Eleventh Session of
SOUTHEAST EUROPE CLIMATE OUTLOOK FORUM

SEECOF-11 ONLINE MEETING

ANALYSIS AND VERIFICATION OF SEECOF-10 CLIMATE OUTLOOK FOR 2013-2014 WINTER SEASON FOR SOUTHEAST EUROPE (SEE)

CLIMATE OUTLOOK FOR 2013-2014 WINTER SEASON FOR SEE REGION

As stated in the SEECOF-10 Consensus Statement for Seasonal Climate Outlook for the 2013-2014 winter season over Southeastern Europe (document http://www.seevccc.rs/SEECOF/SEECOF-10/COF/Consensus%20Statement%20for%20Climate%20outlook%20for%20Winter%202013-2014.pdf, although for most of the domain the uncertainty for the temperature prediction is high, there is a weak tendency for the upper tercile in Hungary, some inland and the eastern part of Turkey**,** Georgia and Azerbaijan, together with the eastern and central Mediterranean, the Ionian Sea, and the southern and central parts of the Adriatic Sea with belonging coasts (zones 2 and 3 in Figure 1). In the rest of the SEECOF region (zone 1 in Figure 1) climatology is assigned for all three categories. It must be emphasised that even in the event of seasonal mean temperature near or above the long-term average, cold periods are still possible.

Precipitation in the largest part of the SEECOF region shows no preference for any climate defined category (zone 1 in Figure 2). The central Mediterranean, the southern part of the Aegean Sea, the Ionian Sea and most of the Adriatic Sea with belonging coasts show some tendency for the wet tercile (zone 2 in Figure 2), whereas the Eastern Black Sea region of Turkey slightly points to the dry tercile (zone 3 in Figure 2).

The climate outlook for the 2013-2014 winter season for the SEE region is presented in Figure 1.

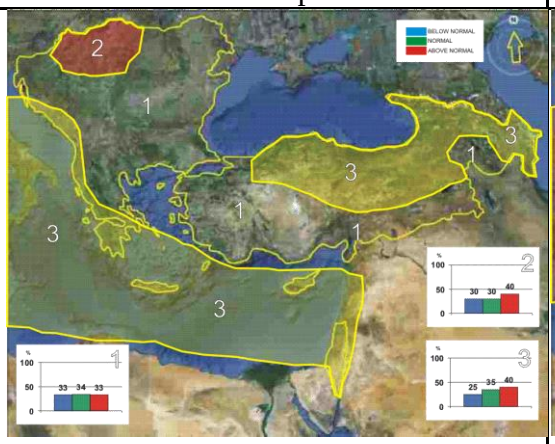
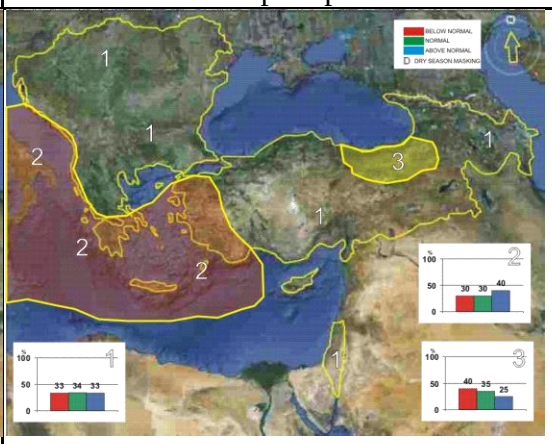
2013/2014 winter temperature outlook	2013/2014 winter precipitation outlook
	

Figure1. Graphical presentation of the climate outlook for the 2013-2014 winter season for the SEE region.

SHORT ANALYSIS OF 2013-2014 WINTER SEASON FOR SEE REGION

The analyses of the 2013-2014 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 the 2013-2014 winter season (ECSM, DWD, Lead of the WMO RA VI RCC Node on Climate Monitoring), http://www.seevccc.rs/SEECOF/SEECOF-11/STEP%201/RCC_CM_DWD_SeasonalClimReport_2013_2014_DJF.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-10 participating countries: Armenia, Bulgaria, Bosnia and Herzegovina/Federation of Bosnia and Herzegovina, Bosnia and Herzegovina/Republic of Srpska, Croatia, Cyprus, Greece, Georgia, Hungary, Israel, the Former Yugoslav Republic of Macedonia, Republic of Moldova, Montenegro, Romania, Serbia, Slovenia and Turkey (documents available on http://www.seevccc.rs/SEECOF/SEECOF-11/STEP%201/).

Winter 2013-2014 was warmer than normal in the Pannonia Plain, western and central parts of the Balkan Peninsula, over the Aegean and Ionian Sea, in the Central and Eastern Mediterranean with belonging coasts, in some parts in the northwest and in the central part of Turkey, as well as in Israel. In the Pannonia Plain and western and central parts of the Balkan Peninsula, mean winter temperature anomalies were between 2-3ºC, but in some parts of the central Balkans they even reached 4ºC. The countries covering the Pannonia Plain and western and central parts of the Balkan Peninsula reported that the past winter was one of the warmest. In Montenegro it was the warmest winter since 1951,

in the Republic of Srpska (Bosnia & Herzegovina) the second warmest, in Hungary the third warmest since 1901, in Serbia the third warmest since 1951 (in Belgrade the second warmest since 1888). On the other hand, in some parts of eastern Turkey and in the valleys and surrounding foothills in the south of the Caucasus the winter season was colder than normal with anomalies ranging between -2ºC and -1ºC (1961-1990 reference period). The rest of the SEECOF region had a normal winter (anomalies were between -1ºC and 1ºC).

The mean seasonal temperature of the winter 2013-2014 season over the Aegean and Adriatic Sea, northern part of the Eastern Mediterranean, Israel and some parts of Jordan was between 10ºC and 15ºC. In the south of the Mediterranean it was even higher – between 15ºC and 20ºC, while in the south and some parts in the west of the Balkan Peninsula, near the coasts of Turkey, Georgia and Azerbaijan the temperature ranged from 5ºC to 10ºC. In most of the SEECOF region temperature ranged from 0ºC to 5ºC; in the northeast of the Carpathian region, the mountainous region of Turkey and most of the Caucasus temperature ranged from -5ºC to 0ºC; in the higher mountains of eastern Turkey and the southern Caucasus it was between -5ºC and -10ºC; and in some parts it was even lower, between -15ºC and -10ºC. Mean seasonal temperatures for the winter 2013-2014 period are presented in Figure 2 (left panel).

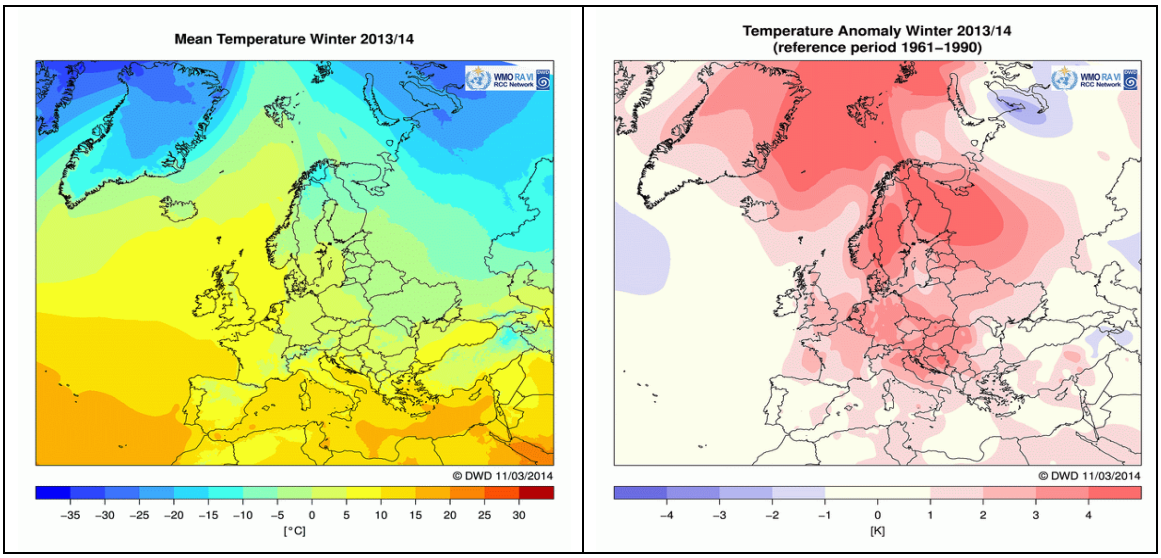


Figure 2. The observed 2013-2014 winter season mean temperatures (left panel) and winter season temperature anomalies (right panel). Source: http://www.dwd.de/rcc-cm

December 2013 was warmer than normal in the Pannonia Plain and western part of the Balkan Peninsula. It was colder than normal in most of Turkey, the Caucasus and in the northeast of Jordan, as a result of the inflow of Arctic cold air at the end of the first decade of December, with negative anomalies between -3ºC and -2ºC; in the east of Turkey and in the south of the Caucasus the anomalies reached even -4ºC. In the rest of the SEECOF region, December mean air temperature was normal.

In almost entire SEECOF area January and February 2014 were warmer than normal. Positive anomalies during the above mentioned months reached more than 4ºC in the Pannonia Plain, over the western and central parts of the Balkan Peninsula and in some parts in the east of Turkey. For instance, in Hungary it has been the seventh warmest

January, and the ninth warmest February since 1901. In Turkey, 25 stations observed new records of daily maximum temperature for February. Such warm weather caused early blooming of plants several weeks before their time.

Winter 2013-2014 was drier than normal (less than 75%) in most of the Pannonia Plain, western and central parts of the Balkans, western part of Romania, northern parts of the Caucasus, most of Turkey, in the Eastern Mediterranean with belonging coasts, in Israel and Jordan. For instance, the past winter has been the driest winter in Cyprus since 1901, the second driest in Hungary since 1901, the third driest in Serbia since 1951, the sixteenth driest in the Republic of Srpska (Bosnia & Herzegovina). Israel reported that the period from mid December 2013 to the end of February 2014 has been the driest in more than 70 years. In contrast, Slovenia, the northern Adriatic Sea, some parts in the northwest of Greece and the central part of Armenia received more precipitation than normal (more than 125%). In other parts of the SEECOF region the values of the winter precipitation anomalies were near normal. The 1951-2000 period was used as a reference period. The 2013-2014 winter season precipitation anomalies are presented in Figure 3 (right panel).

Winter precipitation totals over the SEECOF area ranged from less than 50 mm/per month in the Pannonia Plain, central and eastern Balkan Peninsula, most of the Caucasus region and Turkey, up to more than 150 mm/per month along the western banks of the Dinaric Alps and the coasts of the Adriatic and Ionian Sea, in the south of Greece, some parts in the southwest of Turkey and along the western coasts of the Black Sea. Some areas along the coasts of the Adriatic Sea took more than 200 mm/per month of the winter precipitation (Figure 3, left panel).

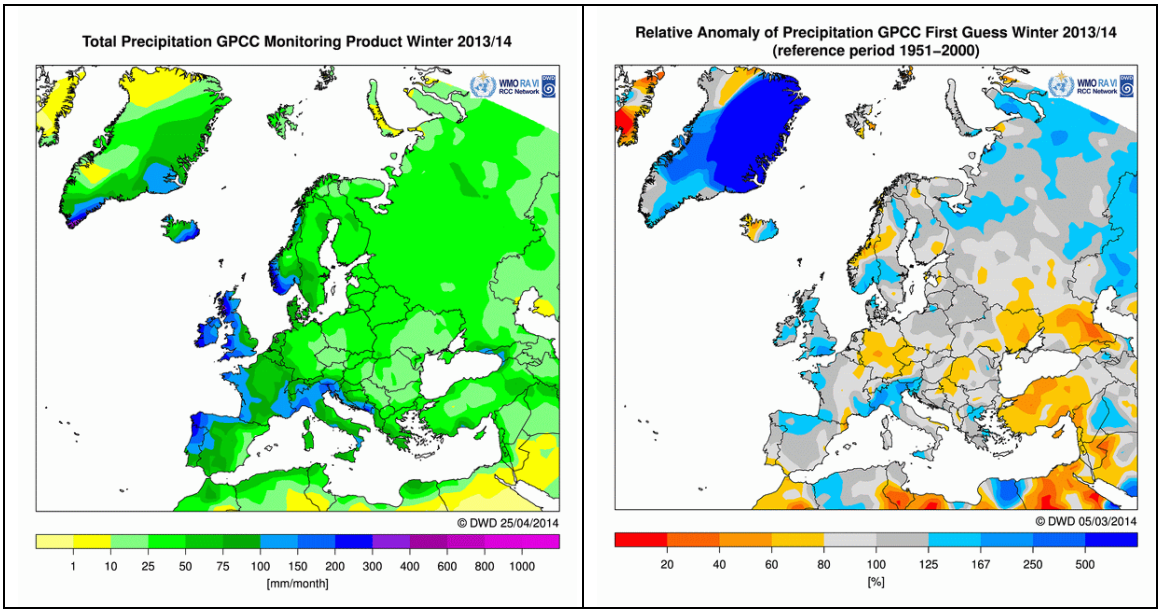


Figure 3. The observed 2013-2014 winter season precipitations in mm per month (left panel) and 2013-2014 winter season precipitation anomalies in mm per month (right panel). Source: http://www.dwd.de/rcc-cm

December 2013 was drier than normal in almost the whole SEECOF area. The Pannonia Plain, eastern Balkans and some parts of the central Turkey received less than 10 mm precipitation, and the eastern part of the Pannonia Plain even less than 1 mm. On the other hand, due to high precipitation totals, in the Central Mediterranean, Israel, Jordan

and the coasts of the Caspian Sea and belonging inland, precipitation of more than 125% of the normal was observed. At the end of December 2013 and early January 2014 extremely heavy precipitation fell in Slovenia (from 80 mm to 261 mm), causing floods and damages in the approximately 20% of the territory.

In January 2014 more precipitation than normal fell along the Adriatic Sea, the eastern Balkan Peninsula as well as in some parts in the south of Turkey. It was drier than normal in the western Balkans, in most of Turkey, the eastern Mediterranean Sea, Israel and Jordan.

February 2014 was wetter than normal in the north of the Dinaric Alps, especially in Slovenia. In Slovenia, at the beginning of the month, 4-day totals between 130 mm and 400 mm occurred, which contributed much to flooding. At the end of this period Slovenia and the western parts of Croatia experienced a severe freezing rain/black ice episode. The ice was more than 5 cm thick, causing enormous damage, especially to forests and electric infrastructure. The total economic damage has been estimated at about 430 million EUR. The electric power supply in some places was interrupted for several weeks, and there were also huge problems with the railways and roads. More than 50% of the country was affected. At the same time, small snow cover coupled with strong wind caused an interruption of highway traffic for 2-3 days. On the other hand, most of the Balkan Peninsula, the eastern Mediterranean, some parts in the south and southeast of Turkey, eastern coasts of the Black Sea with inland and Israel suffered from drought, with monthly totals below 30 mm, and in some parts even below 10 mm.

VERIFICATION OF CLIMATE OUTLOOK FOR 2013-2014 WINTER SEASON

The Consensus statement for the 2013-2014 winter season stated that there was higher uncertainty for the winter season temperature, with a weak tendency for the above normal conditions in the Pannonia Plain, across the central and southern Adriatic and Ionian Sea with belonging coasts, in the south of Greece, in the central and eastern Mediterranean, in Israel and Jordan, as well as in some parts of the continental part of Turkey, which was correctly predicted. In most of the Balkan Peninsula, in the west and south of Turkey and in Armenia, the SEECOF-10 climate outlook for the 2013-2014 winter season temperature suggested equal probabilities for below-, near- or above- normal conditions, so it is impossible to consider the verification of the above mentioned climate outlook.

The climate outlook for the 2013-2014 winter season gave higher uncertainties for precipitation than for temperature. In most of the SEECOF region, the probabilities for below-, near-, or above- normal conditions were approximately equal, so it is impossible to consider the verification of the climate outlook for the 2013-2014 winter season precipitation. In the coastal areas of the Adriatic and Ionian Sea, in the south of Greece, as well as in the central Mediterranean, winter totals were expected to be above normal, which was correctly predicted. The prediction of the below normal conditions for winter precipitation sums along the northeastern coasts of Turkey and the belonging inland was also correct. On the other hand, in the western part of Turkey, the climate outlook for winter precipitation was wrong, since the conditions were above normal, instead of below normal.

APPENDIX A: Contributions to Step 1 of SEECOF-11

- 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
- Armenian State Hydrometeorological and Monitoring Service, Republic of Armenia
- National Institute of Meteorology and Hydrology, Republic of Bulgaria
- Meteorological and Hydrological Service, Republic of Croatia
- Hellenic National Meteorological Service, Greece
- Meteorological Service, the Republic of Cyprus
- The National Environmental Agency of Georgia, Georgia
- Hungarian Meteorological Service, 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
- 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
- National Meteorological Administration, Romania
- Environmental Agency of the Republic of Slovenia, Republic of Slovenia
- Turkish State Meteorological Service, Republic of Turkey

APPENDIX B: **Analysis and verification of SEECOF-10 climate outlook for the 2013-2014 winter season:**
Verification summary based on national reports and contributions of the participants of SEECOF-11 online meeting

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High Impact Events
	Observed	SEECOF-10 climate outlook for temperature	Observed	SEECOF-10 climate outlook for precipitation	
Armenia (1)	Near normal in most of the country Below normal in the southwest of the country (the Ararat valley)	Above normal	Near normal	Normal (No predictive signal)	December 9 – heavy snow in Kajaran. December 11 – heavy snow was observed in Ararat and Gavar; 32 mm/12 h. January 28 – heavy snow was observed in Jermuk; 22 mm/12 h. The lowest minimum and maximum air temperature was observed during the period from December 25 to 31 in the Ararat Valley and surrounding foothills. There was no significant difference in day and night time temperatures during this period. The night air temperature dropped to -19 ... -22ºC in the Ararat valley, -24ºC in Gyumri, and the day time temperatures did not rise above -10 ... -14ºC. The average daily temperature during this period was below normal by 13-16 degrees. During some days there was wind of 25-30 m/sec, with gusts of up to 40 m/sec. December fog with poor visibility – 50-500 m.
Bosnia and Herzegovina, Federation of Bosnia and Herzegovina (1)	Above normal	Normal (No predictive signal) in most of the territory	Normal along the Dinaric Alps Below normal	Normal (No predictive signal)	No comments for high impact events

		Above normal to normal in the southwestern parts of the territory	in the rest of the territory		
Bosnia and Herzegovina, Republic of Srpska (5,6)	Above normal	Normal (No predictive signal) in most of the territory Above normal to normal in the southwestern parts of the country	Below normal	Normal (No predictive signal)	Temperature conditions were at the level of those from 2007. It was the sixteenth driest winter from 1881 up to now. December was the driest month on record, from 1881 up to now. The deficit of precipitation ranged from 99.6% in Banja Luka to 78.1% in Rudo, in relation to the 1981-2010 climatology.
Bulgaria (1,5)	Above normal	Normal (No predictive signal)	Below normal	Normal (No predictive signal)	Dry weather in December led to fire-likely conditions which are unusual for the month. There were indeed a couple of wild fires in the western part of the country at the end of December. The northeastern region of the country experienced the most severe weather with snow blizzards and snow depth between 30 and 80 cm. A couple of municipalities in the region declared emergency status on 27-30 January. Dermantsi, in north-central Bulgaria, reported maximum temperature of

					25.2ºC on February 17.
Croatia (1)	Above normal	Normal (No predictive signal) in most of the territory Normal to above normal in the Adriatic Sea with belonging coasts	Near normal in most of the country Above normal in the northern part and in some parts of the central Adriatic Sea with belonging coasts	Normal (No predictive signal) in the continental part of the country Above normal along the Adriatic Sea and belonging coasts	The driest winter season since 1901.
Cyprus (5)	Above normal	Normal to above normal	Below normal	Normal (No predictive signal)	The driest winter season since the measurements begun in 1901. During the period from 10 to 13 December 2013, Cyprus was affected by a cold depression, which initiated a northeasterly very strong to near gale and locally gale force wind associated with low temperatures and snowfall, falling from the height of 250 m and above.
Georgia (1)	Near normal	Normal to above normal	Below normal to normal in the west of the country and in	Normal (No predictive signal)	An outbreak of the Arctic air masses, which came over eastern Europe and the Black Sea from the White Sea, quickly spread over entire western Georgia, especially Ajara's mountainous territories, and brought a drop of air temperature and very heavy precipitation. In Khulo snow depth was 110 cm on December 9, 200 cm on December 11, and 218 cm on December 15. It was a record for this region. Such heavy precipitation is a very rare phenomenon for Ajara, especially in December.

			several regions of eastern Georgia Near normal in eastern Georgia		
Greece (2)	Above normal	Normal (No predictive signal) in most of the territory Normal to above normal in the coastal part of the Ionian Sea and in the south of Greece	Below normal in the eastern part of the Aegean Sea Normal in most of the country Above normal along the Ionian Sea and the western part of the Peloponnese	Normal (No predictive signal) in most of the territory Above normal along the Ionian Sea and in the southern parts of the country	No comments for high impact events
Hungary	Above	Above	Normal	Normal	The third warmest season since measurements begun in 1901.

(4)	normal	normal	with great extremities in individual months and over different parts of the country.	(No predictive signal)	December was the second driest December in Hungary since measurements begun in 1901. Great extremities in individual months and over different parts of the country.
Former Yugoslav Republic of Macedonia (1)	Above normal	Normal (No predictive signal)	Below normal	Normal (No predictive signal)	The highest daily air temperature of 23.8°C during winter was measured in Bitola on February 19. On January 27, the lowest temperature during winter was observed in Lazaropole, measuring -11.5°C. During most of the winter period, mean, maximum and minimum air temperatures in Macedonia were above the multiannual average, and four heat waves were registered. The first heat wave was registered at certain stations in the period from January 6 to 14, while at the majority of principal meteorological stations the second heat wave was recorded in the period from January 15 to 24. The next two heat waves were observed in February, lasting from February 7 to 13 and from 15 to 23 respectively. The highest daily precipitation amount of 39.0 mm was registered in Gevgelija on December 28.
Israel (1,2,5)	Above normal	Normal to above normal	Below normal	Normal (No predictive signal)	No comments for high impact events
Republic of Moldova (1,2)	Above normal in most of the country Normal in the	Normal (No predictive signal)	Normal in some parts in the north, west and south of the country	Normal (No predictive signal)	Abnormally warm weather was recorded during the first two decades of January, when the average temperature was 5-6ºC higher compared to normal values, which is recorded on average once in each 15 years. However, during the third decade of January anomalous cold weather was reported in the country. The average decadal air temperature was 6.0-7.5ºC lower than the norm, which is recorded on average once in 5-8 years. The average air temperature for the winter season was -0.2 ... -1.6ºC, which is

	central and eastern part of the territory		Below normal in the central and eastern parts of the country		higher than the norm by 0.2 - 1.2ºC. Such conditions are recorded once in each 2-3 years. The absolute minimum of air temperature throughout the season was -27ºC (February), which in winter in the central districts of the country is reported on average every 7-10 years. The absolute maximum reached 14ºC (December). In the period from January 19 to February 6 throughout the country ice deposits with a diameter of up to 1-18 mm were recorded. Locally, their maximal diameter has reached 24-27 mm, which is considered a meteorological hazard and is possible to occur in the territory on average every 2-3 years. The length of the meteorological hazard was properly leveled to 188 hours and 132 hours, which is recorded on average once in 10-15 years. Strong glazed frost, heavy snowfalls and, locally strong wind caused damage to the property of the national economy, disconnected communities from electricity sources and buried the roads in snow.
Montenegro (1)	Above normal	Normal (No predictive signal) in most of the territory Normal to above normal in the coastal part of the Adriatic Sea	Normal in most of the country Below normal from the northern to the eastern part of the country	Normal (No predictive signal) in the continental part of the country Normal to above normal along the Adriatic Sea and belonging coasts	The warmest winter in most of Montenegro. Drought in December 2013 affected the whole country with the amount of precipitation ranging from 2-35% with respect to the 1961-1990 period. A new minimum was recorded in the southeastern part of the coastal region. For the majority of the country it was the second driest December since the begining of measurements. Impact on winter tourism. Prolonged snowcover deficiency that lasted until January 2014 had the highest impact on winter tourism with less than 90% of skiers, the income less than 10% with respect to the same period in 2013, and with 60% loss of income compared to the winter season 2012/2013. Due to unusualy warm conditions in January the phenological phases began in the central and southern part of the country. A yield of pears and strawberries was recorded in the first decade of January. Heavy precipitation from 19 to 23 January in the central and southern part of the country caused floods and higher turbidity of the drinking water. In many

					cases floods were the result of inadequate land management and untimely cleaning of the river beds.
Romania	Above normal	Normal (No predictive signal)	Below normal	Normal (No predictive signal)	No comments for high impact events
Serbia (1,2,5)	Above normal (5)	Normal (No predictive signal)	Below normal (5)	Normal (No predictive signal)	The winter of 2013/14 was the third warmest winter in Serbia in the period 1951-2014 and the second warmest in Belgrade for the period 1888-2014. The highest daily air temperature of 24ºC during winter was measured in Zajecar on February 17. On January 31 the lowest temperature during winter of -20.2ºC was observed on Crni Vrh. Winter 2013/14 was the third winter with lowest precipitation sums in the period 1951-2014 and the sixth in Belgrade for the period 1888-2014. During winter 2013/14 three heat waves were registered in the territory of Serbia. At the end of December, the majority of GMS stations observed the onset of the first heat wave, lasting from 23 to 29 December 2013. In most of Serbia, the second heat wave was recorded during the first two decades of January, while the third one was registered at certain stations. The heat wave with the longest duration (20 days) occurred on Zlatibor, lasting from January 2 to 21. The following heat wave was observed at 13 GMS stations during February.
Slovenia (5)	Above normal	Normal (No predictive signal)	Above normal	Normal (No predictive signal)	The winter of 2013-14 in Slovenia was one of the warmest and one of the wettest on record. While December was generally too dry, both January and February were very wet. January was at some places the warmest on record. There was one particular high impact weather event which occurred in the period from 30 January to 7 February 2014. Slovenia experienced a severe freezing rain/black ice episode. The ice was also more than 5 cm thick in some places. The damage especially to the forests and electric infrastructure was

					enormous. The total economic damage is estimated at about 430 Million EUR. The electric power supply in some places was interrupted for several weeks, not to mention the problems on the railway and roads. More than 50% of the country was affected. One person died while working on electric power repair.
Turkey (2)	Normal in most of the country Above normal along the Aegean Sea, some parts in the south, northwest, and in the central part of the country	Normal (No predictive signal) in the western and southern parts of the territory Normal to above normal in other parts of the country	Normal in some parts of central and eastern Turkey Below normal in most of the country	Normal (No predictive signal) in most of the territory Below normal along the northeastern coasts of the Black Sea and belonging inland	No comments for high impact events

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 (1961-2013)
7 – No information about basic climatological period