Serbia, Slovenia, Turkey and Ukraine are available on: http://www.seevccc.rs/SEECOF/SEECOF-19/STEP-1/.

Winter 2017/2018 in the SEECOF region was mainly characterised by very warm January in most of the SEECOF region. Teleconnection indices show NAO in a positive phase during winter which was suggested in climate outlook for 2017/2018 winter. Blocking area moved from the eastern Atlantic Ocean to the east of the SEECOF region, resulting in advection of warm air over the entire region (Figure 2).

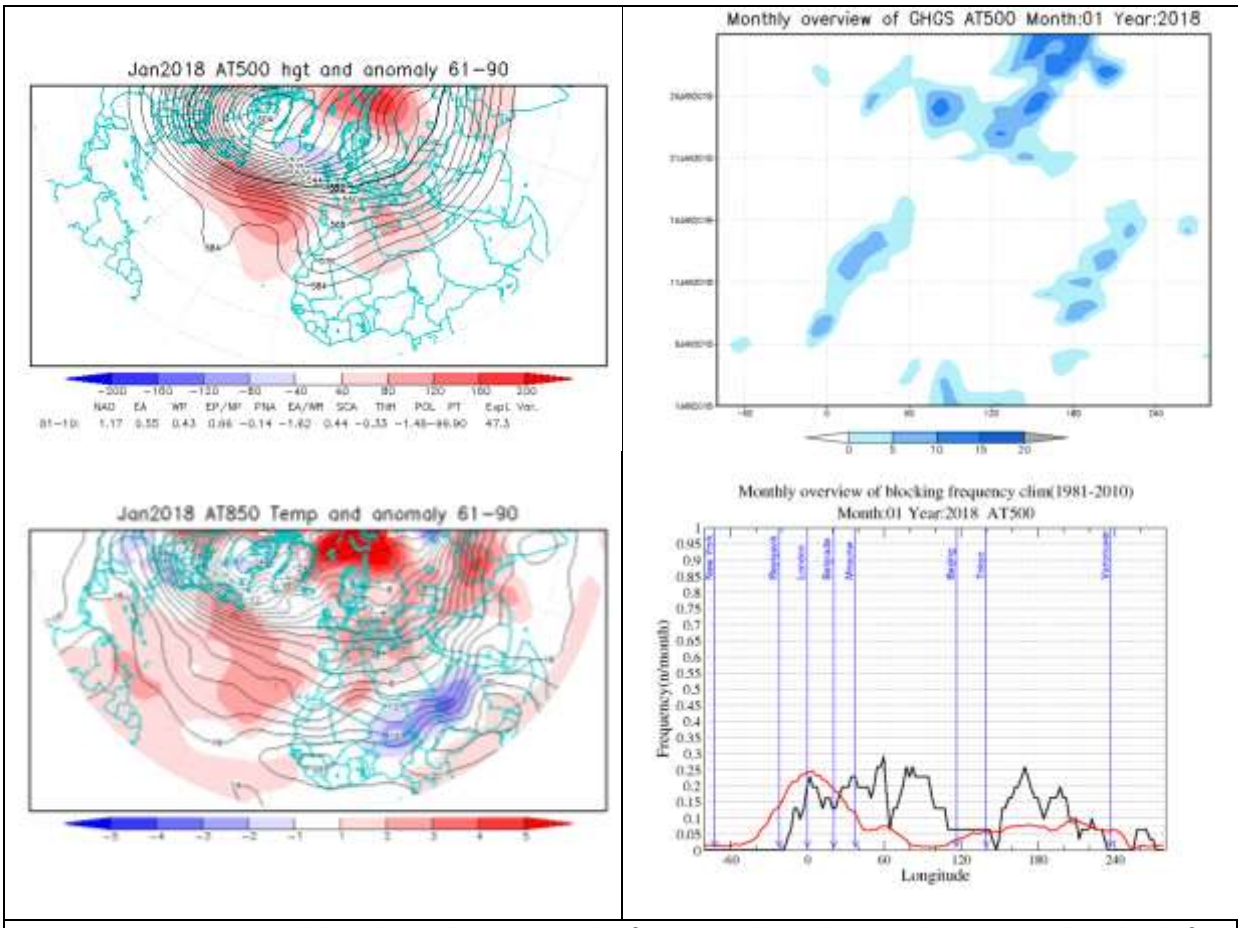


Figure 2. Geopotential height and its anomaly for 500 mb and 850 mb pressure levels (left), Blocking persistence – duration of pressure difference between 40 N and 60 N (Tibaldi-Monten) (right)

Almost the entire SEECOF region observed above-normal winter temperatures.

Temperature anomalies reached up to +3ºC above normal relative to the 1961-1990 base period in most of the SEECOF region. In some parts of eastern Turkey, they were in a range between +4ºC and +7ºC above normal. The winter temperature anomalies are presented in Figures 5 and 6 (left panel).

In most of the SEECOF region, December conditions were above normal, ranging from +1ºC to +5ºC, in most of Ukraine and northern Moldova even up to +7ºC, relative to the 1961-1990 base period.

January was characterized by warmer than normal conditions in almost the entire SEECOF region with highest positive anomalies observed in northern Balkans and eastern Turkey

reaching +7ºC. On January 30, Gevgelija (FYR Macedonia) observed the absolute maximum temperature of 20.3°C thereby breaking the previous record for this month. January was very warm in Slovenia, the third warmest since 1961.

February was characterized by warmer than normal conditions in Turkey, South Caucasus, Israel, Jordan as well as part of southern and eastern Balkans and southern Ukraine. The highest positive anomalies above +7ºC were observed in eastern Turkey. Extremely high temperatures were recorded over Athalassa (Cyprus) with a maximum of 25.2°C (compared to the normal of 16.0°C or over Prodromos with a maximum of 18.2°C (compared to the normal of 6.7°C). Below-normal temperature was registered in the north-western Balkans and part of north-western Ukraine with anomaly around -2ºC. At the end of February, cold spell was recorded in Croatia, Serbia and Slovenia.

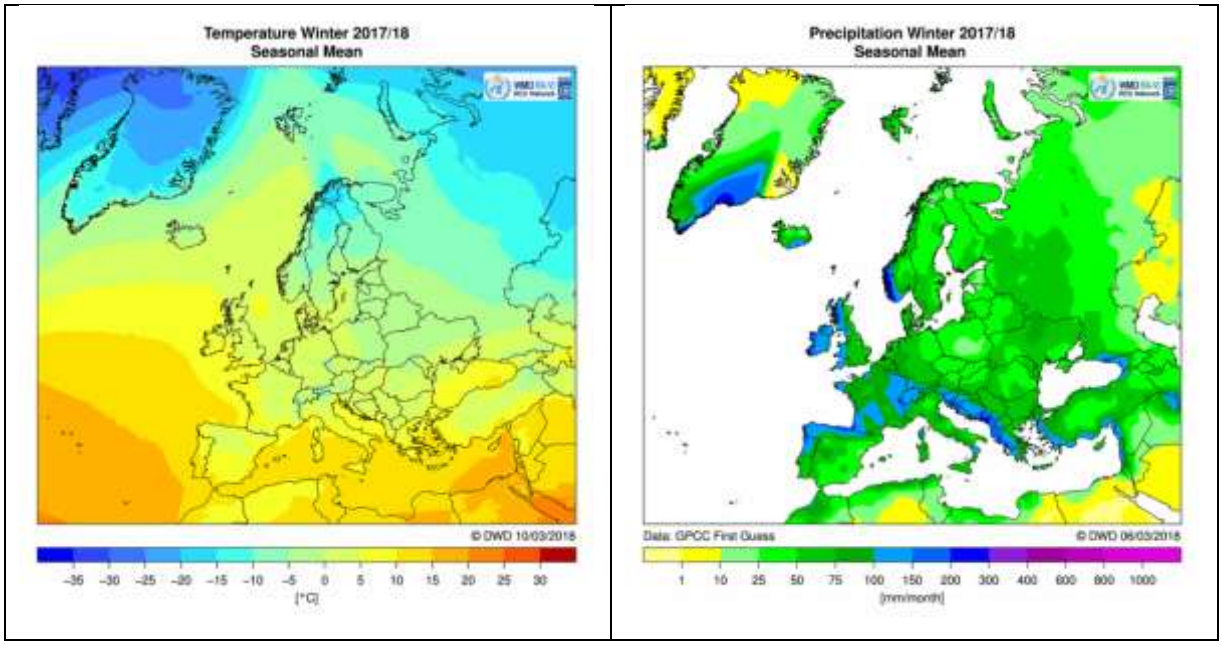


Figure 3. Winter season 2017/2018, Europe – observed temperatures (left panel) and observed precipitation in mm per month (right panel). Source: https://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_ttt.html

Seasonal precipitation sums were mostly in a range from 100 to 400 mm, while coasts of Adriatic and Ionian Sea, southwestern Turkey, northern Israel and the eastern coast of Black Sea received more than 400 mm of precipitation, Figures 3 and 4 (right panel).

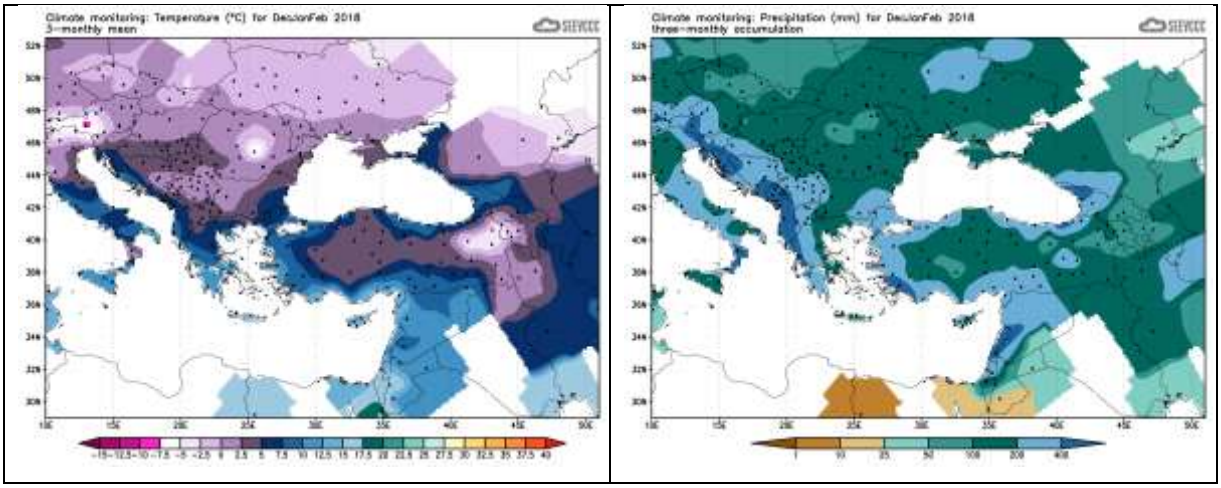


Figure 4. Winter season 2017/2018, SEECOF region – observed temperature (left panel) and observed precipitation (right panel). Source: http://www.seevccc.rs/?p=6

Precipitation was characterized by positive anomalies (>125% of the long-term average) in most of the Balkans and Ukraine as well as some parts of South Caucasus. It was drier than normal (<75% of the long-term average) in most of Turkey and Middle East. The winter precipitation anomalies are presented in Figures 5 and 6 (right panel).

During December, wetter than normal conditions were registered in the western and central Balkans, Ukraine and northernmost Turkey. In some parts of the southern Balkans, as well as southern Turkey, Cyprus, Middle East and eastern part of South Caucasus it was considerably drier. In the first days of December 2017, west Greece was affected by heavy rainfall leading to extensive floods and landslides. December was wettest in Leskovac (southern Serbia), record-breaking daily precipitation sums were registered in Kursumlija and Dimitrovgrad. Heavy rain led to flooding in Ordu and Çanakkale (Turkey) causing damage to some buildings and roads.

January was drier than normal in the southern Balkans, northern Carpathian region and northwest of Turkey. January precipitation sums were above the average in some parts of northern and eastern Balkans, Ukraine, central Turkey, South Caucasus and Middle East. Avalanche occurred in Bitlis (Turkey), while landslide affected Silifke and caused damages to infrastructure.

February was wetter than normal in most of the SEECOF region, with relative anomaly reaching up to 200%, even above 400% in eastern Ukraine and Azerbaijan. Conditions considerably drier than normal were recorded in Greece, Cyprus, southern Turkey and Middle East, with a relative anomaly below 25%. The absolute maximum snow cover was recorded (on 27th) in Delnice (Croatia), Gorski Kotar (measurement from 1981) – 182 cm, Plitvička Jezera (measurement from 1999) – 147 cm and Ogulin (measurement from 1949) – 118 cm. In the mountain part of Croatia, traffic was disrupted due to snow cover, while some parts were completely cut off from rest of the country for several days. The area of eastern Pelion (Greece), in particular the region of Zagora was affected by heavy precipitation during February 2018 causing many landslides, road destructions and transportation disruption. In some locations in FYR of Macedonia heavy rains caused the overflow of water from river beds and flooding. Heavy rain and flood caused damages to buildings in Çanakkale (Turkey). In Şanlıurfa (Turkey), flooding claimed 2 lives.

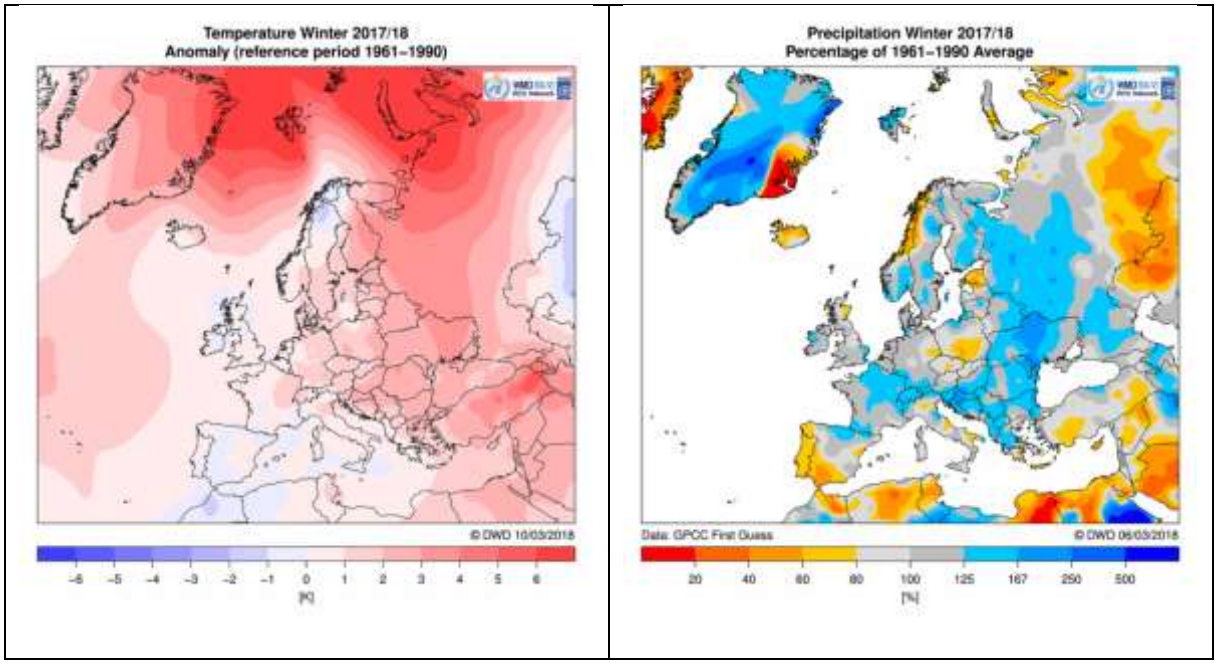


Figure 5. Winter season 2017/2018, Europe – observed temperature anomalies (left panel) and observed precipitation anomalies in percent of 1961-1990 normal (right panel). Source: https://www.dwd.de/EN/ourservices/rcccm/int/rcccm_int_ttt.html

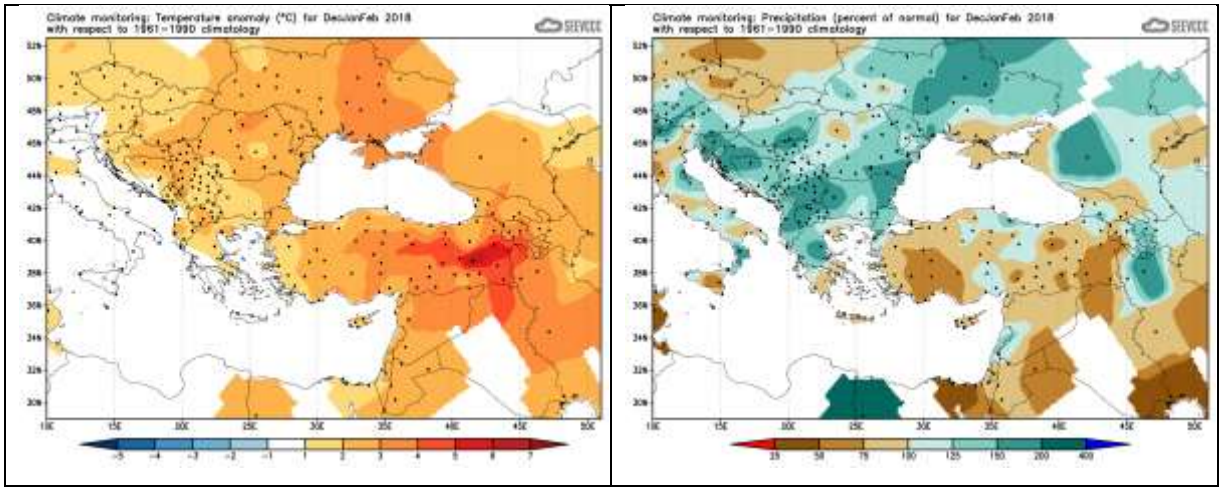


Figure 6. Winter season 2017/2018, SEECOF region – observed temperature anomalies (left panel) and observed precipitation anomalies in percent of 1961-1990 normal (right panel). Source: http://www.seevccc.rs/?p=6

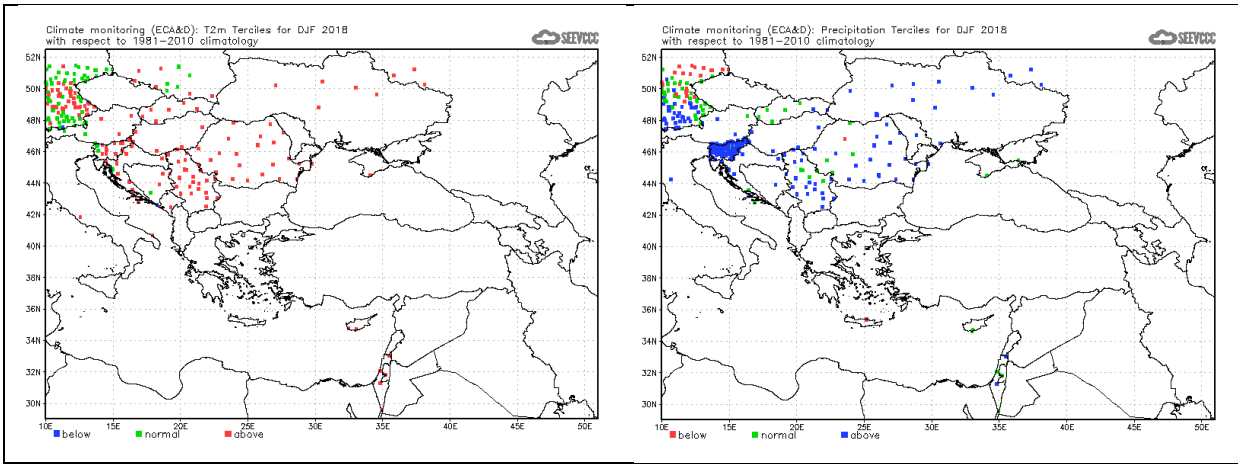


Figure 7. Winter season 2017/2018, SEECOF region – observed temperature (left panel) and precipitation (right panel) terciles in reference to 1981-2010 normal. Source: SEEVCCC

VERIFICATION OF CLIMATE OUTLOOK FOR 2017/2018 WINTER

Winter 2017/2018 temperature was in the above normal category across the entire SEECOF region, consequently, the SEECOF-18 Climate Winter Outlook was accurate. In regard to the winter precipitation anomalies, outlook was correct for the northernmost part of SEECOF region, southernmost of the Balkan Peninsula, along the coasts of the Eastern Mediterranean, as well as the coasts of central Adriatic Sea.

Warmer than normal winter 2017/2018 was expected over the Balkan Peninsula, Eastern Mediterranean coast and hinterland regions (zone 2 in Figure 1). The probabilities for above-normal temperature were slightly attenuated in the North-Eastern part of the SEECOF domain (zone 1 in Figure 1). The winter temperature predictions were correct for the entire SEECOF region, although equal probabilities for above and normal conditions were predicted for the north-eastern parts of the SEECOF domain.

Based on the SEECOF-18 Outlook, the uncertainties in regional predictions were forecasted to be higher for precipitation than for temperature. The main feature of precipitation was a North/South gradient favouring wetter-than-normal conditions over northernmost part of SEECOF region (zone1 in Figure 2) which was correctly predicted. The drier-than-normal conditions were expected to prevail in southernmost of the Balkan Peninsula, along the coasts of the Eastern Mediterranean, as well as the coasts of central Adriatic Sea (zone 3 in Figure 2) which was correctly predicted with the exception of southern Adriatic and Ionian Sea. In the remainder of the SEECOF domain there was no clear signal for precipitation (zone 2 in Figure 2).

NOTE: Detailed analysis, along with the extreme weather events will be performed upon receiving national reports.

APPENDIX B: **Analysis and verification of the SEECOF-18 climate outlook for the winter season 2017/2018:**
Verification summary based on the national reports and contributions of the participants of Pre-COF of the SEECOF-19 meeting

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High Impact Events
	Observed	SEECOF-18 climate outlook for temperature	Observed	SEECOF-18 climate outlook for precipitation	
Armenia (1)	**Above normal**	**Near or above normal** (20,40,40)	**Normal**	**No predictive signal** (33,34,33)	2017/18 winter was characterized by very high temperature and lack of snow cover in lowland areas, as no snow cover was formed. Foggy weather was observed in December and January in Shirak Region, Ararat valley with very low visibility, below 50 m. Strong wind 25-29 m/s was observed on 23rd of December, and 19th, 20th of January in Shirak region.
Bulgaria (1)	**Above normal**	**Near or above normal** (20,40,40)	**Above normal**	**No predictive signal** (33,34,33)	Winter 2017/18 was marked by one significantly strong winter storm observed in the very last days of February. The northeastern part of the country was affected by blizzard accompanied by strong winds and snowdrifts on the roads.
Croatia (1)	**Normal** Southern Adriatic and part of the Northern and Middle Adriatic **Above normal** the rest of Croatia	**Above normal** (20,30,50)	**Normal** Dalmatia and hinterland **Above normal** in the remaining part of Croatia	**Below normal** (40,35,25) along coastal part of Dalmatia **Above normal** (30,30,40) in the far northwest part of Croatia **No predictive signal** (33,34,33) in the rest of Croatia	**December** 2017 was warmer than normal. The amount of precipitation in most part of the country was above normal. The high impact weather was not recorded. **January** 2018 was warmer than normal. According to percentile ranks and classification ratings, thermal conditions in Croatia for January 2018 fall under the category warm, very warm and extremely warm. The high impact weather was not recorded. **February** 2018 was colder than normal in the whole country. The absolute minimum temperature (-6,4°C) was measured in Zadar (measurement from 1961) on 28th February. The cold spell was recorded in the last few days of the mounth (from 25th). As from the 26th, the minimum temperature in most part of the interior was below -10°C, and on 27th and 28th below 0°C, at the coast . The absolute maximum snow cover was recorded (on 27th) in Delnice, Gorski kotar (measurement from 1981) – 182 cm, Plitvička Jezera (measurement from 1999) – 147 cm and Ogulin (measurement from 1949) – 118 cm. In the mountain part of Croatia traffic was disrupted due to snow cover and some parts were completely cut off from rest of the country for several days.

Cyprus (5)	**Above normal**	**Near or above normal** (20,40,40)	**Normal**	**Below normal** (40,35,25)	Hail was recorded on the 5th and 24th of **December**. **January -** Extremely high temperatures were recorded, as an example, Prodromos recorded a highest daily maximum of 15.5°C (compared to the normal of 6.3°C) and Athalassa recorded a highest daily maximum of 21.5°C (compared to the normal of 15.5°C). Extremely low temperatures were also recorded, as an example, note that the lowest daily minimum temperature of Achna was 1.6°C (compared to the normal of 6.6°C). On 4th and 22nd of January hail was reported. **February** - Extremely high temperatures were recorded, over Athalassa with an extreme maximum of 25.2°C (compared to the normal of 16.0°C) or over Prodromos with an extreme maximum of 18.2°C (compared to the normal of 6.7°C). Extremely low temperatures were also recorded at Achna with a recorded low of 3.9°C (compared to the normal of 8.6°C). Record-breaking precipitation total of 91.6mm was recorded on the dawn of the 16th over the area of Limassol (southern part). During this rain event flash floods were recorded.
Federation of Bosnia and Herzegovina (1)	**Above normal** in almost entire Bosnia and Herzegovina (except in mountainous areas)	**Above normal** (20,30,50)	**Above normal** in almost Bosnia and Herzegovina (except in central Herzegovina)	**No predictive signal** (33, 34, 33)	-**December** Wettest and warmest -**January** Extremely warm 3rd Warmest for Bihac and 14th warmest for Bjelasnica -**February** Very wet and extremely wet Record wet for Bihac
Georgia (1)	**Above normal**	**Near or above normal** (20,40,40)	**Near the normal and above normal** in most of the territory of west Georgia **Above normal** on over all Georgia	**No predictive signal** (33, 34, 33)	No high impact events.

Greece (2)	**Above normal**	**Above normal** (20,30,50)	**Above normal** in most parts of the country (except regions of the south - southeastern Greece)	**Below normal** (40,35,25) in western and southern parts of Greece **No predictive signal** (33, 34, 33) in the rest of the country	During winter 2017/18, very warm and extremely warm conditions prevailed in eastern Greece and in the Aegean islands, while warm or normal conditions prevailed in western Greece and Ionian islands. During the first days of December 2017 heavy rainfall affected west Greece leading to extensive floods and landslides. The area of eastern Pelion, in particular the region of Zagora were affected by heavy precipitation during February 2018 causing many landslides, road destructions and transportation disruptions.
Israel (5)	**Above normal**	**Above normal** (20,30,50)	**Above normal**	**Below normal** (40,35,25)	No high impact events.
Moldova (5)	**Above normal**	**Near or above normal** (20,40,40)	**Above normal or Near normal**	**No predictive signal** (33, 34, 33)	Recorded meteorological phenomena in the form of sleet deposits up to 35 mm in diameter (December 18, MS Bravicea) and heavy snowfall with the precipitation sums up to 22-30 mm in 12 hours (January 17-18, MS Camenca, Râbniţa, HP Hruşca, Camenca, Beloci). Mist, deposits of hard rime and glaze, wind gusts up to 20 m/s (January, MS Comrat, Ceadâr-Lunga), blizzard, ice on roads.
Montenegro (1,5)	**Normal to above normal**	**Above normal** (20,30,50)	**Normal to above normal** (December and February) **Below normal to normal** (January)	**Below normal** (40,35,25) in central to coastal area **No predictive signal** (33,34,33) in the rest of the country	No high impact events.

FYR of Macedonia (5)	**Above normal**	**Above normal** (20,30,50)	**Above normal**	**No predictive signal** (33, 34, 33)	**December** Significant monthly amounts of precipitations; Record-breaking daily sum of 130.0 mm was measured on 1st in Mavrovo **January** Absolute maximum temperature in Gevgelija 20.3°C on 30th exceeded the historical values for this month **February** Significant monthly amounts of precipitation; Record-breaking monthly sums in Lazaropole 274.1mm, Mavrovo 293.4mm and Skopje 113.3 mm; Record-breaking daily precipitation sums: 92.5mm in Lazaropole, 71.2mm in Mavrovo and 47.5mm in Skopje on 4th; Heavy rains caused the overflow of water from river beds and flooding
Serbia (1)	**Above normal** in almost entire Serbia	**Above normal** (20,30,50)	**Above normal** in most of Serbia, except in northeastern part	**No predictive signal** (33, 34, 33)	Winter of 2017/2018 was the 4th wettest and 12th warmest for Serbia **December** was wettest in Leskovac (southern Serbia), record breaking daily precipitation sum in Kursumlija and Dimitrovgrad; 4th warmest in Loznica, two heat waves; **January** was the 5th warmest for Serbia, 2nd warmest in Sombor and Banatski Karlovac; **February** was 9th wettest in Serbia, at Palic 3rd, at Sjenica and Zlatibor 4th wettest
Slovenia (5)	**Above normal** in the most of the country **normal to below normal** in the north-west	**Above normal** (20,30,50)	**Above normal**	**Above normal** (30,30,40) in the north **No predictive signal** (33, 34, 33) in the south	Among the 20 warmest winters since 1961/62 Fourth wettest since1961/62, second only to winters 1976/77, 2013/14 and 2008/09 **December** temperature above average, **January** very warm, third warmest since 1961, second only to January 2014 and 2007 **February** very cold, 11th coldest since 1961, due to distinctive cold wave in the last decade. Average daily temperature in the last three to four days of the month dropped 10 °C and more below 1981–2010 average in some areas Very wet December and February. December 4th wettest since 1961, February 5th wettest since 1961
The Republika Srpska - Bosnia and Herzegovina (5)	**Above normal**	**Above normal** (20,30,50)	**Above normal**	**No predictive signal** (33, 34, 33)	At the end of February was extremely cold / lowest daily Tmax record

Turkey (5)	**Above normal**	**Near or above normal** (20,40,40) in north eastern regions **Above normal** (20,30,50) in the whole country except northeastern part	**Mostly normal to below normal** **Above normal** only in small regions in the north	**Above normal** (30,30,40) in the whole country except the south part **No predictive signal** (33, 34, 33) southern regions of the country	In **December** 2017, frost damaged yields in greenhouses in Balıkesir. Heavy rain caused flood in Ordu and Çanakkale which damaged some buildings and roads. In **January** 2018, avalanche occurred in Bitlis. Landslide occurred in Silifke and caused damages to infrastructure. In **February** 2018, heavy rain and flood caused damages in buildings in Çanakkale. In Şanlıurfa, two people lost their lives because of the flood.
Ukraine (1,5)	**Above normal** (83% stations) **Normal** (17% stations)	**Normal and above normal** (20,40,40)	**Above normal** (74,5% stations) **Normal** (25,5% stations)	**Above normal** (30,30,40) in western and southern parts of Ukraine **No predictive signal** (33, 34, 33) in the rest of the country	On **December** 15-16th, very heavy snowfall (20-36 mm precipitation in 6-12 hours) and rain (32-42 mm in 12 hours) in Zakarpattya and Ivano-Frankivsk regions; on 18-19th very heavy snowfall (21-36 mm/12 hours) in the regions of Kyiv, Zhytomyr, Cherkasy. December was record warm month since the records began in the eastern part of country. On **January** 17-18th very heavy snowfall (20-45 mm/6-12 hours) in Kyiv, Chernihiv, Symy, Kirovograd, Chercasy, Odesa regions; very heavy rain (51 mm/12 hours) and strong wind (gust 25-29 m/s) in Odesa region. On **February** 26-28th very heavy snowfall (20-27 mm/12 hours) in Odesa region; strong wind (gust 25-28 m/s) in Donetsk, Zaporizzhya, Kherson, Odesa regions and strong blizzard (for 14-23 hours with wind gust 15-27 m/s) in Mykolaiv and Odesa regions. Unfavorable weather conditions caused power outage, telecommunications, utilities and transport disruptions. Winter was wet, but in some regions (Lviv, Kyiv, Chernihiv regions) stations observed wettest winter conditions since 1961, with 214-306 mm of precipitation (176-223% of the norm).

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