

VERIFICATION OF THE SEECOF -16 WINTER 2016/2017

CLIMATE OUTLOOK FOR REPUBLIC MACEDONIA

COMPARED TO THE 1981-2010 BASE PERIOD

Hydrometeorological Service of Republic of Macedonia prepares regular seasonal climate analysis, based on the products of SEECOF seasonal forecasts and the forecast from the SEEVCCC. The present analysis is for the winter 2016/2017, December 2016, January and February 2017, and it is based on the means of the climatological period 1981-2010.

➤ WINTER 2016/2017

Overall conditions in Republic of Macedonia this winter season had negative divergence from the long term average 1981-2010. During winter 2016/2017, the mean air temperature ranged between -2.3°C in Mavrovo and 4.2°C in Gevgelija. Spatial distribution of the mean seasonal air temperature is shown on Figure1. The mean air temperatures anomaly was below normal. This anomaly from the normal 1981-2010 base period, during winter 2016/2017 ranged from -1.5°C in Berovo to -0.5°C in Prilep and Bitola (Figure2).

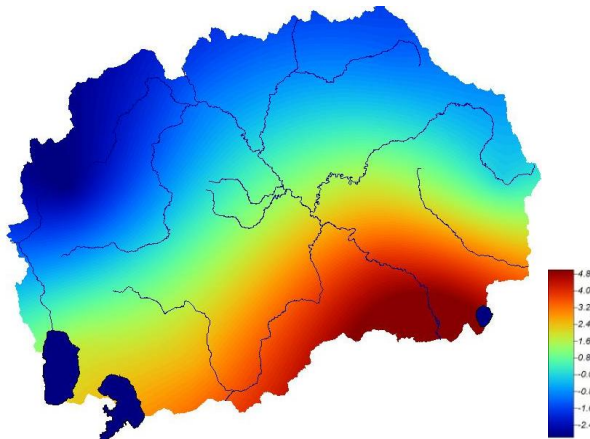


Figure 1: Spatial distribution of the mean seasonal air temperature ($^{\circ}\text{C}$) during winter 2015/2016

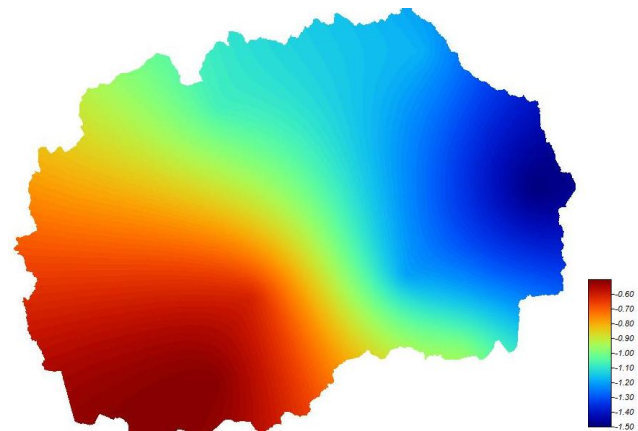


Figure 2: Mean seasonal air temperature anomaly ($^{\circ}\text{C}$) compared to the period 1981-2010 during winter 2015/2016

According to percentile calculation method, the east part was classified as cold and the rest of the territory as normal (Table1). Concerning the percentile method for the maximum temperatures, it is necessary to mention that it was categorized as normal in all parts of the country, while the minimum temperatures were categorized as normal to extremely cold (moving from west to east).

The highest daily air temperature during winter 2016/2017 was measured 22.7°C observed on 23rd February in Demir Kapija, and the lowest air temperature was -28.0°C observed on 8th of January in Berovo.

Rainfall totals were also below the long term average for this winter season. Spatial distribution of the precipitation sums is shown on Figure 3 and the anomaly compared to 1981-2010 base period on Figure 4.

The wettest day was 6th of January in Gevgelija with 46.1mm.

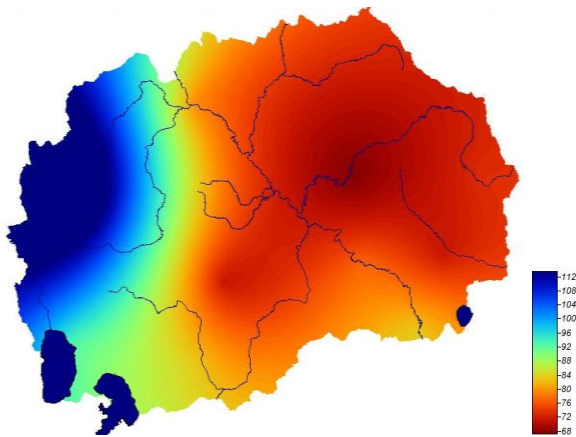


Figure 3: Spatial distribution of the precipitation sums (mm) during winter 2015/2016

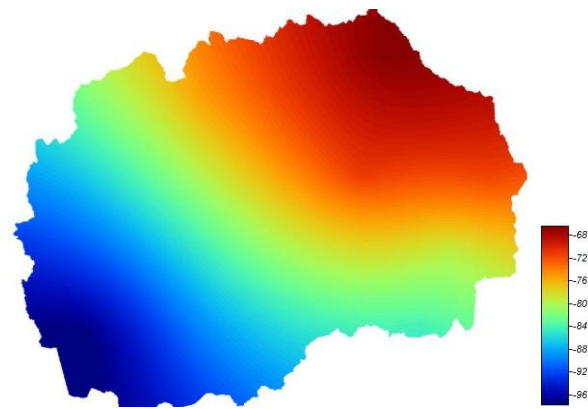


Figure 4: Spatial distribution of the precipitation sums anomaly (mm) during winter 2015/2016

According to percentile calculation method for precipitation, the territory of Republic of Macedonia was classified as dry to extremely dry (Table1).

Meteorological station	Temperature	Precipitation
Berovo	cold	dry
Kriva Palanka	cold	dry
Stip	normal	dry
Strumica	normal	very dry
Demir Kapija	cold	dry
Gevgelija	normal	normal
Skopje	cold	dry
Prilep	normal	extremely dry
Bitola	normal	dry
Ohrid	normal	extremely dry
Mavrovo	normal	dry

Table1: Air temperature and precipitation classification in Republic of Macedonia for winter 2016/2017 using percentile method compared to 1981-2010 base period

The values of distribution of tercile for the air temperature and the precipitation sums for this season are shown in Table 2 and 3, respectively.

Air Temperature (°C)	2016/2017	1981-2010	
		33	67
Berovo	2.1	-1.2	0.6
Kriva Palanka	3.3	0.4	1.4
Stip	5.1	1.8	3.2
Strumica	4.6	1.4	3.2
Demir Kapija	5.6	2.3	4.1
Gevgelija	7.4	4.5	5.6
Skopje	4.5	1.6	2.7
Prilep	4.3	0.5	2.3
Bitola	3.9	-0.5	2
Ohrid	4.6	2.1	3.1
Mavrovo	-2.3	-2.7	-0.5

Table 2: Values of distribution of tercile for temperature for period 1981-2010

Precipitation sums (mm)	2016/2017	1981-2010	
		33	67
Berovo	81.8	109.5	662.9
Kriva Palanka	74.1	106.9	665.4
Stip	47.1	71.3	500
Strumica	47	120.9	602.8
Demir Kapija	96.5	125.7	597.7
Gevgelija	108.4	111.8	776
Skopje	43.8	87.5	521.6
Prilep	27.2	80.5	531.7
Bitola	92.7	145	675.7
Ohrid	64.4	178.8	749.9
Mavrovo	219.8	269	1172.7

Table 3: Values of distribution of tercile for precipitation for period 1981-2010

The SEECOF-16 forecast for the mean temperatures for winter season put Republic of Macedonia in a zone 1 and zone 2, which means to have near or higher probability of exceeding the above-average conditions (Figure 5). Forecast for the precipitation for DJF 2016/2017 categorized our country in zone 1 and zone2 (Figure6). It means to have higher probability of exceeding the above-average conditions in the west part of Macedonia and high uncertainties, probabilities for below-, near-, or above- average conditions are approximately equal for the rest of the country.

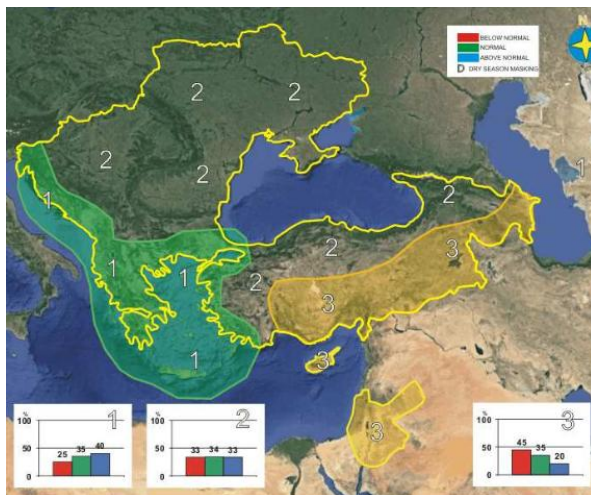


Figure 5: Graphical presentation of the winter 2016/2017 temperature outlook

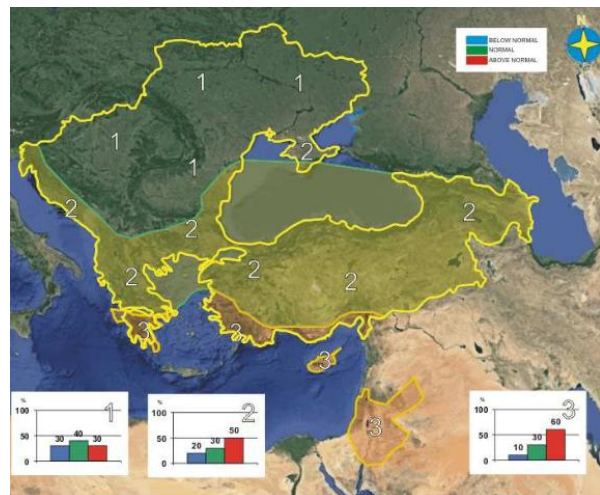


Figure 6: Graphical presentation of the winter 2016/2017 precipitation outlook

➤ DECEMBER 2016

Measured mean air temperatures for December was below long term average. The anomaly reached from -0.8°C in Skopje to -2.5°C in Berovo. The difference of the mean monthly maximum temperatures from normal value is from -0.6°C to 1.9°C . Mean monthly minimum temperatures were measured below the long term average for all meteorological stations in Republic of Macedonia, with difference from -0.6°C to 1.9°C . The difference of the mean monthly minimum temperatures from normal value is from -1.5°C to -4.1°C . The absolute temperature range is from -16.5°C in Berovo to 18.4°C in Gevgelija. The absolute temperatures did not exceed the long term average values.

Precipitation sums in December were insignificant and below the long term average. Unlike usual for the month of December, there was no appearance of snow.

The forecast from the Southeast Europe Virtual Center for Climate Change in Serbia for December 2016 was not efficient for temperature and it was partly efficient for the precipitation (Figure 7 and 8).

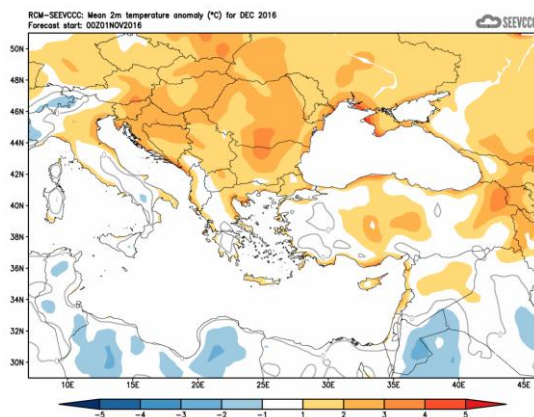


Figure 7: Divergence of the mean monthly temperature ($^{\circ}\text{C}$) from the normal 1981-2010 in December

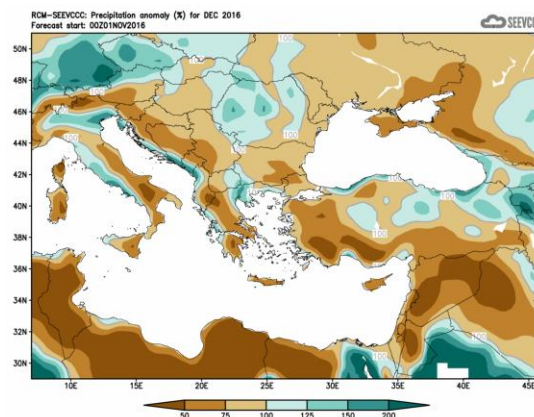


Figure 8: Percentage of the mean monthly precipitation (%) from the normal 1981-2010 in December

➤ JANUARY 2017

January was characterized as extremely cold month. The anomaly reached from 1.1°C in Berovo to -4.8°C in Mavrovo. The measured mean monthly temperature exceeded the long term average, the measured mean monthly air temperature in Gevgelija reached -0.1°C , in Kriva Palanka -4.2°C , in Stip -3.3°C and in Skopje -4.0°C . The mean monthly maximum and minimum temperatures were also below the long term average, reaching to -6°C difference. Absolute minimal air temperature was exceeded in Kriva Palanka, reaching -23.3°C on 8th of January.

In January was registered heavy snowfall, which began on 6th of January, and snow cover in most of the country, which remained until the end of the month. Maximal height of the snow

cover was 85cm, registered on 19th of January in Mavrovo, but it did not exceed the long term values. Precipitation amounts were in the range of the average, except in Demir Kapija where the precipitation sum was doubled.

The forecast from the Southeast Europe Virtual Center for Climate Change in Serbia for the month of January was not efficient for both, temperature and precipitation (Figure 9 and 10).

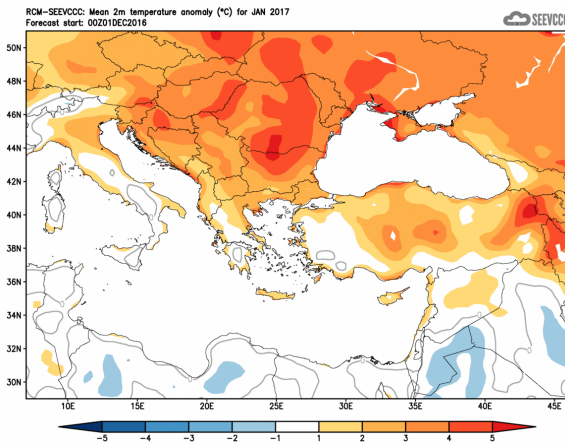


Figure 9: Divergence of the mean monthly temperature (°C) from the normal 1981-2010 in January

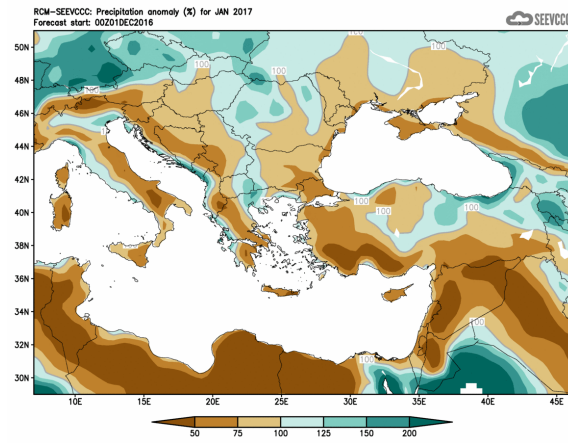


Figure 10: Percentage of the mean monthly precipitation (%) from the normal 1981-2010 in January

➤ **FEBRUARY 2017**

The mean temperatures for February were above long term average, and the positive divergence was higher in the west part of the country. The anomaly reached from 2.0°C in Strumica and Gogelija to 3.7°C in Mavrovo. The mean maximum and minimum temperature were also above than the long term average. Higher daily temperatures were measured in the third decade of the month, but the extreme values were not exceeded.

In February there was not snow precipitation, nor significant rain precipitation. Monthly precipitation sums were below long term average. The deficit was evident in the Pelagonian part, south part and Skopje, and slightly below the average was registered in the east and west part of Macedonia.

The forecast from the SEEVCCC for the month of February was partly efficient for temperature and partly for precipitation (Figure 11 and 12).

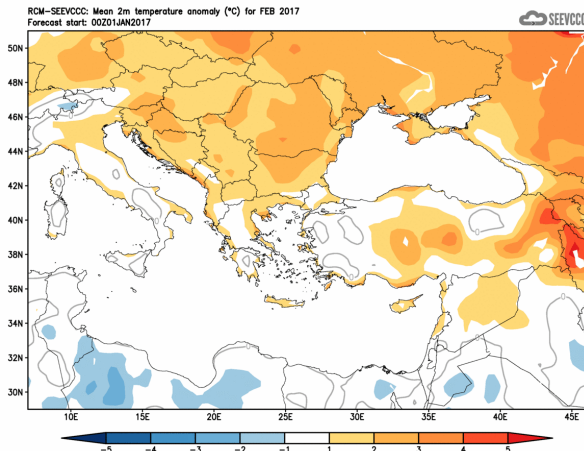


Figure 11: Divergence of the mean monthly temperature (°C) from the normal 1981-2010 in February

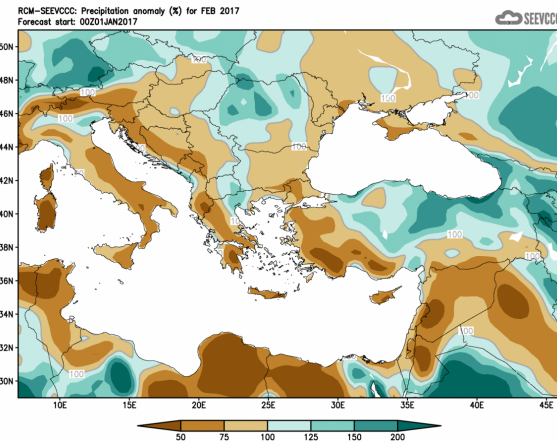


Figure 12: Percentage of the mean monthly precipitation (%) from the normal 1981-2010 in February

Below is a table presenting the general anomalies of SEECOF products and extreme events of the recorded winter weather.

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High Impact Events
	Observed	SEECOF climate outlook for temperature	Observed	SEECOF climate outlook for precipitation	
REPUBLIC OF MACEDONIA	Below normal	Normal (30, 40, 30) West part – warmer than normal (20, 30, 50)	Below normal	No signal (33, 34, 33) West part – wetter than normal (25, 35, 40)	<p>December Insignificant amounts of precipitations</p> <p>January Extremely cold Absolute minimal temperature in Kriva Palanka -23.3°C on 8th exceeded the historical values for this month. Heavy snow precipitation</p> <p>February Unusually high air temperatures Insignificant amounts of precipitations and no snow precipitations</p>