

CLIMATIC CONSIDERATION OF THE AUTUMN OF 2015 IN THE SOUTH-WEST OF ROMANIA

ION MARINICĂ¹, ANDREEA FLORIANA MARINICĂ²

ABSTRACT. - Climatic consideration of the autumn of 2015 in the south-west of Romania. In the south-west of Romania, in the autumn of 2015 climate evolution in Oltenia was atypical. Therefore, July and August were canicular and droughty, and the summer canicula continued until 5th September, thus confirming the summer translation towards autumn. September and October were excessively rainy and the secondary pluviometric maximum was thus registered. The highest monthly quantities of precipitation were registered in September and often exceeded 100 l/m², and their maximum value was registered in the area of the Subcarpathian Depressions, as well as in October in Apa Neagră. The autumn of 2015 marked a new oscillation of Oltenia climate, from a droughty and canicular weather to a rainy weather. The analysis of the climatic conditions in the south-west of Romania in the autumn of 2015 is a continuation of some extended studies on climate variability (Bogdan, Marinică & Marinică, 2014; Marinică & Marinică, 2014). The paper is useful to specialists, doctoral candidates and master graduates and to all people interested in the climate's evolution.

Key words: pouring rains, ground excess of humidity, canicula, drought.

1. INTRODUCTION

Global warming was again confirmed in 2015. The global average temperature in the first six months of 2015 marked a new record according to the report of the National Oceanic and Atmospheric Administration (NOAA). The average temperature calculated at earth and ocean surface was 0.85°C above the mean of XXth century and exceeded with 0.09° C the previous record from 2010. 2015 registered a new global climatic record: British Weather Institute announced on 9th November), that in 2015 the global average temperature will be 1.0°C higher than in the preindustrial age (AFP). According to data registered between January and September, Had CRUT program administrated together with Met Office and the climatic research unit of the University of East England, show that the global average temperature in 2015 will be 1.02°C higher than in preindustrial age" (1850-1900). The agreement concluded at COP21 (30 November - 11 December 2015) should set a limit for the increase of global temperature to 2.0°C compared to the level from preindustrial age. "We have witnessed a strong phenomenon El Nino which took place in Pacific this year, and had an impact on global temperatures", (Stephen Belcher, director of Met Office Hadley Center). "We had similar events also in the past, but it is the first time when the threshold of 1.0°C is

¹ Ph. D. S.R. II, First Degree Weather Forecaster, Regional Meteorological Center Oltenia, ionmarinica@yahoo.com

² Bachelor of Sciences, Klimacampus, Hamburg Germany, marinica.andreea@gmail.com

reached and it is obvious that the human influence leads the nowadays climate towards an unknown territory".

2. DATA AND METHODS

We have used for our research on this warm autumn the data from Oltenia MRC Archive, NAM (National Administration of Meteorology) Bucharest, the maps made by the Agrometeorology Laboratory (NAM), synoptic maps, the data offered by the archive, the satellite and radar images as well as the facilities offered by Office.

3. RESULTS AND DISCUSSION

3.1. Climatic characteristics of September 2015

Thermal regime of September 2015. The monthly average temperatures were comprised between 15.2°C Voineasa Intracarpethian Depression and 20.2°C in Dr. Tr. Severin, and their deviations from the multiannual means were comprised between 1.3°C in Calafat and 2.9°C in Voineasa, the highest deviations being registered in the high area and in the mountains 3.2°C in Parâng. These deviations determining classifications of pluviometric time type from warmish in the south-west of the region and southern half of the hills to warm in the area of Băilești, Caracal, the Subcarpathians and in the mountains. *The average temperature of September* calculated for the entire region was 18.3°C, and its deviation from the multiannual mean was 2.0°C which confirms the classification of war month for the entire region. Most of *the monthly minimum air temperatures* were registered in the end of the first month decade, on 9 September and were comprised between 3.0°C in Voineasa and 9.1°C in Calafat, and their mean for the entire region was 6.5°C. Thus in the first decade of the month the highest variations of temperature were registered: in the first five days the heat wave persisted with temperatures exceeding 37.0°C in some meteorological stations, while other stations registered tropical nights, and then the severe cooling in the last three days of the decade led to the registration of the monthly minimum thermal values. *The monthly maximum air temperatures* were registered in the beginning of the month, most of them in the first three days and were comprised between 31.4°C in Voineasa and 37.7°C in Calafat. The value of 26.2°C from Parâng meteorological station became ***an absolute climatic record for this station***, being the highest value ever registered, exceeding with 1.0°C, after 71 years the old record of 25.2°C. The global warming and the translation of summer in the first month of autumn are thus confirmed, especially in the mountainous area (Bogdan, A. Marinică & Marinică, 2014). There have been other maximum temperature values registered in September 2015 which approached the climatic records: the value of 37.4°C registered in Băilești is the second value of the entire range of data after the record in 1987. In Rm. Vâlcea meteorological station, the value of 36.0°C is the second value of the entire range of data after the record in 1946 (38.5°C/8

September 1946), and all the other maximum values from the meteorological stations were placed on the third place of all the range of data. Consequently September 2015 can be considered the third warm month overall of all time meteorological registrations. The sudden transition from the thermal regime specific for summer to that typical for autumn occurred in the night of 5/6 September. Most of the *lowest daily maximum temperatures* were registered on 29 September when air temperature dropped below 15.0°C in the entire region and were comprised between 10.9°C in Polovragi and Bâcleș and 14.4°C in Bechet. The daily mean of the maximum temperature values dropped for 27 days with 22.0°C, from 34.4°C registered on 2 September, to 12.4°C registered on 29 September. *The parameter variation characterizing air temperatures* (daily maximum temperature mean calculated for the entire region, daily mean and daily minimum mean) has decreasing tendencies, and of the thermal maximum values

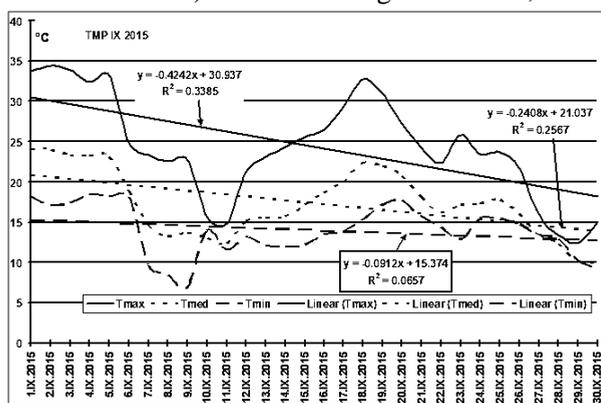


Fig. 1. General mean variation for the entire Oltenia region, of the daily minimum, average and maximum temperature values in September 2015. (Source: processed data from Oltenia CMR archive).

has the strongest decreasing tendency (Figure 1). This variation was marked by an intense, late autumn heat wave in the interval 1-5 September when the air temperature reached 37.7°C and two extremely cold air waves for September, one in the interval 6-13 September (when the maximum temperatures dropped below 16.2°C on 11 September and monthly thermal minimum values were registered) and another in the interval 26-30 September with a peak on 29 September when the daily thermal maximum values dropped below 14.5°C and were registered the lowest thermal maximum values of the month. In September there were registered summer, tropical and canicular days, with scorching heat. *The number of summer days* was comprised between 1 in Parâng in the mountainous area and 20 in Bechet with a mean for the entire region of 13.8. *The number of tropical days* was comprised between 2 in Voineasa and 8 in Dr. Tr. Severin, Calafat, Bechet, Băilești, Caracal, Craiova and Slatina with the mean for the entire region of 6.5. *The number of days with scorching heat* was comprised between 2 in Polovragi and 7 in Dr. Tr. Severin, Calafat, Bechet and Băilești, with the mean for the entire region of 5.2. *The number of days with canicula* was comprised between 1 in Slatina, Drăgășani, Apa Neagră and Rm. Vâlcea and 5 in Calafat, Bechet, Caracal and Băilești, with the mean for the entire region of 2.1. In the first 5 days, ITU exceeded 80 units on extended area. Most of the *monthly minimum ground surface temperatures* were registered in the end of the first decade of the month, on

8 and 9 September and were comprised between 3.0°C in Tg. Logrești and 11.9°C in Slatina with the mean for the entire region of 7.6°C. Most of the *monthly maximum ground surface temperatures* were registered on 1, 2 and 3 September and were comprised between 35.8°C in Slatina and 61.0°C in Apa Neagră, being comparable to those registered in June, due to the heat wave in the first part of the month. *Their mean for the entire region* was 49.3°C. In the end of September the daily maximum ground surface values dropped below 18.0°C.

Pluviometric regime of September 2015. The monthly quantities of precipitation were comprised between 56.0 l/m² in Calafat and 165.4 l/m² in Apa Neagră, and their percentage deviations from the multiannual means were comprised between 44.7% in Calafat in the extreme south-west and 281.7% in Craiova, leading to classifications of pluviometric time type of exceedingly rainy month in most part of the region (Table no. 1). *The mean of the monthly quantities of precipitation* calculated for the entire region was 110.5 l/m², and its percentage deviation from the multiannual mean was 133.8% confirming that September was exceedingly rainy for the entire region. *The first significant rains for agriculture* were registered in the interval 9-11 September, and the *maximum precipitation value registered in 24 hours in this interval, and even for the entire month, was 73.8 l/m²*, registered in Balta in Mehedinți County on 10 September. The rainiest day in this interval and even for the entire month, was on 10 September, with the mean for the entire region of 26.1 l/m². The second interval of abundant rains in this month was 25-28 September, with the maximum precipitation values registered in 24 hours of 68.4 l/m² in Băile Olănești in Vâlcea County registered on 27 September, when the precipitation mean for 24 hours, for the entire region was 22.3 l/m². *The number of rainy days* in September was comprised between 8 in Bechet and Băcleș and 15 in Tg. Jiu and Voineasa, and in the mountainous area 19 in Parâng. The number of days with precipitation ≥ 15.0 l/m² was comprised between 1 in Calafat, Bechet, Băilești and Voineasa and 5 in Craiova, and at the meteorological stations the quantity of precipitation registered in 24 hours was 55.4 l/m² in Apa Neagră on 10 September. In September at 10 meteorological stations precipitation exceeded 100.0 l/m² (62.5% of Oltenia meteorological stations) and at two stations the value of 150.0 l/m² was exceeded. *The water supply* in the ground layer of 0-20 cm land on 29 September 2015 was comprised between 200 -550 m³/ha from satisfactory values in the extreme south of the region to excessively moist in the north-east of the region (Vâlcea County and the north of Olt County).

3.2. Climatic characteristics of October 2015

The thermal regime of October 2015. The monthly average temperatures were comprised between 7.8°C in Voineasa and 11.3°C in Dr. Tr. Severin, and their deviations from the multiannual means were comprised between -1.1°C in Calafat and 0.6°C in Voineasa, and in the mountains -0.2°C in Parâng, leading to classifications of pluviometric time type from cool in Calafat, Polovragi and the Getic Piedmont in Slatina, Băcleș and Tg. Logrești, and normal in most part of the region. The mean air temperature calculated for the entire region was 9.8°C, and its deviation from the multiannual mean was -0.6°C confirming that October was thermally normal overall

for the entire region. Most of the *monthly minimum air temperatures* were registered in the end of the month on 29 October and were comprised between -3.7°C in Voineasa and 3.2°C in Drăgășani, and their mean for the entire region was -0.3°C. Most of the *monthly maximum air temperatures* were registered in the beginning of the month on 5 and 6 October and were comprised between 19.8°C in Polovragi and 24.7°C in Calafat, and their mean for the entire region was 22.4°C.

Table 1. Quantities of precipitation registered in the autumn of 2015 (Σ), compared to the normal values (N for the period 1901-1990), the deviation (%) and the pluviometric time type according to Hellmann criterion (CH).

Meteorological Station	Hm	September 2015				October 2015			
		Σ IX	N	$\Delta\%$	CH	Σ X	N	$\Delta\%$	CH
Dr. Tr. Severin	77	109.0	48.4	125.2	ER	139.0	66.4	109.3	ER
Calafat	66	56.0	38.7	44.7	VR	81.9	48.9	67.5	ER
Bechet	65	62.8	42.8	46.7	VR	80.2	42.6	88.3	ER
Băilești	56	62.3	34.5	80.6	ER	68.8	46.2	48.9	VR
Caracal	112	117.4	35.1	234.5	ER	63.2	39.8	58.8	ER
Craiova	190	137.8	36.1	281.7	ER	72.8	41.3	76.3	ER
Slatina	165	145.4	38.4	278.6	ER	66.4	46.3	43.4	VR
Băcleș	309	69.9	39.2	78.3	ER	85.2	57.1	49.2	VR
Tg. Logrești	262	87.6	38.4	128.1	ER	74.2	47.5	56.2	ER
Drăgășani	280	118.3	50.3	135.2	ER	74.6	50.3	48.3	VR
Apa Neagră	250	165.4	60.5	173.4	ER	192.8	66.7	189.1	ER
Tg. Jiu	210	97.8	51.5	89.9	ER	105.6	66.3	59.3	ER
Polovragi	546	136.8	61.7	121.7	ER	82.6	68.6	20.4	R
Rm. Vâlcea	243	151.2	53.2	184.2	ER	74.1	48.6	52.5	ER
Voineasa	587	106.9	55.1	94.0	ER	31.1	56.1	-44.6	VD
Parâng	1585	143.6	72.5	98.1	ER	49.0	69.7	-29.7	D
Mean Oltenia	-	110.5	47.3	133.8	ER	83.8	53.9	55.6	ER
Ob. Lotrului	1404	119.4	-	-	-	27.7	-	-	-
Meteorological Station	Hm	November 2015				Autumn 2015			
		Σ XI	N	$\Delta\%$	CH	Σ T	N	$\Delta\%$	CH
Dr. Tr. Severin	77	83.7	71.5	17.1	LR	331.7	186.3	78.0	ER
Calafat	66	87.7	54.2	61.8	ER	225.6	141.8	59.1	ER
Bechet	65	62.5	49.3	26.8	R	205.5	134.7	52.6	ER
Băilești	56	86.2	57.2	50.7	ER	217.3	137.9	57.6	ER
Caracal	112	119.1	48.5	145.6	ER	299.7	123.4	142.9	ER
Craiova	190	106.8	44.7	138.9	ER	317.4	122.1	160.0	ER
Slatina	165	101.5	47.5	113.7	ER	313.3	132.2	137.0	ER
Băcleș³	309	27.2	47.9	-43.2	VD	182.3	144.2	26.4	R
Tg. Logrești	262	99.5	49.8	99.8	ER	261.3	135.7	92.6	ER
Drăgășani	280	109.9	52.6	108.9	ER	302.8	153.2	97.7	ER
Apa Neagră	250	106.6	87.1	22.4	R	464.8	214.3	116.9	ER
Tg. Jiu	210	91.2	62.3	46.4	VR	294.6	180.1	63.6	ER
Polovragi	546	119.4	78.7	51.7	ER	338.8	209.0	62.1	ER
Rm. Vâlcea	243	125.5	55.0	128.2	ER	350.8	156.8	123.7	ER
Voineasa	587	50.1	53.3	-6.0	N	188.1	164.5	14.3	LR
Parâng	1585	77.7	55.7	39.5	VR	270.3	197.9	36.6	VR
Mean Oltenia	-	95.2	57.2	66.3	ER	285.2	158.4	80.1	ER
Ob. Lotrului	1404	75.5	-	-	-	222.6	-	-	-

(Source: processed data from Oltenia CMR archive)

³ Băcleș meteorological station is autonomous, and the precipitation is missing in the interval 24-28 November, therefore it is excluded from the precipitation hierarchy and the calculation of monthly mean of November.

The lowest daily maximum temperatures were comprised between 7.7°C registered in Polovragi on 13 October and Calafat on 22 October and 10.5°C registered in Tg. Jiu on 8, 12, 13 and 27 October (dates in which most of the lowest daily thermal maximum values were registered). *In the mountainous area the lowest daily thermal maximum value* was 2.1°C in Parâng on 21 October. *The parameter variation characterizing air temperatures* (the mean of daily maximum values calculated for the entire region, daily mean and the mean of daily minimum values), in October had decreasing tendencies, and that of thermal minimum values was the most decreasing. We notice two intervals of weather cooling: 8-17 October and 27-31 October amounting 15 days, in which the maximum temperatures at many meteorological stations dropped below 15.0°C. *The monthly minimum ground surface values* were typically registered in the end of the month on 29 and 30 October, (they turned into negative values on 29 October), and were comprised between -3.4°C in Apa Neagră and 2.6°C in Craiova, and their mean for the entire region was -0.4°C. *The monthly maximum ground surface values* were registered in the interval 2-7 October and were comprised between 24.3°C in Craiova and 36.4°C in Băilești, and their mean for the entire region was 31.2°C. Consequently, *the thermal conditions for germination, emergence and growth of incipient stages of vegetation* at autumn crops were optimum.

Pluviometric regime of October 2015. The monthly quantities of precipitation were comprised between 31.1 l/m² in Voineasa and 192.8 l/m² in Apa Neagră, and their percentage deviations from the multiannual means were comprised between -44.6% in Voineasa and 189.1% in Apa Neagră. As a consequence of these deviations, most of them being positive, the classifications of pluviometric time type for Oltenia meteorological stations were in most part of the region of exceedingly rainy and very rainy month (Table no. 1). The scanty precipitation was registered in Voineasa intramountainous depression where October was a very droughty month and in the mountainous area in Parâng it was droughty.

The mean of monthly quantities of precipitation calculated for the entire region was 83.8 l/m², and its percentage deviation from the multiannual mean was 55.6% which confirms the classification of exceedingly rainy month for the entire region. The precipitation in October were registered in the interval 5-22 October, and in the intervals 1-4 October and 23-31 October were registered 13 days with atmospheric drought, in which the weather warmed, water excess drained, and the conditions were extremely favorable for seasonal agricultural works and led to the continuation of works of setting up the autumn crops, even if after 20 October the period isn't considered optimum. *The number of days with precipitation* was comprised between 8 in Craiova, Slatina and Voineasa and 14 in Apa Neagră with the mean for the entire region of 10.9. *The rainiest interval* was 10-11 October in which the means of precipitation calculated for the entire region were 19.2 l/m² and 21.5 l/m², and *the maximum quantity of precipitation registered in 24 hours* was 65.8 l/m² in Runcu (Gorj County).

3.3. Climatic characteristics of November 2015

Thermal regime of November 2015. The monthly average temperatures were comprised between 4.9°C in Voineasa and 9.4°C in Calafat, and their deviations from the multiannual means were comprised between 1.3°C in Apa Neagră and 3.4°C in Calafat leading to the classification of thermal time type of warm month in most part of the region excepting some extended area in the Subcarpathian Depressions Tg. Jiu and Apa Neagră, where the small deviations determined the classification of warmish month. The general temperature mean of November calculated for the entire region was 7.5°C, and its deviation from the multiannual mean was 2.6°C confirming the classification of warm month overall for the entire region. The monthly minimum air temperatures were registered in the interval 1-4 November and fell within -6.6°C in Apa Neagră and -0.2°C in Bâcleș, and their mean for the entire region was -3.5°C. Most of the monthly maximum air temperatures were registered in the beginning and the end of the second decade and were comprised between 19.0°C in Voineasa and 24.9°C in Calafat, and their mean for the entire region was 21.9°C. On ground surface, most of the monthly minimum temperatures were atypically registered in the beginning of the month, on 2 November and were comprised between -6.5°C in Apa Neagră and 1.8°C in Caracal, and their mean for the entire region was -2.9°C. Most of the maximum ground surface temperatures were registered on 11 and 12 November and were comprised between 19.6°C in Caracal in Romanai Plain and 30.8°C in Tg. Logrești, and their mean calculated for the entire region was 26.4°C. The parameter variation characterizing air temperatures (the mean for the entire region and the daily mean), in November had decreasing tendencies, and the mean of daily minimum values had a significant increasing tendency, and corroborated with the maximum and minimum ground surface values led to optimum thermal conditions for a good growth of plants from autumn crops. In November the interval 3-21 November can be remarked, in which for 18 days air temperature was higher than the multiannual means. In the interval 24-29 November the thermal maximum value dropped below 10.0°C.

Pluviometric regime of November 2015. In November the monthly precipitation was comprised between 50.1 l/m² in Voineasa and 125.5 l/m² in Rm. Vâlcea, and their percentage deviations from the multiannual means were comprised between -6.0% in Voineasa and 145.6% in Caracal, leading to classifications of pluviometric time type of exceedingly rainy in most part of the region. The monthly mean for the entire region was 95.2 l/m², placing November as the second rainiest month of autumn, and its percentage deviation from the multiannual mean was 66.3%, which confirms the classification of exceedingly rainy month overall. The highest quantity of precipitation registered in 24 hours was 50.7 l/m² in Cornet in Vâlcea County on 27 November. In November one single rainy period was registered in the interval 21-28 November, when we notice only two days with abundant precipitation which were pouring in some areas, on 25 and 27 November. The highest daily means of precipitation for the entire region were 20.2 l/m² on 25 November and 28.5 l/m² on 27 November. The number of days with precipitation was comprised between 6 in Voineasa and 10 in Slatina, and in the mountainous area was 15 in Parâng; with the

mean for the entire region of 7.9. The atmospheric drought was registered in the intervals 1-20 November and 29-30 November.

4. CONCLUSIONS

In the autumn of 2015, in Oltenia, *the climatic variability was extremely high*, therefore *the monthly mean of air temperature*, for the entire region dropped from 18.3°C in September to 7.5°C in November. *The daily mean of air temperature for the entire region* dropped from 25.1°C on 1 September to 3.0°C on 28 November. *The monthly maximum air temperature value* dropped from 37.7°C registered in Calafat on 1 September to 1.4°C in Voineasa on 26 November. *The value of 26.2°C from Parâng meteorological station* became *an absolute climatic record for this station*, being the highest value ever registered, exceeding with 1.0°C, after 71 years, the old record of 25.2°C. For Oltenia, September 2015 was, overall, the third warmest month since meteorological registrations are made. In September summer, tropical and scorching heat days were registered and the global warming was confirmed, as well as the translation and extension of summer towards autumn. The highest thermal deviations were registered in November, which essentially contributed to the general classification of warm autumn. The autumn was warm in the entire region, and the rich precipitation favored the strong growth of autumn agricultural crops. Thus on 24 December, on significantly extended area in Muntenia, rape was blossomed. Also in Oltenia there was partially noticed this extremely advanced stage rape crop, causing an extremely agroclimatic risk for this crops, because in January 2016, days with agrometeorological frost were registered, with no snow layer. Also some species of fruit trees blossomed, and in Muntenia fruits grew (in apple trees). The secondary pluviometric maximum was typically registered in autumn, all the autumn months being exceedingly rainy. *The average intensity of the secondary pluviometric maximum was characterized by the mean for the entire region of 299.6 l/m², and its maximum value of 464.8 l/m² in Apa Neagră*. During autumn, the number of days with precipitation was comprised between 25 in Craiova and 35 in Tg. Jiu and Apa Neagră with the mean for the entire region of 30.9 (34% of autumn days).

REFERENCES

1. Bogdan Octavia, Marinică Andreea Floriana, Marinică I. (2014) *Tranșlația anotimpurilor*, Geo-Carpathica, An XIV, Nr. 14/2014, pp. 31-51, Analele Universității Creștine „Dimitrie Cantemir”, Edit. Universității „Lucian Blaga”, Sibiu.
2. Marinică I., Marinică Andreea Floriana (2014), *Considerations on Desertification Phenomenon in Oltenia*, Forum geografic. Studii și cercetări de geografie și protecția mediului. Vol. XIII, 2 (Decembrie 2014), pp. 136-147 (12).
3. <http://www.agerpres.ro/mediu/2015/11/10/temperaturile-mondiale-mai-mari-in-2015-cu-1-grad-celsius-decat-in-epoca-preindustrial-a-met-office--08-21-20>.
4. http://www.romaniatv.net/vreme-anormal-de-calda-in-inainte-de-craciun_264601.html