THE WARM WINTER OF 2014-2015 IN SOUTH-WESTERN ROMANIA

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Abstract. The winter of 2014-2015, in the south-west of Romania, was warm, marked by ***6 intervals of weather warming*** (December 1-24, January 2-5, January 10-16, January 19-31, February 2-5 and February 19-28) which amounted 63 days (70.0% of winter days), a heatwave (December 18-25), a positive thermal singularity (January 11), two frost waves: an intense one in the interval December 28, 2014-January 2, 2015 and a moderate one in the interval January 6-9. The intervals of warm weather are called "warm windows of winter" and are extremely good for biocoenoses, led to the restart of plant vegetation phases, feeding and revival of hives of bees, birds and wild animals, a good mood of people, significant savings of heating costs, etc. *Frost units* were comprised between 55.5 in Drobeta Turnu Severin and 148.7 in Voineasa with the seasonal mean for the entire region of Oltenia of 106.6 (excepting the mountainous area). *Heat units* were comprised between 133.8 in Voineasa and 288.0 in Drobeta Turnu Severin with the seasonal mean for the entire region of Oltenia of 215.6 (excepting the mountainous area), being more than double than the frost units. *The units of agrometeorological frost* have been insignificant. The highest quantities of precipitation were in December 2014 when there were floods and landslips. In Gorj County, landslips also registered in February (February 26). Humidity excess in ground maintained during all winter. The paper is useful to master graduates, PhD candidates and in general to specialists interested in climate evolution and climate changes.

Keywords: temperature monthly means, Hellmann criterion, phenomena of warm winter, vegetative processes.

Rezumat. Iarna caldă 2014-2015 în sud-vestul României. Iarna 2014-2015, în sud-vestul României, a fost caldă, marcată de ***6 intervale de încălzire a vremii*** (1-24 decembrie, 2-5 ianuarie, 10-16 ianuarie, 19-31 ianuarie, 2-5 februarie și 19-28 februarie) care au însumat 63 de zile (70,0% din zilele iernii), un val de căldură (18-25 decembrie), o singularitate termică pozitivă (11 ianuarie), două valuri de frig: unul intens 28 decembrie 2014-2 ianuarie 2015 și unul moderat 6-9 ianuarie. Intervalele de vreme caldă se numesc „ferestrele calde ale iernii`` care sunt deosebit de benefice pentru biocenoze, determinând reluarea fazelor de vegetație la plante, hrănirea și revigorarea stupilor de albine, a păsărilor și animalelor sălbatice, o stare bine la oameni, importante economii la cheltuielile de încălzire etc. *Unităţile de frig* au fost cuprinse între 55,5 la Drobeta Turnu Severin și 148,7 la Voineasa cu media anotimpuală pentru întreaga regiune Oltenia (cu excepția arealului de munte) de 106,6. *Unităţile de căldură* au fost cuprinse între 133,8 la Voineasa și 288,0 la Drobeta Turnu Severin cu media media anotimpuală pentru întreaga regiune Oltenia (cu excepția arealului de munte) de 215,6, find ceva mai mult decât dublă față de unitățile de frig. *Unităţile de ger agrometeorologic* au fost nesemnificative. Cantitățile de precipitații au fost cele mai mari în decembrie 2014 când s-au produs inundații și alunecări de teren. Alunecări de teren în județul Gorj s-au înregistrat și în februarie (26 februarie). În tot cursul iernii s-a menținut excesul de umezeală în sol. Lucrarea este utilă masteranzilor, doctoranzilor și în general specialiștilor interesați de evoluția climatului și schimbările climatice.

Cuvinte cheie: medii lunare de temperatură, criteriul Hellmann, fenomene de iarnă caldă, procese vegetative.

INTRODUCTION

The year 2014 has been the warmest year since weather forecasts were made (1880) according to John Tucker, climatologist at NASA. Record temperatures were registered on all continents: in Europe, Northern Africa, Western United States and Eastern Russia. Australia has also confronted with a strong drought in 2014. According to BBC publications and specialized analyses, practically, all the last 14 years, have been at their turn the warmest years of the last centuries. The temperatures higher than those registered during the variation intervals of the last centuries cause the increase in intensity and frequency of precipitation phenomena and have as natural consequence the rise of sea level, which increases the frequency of intense storms and floods.

Global warming is the increase of the average amount of water vapour contained in the atmosphere as a result of a higher temperature on earth and consequently extreme meteorological phenomena occurred more often. In temperate areas, winters are rougher, summers more droughty, and temperature differences from one day to another can be extremely high.

Although globally 2014 has been considered the warmest year since the beginning of systematic weather forecasts, in Oltenia this year has been thermally normal and exceedingly rainy, being very similar to 2005, which was exceedingly rainy, but exceeded it due to the amounts of precipitation registered. Globally, the first ten months of 2014, have been each of them the warmest months registered on Earth since the beginning of weather forecasts in 1880 (NOAA), and October 2014 has been the 38th consecutive month of October during which the global temperature was higher than the average temperature of the 20th century, reaching the value of 14.74°C. October 2014 has been the third consecutive month of 2014 with a record global temperature and the fifth in the last six months which established this record.

In Oltenia, a long rainy period has begun after an exceedingly warmish and droughty summer (the summer of 2013), in September 2013, and the agricultural year of 2013-2014 has been the rainiest year ever registered in the south-west of the country since 1960. Therefore, there has been marked an exceptional variability of daily, monthly seasonal and annual quantities of precipitation. 2014 has been marked by many consecutive exceedingly rainy months, with a lot of intervals of pouring rains. *Rainy intervals* were interrupted by two droughty months, February 2014, exceedingly droughty, and November 2014 very droughty.

During rainy years, in Oltenia, usually weather phenomena specific to winter appear early and sometimes winters are rougher and longer. Although the early phenomena specific to winter were registered on October 25, reaching after 102 years the climatic record of the first snow registered on October 25-27, 1912, the winter of 2014-2015 was warm and rich in precipitation. October 25, 2014 has been the coldest day of October 25 in the Romanian Plain since weather forecasts are made.

The analysis of climatic conditions in the south-west of Romania during the winter of 2014-2015 is a continuation of some extended studies on climate variability (MARINICĂ, 2006; BOGDAN & MARINICĂ, 2009; MARINICĂ & CHIMIŞLIU, 2008; MARINICĂ et al., 2010, 2011, 2012, 2013; MARINICĂ & MARINICĂ, 2012; SANDU et al., 2010, 2012; BOGDAN et al., 2008, 2010).

We will further analyze the aspects of climate variability during the winter of 2014-2015, the effects on bioclimate and the causes of their occurrence.

DATA AND METHODS

For this paper we analysed the results of the daily processing with special software from the weather forecast, the data from Oltenia MRC[1] Archive, the current maps from the operative activity, and those on the internet provided by the analysis and forecast international centres and NAM Bucharest (National Administration of Meteorology). We used the facilities provided by Office for drawing the tables and charts.

The paper analyses the climatic conditions during the winter of 2014-2015, on the basis of thermal and pluviometric regime of December 2014, January and February 2015 and the overall thermal and pluviometric regime of the winter of 2014-2015.

RESULTS

1a. Thermal regime of December 2014.

Monthly air temperature means were comprised between 0.5°C in Voineasa intramountainous depression and 3.3°C in the extreme west of the region in Drobeta Turnu Severin. Their deviations from the multiannual means (calculated for the interval 1901-1990) were comprised between 0.8°C in Bechet in the extreme south of Oltenia and 2.4°C in Voineasa, which leads to the classification of pluviometric time type comprised between normal (N) in Oltenia Plain at Bechet, Băileşti, Slatina and in the Getic Piedmont and warm in Mehedinţi Hills at Bâcleş, in the Subcarpathian Depression at Polovragi, Voineasa and in the mountainous area at Obârşia Lotrului (Table 1).

Table 1. Air temperature regime in Oltenia and the minimum and maximum temperature values at ground surface in December 2014.

Crt. No.	Meteorological Station	Hm	N	M	ΔT=M-N	CH	Air minT		Air maxT		Soil minT		Soil maxT	
							(°C)	Data	(°C)	Date	(°C)	Data	(°C)	Date
1	Drobeta Turnu Severin	77	1.4	**3.3**	1.9	**CL**	-10.2	31	**18.0**	24	**-12.6**	31	**19.8**	24
2	Calafat	66	1.0	2.2	1.2	**CL**	***-9.8***	31	**20.1**	24	***-3.1***	31	**13.2**	24
3	Bechet	65	0.4	1.2	***0.8***	**N**	-13.2	28	**16.3**	24	**-12.0**	31	**17.1**	24
4	Băileşti	56	0.4	1.3	0.9	**N**	-16.5	30	**16.8**	24	**-20.9**	30	**14.1**	20
5	Caracal	112	-0.1	1.1	1.2	**CL**	-13.2	30	**16.4**	24	**-13.0**	30	**12.1**	24
6	Craiova	190	0.1	1.1	1.0	**CL**	-12.6	31	**16.7**	24	**-17.6**	30	**18.0**	24
7	Slatina	165	0.3	1.2	0.9	**N**	-15.4	31	**16.9**	24	**-16.4**	31	***10.7***	24
8	Bâcleş	309	-0.4	1.7	2.1	**C**	-11.8	30	**14.9**	24	-	-	-	-
9	Târgu Logreşti	262	0.1	1.2	1.1	**CL**	-21.1	31	**16.9**	24	**-27.0**	31	**18.0**	23
10	Drăgăşani	280	0.6	1.8	1.2	**CL**	-11.8	31	**17.9**	23	**-18.2**	31	**19.5**	24
11	Apa Neagră	250	0.1	1.6	1.5	**CL**	**-25.0**	30	**18.2**	24	**-27.0**	30	**16.8**	23
12	Târgu Jiu	210	0.1	1.5	1.4	**CL**	-14.7	31	**17.1**	24	**-21.2**	30;31	**18.0**	23
13	Polovragi	546	0.1	2.1	2.0	**C**	-14.7	31	**17.9**	24	**-21.2**	31	**17.3**	24
14	Râmnicu Vâlcea	243	0.5	2.3	1.8	**CL**	-14.3	31	**18.0**	24	**-16.8**	31	**15.5**	23
15	Voineasa	587	-1.9	***0.5***	**2.4**	**C**	-17.4	31	***12.9***	23	-	-	-	-
16	Parâng	1585	-3.7	-2.7	1.0	**CL**	-19.2	31	**7.4**	24	-	-	-	-
17	Mean Oltenia	-	-0.1	1.3	1.4	**CL**	-15.0	-	**16.4**	-	**-17.0**	31	**15.2**	24
18	Obârşia Lotrului	1404	-4.9	-2.6	2.3	**C**	**-25.9**	31	**7.4**	24	-	-	-	-
19	Halânga	76		3.1	3.1	**C**	-9.6	31	**18.4**	24	**-9.3**	31	**22.0**	24

(Source: processed data from Oltenia MRC archive)

Temperature general mean for the entire region of Oltenia was 1.3°C and its deviation from the multiannual mean was of 1.4°C, which according to Hellmann criterion the month was warmish (WS) for the entire region.

The monthly minimum air temperature values were registered in the last three days of the month and were comprised between -9.8°C registered on December 31 in south-west at Calafat and -25.0°C at Apa Neagră Subcarpathian Depression, registered on January 30, and their mean for the entire region was -15.0°C. In the hilly area,

[1] MRC = Meteorological Regional Center.

the minimum thermal value was -25.9°C registered at Obârşia Lotrului[2] on December 3, being ***the absolute minimum thermal value*** for this meteorological station and ***the minimum thermal value*** for the entire winter of 2014-2015, in the mountainous area in the north of Oltenia. Therefore, we register a new climate record for the mountainous area. The value of -25.0°C registered at Apa Neagră is the ***absolute minimum thermal value*** for this meteorological station, being the lowest value of a complete range of data.

Frost units[3] in December 2014 were insignificant and were registered in the intervals December 1-2, December 13-16 and December 27-31 and ranged between 15.4 in Drobeta Turnu Severin and 36.9 at Voineasa; in the mountainous area, it ranged between 94.4 at Obârşia Lotrului and 97.3 at Parâng. These helped crops and, in general, the vegetal cover to adapt to wintering conditions. A*grometeorological frost* was insignificant and was sparsely registered in the last two days of the month, and the sum of frost units was comprised between 0 in most part of the region and 17.8 at Apa Neagră in the Subcarpathian Depression and in the mountainous area between 6.5 at Parâng and 12.5 at Obârşia Lotrului. *Heat units* (the sum of active daily average temperature means) highly exceeded frost units and were comprised between 52.2 at Voineasa and 118.4 in Drobeta Turnu Severin, and in the mountainous area between 8.8 at Obârşia Lotrului and 14.5 at Parâng, being a warm winter month. These helped to slow vegetative processes at autumn crops, and, in general, the vegetal cover and biotic processes in biocoenoses[4] to take place.

Monthly maximum temperature values were registered atypically in the last decade of the month (as well as minimum temperature values) on December 23 and 24 and were comprised between 12.9°C at Voineasa and 20.1°C in the extreme south-west of Calafat region, and their monthly mean for the entire region was 16.4°C.

Air temperature amplitude in December 2014 was of 46.0°C. All these show a great amplitude of air temperature. The maximum value of 20.1°C registered at Calafat is ***the maximum temperature*** for the entire winter of 2014-2015.

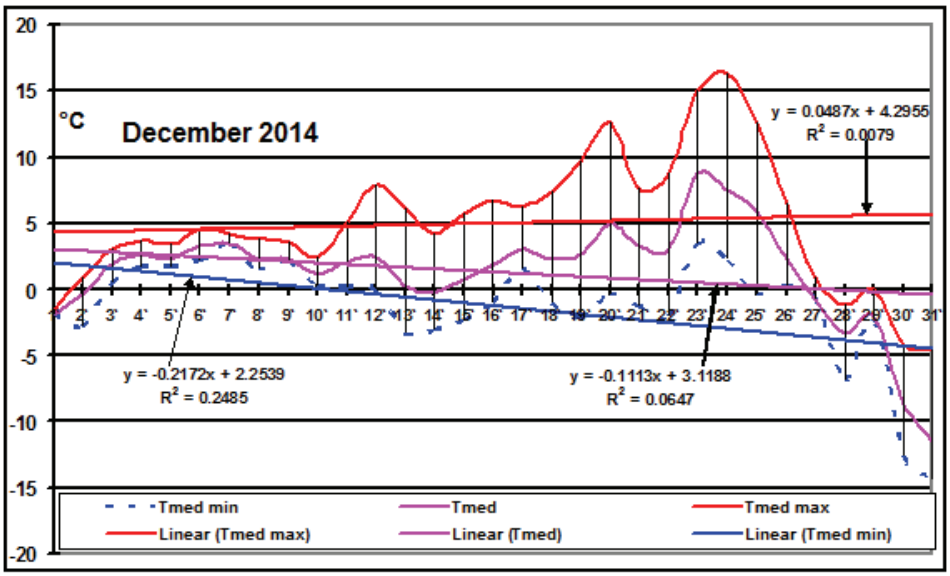

Figure 1. Air temperature variation (the daily means, daily minimum and maximum temperatures mean) in December 2014. (Source: processed data from Oltenia MRC archive)

The chart of air temperature variation in December 2014 presents a slightly decreasing tendency for daily average and minimum values and a slightly increasing tendency for daily maximum temperature value (Fig. 1). For the ***interval December 1-24***, the tendency is increasing for all these parameters, and in the ***interval December 25-31***, ***there was a weather cooling,*** which continued in the first days of January, reaching cooling climax on January 1, 2015.

[2]The mountainous meteorological station Obârşia Lotrului has a short range of data, is situated on the north-western side of the mountains and came into operation in February 1976, and in 2011 became an autonomous station, functioning without personnel, and consequently, some data as for example the type of precipitation, quantities of precipitation during cold season, etc. cannot be measured. As a result of its position on the north-western side, it has much lower thermal regime than of Parâng, where the meteorological station is situated on the southern side.

[3]***The degree of winter bitterness*** in agrometeorology (winter type) classifies according to the sum of frost units (∑ differences between the daily minimum temperature values <-15°C and the agroclimatic critical threshold of -15.0°C, in the interval December - February). Therefore, ***a frost unit*** is the difference of 1°C between the critical threshold of -15.0°C and an air minimum thermal value ≤ -15°C (for example for T min = -16.0°C then the difference -15.0°C - (-16.0°C) = 1, namely a frost unit, (SANDU et al, 2010).

Frost units for all the cold season is calculated as Σ of daily average temperatures <0°C, in November-March; A day of frost is the day in which the average temperature is ≤ 0°C;) The active temperatures are those ≥0°C, and the temperature of the biological minimum is 0°C. A winter day is a day in which air temperature is < 0°C. Heat units (∑ daily average temp ≥ 0°C), Active temperatures = are temperatures ≥0°C.

[4]The term of **biocoenosis** (Greek *koinosis*– to share) is the supra individual level of organizing living matter and describes the totality of living, vegetal (phytocoenosis) and animal (zoocoenosis) organisms, which interact with each other and live together in a habitat or a sector of biosphere (*biotope*), forming a single whole and is in a dynamic balance dependent on that environment. It is characterized by a certain structure and functioning given by the mode of matter, energy and information flow. The term of biocoenosis was proposed by Karl Möbius in 1877 (http://ro.wikipedia.org/wiki/Biocenoz%C4%83).

The warmest interval in December was December 18-25, 2014, an interval in which ***a heat wave of winter*** was actually registered, and *the coldest* was December 28-31.

The most intense cold wave in the winter of 2014-2015 was registered in the interval December 28, 2014-January 2, 2015. *The warmest day* of December 2014 according to temperature means was on 23, when the mean for the entire region was 8.7°C, and the coldest day was December 31 with the mean of -11.3°C. *The number of days with maximum temperatures ≤0°C (*winter days) was comprised between 3 in Drobeta Turnu Severin, Caracal and Râmnicu Vâlcea and 6 at Voineasa, and the mean for the entire region was of 5 winter days.

Only ***4 days with frost***[5] were registered in the interval December 28-31 and only two days in which the minimum temperature mean for the entire region dropped below -10.0°C (December 30-31). During an interval of 7 days (December 24-31) air temperature decreased from high to low temperatures, registering the maximum amplitude of 46.0°C. At ground surface *the minimum temperature values* were registered in the last two days of the month and were comprised between -27.0°C at Târgu Logreşti and -3.1°C at Calafat, and their mean for the entire region was -17.0°C. *The monthly maximum temperature values at ground surface* were mostly registered on 23 and 24 and ranged between 10.7°C and 19.8°C, and their mean for the entire region was 15.2°C.

1.b. Pluviometric regime of December 2014

In December 2014, *the monthly quantities of precipitations* were comprised between 96.8 l/m^2 at Bechet in the extreme south of the region and 218.0 l/m^2 at Apa Neagră, and in the mountainous area at Parâng[6] 67.1 l/m^2. The quantity of 218.0 l/m^2 registered at Apa Neagră is the third value in descending order of all range of data at this meteorological station (Table 2).

Table 2. Quantities of precipitation (l/m^2) registered in the winter of 2014-2015 (Σ), compared with normal values[7].

Crt. No.	Meteorological Station	Hm	December 2014				January 2015				February 2015				Winter 2014-2015			
			ΣXII	**N**	**Δ%**	**CH**	**ΣI**	**N**	**Δ%**	**CH**	**ΣII**	**N**	**Δ%**	**CH**	**ΣW**	**N**	**Δ%**	**CH**
1	Drobeta Turnu Severin	77	119.5	61.2	95.3	**ER**	56.1	51.4	9.1	**N**	60.9	47.9	27.1	**R**	236.5	160.5	47.4	**ER**
2	Calafat	66	110.6	45.5	143.1	**ER**	31.5	40.4	-22.0	**D**	56.2	38.0	47.9	**VR**	198.3	123.9	60.0	**ER**
3	Bechet	65	***96.8***	36.3	166.7	**ER**	***23.2***	33.5	-30.7	**VD**	***28.2***	34.8	-19.0	**LD**	***148.2***	104.6	41.7	**VR**
4	Băileşti	56	125.6	46.8	168.4	**ER**	24.2	38.5	***-37.1***	**VD**	64.9	36.1	79.8	**ER**	214.7	121.4	76.9	**ER**
5	Caracal	112	130.9	39.5	231.4	**ER**	31.0	34.7	-10.7	**LD**	36.8	34.5	6.7	**N**	198.7	108.7	82.8	**ER**
6	Craiova	190	150.9	41.8	261.0	**ER**	37.5	37.5	0.0	**N**	43.1	30.4	41.8	**VR**	231.5	109.7	**111.0**	**ER**
7	Slatina	165	166.5	42.8	**289.0**	**ER**	37.5	36.0	4.2	**N**	40.3	38.4	4.9	**N**	244.3	117.2	108.4	**ER**
8	Bâcleş	309	-	-	-	**-**	-	-	-	**-**	-	-	-	**-**	-	-	-	**-**
9	Tg. Logreşti	262	116.6	44.8	160.3	**ER**	36.2	35.9	0.8	**N**	32.6	41.0	-20.5	**D**	185.4	121.7	52.3	**ER**
10	Drăgăşani	280	139.9	44.6	213.7	**ER**	37.1	34.1	8.8	**N**	39.8	35.4	12.4	**LR**	216.8	114.1	90.0	**ER**
11	Apa Neagră	250	**218.0**	82.3	164.9	**ER**	**88.8**	70.9	**25.2**	**R**	**89.7**	66.4	35.1	**VR**	**396.5**	219.6	80.6	**ER**
12	Târgu Jiu	210	149.1	64.0	133.0	**ER**	60.3	53.9	11.9	**LR**	66.7	52.0	28.3	**R**	276.1	169.9	62.5	**ER**
13	Polovragi	546	106.3	56.1	***89.5***	**ER**	48.9	48.9	0.0	**N**	34.5	48.4	-28.7	**D**	189.7	153.4	***23.7***	**ER**
14	Râmnicu Vâlcea	243	113.0	46.2	144.6	**ER**	42.0	35.5	18.3	**LR**	37.5	38.4	-2.3	**N**	192.5	120.1	60.3	**ER**
15	Voineasa	587	-	-	-	**-**	-	-	-	**-**	-	-	-	**-**	-	-	-	**-**
16	Parâng	1585	67.1	54.6	22.9	**R**	**95.8**	57.7	**66.0**	**ER**	27.9	47.7	-41.5	**VD**	190.8	160.0	19.3	**R**
17	Mean Oltenia	-	129.3	50.5	95.3	**ER**	46.4	43.5	6.8	**N**	47.1	42.1	11.8	**LR**	205.0	136.1	50.7	**ER**
18	Halânga	76	114.0	-	-	**-**	61.0	-	-	**-**	60.4	-	-	**-**	235.4	-	-	**-**
19	Obârşia Lotrului	1404	66.3	-	-	**-**	-	-	-	**-**	39.0	-	-	**-**	105.3	-	-	**-**
20	Petroşani	607	50.7	47.8	6.1	**N**	107.7	45.3	137.7	**ER**	32.1	46.4	-30.8	**VD**	190.5	139.5	36.6	**VR**

(Source: processed data from Oltenia MRC archive)

Monthly mean of precipitation calculated for the entire region was 129.3 l/m^2 being the highest monthly mean of all winter. The percentage deviations of monthly quantities of precipitation from the normal were comprised between 89.5% at Polovragi and 289.0% in Slatina, designating according to Hellmann criterion an exceedingly rainy month (ER) in the entire Oltenia. An exception is the mountainous area where, at Parâng, the percentage deviation was of 22.9% designating a rainy month (R). In December three rainy intervals were registered: December 1-2, December 6-10 and December 26-28, amounting 10 days with significant precipitation, and the rainiest day was on December 9, 2014 with a general mean for the entire region of 27.4 l/m^2. The maximum quantity of precipitation registered in 24 hours was of 69.8 l/m^2 in Sadu (Gorj County), registered on December 9, 2014.

The rain which started in the morning of December 26 turned into sleet in the evening and snowfall during the night, and a consistent snow layer was formed, with a maximum thickness comprised between 2cm at Halânga and 44

[5]From the point of view of weather forecast for people, the notion of "***frost***" (or ***frosty weather***) means temperature values of ≤ -10°C. Therefore we observe that ***frost*** defined by the terms of weather forecast (which are adapted to living organisms) is different from ***agrometeorological frost*** (temperatures of ≤-15°C), plants being better adapted to climatic conditions (due to their cellular structure and specific biotic processes).

[6] Parâng meteorological station, being located on the southern slopes of Parâng Mountain, closed to the northern limit of Gorj County, having a wide range of data and being a station with personnel, has the most significant data for the mountainous area in the north of Oltenia, although it is situated in Hunedoara County.

[7] Voineasa and Bâcleş meteorological stations, since they have incomplete data, being autonomous, cannot be taken into consideration in calculating the sum and monthly mean. The normal values were calculated for the interval 1901-1990.

cm at Drăgăşani on December 30 (Fig. 2). A thin, passing *snow layer* with a thickness up to 5 cm in some area was formed also in the intervals December 2-4 and December 10-11. *The number of days with snow layer* was comprised between 4 in Drobeta Turnu Severin and at Halânga and 8 at Apa Neagră and Drăgăşani, and their mean for the entire region was of 6.4 days. In the mountainous area, the number of days with snow layer was 29, registered at Parâng.

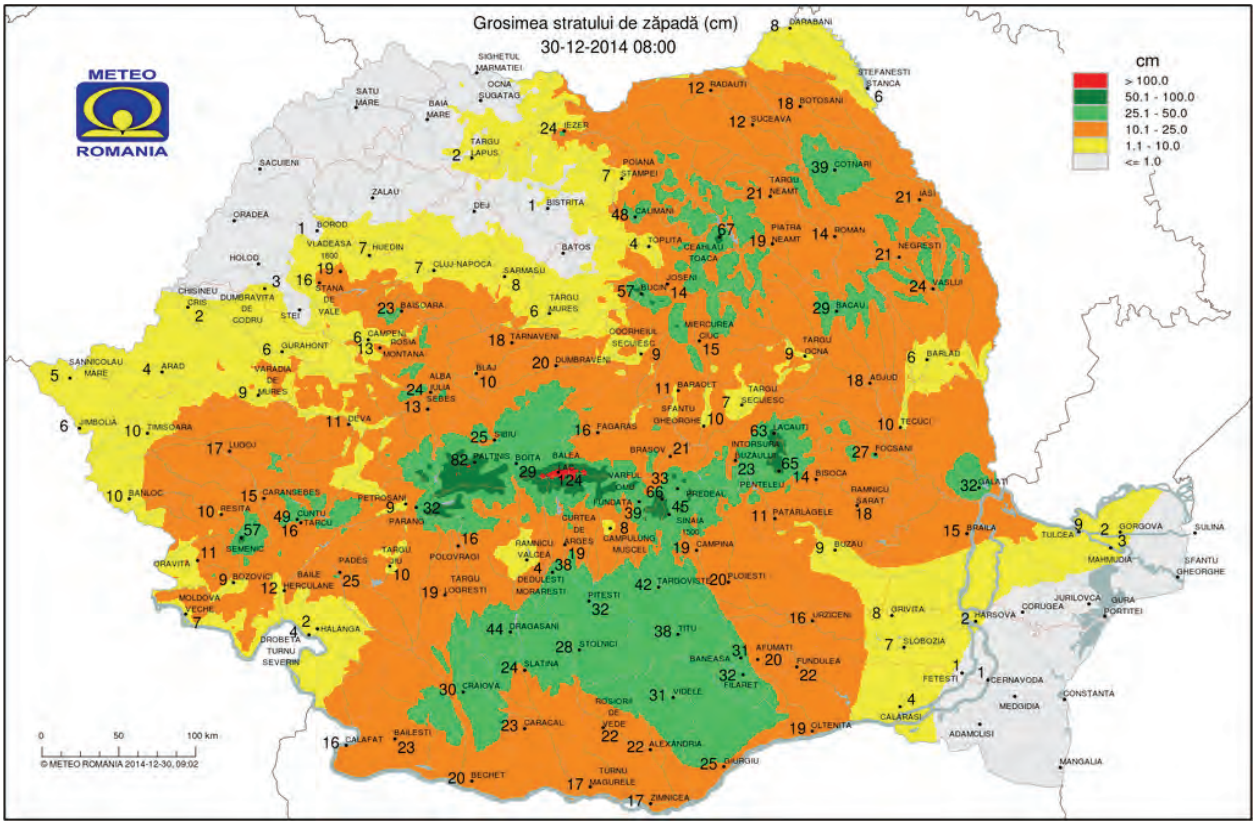

Figure 2. Maximum snow layer in December 2014 (according to NAM Bucharest).

The most significant snowfalls in December were registered in the interval December 26-28.

The climatic phenomena registered in December 2014 were: drizzle, rain, sleet, snowfall, glazed frost, fog, hoarfrost, and blizzard.

The number of days with drizzle was comprised between 1 at Bechet and 8 in Slatina and the mean for the entire region was of 3.6 days.

The number of days with rain was comprised between 2 at Voineasa and 13 in Drobeta Turnu Severin, Calafat, Băileşti and Târgu Jiu, and their mean for the entire region was of 9.3, being the highest mean of days with precipitation.

The number of days with sleet was comprised between 1 at Băileşti, Târgu Logreşti, Râmnicu Vâlcea and Parâng and 4 at Caracal and Târgu Jiu, and their mean for the entire region was 2.5.

The total number of days with liquid precipitation (drizzle, rain and sleet) was comprised between 1 at Parâng in the mountainous area and 22 in Târgu Jiu and their mean for the entire region was 13.3.

The total number of days with snowfall was comprised between 1 at Voineasa and 8 in Craiova, and in the mountainous area there were 14 days at Parâng, their mean for the entire region being of 6.3. The total number of days with precipitation was comprised between 15 in Râmnicu Vâlcea and Parâng and 30 in Slatina, and their mean for the entire region was 19.6 days.

All these show a high number of days with precipitation, which caused a strong hydric stress to biocoenoses, vegetal cover and crops, because of the excessive humidity in the ground that created water bogging on the ground, the rise of underground water to surface, leading in some areas to plant suffocation and stop of some agricultural works specific to the beginning of winter. Although winter climatic phenomena appeared early, on October 25, the intervals of warm weather led to the predominance of liquid precipitation and the occurrence of snow layer beginning with December 27.

The duration of snow layer in December 2014 was comprised between 4 days in Drobeta Turnu Severin and at Halânga and 8 days at Drăgăşani and Halânga with a mean of 6.4 days for the entire region.

Yellow code warnings have been remitted for abundant precipitation for the intervals: December 8, at 11 p.m. – December 10, at 10 a.m., December 26, at 8 p.m. – 27 December.

2.a Thermal regime of January 2015

Monthly means of air temperature were comprised between -0.4°C in Voineasa intramountainous depression (the only negative mean, excepting the mountainous area) and 2.1°C in Drobeta Turnu Severin, and their deviations

from the multiannual means were comprised between 2.6°C at Apa Neagră and 4.3°C at Voineasa. According to Hellmann criterion these deviations classify January as a warm month in the entire region of Oltenia (Table 3).

Table 3. Air temperature regime in Oltenia and the minimum and maximum temperature values at ground surface in January 2015.

Crt. No.	Meteorological Station	Hm	N	M	ΔT=M-N	CH	Air minT		Air maxT		Soil minT		Soil maxT	
							(°C)	Data	(°C)	Data	(°C)	Data	(°C)	Data
1	Drobeta Turnu Severin	77	-1.1	**2.1**	3.2	W	**-13.9**	1	**17.4**	11	**-16.2**	1	**17.6**	11
2	Calafat	66	-1.8	1.7	3.5	W	**-23.2**	1	**19.5**	11	***-9.9***	2	**16.8**	11
3	Bechet	65	-2.2	0.6	2.8	W	**-25.1**	1	**19.4**	11	**-26.0**	1;2	**17.3**	31
4	Băileşti	56	-2.3	1.0	3.3	W	**-21.0**	1	**18.0**	11	**-28.4**	1	**17.2**	11
5	Caracal	112	-2.9	0.5	3.4	W	**-21.9**	1	**14.4**	11	**-22.6**	1	**17.0**	31
6	Craiova	190	-2.6	0.7	3.3	W	**-19.0**	1	**16.8**	11	**-20.6**	1;2	**15.6**	11
7	Slatina	165	-2.4	0.5	2.9	W	**-19.3**	1	**15.0**	11	**-20.1**	1	***10.3***	31
8	Bâcleş	309	-3.0	0.8	3.8	W	**-15.6**	1	**14.9**	11	**-**	-	**-**	-
9	Tg. Logreşti	262	-2.7	0.5	3.2	W	**-23.4**	1	**14.8**	11	**-28.4**	1	**12.8**	23
10	Drăgăşani	280	-2.2	1.3	3.5	W	***-13.9***	1	**15.6**	11	**-23.0**	1	**20.0**	11
11	Apa Neagră	250	-2.6	0.0	***2.6***	W	**-29.8**	1	**16.7**	11	**-31.0**	1	**16.0**	21
12	Târgu Jiu	210	-2.6	0.8	3.4	W	**-18.5**	1	**14.7**	11	**-22.2**	1	**10.4**	31
13	Polovragi	546	-3.2	0.9	4.1	W	**-18.2**	1	**15.7**	11	**-25.8**	1	**17.4**	21
14	Râmnicu Vâlcea	243	-2.2	1.4	3.6	W	**-16.0**	1	**16.6**	11	**-19.0**	1	**12.6**	31
15	Voineasa	587	-4.7	***-0.4***	**4.3**	W	**-17.2**	1	***12.0***	11	**-**	-	**-**	-
16	Parâng	1585	-5.9	-3.3	***2.6***	W	**-19.1**	7	**9.8**	11	**-**	-	**-**	-
17	Mean Oltenia	-	-2.8	0.6	3.4	W	**-19.6**	1	**15.5**	11	**-22.1**	1	**13.4**	31
18	Obârşia Lotrului	1404		-4.1	-4.1		**-24.6**	7	**6.1**	22	**-**	-	**-**	-
19	Halânga	76		2	2	W	**-14.2**	1	**17**	11	**-12.8**	2	**17.4**	31

(Source: processed data from Oltenia MRC archive)

Temperature general mean for the entire region of Oltenia was 0.6°C and its deviation from the multiannual mean was of 3.4°C, which confirms the classification of warm month.

Monthly minimum air temperature values were registered in the morning of January 1 and were comprised between -13.9°C registered at Drăgăşani and -29.8°C in the Subcarpathian Depression at Apa Neagră and their mean for the entire region was -19.6°C. The value of -29.8°C is the second lowest value registered at this meteorological station of all range of data. The minimum of -29.8°C registered in the Subcarpathian Depression at Apa Neagră is the thermal minimum value of the winter of 2014-2015.

Maximum air temperature values were registered on January 11 and were comprised between 12.0°C at Voineasa and 19.5°C at Calafat, and their mean for the entire region was 15.5°C. January 11 is a positive thermal ***singularity*** of January, because the daily mean for the entire region of this day was 7.7°C, and on January 10, the mean was 4.3°C and the maximum registered only 12.5°C at Calafat, and on January 12, the mean for the entire region was 3.0°C, and the maximum temperatures did not reach 9.0°C.

Heat units in January (the sum of active daily average temperature means) were comprised between 54 at Voineasa and 90.3 in Drobeta Turnu Severin, with a mean for low area of 73.6, excepting the mountainous areas, and exceeding frost units.

Frost units in January 2015 were comprised between 24.4 in Drobeta Turnu Severin and 70.8 at Halânga, and in the mountainous area 124.1, with a mean for low areas (Oltenia excepting the mountainous area) of 47.6, which designate a mild winter month.

Agrometeorological frost in January was insignificant and was registered in almost all region on January 1 and sparsely on January 2, 6, 7, 8 and 9, and frost units were comprised between 0.6 at Bâcleş and 23.8 at Apa Neagră Subcarpathian Depression, designating a warm month.

At ground surface, *the minimum temperature values* were registered on January 1 and 2 and were comprised between -9.9°C, registered in the extreme south-west of Calafat region on January 2 and -31.0 at Apa Neagră on January 1, and their mean was -22.1°C. These extremely low thermal means, which induce a bitter agrometeorological frost at ground surface, were registered on a ground generally covered by a snow layer sufficiently thick in most part of the region that ensured a good protection for crops and vegetal cover excepting a small area in the extreme west where the snow layer was ≤ 10 cm (Drobeta Turnu Severin - Halânga), but here the frost was less intense than in the north and east of the region. The minimum of -31.0°C at Apa Neagră registered on January 1, is ***the thermal minimum value of the winter of*** 2014-2015 at ground surface.

The maximum temperature values at ground surface were registered on January 11, 21, 23 and 31 and were comprised between 10.3°C in Slatina and 20.0°C at Drăgăşani, and their mean for the entire region of 13.4°C.

The chart of air temperature variation in January 2015 presents increasing tendencies for daily average, minimum and maximum temperature values (Fig. 3).

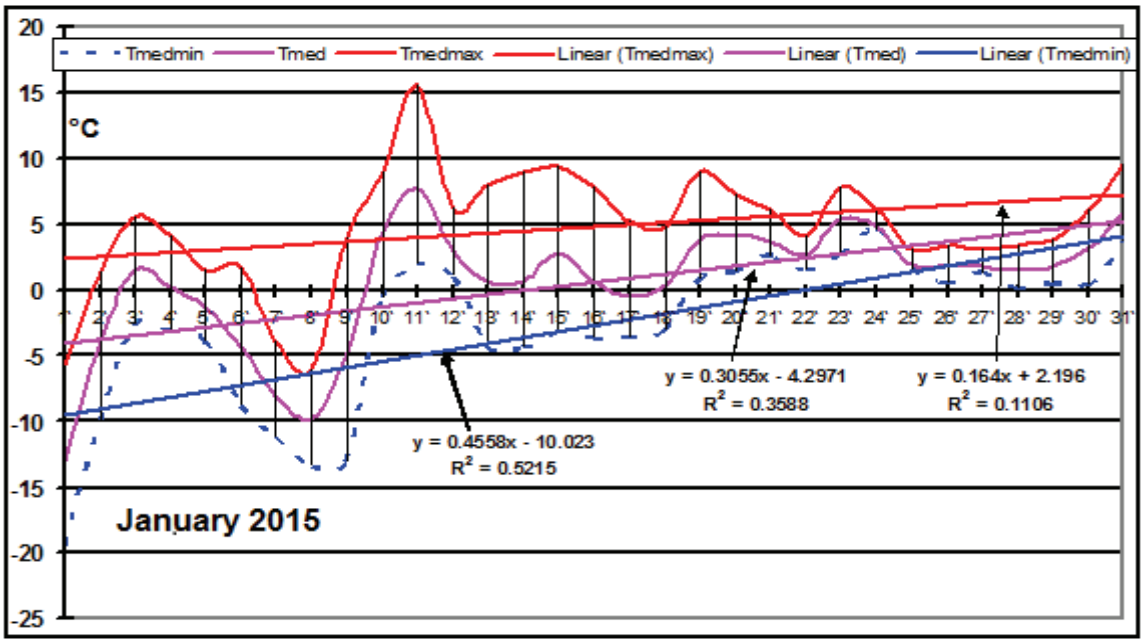

Figure 3. Air temperature variation (the daily means, daily minimum and maximum temperatures mean) in January 2015. (Source: processed data from Oltenia MRC archive).

It is highlighted the cooling caused by ***the second moderate wave*** of this winter, which registered in the interval January 6-9, when the minimum temperatures dropped below -15.0°C in some areas, (-18.6°C at Apa Neagră on January 7). We notice three intervals of *weather warming*: January 2-5, January 10-16 and January 19-31.

2.b. Pluviometric regime of January 2015

Monthly quantities of precipitation were comprised between 23.2 l/m^2 at Bechet and 88.8 l/m^2 at Apa Neagră, and the percentage deviations from the multiannual means were comprised between -37.1% in Oltenia Plain at Băileşti and 25.2% at Apa Neagră, and in the mountainous area 66.0% at Parâng. These deviations led to classifications of the pluviometric time type from very droughty (VD) in Oltenia Plain at Bechet and Băileşti and rainy (R) at Apa Neagră, and in the mountainous area excessively rainy at Parâng (Table 2).

The general mean of precipitation for the entire region was 46.4 l/m^2 and its percentage deviation from the normal mean was 6.8%, which designates a normal pluviometric month on average.

The number of days with drizzle was comprised between 1 in Drobeta Turnu Severin and 4 in Craiova and at Caracal.

The number of days with rain was comprised between 7 at Târgu Logreşti and 16 in Drobeta Turnu Severin, *the number of days with sleet* was between 1 at Băileşti, Bechet, Polovragi and Slatina and 2 in Craiova, Râmnicu Vâlcea, at Apa Neagră, Târgu Logreşti and Parâng.

The number of days with liquid precipitation (drizzle, rain and sleet) was comprised between 9 Râmnicu Vâlcea Târgu Logreşti and 18 in Drobeta Turnu Severin and at Băileşti.

The number of days with snowfall was comprised between 1 at Bechet and Apa Neagră and 12 at Polovragi.

The total number of days with precipitation was comprised between 9 at Târgu Logreşti and 25 at Polovragi with an average of 16.1 days and most of precipitation was weak. Until January 12 the snow layer melted as a consequence of gradual warming, and *its duration was comprised* between one day at Halânga and 14 days at Târgu Logreşti and Polovragi.

The maximum thickness of the snow layer in January was registered on January 1 (the frostiest day of winter) and was comprised between 1 cm at Halânga in the extreme west and 35 cm at Drăgăşani.

3.a. Thermal regime of February 2015

The monthly average temperature values in the air were comprised between -0.7°C at Voineasa and 2.3°C in Drobeta Turnu Severin and Râmnicu Vâlcea, and their deviations from the multiannual means were comprised between 0.7°C at Calafat and Băileşti and 2.3°C in Râmnicu Vâlcea leading to thermal time type classifications from normal (N) at Calafat and Băileşti in Oltenia Plain and at Obârşia Lotrului to warm (W) in the Olt Couloir at Caracal, Drăgăşani and in Râmnicu Vâlcea and in Târgu Jiu Depression. On extended areas, the weather was warmish (WS) in February (Table 4).

Air temperature mean for the entire region was 0.9°C and the deviation from the normal was 1.7°C confirming the classification of warmish weather (WS) on average for the entire region.

Most of the *minimum air temperature values* were registered in the interval February 10-12 and were comprised between -7.6°C in Drobeta Turnu Severin and -18.2°C at Băileşti and in the mountainous area -19.9°C at

Obârşia Lotrului, and their mean for the entire region was -12.0°C, being 3.0°C higher than the mean of December and 7.6°C than the mean of minimum temperature values of January, which shows that regarding the thermal regime of nights February was warmer than January.

Table 4. Air temperature regime in Oltenia and the minimum and maximum temperature values at ground surface in February 2015.

Crt. No.	Meteorological Station	Hm	N	M	ΔT=M-N	CH	Air minT		Air maxT		Soil minT		Soil maxT	
							(°C)	Date	(°C)	Date	(°C)	Date	(°C)	Date
1	Drobeta Turnu Severin	77	0.9	**2.3**	1.4	**WS**	***-7.6***	18	**15.1**	28	**-10.2**	11	**22.4**	28
2	Calafat	66	0.4	1.1	***0.7***	**N**	**-14.7**	11	***11.6***	27	**-15.8**	11	**17.7**	26
3	Bechet	65	-0.1	1.7	1.8	**WS**	**-11.1**	11	**14.5**	28	**-9.5**	13	**19.5**	28
4	Băileşti	56	-0.1	0.6	***0.7***	**N**	**-18.2**	12	**12.4**	28	**-21.0**	11	**20.6**	28
5	Caracal	112	-0.7	1.4	2.1	**W**	**-13.0**	11	**13.4**	28	**-14.8**	12	**21.7**	28
6	Craiova	190	-0.4	1.3	1.7	**WS**	**-11.6**	11	**13.8**	28	**-15.0**	11	**22.0**	28
7	Slatina	165	-0.2	1.6	1.8	**WS**	**-12.5**	11	**14.2**	28	**-15.2**	12	***16.1***	28
8	Bâcleş	309	-0.9	0.7	1.6	**WS**	**-10.3**	11	**13.3**	28	-	-	-	-
9	Tgârgu Logreşti	262	-0.7	1.0	1.7	**WS**	**-13.4**	11	**14.0**	28	**-14.0**	11	**19.0**	21
10	Drăgăşani	280	-0.2	2.0	2.2	**W**	**-7.7**	18	**14.7**	28	**-11.2**	18	**20.5**	28
11	Apa Neagră	250	-0.6	0.6	1.2	**WS**	**-15.5**	11	**15.5**	28	**-16.0**	11	**23.0**	28
12	Târgu Jiu	210	-0.4	1.7	2.1	**W**	**-8.7**	10	**16.0**	28	**-12.2**	10	**22.2**	28
13	Polovragi	546	-1.4	0.4	1.8	**WS**	**-12.6**	18	**13.5**	28	**-18.3**	19	**20.0**	28
14	Râmnicu Vâlcea	243	0.0	**2.3**	**2.3**	**W**	**-9.2**	10	**16.4**	28	***-9.0***	13	**21.6**	28
15	Voineasa	587	-2.5	***-0.7***	1.8	**WS**	**-11.9**	18	**14.7**	28	-	-	-	-
16	Parâng	1585	-5.6	-4.1	1.5	**WS**	**-14.5**	10	**5.9**	27	-	-	-	-
17	Mean Oltenia	-	-0.8	0.9	1.7	**WS**	**-12.0**	-	**13.7**		**-14.0**		**20.3**	28
18	Obârşia Lotrului	1404	-5.5	-5.3	0.2	**N**	**-19.9**	18	**8.3**	24	-	-	-	-
19	Halânga	76	-	2.4	-	-	**-8.3**	18	**15**	28	**-9.1**	18	**24.2**	28

(Source: processed data from Oltenia MRC archive)

Air maximum temperature values were mostly registered in the interval February 26-28 and were comprised between 11.6°C at Calafat and 16.4°C in Râmnicu Vâlcea, and their mean for the entire region was 13.7°C, being 2.7°C lower than the maximum values of December 2014 and 1.8°C than the mean of January, which shows that in February days were colder than in December and January.

Heat units were registered especially in the intervals February 1-6 and February 20-28 and ranged between 27.6 at Voineasa and 79.7 in Râmnicu Vâlcea with a mean for the entire region of 63.9, exceeding the frost units and designating a warm winter month.

Frost units were registered especially in the interval February 7-19, in the interval February 20-28, because of the weather warming no frost units were registered at any meteorological station. These were comprised between 15.7 in Drobeta Turnu Severin and 51.0 at Băileşti, with a mean for low area of Oltenia of 30.6 designating a warm winter month.

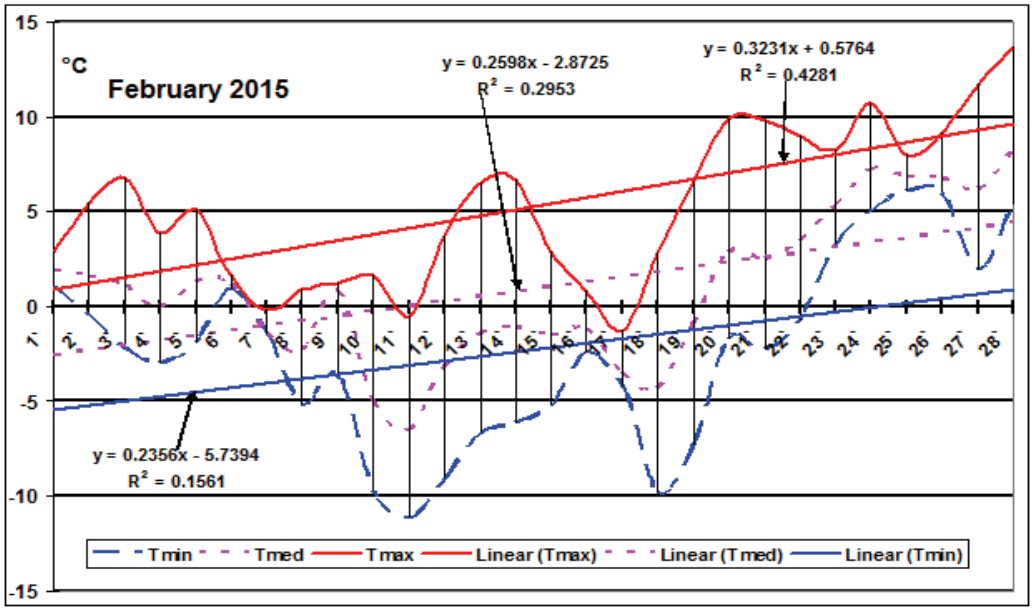

Figure 4. Air temperature variation (the daily means, daily minimum and maximum temperatures mean) in February 2015. (Source: processed data from Oltenia MRC archive).

The chart of air temperature variation in February 2015 presents highly increasing tendencies for daily average, minimum and maximum values (Fig. 4). In February we notice two weather warming intervals February 2-5 and February 19-28 and a cooling interval in the middle of the month, February 8-15.

The minimum temperature values at ground level were comprised between -9.0°C in Râmnicu Vâlcea and -21.0°C at Băileşti, and their mean for the entire region was -14.0°C, 3.0°C higher than the mean corresponding to December and 8.1°C than the mean of January.

The maximum temperature values at ground surface were comprised between 16.1°C in Slatina and 23.0°C at Apa Neagră, and their mean for the entire region was of 20.3°C, 5.1°C higher than the mean corresponding to December and 6.9°C than the mean of January. These temperature increases led to a slow continuation of vegetation phases in some periods of time, and in the end of February, the buds of fruit trees had raised their diameter, and some species of plants of the vegetal cover had a significant development.

3.b. Pluviometric regime of February 2015

Monthly quantities of precipitation were comprised between 28.2 l/m^2 at Bechet in the extreme south and 89.7 l/m^2 at Apa Neagră and their percentage deviations from the multiannual means were comprised between -28.7% at Polovragi and 79.8% at Băileşti leading to classifications of pluviometric time type from droughty (D) at Polovragi and Târgu Logreşti and exceedingly rainy at Băileşti, and in the mountainous area at Parâng very droughty (VD) (Table 2).

The quantities of precipitation mean for the entire region of Oltenia was 47.1 l/m^2 and its percentage deviation from the multiannual mean was 11.8%, which lead to the classification of little rainy month (LR) on average.

The number of days with drizzle was comprised between 1 at Târgu Logreşti, Drobeta Turnu Severin, Halânga and Slatina and 4 at Băileşti and Caracal with a mean of 1.6.

The number of days with rain was comprised between 6 at Bechet and Târgu Logreşti and 12 in Târgu Jiu and Drobeta Turnu Severin with a mean of 9.1.

The number of days with sleet was comprised between 1 at Bechet, Slatina, Caracal and in Râmnicu Vâlcea and 4 at Târgu Logreşti and Apa Neagră.

The number of days with liquid precipitation (drizzle, rain and sleet) was comprised between 8 at Drăgăşani and 17 at Băileşti with a mean of 12.6.

The number of days with snowfall was comprised between 3 at Bechet and in Drobeta Turnu Severin and 7 in Râmnicu Vâlcea with a mean of 5.2.

The number of days with precipitation of all types was comprised between 13 at Bechet and 24 in Târgu Jiu with a mean of 17.8.

The snow layer was registered in the interval February 7-18 and in the extreme west of the region in the interval February 7-10. The maximum thickness of the snow layer was registered in the interval February 5-12 and was comprised between 7 cm at Halânga and in Râmnicu Vâlcea and 25 cm at Calafat. The snow layer has slowly melted in the interval February 11-18.

The number of days with snow layer (excepting the mountainous area) was comprised between 4 in Drobeta Turnu Severin and Halânga and 17 at Apa Neagră, with a mean for the entire region of 10 days. In spite of these apparently insignificant values, February was little rainy (LT) due to the fact that precipitation were weak in many days. Usually, in February, there are registered the lowest quantities of precipitation within a year, being *the most droughty month of the year*. But there are also some years, with a low frequency, when in February there are registered exceptional quantities of precipitation.

4.a. Overall thermal regime of the winter of 2014-2015

Temperature seasonal means were comprised between -0.2°C at Voineasa and 2.6°C in Drobeta Turnu Severin, and their deviations from the multiannual means were comprised between 1.7°C at Băileşti and Parâng and 2.8°C at Voineasa designating the classification of warm month (W) at all meteorological stations of Oltenia.

The average temperature of winter for the entire region was of 0.9°C with a deviation of 2.1°C from the normal mean which confirms the classification of warm winter for the entire region (Table 5).

The winter of 2014 - 2015 was marked by ***6 intervals of weather warming*** (December 1-24, January 2-5, January 10-16, January 19-31, February 2-5 and February 19-28), which amounted 63 days (70.0% of winter days), a heat wave (February 18-25), a positive thermal singularity (January 11), two frost waves: an intense one in the interval December 28, 2014-January 2, 2015 and a moderate one on January 6-9. The intervals of warm weather are called "warm windows of winter" and are extremely good for biocoenoses, led to the restart of plant vegetation phases, feeding and revival of hives of bees, birds and wild animals, a good mood of people, significant savings of heating costs, etc.

Frost units were comprised between 55.5 in Drobeta Turnu Severin and 148.7 at Voineasa with a seasonal mean for the entire region Oltenia (excepting the mountainous area) of 106.6.

Heat units were comprised between 133.8 at Voineasa and 288.0 in Drobeta Turnu Severin with a seasonal mean for the entire region of Oltenia (excepting the mountainous area) of 215.6, being more than double than frost units.

The units of agrometeorological frost were insignificant. All these show that the winter of 2014-2015 was a warm winter with a high thermal variability.

4.b. Overall pluviometric regime of the winter of 2014-2015

The seasonal quantities of precipitation were comprised between 148.2 l/m^2 at Bechet and 396.5 l/m^2 at Apa Neagră and their percentage deviations from the multiannual means were comprised between 23.7% at Polovragi and 111.0 l/m^2 in Craiova designating the classification of pluviometric time type of excessively rainy winter (ER), according to Hellmann criterion, at all meteorological stations in Oltenia.

Table 5. Overall average thermal characteristics of the winter of 2014-2015.

Crt. No.	Staţia meteorologică	Hm	Tmed N Iarna	Med Iarna 2014-2015	Δ=Tmed-N	CH
1	Drobeta Turnu Severin	77	**0.4**	**2.6**	2.2	**W**
2	Calafat	66	-0.1	1.7	1.8	**W**
3	Bechet	65	-0.6	1.2	1.8	**W**
4	Băileşti	56	-0.7	1.0	***1.7***	**W**
5	Caracal	112	-1.2	1.0	2.2	**W**
6	Craiova	190	-1.0	1.0	2.0	**W**
7	Slatina	165	-0.8	1.1	1.9	**W**
8	Bâcleş	309	-1.4	1.1	2.5	**W**
9	Târgu. Logreşti	262	-1.1	0.9	2.0	**W**
10	Drăgăşani	280	-0.6	1.7	2.3	**W**
11	Apa Neagră	250	-1.0	0.7	***1.7***	**W**
12	Târgu Jiu	210	-1.0	1.3	2.3	**W**
13	Polovragi	546	-1.5	1.1	2.6	**W**
14	Râmnicu Vâlcea	243	-0.6	2.0	2.6	**W**
15	Voineasa	587	***-3.0***	***-0.2***	**2.8**	**W**
16	Parâng	1585	-5.1	-3.4	***1.7***	**W**
17	Mean Oltenia	-	-1.2	0.9	2.1	**W**
18	Halânga	76	-	2.5	-	-
19	Obârşia Lotrului	1404	-5.5	-4.0	1.5	**W**

(Source: processed data from Oltenia MRC archive)

The mountainous area is an exception, the winter being rainy (R) at Parâng.

The rainiest winter month was December, the extremely increased quantities of precipitation highly contributing to the seasonal quantities of precipitation (Table 2).

DISCUSSIONS

For the interval December 8, 2014, 00 a.m. – December 9, 2014 6 a.m., the National Institute of Hydrology (NIH) remitted a YELLOW CODE for floods: "On the rivers in the hydrographic basins: the Drincea, the Desnăţui (Mehedinţi and Dolj counties), the Motru and some small streams of the Jiu in Gorj, Mehedinţi and Dolj counties, the lower Jiu, the Motru confluence (Dolj County), streams of the lower Olt in Vâlcea, Gorj, Dolj and Olt Counties, the Călmăţui, the upper Vedea upstream Văleni, Teleorman and on other small streams of the Vedea river (Olt, Argeş and Teleorman Counties), the Râul Doamnei, the Neajlov, the Sabar and other small rivers in the middle and lower Argeş basin (Argeş, Dambovița, Giurgiu and Ilfov Counties).

ORANGE CODE: on the Neajlov River – sector Vadu Lat – Călugăreni (Giurgiu County) and on the Teleorman locally upstream and downstream Teleorman hydrometric station (Teleorman County). Dangerous hydrological phenomena can appear especially on the lower sectors of these rivers.

For the Jiu River a RED CODE for floods was remitted. *Abundant precipitation* with a pouring character caused landslips in some area in Oltenia, and Păuşeşti-Măglaşi in Vâlcea County, 40 houses were in danger to fall. There occurred a landslide on the hill were the houses were built, near the bank of the Olăneşti River. The proper consolidation works performed in summer, when the first landslide occurred, were destroyed by water flowing on hillsides. The village road was damaged, etc.

Synoptic causes of rainy intervals. The abundant precipitations were caused by the evolution of some strong Mediterranean Cyclones, atmospheric fronts of which rich in humidity crossed the territory of our country.

For example, ***the synoptic situation*** on December 9, 2014, when the intensity of precipitation phenomena in Oltenia was maximum. On December 9, 2014 at 12 UTC, at ground level above Europe, it could be observed a wide anticyclone girdle formed between the Azores High (with central pressure values exceeding 1035 hPa, above the Atlantic Ocean) and the East-European Anticyclone (with central pressure values exceeding 1050 hPa, above the Russian Plain) (Fig. 6). In the Mediterranean Sea, the Mediterranean Cyclone was central located in the south of Greece with central pressure values below 1005 hPa, formed of the altitude thalweg of Iceland Cyclone. The coupling of the Mediterranean Cyclone with the anticyclone girdle located in north of Romania caused the advection of cold and moist air above the Black Sea. On the altitude circulation, a mass of warm and moist air was advected above the Mediterranean Sea, which caused an intense precipitation above Romania. The interaction of the atmospheric circulation with the levelled forms of relief of Oltenia increased the intensity of rains due to the dynamic convection. The East-European Cyclone created an effect of blockage above the Mediterranean Cyclone, which led to a slow

evolution on its trajectory, and during 5 rainy days (December 6-10, 2014) the quantities of precipitation registered in Oltenia were comprised between 42.0 l/m^2 at Bechet in the extreme south and 96.4 l/m^2 in the Getic Piedmont in Slatina with a mean for the entire region of 59.3 l/m^2 (116.2% of the normal mean). Compared to the monthly normal quantities of precipitation, these amounts are percentages comprised between 53.5% at Parâng and 225.2% in Slatina, 92.3% of measured quantities have been higher with 100% than the normal values.

Our observations on site led us to the conclusion that on agricultural fields where herbicides were used, ground permeability highly changed (due to the soil change of chemistry), and the processes of rain water leakage under the form of torrents did no longer occur, and the rain water was absorbed in the ground. Thus, the infiltration was not total and the water remained impregnated in a ground layer of a considerable thickness (1-2 m). This phenomenon can cause water infiltration in the basements of houses (if herbicides are used in courtyards) or can lead together with other favouring factor to landslides on slope. Therefore, we consider that *their use and batching* must be done with a lot of caution.

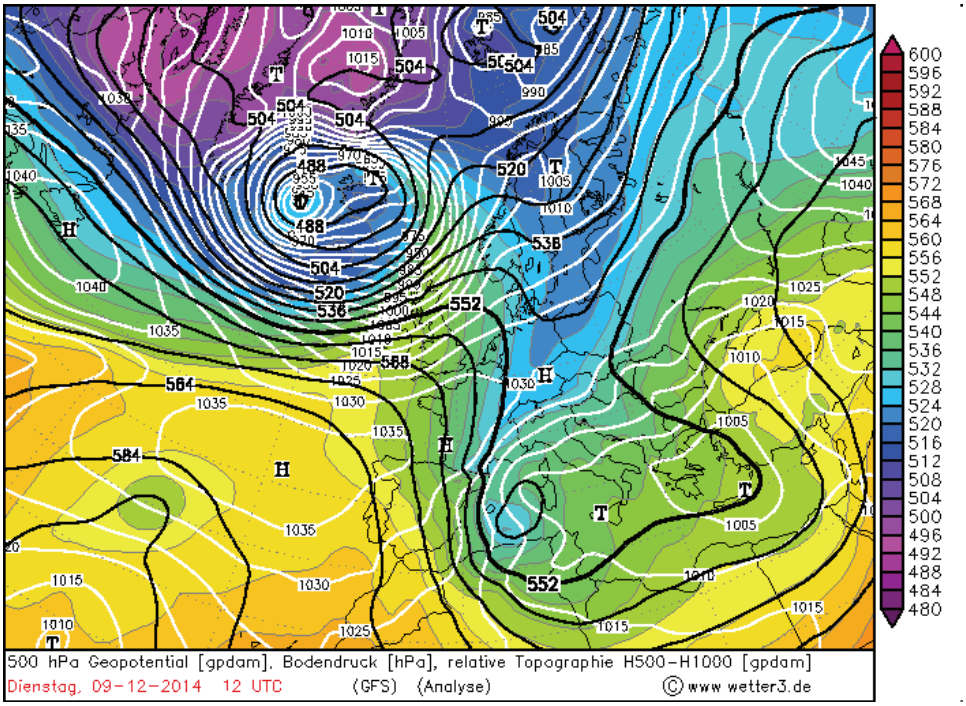

Figure 6. Synoptic situation at ground level (pressure field), superposed on altitude baric topography at the level of 500 hPa (geopotential field at the average height of 5000 m) and relative topography (TR 500/1000 hPa) on December 9, 2014 at 12 UTC.

We briefly analyze *the synoptic situation* on December 26, 2014 which caused abundant snowfalls in the last part of December followed by ***the most intense wave of frost*** of the winter of 2014-2015 registered in the interval December 28, 2014-January 2, 2015. On February 26, 2014, at 6 p.m. UTC, at ground level, the distribution of baric centres of action of the atmosphere above Europe was the following: in the north of the continent the depression field of Iceland Cyclones with many nuclei, in the Mediterranean Sea above the Balkan Peninsula and above the Black Sea operated a Mediterranean Cyclone with values of the atmospheric pressure below 1005 hPa (Fig. 7). The Mediterranean Cyclone was positioned at the southern periphery of the anticyclone girdle formed of the Azores High (with central pressure value exceeding 1030 hPa, above the Atlantic Ocean and the Iberian Peninsula) and couple with the East European one (with central pressure values exceeding 1025 hPa, above Minor Asia and the Russian Plain).

At the level of 500 hPa in the lower troposphere, above most part of Europe, the geopotential field presented a wide thalweg extended towards the south of the Balkan Peninsula. In altitude, a strong advection of polar maritime moist air (mP) came from the north of the Atlantic Ocean, and in the lower troposphere there was an advection of maritime warm air above the Mediterranean Sea mixed with the moist and colder air above the Black Sea and in the same time an advection of cold air from the north-east above the Russian Plain.

These multiple advections of moist air mixed with cold air transformed the precipitation in snowfall and maintained the precipitation processes in our country during three days, which poorly continued up to the morning of January 1, 2015.

The quantities of precipitation registered in the interval December 26-29, 2014 were comprised between 20.9 l/m^2 at Polovragi and 49.9 l/m^2 at Drăgăşani, with a mean of 30.3 l/m^2 for the entire region and the maximum quantity within 24 hours was of 34.8 l/m^2 at Drăgăşani registered in the interval December 26, 8 p.m. December 27, 8 p.m.. These quantities of precipitation are percentage values comprised between 37.3% at Polovragi and 111.9% at Drăgăşani, of multiannual normal means.

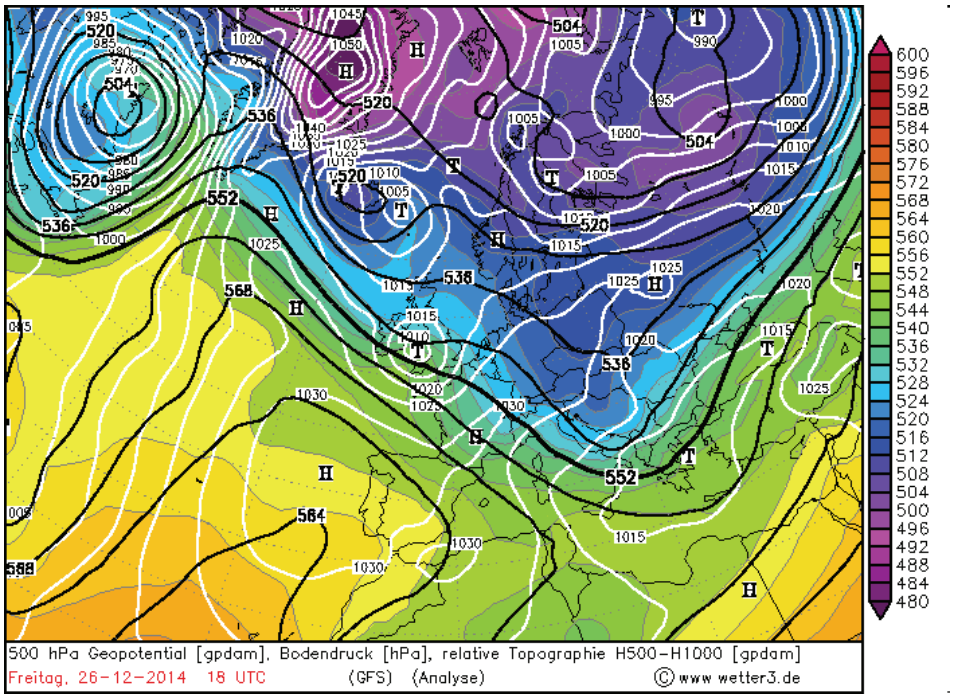

Figure 7. Synoptic situation at ground level (pressure field), superposed on altitude baric topography at the level of 500 hPa (geopotential field at the average height of 5000 m) and relative topography (TR 500/1000 hPa) on December 26, 2014 at 6 p.m. UTC.

As a *general conclusion* we note that December 2014 was a warmish winter month, excessively rainy, marked a winter heat wave, snowfalls in the last part of the month and an intense frost wave which reached its climax in the morning of January 1. 2015, marking ***the frostiest New Year's Eve*** in the last 50 years. December 2014 was a month with a high climatic variability and represents an example of warmish winter month in which floods and a frost wave were registered, causing an exceptional hydric and thermal stress to crops and in general to biocoenoses.

Synoptic causes of the frost wave in the interval 30 December 2014-2 January 2015. The most intense frost wave of the winter of 2014-2015 was caused by a synoptic situation specific to these excessive cooling of air during winter. The withdrawal of the Mediterranean Cyclone, which caused the snowfalls in the end of December, towards south-east and the extension of the anticyclone girdle towards east and north, intensified the advection of cold air from east and north in lower troposphere (Fig. 8).

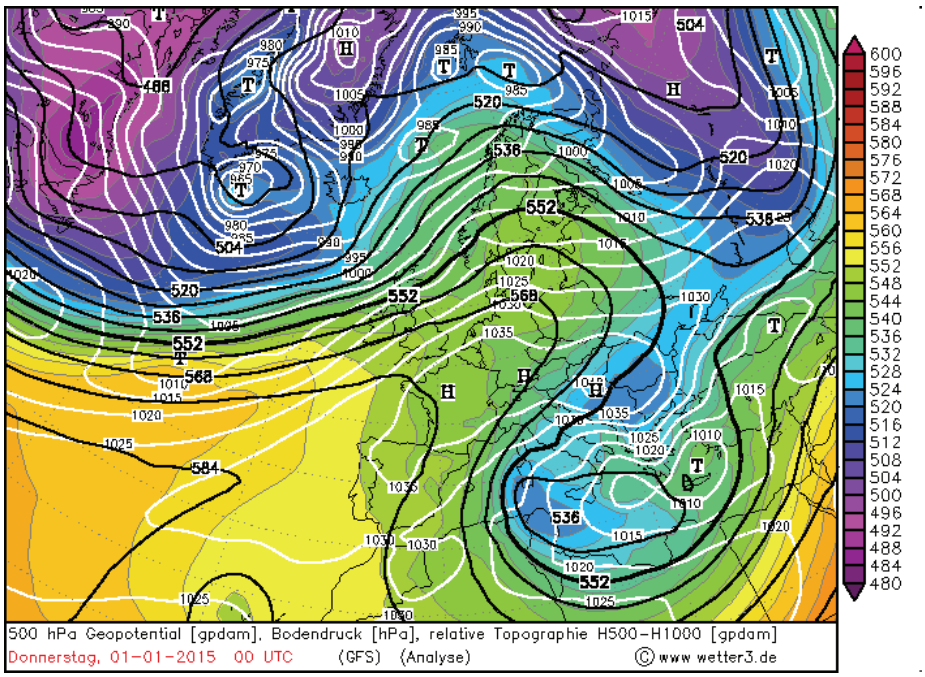

Figure 8. Synoptic situation at ground level (pressure field), superposed on altitude baric topography at the level of 500 hPa (geopotential field at the average height of 5000 m) and relative topography (TR 500/1000 hPa) on January 1, 2015 at 00 UTC.

In altitude, at the level of 500 hPa a blocking circulation can be observed above the most extended part of Europe, which caused an intense advection of extremely cold air from the Scandinavian Peninsula first towards the Russian Plain, where it continued its cooling, and then, from north-east, it reached Oltenia going round the Carpathian Curvature.

In figure 9 we underlined this extremely cold advection with its nucleus of very cold air and closed isotherm of -12.0°C and a secondary nucleus even colder with closed isotherm of -15.0°C above the Balkans and the Dinaric Alps.

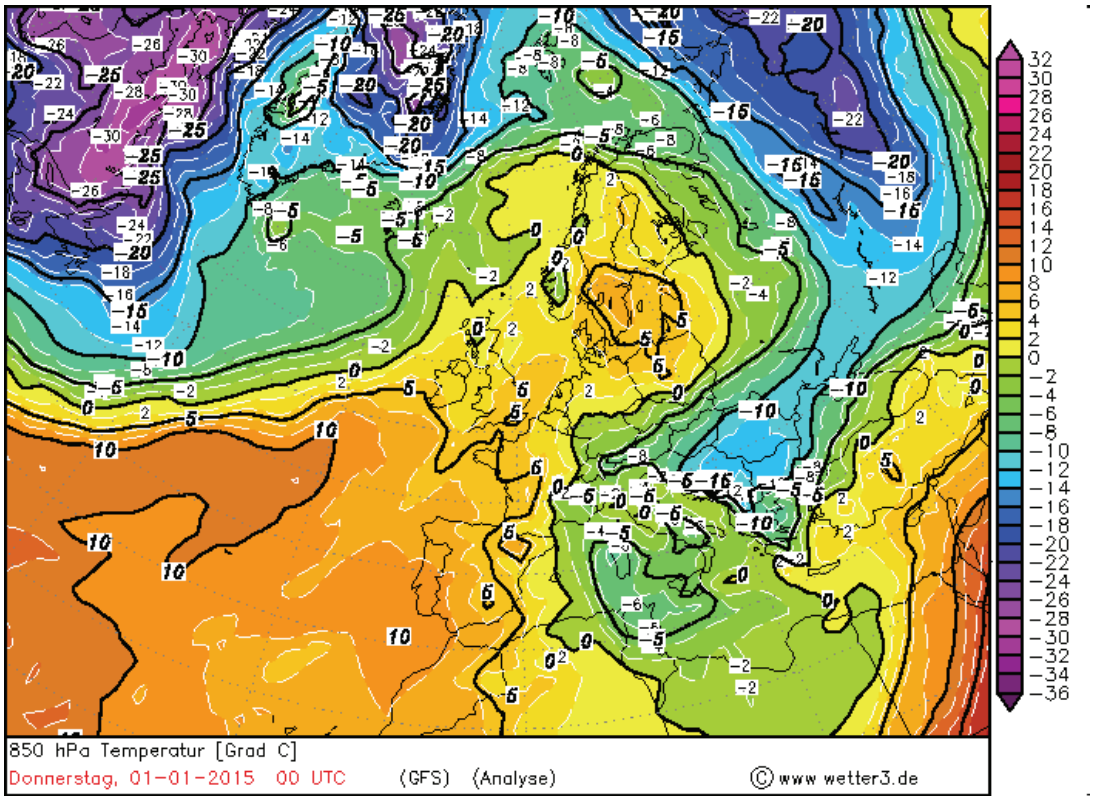

Figure 9. Thermal field at the level of 850 hPa, above Europe, on January 1, 2015 at 00 UTC.

As a bioclimatic effect, it is important to mention that the warm weather of the winter 2014-2015 determined the hatching of eggs of birds such as the Barbary dove or the wild pigeon. This situation favoured the development of the chicks, such that they started flying in the beginning of March.

CONCLUSIONS

Although the winter of 2014-2015 has come after a normal and excessively rainy autumn, in which the climatic phenomena specific to winter were registered very early (October 25) and then even from the first day of December, weather warming, during a long period of time (December 4-25), led to a significant number of liquid precipitation, minimum, average and maximum temperature values and to the classification of December as a warm winter month. According to the deviations of monthly means from the normal, the warmest winter month was January with an average deviation higher than 3.4°C, followed by December with a deviation of 1.4°C and February with 1.7°C.

The ground maintained unfrozen during long intervals of time, and the number of days with phenomena of frost-thaw (by passing from day to night) was significant. There was warm weather for long intervals of time during winter and there were registered ***6 weather warming intervals*** (December 1-24, January 2-5, January 10-16, January 19-31, February 2-5 and February 19-28) which amounted 63 days (70.0% of winter days), a heat wave (December 18-25), a positive thermal singularity (January 11), two frost waves: an intense one in the interval December 28, 2014- January 2, 2015 and a moderate one January 6-9. The intervals of warm weather are called "warm windows of winter" and are extremely good for biocoenoses, led to the restart of plant vegetation phases, feeding and revival of hives of bees, birds and wild animals, a good mood of people, significant savings of heating costs, etc. *Frost units* were comprised between 55.5 in Drobeta Turnu Severin and 148.7 at Voineasa with the seasonal mean for the entire region of Oltenia of 106.6 (excepting the mountainous area).

Heat units were comprised between 133.8 at Voineasa and 288.0 in Drobeta Turnu Severin with the seasonal mean for the entire region of Oltenia of 215.6 (excepting the mountainous area), being more than double than frost units.

The units of agrometeorological frost have been insignificant. All these show that the winter of 2014-2015 was a warm winter with a high thermal variability. For the entire winter the number of days with snow layer (excepting the mountainous area) was comprised between 9 at Halânga in the extreme south of Oltenia and 35 at Polovragi in the area of the Subcarpathian Depression with a mean of 25.6 for the entire region.

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