Thirteenth Session of
SOUTHEAST EUROPE CLIMATE OUTLOOK FORUM

SEECOF-13 ONLINE MEETING

ANALYSIS AND VERIFICATION OF SEECOF-12 CLIMATE OUTLOOK FOR 2014/2015 WINTER SEASON FOR SOUTHEAST EUROPE (SEE)

CLIMATE OUTLOOK FOR 2014/2015 WINTER SEASON FOR SEE REGION

As stated in the SEECOF-12 Consensus Statement for Seasonal Climate Outlook for the 2014/2015 winter season over Southeast Europe (document hhttp://www.seevccc.rs/SEECOF/SEECOF-12/COF/Consensus%20Statement%20for%20Climate%20outlook%20for%20Winter%202014-2015.pdf, across the SEECOF region near or above average seasonal temperatures were favoured, with equal probability: in the region 1 on the map (zone 1 in Figure 1) the probability for above normal values was 40%, while in the region 2 (zone 2 in Figure 1) it was 35%.

For precipitation, predictability was lower than that for temperature. For the region 1 (zone 1 in Figure 1) a drier-than-average winter was favoured, with the probability of 40% for the lower category. For the region 2 (zone 2 in Figure 1) the near- and above-average categories (35% and 40% respectively) were more likely than below-average, while for the region 3 (zone 3 in Figure 1), there was no signal.

Seasonal averages cannot provide details about short spells of weather during a season. It is possible that, even in an average season, spells of severe wintry weather (for example: winter storms, very cold episodes, very wet spells) occur and lead to significant local socio-economic impacts.

The climate outlook for the 2014/2015 winter season for the SEE region is presented in Figure 1.

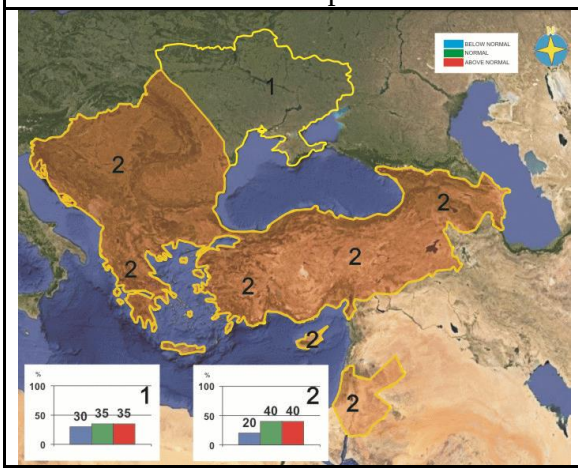
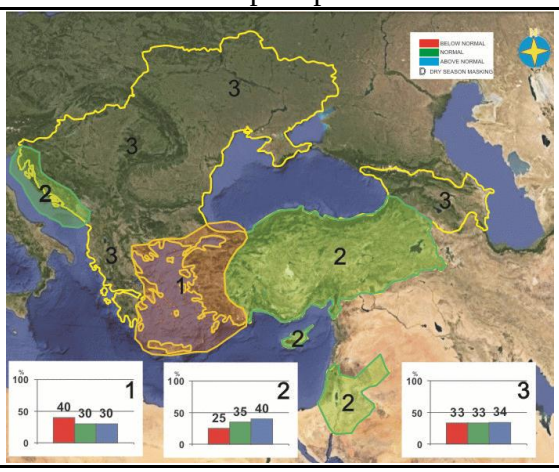
2014/2015 winter temperature outlook	2014/2015 winter precipitation outlook
	

Figure1. Graphical presentation of the Climate outlook for the 2014/2015 winter season for the SEE region.

SHORT ANALYSIS OF 2014/2015 WINTER SEASON FOR SEE REGION

The analyses of the 2014/2015 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 2014/2015 winter season (ECSM, DWD, Lead of the WMO RA VI RCC Node on Climate Monitoring), http://www.seevccc.rs/SEECOF/SEECOF-13/STEP1/RCC_CM_DWD_SeasonalClimReport_2014_2015_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-12 participating countries: Armenia, Bulgaria, Bosnia and Herzegovina/Federation of Bosnia and Herzegovina, Croatia, Cyprus, Georgia, Greece, Israel, the Former Yugoslav Republic of Macedonia, Republic of Moldova, Montenegro, Serbia, Slovenia, Turkey and Ukraine (documents available on http://www.seevccc.rs/SEECOF/SEECOF-13/STEP1/).

Winter 2014/2015 was warmer than normal in the whole SEECOF region. In most of the SEECOF region it was much warmer than normal; the exception was the central part of the Balkan Peninsula, the east of Romania, Moldova, the southwest of Ukraine, the northeast of Turkey and the western part of the South Caucasus region, as well as the eastern part of the Aegean Sea with belonging coasts, where it was warmer than normal. In the Pannonia Plain, the western parts of the Balkan Peninsula, and the west of Romania, positive mean winter temperature anomalies were between 1-2ºC; in the area between Turkey and Armenia even 3ºC, while in the rest of the SEECOF region they were up to 1ºC.

The mean seasonal temperature of winter 2014/2015 along the coasts of the Ionian, Aegean Sea and the Eastern Mediterranean, in most of Israel and Jordan was between 10ºC and 15ºC. In the south of the Eastern Mediterranean it was even higher – between 15ºC and 20ºC, while along the coasts of the Adriatic Sea, the southern and southeastern coasts of the Caspian Sea, the eastern coasts of the Aegean Sea with its hinterland and some parts in the far southeast of Turkey, 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, Ukraine, mountainous region in the east of Turkey and most of the Caucasus, temperature ranged from -5ºC to 0ºC; in the higher mountains of eastern Turkey it was between -10ºC and -5ºC. Mean seasonal temperatures for the winter 2014/2015 period are presented in Figure 2 (left panel).

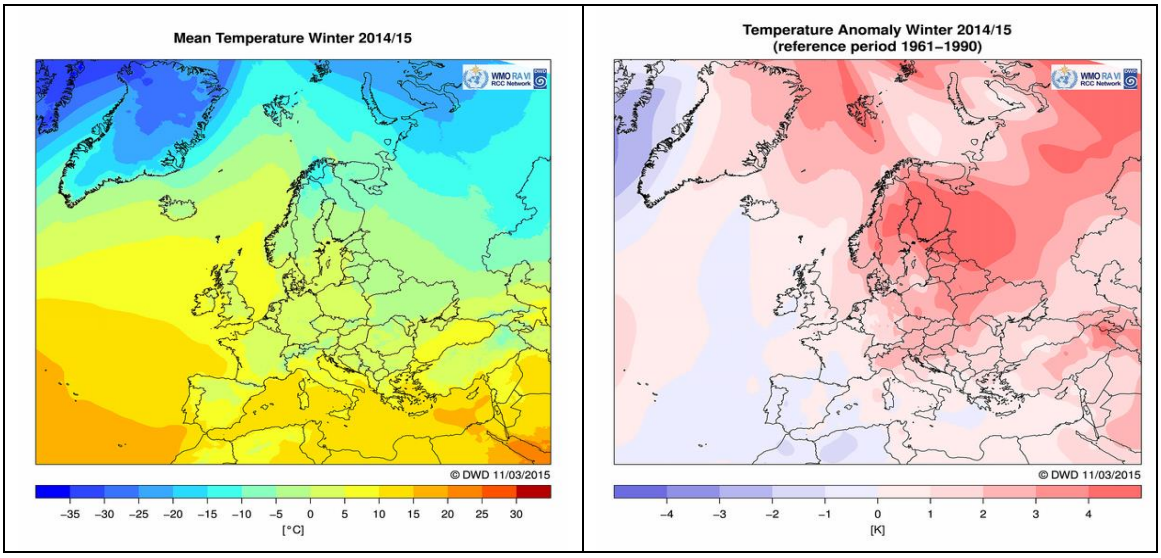


Figure 2. The observed 2014/2015 winter season mean temperatures (left panel) and winter season temperature anomalies (right panel). Source: http://www.dwd.de/rcc-cm

December 2014 was warmer than normal in most of the SEECOF region with anomalies between 1ºC and 2ºC; in the Pannonia plain, western part of the Balkans, eastern parts of the Carpathian region, most of Turkey and South Caucasus between 2ºC and 3ºC; and in the mountainous region of Turkey and border to Armenia above 4ºC. In Prodromos (in the mountainous region of Cyprus) with 16.8ºC, as well as in Fiorina and Edremit (Turkey), the absolute maximum air temperatures were observed. The exception was Ukraine, Moldova, and the eastern part of Romania with near-average December mean air temperature.

In almost entire SEECOF area, January and February 2015 were warmer than normal. Positive anomalies during January reached more than 4ºC in most of Ukraine and in the western parts of the South Caucasus. Positive anomalies of the February mean temperatures above 4ºC were observed in the north of Ukraine and in the mountainous areas in the east of Turkey and in the South Caucasus region. During the second decades of January and February, cold spells hit Turkey and the eastern Mediterranean with the belonging coast causing heavy snowfall and a fall of temperature. In the first decade of January, certain stations over 1000 m height in Cyprus and Israel got the absolute minimum temperatures – station on the Golan Heights (Israel) recorded the absolute minimum temperature (since 1978) of -14.2ºC, while the station on Prodromos mountain recorded the extreme minimum temperature of -10.0ºC.

During winter 2014/2015, most of the SEECOF region received a normal amount of precipitation. The Balkan Peninsula, especially its eastern parts, the mountainous regions in the west of Turkey and in the South Caucasus region were wetter than normal (more than 125%). In contrast to that, some regions in the southwest of Ukraine and Georgia were drier than normal (less than 75%). The 1951-2000 period was used as a reference period. The 2014-2015 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 Ukraine, the Pannonia Plain, most of the Carpathian region, most of the Caucasus region and the central part of Turkey, up to more than 150 mm/per month along the western slopes of the Dinaric Alps and the coasts of the Adriatic and Ionian Sea, in the south of Greece, along the western coasts of the Aegean Sea with its hinterland and northern coasts of the Eastern Mediterranean. Some areas along the coasts of the Adriatic Sea and along the southwestern coasts of the Aegean Sea took more than 300 mm/per month of winter precipitation (Figure 3, left panel).

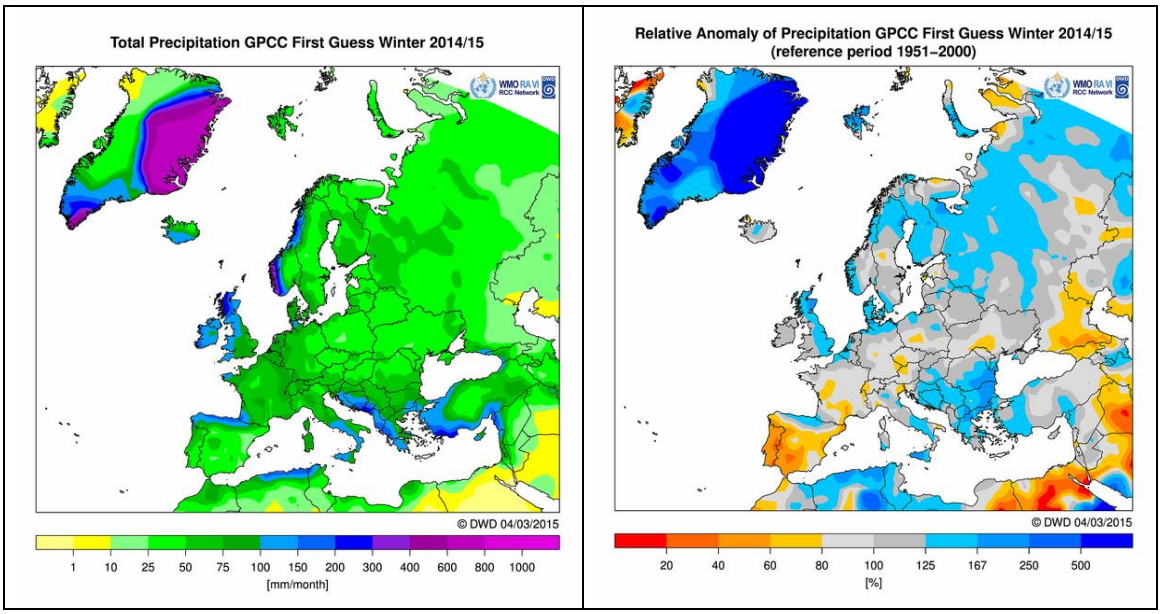


Figure 3. The observed 2014/2015 winter season precipitation in mm per month (left panel) and 2014/2015 winter season precipitation anomalies in mm per month (right panel). Source: http://www.dwd.de/rcc-cm

December 2014 was wetter than normal in the central and eastern parts of the Balkans, along the coasts of the Aegean Sea and in some regions in the north of Turkey, as well as on the islands in the Adriatic Sea. For instance, the southeastern part of Romania measured precipitation sums up to 200 mm. The absolute daily maximum of precipitation for December 2014, with the value of 142.3 mm, was recorded on the station Hvar in Croatia on 3rd December 2014 (1858-2013). In most of the Caucasus, the central parts of Ukraine and Turkey, as well as in Israel and in the west of Jordan, monthly precipitation of less than 80% was observed, while in the rest of the SEECOF region December precipitation totals were near normal.

In January 2015 more precipitation than normal fell in the Pannonia Plain, central and eastern Balkans, in some areas of the mountainous regions of Greece, Bulgaria and Turkey, in most of Israel and in Jordan, as well as in the east of Bulgaria. It was drier than normal in the western and central parts of the South Caucasus, in Moldova, in the northeast of Romania, in the south of Israel and some areas in central Turkey. During the period from January 11th to 16th, Cyprus, Israel and Jordan recorded from 150 mm up to 200 mm precipitation. Snow fell even at lower altitudes making thin snow cover, which has happened only 4-5 times since the 40s. In Jerusalem snow cover was only 5 cm high, but at higher altitudes it was between 0.3 m and 1 m, which caused traffic problems.

February 2015 was wetter than normal in the north of the Dinaric Alps, some parts of the central and southern Balkan Peninsula, in the eastern part of Romania, northeastern Ukraine, some parts in central Turkey, in most of the South Caucasus region and in the southern parts of Israel and Jordan. The highest precipitation amount, more than 200 mm fell along the mountains in the hinterland of the Adriatic and the Ionian Sea, the southern coasts of Turkey, and the mountainous region of Cyprus. On the other hand, the eastern parts of Ukraine, the areas in the north of Hungary and northwest of Romania suffered from drought, with monthly totals below 50 mm, in some parts even below 25 mm. On February 1st the absolute daily maximum of precipitation (since 1951) was recorded at several stations in the FYR of Macedonia: Bitola (46.4 mm), Berovo (49.4 mm), Ohrid (66.5 mm) and Prilep (58.5 mm), while in the southern parts of Bulgaria the daily precipitation amounts exceeded 100 mm. At the end of January and in the first decade of February, the above mentioned heavy rain events combined with the water saturated ground led to several consecutive floods in Macedonia and near the border between Bulgaria and Turkey. Most of them affected agriculture fields and caused damage and traffic interruptions on bridges and roads. At the end of the first and start of the second decade of February, the western part of Turkey and the Eastern Mediterranean with belonging coasts were hit by a cold spell with heavy rain (from 30 mm up to 140 mm in the central mountainous region of Israel) and snow in the altitudes over 300 m. For instance, Jerusalem had a snow cover of less than 5 cm, while in the mountains over 300 m altitude in northern and over 500 m in central Israel snow depth was between 10 and 30 cm. In the western part of Turkey due to heavy snowfall schools were closed and transportation disrupted.

VERIFICATION OF CLIMATE OUTLOOK FOR 2014/2015 WINTER SEASON

The Consensus statement for the 2014-2015 winter season stated that in the whole SEECOF region there was higher certainty for the winter season temperature. Near- or above- average seasonal temperatures were favoured with equal probability: in zone 1 the above probability was 40%, while in zone 2 it was 35%, which was correctly predicted.

The climate outlook for the 2014/2015 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 has been impossible to consider the verification of the climate outlook for the 2014/2015 winter season precipitation. In the coastal areas of the Aegean Sea and in the south of Greece winter totals were expected to be below normal, which was correctly predicted. On the other hand, in the northern and central Adriatic with belonging hinterland, in Israel, Jordan, and in most of Turkey, climate outlook for winter precipitation was incorrect, since the conditions were near normal, instead of above normal.

APPENDIX A: Contributions to Step 1 of SEECOF-13

- 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
- Ukrainian Hydrometeorological Center, Ukraine

APPENDIX B: **Analysis and verification of the SEECOF-12 climate outlook for the 2014-2015 winter season:**
Verification summary based on the national reports and contributions of the participants of the SEECOF-13 online meeting

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High Impact Events
	Observed	SEECOF-12 climate outlook for temperature	Observed	SEECOF-12 climate outlook for precipitation	
Armenia (1)	Above normal	Normal to above normal	Below normal	No predictive signal	Heavy snowfall on February 9th in Amasia (29.4 mm). Strong wind of 24 m/s, with gusts of 38 m/s, on January 5th in Pushkin Pass. Strong wind of 18 m/s, with gusts of 31 m/s, on January 6th in Martuni. Strong wind of 24 m/s, with gusts of 32 m/s, on February 1st in Pushkin Pass.
Bosnia and Herzegovina, Federation of Bosnia and Herzegovina (1)	Above normal in most of the country Normal in the south of the country	Normal to above normal	Above normal in most of the country Normal near the eastern boundaries of the country	No predictive signal	No comments for high impact events.
Bulgaria (1,5)	Above normal	Normal to above normal	Normal	No predictive signal	1st – 5th December 2014: Heavy icing grasped the northwestern part of the country due to a prolonged period of ground temperature slightly below 0ºC in a thin layer of cold air, trapped in the western bottom of the Danube Plain, and precipitation in the form of rain or sleet. There were damaged electric infrastructure and roads.

					5th – 9th December 2014: A prolonged period of rain in the south and snow in the north caused problems in many parts of the country. The rain in the south combined with the water saturated ground led to river overflow near the border with Turkey. 31st January – 3rd February 2015: The south was again hit by a heavy rain event with 24-hour precipitation amounts exceeding 100 mm. Overflow of rivers caused damage.
Croatia (1)	Normal to above normal	Normal to above normal	Above normal in most of the country Normal in the North Adriatic, hinterland of the Central Adriatic and the westernmost part of continental Croatia	No predictive signal in the continental part of Croatia Normal or above normal along the Adriatic Sea and belonging hinterland	**In December**, the absolute **monthly maximum** (since 1981) of temperature was recorded in Makarska (Dalmatia); Tmax=21°C, on 3rd December. Very low minimum temperatures were recorded on December 30th and 31st all over Croatia – the lowest temperature was measured in Slatina (east continental part) on 31st December (-21°C). The absolute **daily maximum** of rain (since 1894) was recorded on island Hvar (Dalmatia) on 3rd December – 142.3mm/24h. Significant accumulations of rain (132 mm) were recorded from 4th to 6th December in Sibenik (Dalmatia). In this period many floods and damages were recorded too. On 28th and 29th December heavy snowfall was recorded over the continental part of Croatia – snow cover was between 10 and 50 cm high. During December a few "episodes" with gale force wind were recorded. Mean wind speed at the Adriatic coast (mostly bora, NE wind) was around 24 m/s, and gusts up to 45 m/s (on 9th and 10th December, and from 28th to 31st December). In the mountains area, along with heavy snow, wind caused a lot of damages and traffic interruptions.
Cyprus (5)	Normal	Normal to above normal	Below normal	Above normal	**DEC:** An extreme Tmax (16.8°C) was recorded over Prodromos (mountainous station) with a positive anomaly of 8.5°C from normal (8.3°C) **JAN:** Extreme Tmax (14.1°C) was recorded over the Prodromos mountainous station with a maximum positive anomaly of 7.9°C.

					Extreme Tmin (-10.7°C) was again recorded over the Prodromos mountainous station with a negative deviation of -10.0°C from normal (0.7°C) During the first week, a mean area of 82.6mm was recorded while other significant accumulations were recorded from the 13th to the 14th of the month and during the end of the month. January was «closed» with a mean area average of 168.2mm or 164% of normal. During this period a polar air mass affected the area resulting in the recorded low temperatures. Snowfall was recorded over the mountainous range but also over the areas with lower altitude such as Nicosia (160 m), the capital of Cyprus. Snow was recorded from 6th to 8th January, on the 14th and also during the 30th and 31st of January. As a consequence of snowfall and ground frost several schools in the mountains were closed and part of the transportation program was disrupted. During the mentioned periods the wind field was high. **FEB:** An extreme Tmax (17.6°C) was recorded over Prodromos (mountainous station) with a positive anomaly of 9.8°C from normal (6.8°C). Extreme Tmin (-9.5°C) was again recorded over the Prodromos mountainous station with a negative deviation of -9.0°C from normal (0.5°C) Regarding the accumulated February precipitation, a notable amount of area average 105.2mm, or 129% of normal (81.6mm) area average, was accumulated. It is worth mentioning that all mountainous and semi-mountainous stations encountered accumulated precipitation well above the month's normal. The precipitation distribution was significantly higher over the mountains (over the Prodromos station 252mm of accumulated precipitation was measured, or 173% of normal) if compared to the coastal areas. It was the main result of two successive depressions associated with

					cold invasions which have affected eastern Mediterranean during the periods from 9th to 15th and from 18th to 24th February. In the period from 9th to 12th February hail was reported as a result of thunder activity. During the above periods there were 6 fresh snow days, with snow noted not only over the highest mountainous areas of Troodos Range but also over the semi-mountainous areas and plane areas such as the Athalassa station (nearby Nicosia, the capital). On 19th snow and/or rain snow was also observed over the coastal stations, such as Kato Pirgos, Gialia and Limassol.
Georgia (1)	Above normal	Normal to above normal	Below normal in most of the country	No predictive signal	On January 6th and 7th heavy snowfall was observed causing snow cover of 180 cm depth. It affected on slid avalanches, blocked roads and made damage on electric lines.
Greece (2)	Above normal	Normal to above normal	Above normal	No predictive signal in most of the territory Below normal in the Aegean Sea with belonging coastal areas	No comments for high impact events

The Former Yugoslav Republic of Macedonia (5)	Above normal in most of the country Normal in the southwestern part of the country	Normal to above normal	Above normal	No predictive signal	Very high daily precipitation values were recorded during January and most of February. Absolute daily maximums of rain (since 1951) were recorded on 1st February in Bitola (46.4 mm), Berovo (49.4 mm), Ohrid (66.5 mm) and Prilep (58.5 mm). Especially in the period from the 3rd decade of January to the 1st decade of February intensive rains on the territory of Macedonia caused damages due to several consecutive floods. Most of them affected agricultural areas, as well as some villages. They caused traffic interruptions on bridges and roads.
Israel (5)	Above normal	Normal to above normal	Near normal	Above normal	DJF 2014/15 included two impact events of snow in Jerusalem, although it usually happens only once a year. **The first event of snow in Jerusalem** - A major cold spell storm during 11th -16th January 2014 which included: a. Snow depth of 1 m at Hermon (2200 m above sea level), 0.3-1 m in Galilee and Golan heights (900-1100 m). Snow cover reached the low altitudes of 70 m ASL, which has happened only 4-5 times since the 40s. In Jerusalem snow depth was only 5 cm. b. In North Israel rain amounts on this occasion reached 150-220 mm. In the southern and central coastal plain precipitation amounts were 100-150 mm. c. A record-breaking minimum temperature (since 1978) of -14.2ºC was measured at Golan Heights (1100 m), breaking the last year record of -13.6 ºC. **The second snow event** - A cold spell during 8th -11th of February 2014 which included: a. Snow depth of 10-30 cm in the mountains above 300 m ASL in northern Israel and 500 m in Central Israel.

					b. In North Israel rain amounts reached 30-60 mm. c. In the Israel plain area rain amounts were between 20-90 mm. d. In Central Mountain of Israel the precipitation amount was 80-140 mm.
Republic of Moldova (5)	Above normal	Normal or above normal	Normal in most of the country Above normal in the southern parts of the country	No predictive signal	During the winter season, meteorological phenomena in the form of heavy snowfall were observed: on December 29th, in some places in the central and southern regions, 20 to 30 mm of precipitation fell in 12 hours. Snowfall was accompanied by the increased wind speeds of up to 16-21 m/s, and sometimes blizzards. As a result of the transfer of snow, drifts formed on the roads in the southern half of Moldova, which created extremely unfavourable conditions for road traffic. Also, during the winter season, fog, sleet and rime deposits up to 9 mm in diameter, blizzards, increased wind speeds up to 22 m/s, and ice on the roads were observed.
Montenegro (1)	Above normal	Normal to Above normal	Above normal In the western parts Normal In the rest of the country	No predictive signal in the continental part of the country Above normal along the Adriatic Sea and belonging coasts	From the 1st to the 3rd December - ***Heavy precipitation followed by strong wind*** affected central and southern parts of Montenegro causing damages in electrical supply in capital town Podgorica and Cetinje (mountainous region towards the coastal area) and several towns in the coastal region. On January 30th - ***Heavy precipitation followed by strong southern to southeastern wind*** affected snowdrift almost 2 m of height in the towns and villages of the north mountainous region and had impact on the traffic and electrical supply From the 9th to the 11th February - strong blizzard hit country. Part of the main road which connected the northwestern mountainous region was closed; There were also damages in electrical supply which could not be repaired on time, in total 12 days without electrical energy in the

					villages of the northwest mountainous region.
Serbia (5)	Above normal	Normal to above normal	Above normal	No predictive signal	No impact events.
Slovenia (5)	Above normal	Normal to above normal	Normal	No predictive signal	No major high impact events occurred during the winter season.
Turkey (2)	Normal in the western, northern and southeastern part of the country Above normal in most of the country	Normal to above normal	Above normal in the west, north and on the southern coasts and in some cities in the east Normal in most of the country Below normal in some inland areas and in the east side of the country	Above normal	In **December** 2014, the roads between Kütahya - Afyonkarahisar and Balıkesir - Akhisar were blocked due to heavy snowfall. In **January** 2015, agricultural damage occurred and transportation stopped in some areas in Antalya due to a storm. In Istanbul, flights were cancelled because of a storm and heavy snowfall. In **February** 2015, heavy snowfall affected the cities of Bitlis, Kocaeli, Mersin, Bursa, Konya, Karaman, Samsun, Kayseri and İstanbul. Schools were closed and transportation interrupted.

Ukraine (5)	Above normal	Normal to Above normal	Normal in the most of the country	No predictive signal	The warmest period was between 25th and 27th December, when absolute maximum temperatures were broken in the most of Ukraine and increased for 0.2°C till 3.3°C. On December 29th the amount of 329 mm observed in Pozhezhevska of Ivano-Frankivsk (Carpathians) was the record breaking precipitation total registered during winter 2014-2015. During the winter season, meteorological extraordinary phenomena in the form of heavy snowfall were observed: on December 29-30 in some places in the southern and eastern part (Mykolaiv, Odesa, Kherson, Dnipropetrovsk and Kharkiv regions) 20 to 45 mm of precipitation fell in 12 hours. Snowfall was accompanied by the increased wind speeds of up to 16 - 20 m/s, some places 25-38 m/c and blizzards with duration 14-16 hours, snow cover 25-57 cm. Unfavorable weather conditions caused loss power, telecommunications, utilities and transport.

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