Fifth Session of
SOUTHEASTERN EUROPE CLIMATE OUTLOOK FORUM

SEECOF-5 ONLINE MEETING

ANALYSIS AND VERIFICATION OF SEECOF-4 CLIMATE OUTLOOK FOR 2010-2011 WINTER SEASON FOR SOUTHEASTERN EUROPE (SEE)

CLIMATE OUTLOOK FOR 2010-2011 WINTER SEASON FOR SEE REGION

As stated in the SEECOF-4 Seasonal Climate Outlook for 2010-2011 winter season over Southeastern Europe Consensus Statement (document http://www.seevccc.rs/wp-content/uploads/2010/12/Statement-SEECOF-4.pdf). "There are higher probabilities for below-average than for near – or above–average temperatures in the north-western part of the region. The prediction uncertainty increases towards the southeast. For the southern and eastern regions of the domain (see Figure 1) there is currently no predictive signal. Uncertainties in regional predictions are larger for precipitation than for temperature. In summary, current indications are for a slight shift towards drier-than-average conditions in the northwestern and southern parts, and towards wetter-than-average conditions for eastern and southwestern regions. It must be emphasized that even in the event of seasonal totals below the long-term average, shorter wet spells of heavy precipitation, possibly snow in places, are still possible, especially given the predicted large-scale atmospheric circulation. Climate outlook for 2010-2011 winter season for the SEE region is presented in Figure 1.

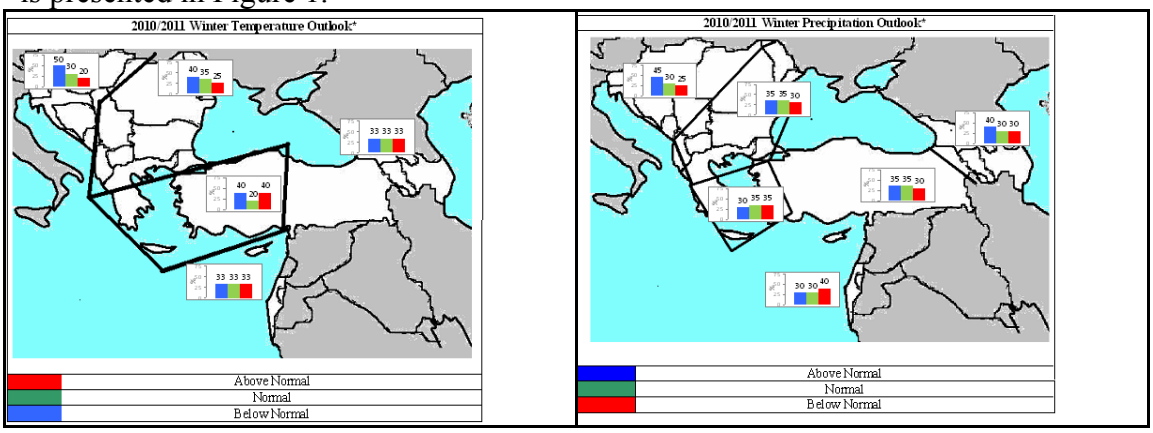


Figure1. Graphical presentation of climate outlook for 2010-2011 winter season for the SEE region.

SHORT ANALYSIS OF THE 2010-2011 WINTER SEASON FOR SEE REGION

Analyses of the 2010-2011 winter 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), Lead of the WMO RA VI RCC Node on Climate Monitoring, http://www.dwd.de/rcc-cm;
- climate monitoring review of 2010-2011 winter season and brief assessment of the correctness of the SEECOF 4 climate outlook for 2010-11 winter season, (ECSM, DWD, Lead of the WMO RA VI RCC Node on Climate Monitoring), http://www.seevccc.rs/SEECOF/SEECOF%205/STEP%201/RCC-CM-DWD-2010-2011-Winter-season.pdf
- climate monitoring products of the South East European Virtual Climate Change Center - SEEVCCC (Member of the WMO RA VI RCC Node on Climate Monitoring, http://www.seevccc.rs/?p=6), and
- national climate monitoring reports of the following SEECOF-5 participating countries: Armenia, Azerbaijan Republic, Bulgaria, Bosnia and Herzegovina/ Republic of Srpska, Croatia, Greece, Georgia, Hungary, Israel, Former Yugoslav Republic of Macedonia, Republic of Moldova, Romania, Serbia, Slovenia and Turkey (documents available on http://www.seevccc.rs/SEECOF/SEECOF%205/STEP%201/).

Seasonal mean temperatures of winter 2010-2011 in the lowlands of the SEECOF area were mostly around 0°C; near the coasts, in parts of the South Caucasus region and in most of the Middle East 5°C -10°C and in Israel above 10°C. Higher mountains on the Balkan peninsula and in the Caucasus region had seasonal means below -5°C. Seasonal mean temperatures for winter 2010-2011 are presented in Figure 2 (left panel).

Winter was slightly colder than normal (anomalies were between -1°C and 0°C, 1961-1990 reference period) in north-eastern parts of the Balkan peninsula, whereas the rest of the SEECOF area was warmer than normal. Most of Turkey, the South Caucasus region, the eastern Mediterranean and the Middle East were even more than +1°C warmer than normal. 2010-2011 winter season temperature anomalies are presented in Figure 3 (left panel).

The cold anomalies in the northeast of the Balkan peninsula were mainly due to cold spells in December 2010 and once more in February 2011 as part of a cooling which took place over large parts of northern and eastern Europe, whereas January 2011 was generally mild on the Balkan peninsula. In contrast, very warm air masses in December 2010 and January 2011 affected especially the Middle East, Turkey and the South Caucasus. Due to above mentioned synoptic situation Baku, in Azerbaijan Republic, reached 22.7˚C on the12nd of December, the highest value of daily maximum temperature in the last 100 years. In February 2011, the cooling affected also large parts of the Balkan peninsula and the South Caucasus, only southern parts of the SEECOF region were significantly warmer than normal.

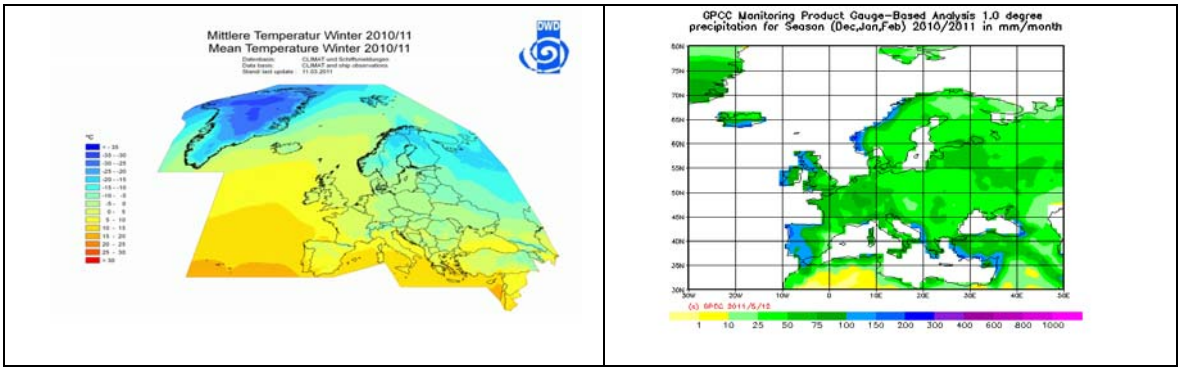


Figure 2. 2010-2011 winter season observed temperatures (left panel) and 2010-2011 winter season observed precipitations in mm per month (right panel). Source: http://www.dwd.de/rcc-cm

Northeastern parts of the Balkan peninsula also recorded a much higher number of ice days (daily maximum below 0°C) compared to the reference period 1961-1990 normal.

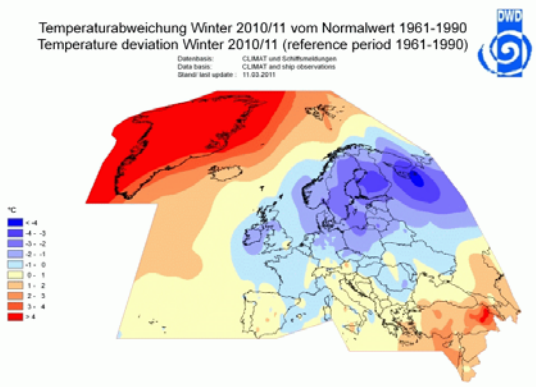
The winter precipitation totals were between 75 mm and 150 mm in most of the SEECOF region, in Turkey mostly above 150 mm, and in many coastal areas above 300 mm, according to monitoring product data of the Global Precipitation Climatology Centre (GPCC). 2010-2011 winter season precipitations are presented in Figure 2 (right panel).

Most of the SEECOF region was drier than normal (1951-2000 reference period). Especially dry (<80% of the normal) was the northwest of the Balkan peninsula (especially in January and February 2011), large parts of Greece and eastern Turkey. On the other hand, especially Romania and central parts of Turkey were much wetter than normal (>125%), especially in December 2010. The south Caucasus and eastern Turkey were very dry in December 2010, but wet in February 2011. 2010-2011 winter season precipitation anomalies are presented in Figure 3 (right panel).

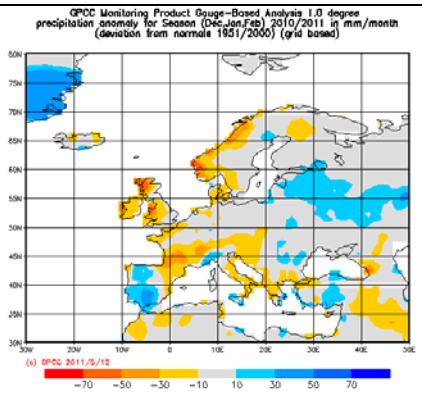
Heavy rain events in December 2010 flooded areas in Albania, Bosnia and Herzegovina, Serbia and Montenegro. On 13 December 2010 the coasts of Israel were severely hit by storm and heavy rain.

In the middle of February, unusual seasonal thunderstorms and hails were observed in Bulgaria. Several days later, strong storm hit central Anatolia and the coast of the Mediterranean Sea causing on 19th of February small size tornado near Erdemli/Mersin (located on coastal side of the Mediterranean).

Widespread snowfall occurred even in southern areas, e.g. in northern Greece, Macedonia and Turkey during some days.



Product prepared and supplied by Deutscher Wetterdienst



Product prepared and supplied by Deutscher Wetterdienst

Figure 3. 2010-2011 winter season observed temperature anomalies (left panel) and winter season observed precipitation anomalies in mm per a month (right panel). Source: http://www.dwd.de/rcc-cm

VERIFICATION OF CLIMATE OUTLOOK FOR 2010-2011 WINTER SEASON

The SEECOF 4 climate outlook for 2010-2011 winter season concluded temperatures likely below normal especially on most of the Balkan peninsula, particularly in the northwest, while there was no clear signal in other parts of the SEECOF area. This was partly correct since, in fact, some parts of the Balkan peninsula were colder than normal, especially in the northeast. The very high, warm seasonal anomaly over the South Caucasus, Turkey, and the Middle East, however, was not clearly predicted.

The prediction uncertainty for precipitation was quite high for that winter. However, there was a certain likelihood for below-normal precipitation in northwestern parts of the Balkan peninsula, which was in fact represented also by the real anomalies. Since large parts of the SEECOF area had near normal precipitation and larger anomalies were confined to smaller areas, the anomaly signals were actually not very strong over large areas. Thus, the prediction was partly correct, at least in northwestern parts.

APPENDIX A: Contributions to Step 1 of SEECOF-5

- World Meteorological Organization
- Met Office, United Kingdom
- International Research Institute for Climate and Society, United States of America
- European Center for Medium Range Weather Forecast
- Meteo France, Republic of France
- Federal Service for Hydrometeorology and Environmental Monitoring, Russian Federation
- Deutscher Wetterdienst, Federal Republic of Germany
- National Centers for Environmental Prediction, United States of America
- South East European Virtual Climate Change Center hosted by Republic Hydrometeorological Service of Serbia, Republic of Serbia
- Institute for Energy, Water and Environment, Republic of Albania
- Armenian State Hydrometeorological and Monitoring Service, Republic of Armenia
- National Hydrometeorological Department, Republic of Azerbaijan
- National Institute of Meteorology and Hydrology, Republic of Bulgaria
- Meteorological and Hydrological Service, Republic of Croatia
- Hellenic National Meteorological Service, Greece
- Meteorological Service, Republic of Cyprus
- The National Environmental Agency of Georgia, Georgia
- Meteorological Service of the Republic of Hungary, Republic of Hungary
- Israel Meteorological Service, State of Israel
- Republic Hydrometeorological Institute, Former Yugoslav Republic of Macedonia
- State Hydrometeorological Service, Republic of Moldova
- Hydrometeorological Institute of Montenegro, Montenegro
- National Meteorological Administration, Romania
- Federal Hydrometeorological Service of the Federation of Bosnia and Herzegovina, Federation of Bosnia and Herzegovina, Bosnia and Herzegovina
- Republic Hydrometeorological Service of the Republic of Srpska, Republic of Srpska, Bosnia and Herzegovina
- Republic Hydrometeorological Service of Serbia, Republic of Serbia
- Environmental Agency of the Republic of Slovenia, Republic of Slovenia
- Turkish State Meteorological Service, Republic of Turkey

APPENDIX B: **Analysis and verification of SEECOF-4 climate outlook for the 2010-2011 winter season:**
Verification summary based on national reports and contributions of the participants of SEECOF-5 online meeting

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High Impact Events
		SEECOF-4 climate outlook for temperature	Observed	SEECOF-4 climate outlook for precipitation	
Albania		Below to normal		Below normal	
Armenia (1)	Above normal	Normal (No predictive signal)	Above to normal	Above to normal	In the first 5 days of December daily mean air temperatures exceeded the norm by 5-10 degrees. The lowest temperature was recorded in the first decade of February. The air temperature was in mountains and northern foothill areas of -20 ...- 26^{0}C, in the Ararat valley -12 ...- 16^{0}C, in the lowlands of Syunik -4 ...- 9^{0}C. Mean daily temperature in those days were 6-8^{0}C below normal. Heavy snowfall was observed in Urtsadzor (25 mm in 12 hours) on February 1st and in Jarmuk (20 mm in 12 hours) on February 15th. Strong wind in Pushkin pass with mean value of 32 m/s and gusts of 47 m/s was measured on February 6th.
Azerbaijan Republic (1)	Above normal	Normal (No predictive signal)	In the foothills and lowlands near normal,	Above to normal	In December, daily mean air temperature was 5-7^{0}C, on the 12nd, 12^{0}C above normal.

			in the other regions below normal		During December, air temperature in lowlands areas peaked up its maximum at 18-23^{0}C, in highlands 16-21^{0}C, in Nakhchivan AU 17-22^{0}C, Absheron peninsula 18-23^{0}C. Baku station **recorded** daily maximum of 22.7^{0}C on the 12nd of December, breaking the previous December record for the past 100 years of 19.6^{0}C which was recorded in 1906. In Baku, on 26th of January, daily mean temperature was 9^{0}C above normal. On the same day, maximum temperature in Baku was 17.2^{0}C and in Sumqayit 19^{0}C, similar temperatures were observed on 26.01.1993 (18.4^{0}C and 20^{0}C).
Bosnia and Herzegovina, Federation of Bosnia and Herzegovina (1)	l	Below normal		Below to normal	
Bosnia and Herzegovina, Republic of Srpska, (5,6)	Normal (ref. period 6)	Below normal	Below normal in northwestern part, above normal in some parts in eastern Herzegovina, normal on the other part of the territory (ref. period 5)	Below to normal	By the beginning of December, due to heavy precipitation in Montenegro, Bosnia and Herzegovina and Serbia, floods have occurred in the north-eastern part of Republic of Srpska/Bosnia and Herzegovina in Drina basin. During December, due to heavy precipitation, eastern Herzegovina was hit by floods.
Bulgaria (5)	Below to normal	Below to normal	Above to normal	Below to normal	There was a strong precipitation event around 3-5 December 2010. It marked the transition between the exceptionally warm November and the beginning of the winter season. It is

					associated with the strong thermal contrast between Central Europe and the Balkans that has been present around the end of November and the beginning of December. At some places in the west of Bulgaria the 24 hour precipitation amounts reached 60 mm - 70 mm on 4-5 December. There were unusually high temperatures in the middle of January and February. At some places maximum temperatures were above 20ºC. In February, the transition between the warm in the middle of the month and the cold at the end was marked by unseasonal thunderstorms and hailstorms.
Croatia (1)	Normal	Below normal	Below normal in the central part and hinterland of middle Adriatic), normal in the rest of the country.	Below normal	No comments for high impact events
Cyprus (1)		Normal (No predictive signal)		Below normal	
Georgia (1)	Above normal	Normal (No predictive signal)	Below normal in Northern mountainous parts (extremely dry in Northern high mountains), above normal	Above to normal	The temperature regime in December was above the normal values by 3°C to 5°C. The average monthly temperature in coastal zone and on Kolkheti Lowland (West Georgia) was from 1.5°C to 4.0°C; on the lowlands of East Georgia from 3.4°C to 6.3°C, in mountain regions from 1.4°C to 8°C. The absolute maximum temperature was observed at the end of December and reached +25°C in coastal zone and Kolkheti lowland (West Georgia) and 21°C on the lowlands of East

			in eastern part, normal on the rest of the territory.		Georgia. Wind maximum velocities were occurred mostly in the first and last decade of December. The highest values were registered in Poti (20m/s).
Greece (1)	Normal to above normal in the most of the territory, above normal in the eastern Aegean, the Cyclades, Creete and Dodecanese	Below to normal in northern part, below or above normal on the other part of the territory,	Below normal In the northern Ionian, Epirus, west Sterea and Thessaly, normal in the southern Ionian and Peloponnese, above normal throughout most of the Aegean(central and south), Crete and Dodecanese	Above to normal in the northern part, normal to above normal on the other part of the territory	No comments for high impact events
Hungary (2)	Below to normal	Below normal	Normal	Below normal	On 15th of January daily maximum temperature record was broken in Szombathely where 13.6˚C was measured. On the 1st of December in the eastern part of the country daily precipitation was in range from 20 mm to 30 mm, while on 25th of December in the Northern Mountain fall 20 mm.
Israel (2,5)	Above normal (2)	Normal (No predictive signal)	Normal (2,5)	Below to normal	No comments for high impact events
Former	Above normal	Below	Below normal	Below	No comments for high impact events

Yugoslav Republic of Macedonia (1)		to normal		to normal	
Republic of Moldova (1,2)	Below normal (ref. period 2) Below normal to normal (ref. period 1)	Below to normal	Above to normal (ref. period 2)	Below to normal	February was colder than January by 1-2 ºC. Such figures are recorded averages once in three years. The absolute minimum air temperature during the winter season was -19ºC (January, MS Bălți, Tiraspol, Comrat). The absolute maximum temperature was +16.0ºC (January, MS Bălțata, Comrat , Fabruary, Făleşti, Bravicea, Dubăsari). The recorded quantity of precipitations during the season was 81-142 mm or **89-146%** of the **1971-2000** norm, and **77-127%** of the **1961-1990** norm**.**
Montenegro (1)	Above normal in most parts of the territory, normal in the narrow area of the eastern part of the country	Below to normal	Normal in the most parts of country, below normal in the northeastern part, above (extremely above) normal in the mountainous region of the	Below to normal in the mainland, below normal in the south of the country	No comments for high impact events

			northwestern part of the country		
Romania (1)	Normal in the most parts of territory, below normal in Southern and Eastern region	Below to normal	Above normal in almost all Romanian regions	Below normal in the northwestern half, below to normal in the southeastern half of the country	In the first part of the winter, floods occurred in the North-Western regions of Romania due to high precipitation amounts cumulated with snow melting during warm episodes which alternated with cold ones. The subjective perception among outlook users has been that the winter was a severe one, even though from the climatological point of view it was not in the top of most severe winters in Romania. Mild winters of the last 2 decades are still influencing the users perception.
Slovenia (2)	Near normal or slightly above normal	Below normal	Normal	Below normal	There were no major weather events in winter period - the main characteristics of winter period was that the snow in lowlands only fell in December, but almost none in January and February.
Serbia (1,2)	Normal in the most of the territory, below normal in the far east part of country.	Below to normal in the greater part, below normal in the northern part of the territory	Normal in the most of the territory, above normal in parts of the east and southeast of the country	Below to normal in the southern and southeastern parts, below normal on the other part of the territory	By the beginning of December, heavy precipitation in the southeastern Europe, and especially in Montenegro and Bosnia and Herzegovina (from 100 mm to 200 mm in 3 days), caused great rise of the water level on all the rivers in the Drina basin. Flood wave formed on the Lim and the Drina ranged in the domain of very high values and lasted during the first decade of December 2010. The water levels on the whole basin of the Drina river exceeded the points on which the emergency flood defense is announced. Emergency measures were applied because of the flooding from the Drina river bed on some sections. Despite significant protection measures, great material damage occurred in the whole course of the Lim and in the lower and middle course of the Drina. A new absolute maximum water level was recorded on the Drina river at the

					hydro-power station Radalj, H=659 cm, 3 December 2010. During December 2010, the water level of the Sava river was rising and ranged in the domain of high values for this period. The limits of regular and emergency flood defense were exceeded on the whole course of the Sava river through Serbia territory. By the end of December 2010 and during the first decade of January 2011, coastal ice and moving ice of 10% to 30% formed on the river Tisa. On the water courses of Banat region (north of Serbia), the Tamis, the Begej, the Moravica and the Brzava, full ice block was formed on three occasions during the winter of 2010/2011: in the second decade of December, from 14 to 20 December, then from 28 December to 10 January and from 29 January to 9 February.
Turkey (2)	Above normal in the most parts of the territory, normal in the west, north-west, mid-north parts of the country	Normal (no predictive signal) in the eastern half, below or above normal on the other part of territory	Below normal	Above to normal on the western coast and on the ultimate east of the Turkey, below to normal on the other parts of territory	In December 2010, some series of severe events such as heavy thunderstorms and hail with strong wind, heavy rain and floods affected in particular west of Turkey. Although these events were seen fitfully through the month, particularly in 10/11 and 16/17 December, throughout the Mediterranean Sea and Aegean Sea coastal parts, Maramara Region, agricultural areas, residence places and humans were damaged. Some parts of country water floods were seen. In the first part of January 2011, heavy rain and the floods affected south-west part of Turkey. On 24/25 of December, in the coast of the Mediterranean sea, event of hail occurred and damaged transportation system, greenhouses and residence places. On 28/29 January, due effective snow precipitation, transportation and communications were blocked. On 19th of February, strong storm happened in the center of Anatolia and on the coastal side of the Mediterranean Sea. In

					addition, on the same date, small size tornado was recorded near Erdemli/Mersin located on the coastal side of the Mediterranean Sea. In the same area, hail was seen and damaged some agricultural fields on 24th of February.

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