



## CLIMATIC FEATURES OF THE AUTUMN 2010 IN OLTENIA

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**Abstract. - Climatic features of the autumn 2010 in Oltenia.** The autumn 2010 displayed two distinct parts in Oltenia: the first one was warm and dry, while the second was rainy, but also marked by warm intervals. In November, there were registered exceptional maximum thermal values. It was the 12<sup>th</sup> rainy autumn and this feature of rainy autumn became quite frequent in Oltenia. In November, the weather was generally warmer than in October and there were registered absolute thermal records at many meteorological stations. The present paper aims at thoroughly analysing the features of this autumn and at rendering a comparison with the last 11 autumns. The paper is useful to researchers, experts in climate field, PhD and master students.

**Keywords:** rainy autumn, heat waves, Hellmann criterion, warm autumn, record maximum thermal values.

### 1. INTRODUCTION

The frequency of rainy autumns increased in Oltenia in the last 30 years (Octavia Bogdan, Ion Marinică, Loredana-Elena Mic, 2009; Marinică, Andreea-Floriana Marinică, 2010). Consequently, the frequency of cool autumns also increased. The autumn 2010 was rainy and the warm and cool or even cold intervals alternated. In November, there were registered exceptional maximum thermal values. After a warm November, weather got cold rapidly and the winter 2010-2011 was early, not only in Oltenia, but also on the entire continent.

We quote M. Jarraud, the general secretary of WMO:

*The period 2001-2010 reached a new record. This will be the warmest decade ever registered. Temperatures at Earth's surface exceeded the normal in most of the world regions, specified WMO, but anomalies of extreme heat were registered in two zones.*

*In Canada and Greenland, the mean annual temperatures exceeded the normal by 3°C or even more in certain regions. The surface of the Arctic ice cap decreased to a very, very reduced level, the third most decreased level ever registered. In the northern part of Africa and South Asia up to the western part of China, the mercury was 3°C above the normal within almost all the regions. There have been registered many extreme meteorological events this year: an*

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*unprecedented heat wave in Russia (about 11,000 dead people) or devastating floods in Pakistan, which affected millions of people. In numerous temperate regions from the Northern Hemisphere, the winter was abnormally cold (i.e. the winter 2009-2010), with a new record registered in Ireland and Scotland after the '60. The meteorological year 2010 (December 1, 2009-November 30, 2010) was the hottest in the last 130 years. Mean global temperature (on land and ocean) reached 14.65°C (0.65°C > than the mean for the interval 1951-1980, a reference period used by experts). The mean global temperature of 2005 was of 14.53°C, while in 2010, it reached 14.85°C on land. Referring to November 2010, NASA communicated that it was the warmest month since the start of measurements, registering a global deviation of 0.96°C compared to the period 1951-1980 (Sources: Science Now, NASA, Vicky Pope director Met Office).*

It is worth mentioning that for Romania, as well as for most of Central Europe, the summer 2010 was close to the thermal normal and intense heat waves affected only the Western and Eastern Europe.

## **2. DATA AND METHODS**

We analyzed the data provided by the archives of RMC Oltenia, as well as by the NMA. For the study of climatic features, we used Hellmann criterion. The analysis of the data and satellite maps was useful for emphasizing the feature of the heat wave registered in November.

## **3. PLUVIOMETRIC FEATURES OF THE AUTUMN 2010**

### *3.1. Pluviometric features of September 2010.*

According to *the percentage deviation of the general mean* of precipitation for the entire region compared to the general mean (-31.6%), September was very dry (VD).

*The monthly precipitation amounts* oscillated between 8.4 l/sq m at Băilești and 73.6 l/ sq m at Apa Neagră in Gorj County. The percentage deviations compared to the multiannual mean values were comprised between -76.2% at Calafat and +21.7% at Apa Neagră. According to Hellmann criterion, it was excessively dry within most of the Oltenia Plain (ED), very dry (VD) in the hilly region, and rainy (R) in the mountains and the Subcarpathian Depression (Parâng and Apa Neagră).

### *3.2. Pluviometric features of October 2010*

*The deviation of the general mean of the precipitation amounts* compared to the multiannual mean was of 39.5 l/ sq m emphasizes a percentage deviation of 73.5%, which is an excessively rainy month according to Hellmann criterion (ER).

The monthly precipitation amounts oscillated between 67.0 l/ sq m at Rm. Vâlcea and 221.8 l/ sq m at Apa Neagră, while the deviations compared to the multiannual means were comprised between 15.4 l/ sq m in the Mehedinti Hills, at



Bâcleș, and 155.1 l/ sq m at Apa Neagră in the Subcarpathian Depression. The percentage deviations compared to the multiannual means varied between 27.0% at Bâcleș and 232.5% at Apa Neagră. According to Hellmann criterion, the classification was from rainy (R) at Bâcleș within the Mehedinti Hills to excessively rainy (ER) within most of the region. On small areas, within Gorj and Vâlcea Hills, it was a very rainy month (VR). In the mountains, at Parâng, the deviation of the precipitation amounts was negative (-35.3%), which means a very dry month (VD).

### 3.3. Pluviometric features of November 2010

The deviation of the general mean of the precipitation amounts compared to the multiannual mean was of 18.3 l/ sq m, while the percentage deviation of the mean reached 31.9%, which allows us to classify November as a very rainy month (VR). Within the territory, the monthly precipitation amounts oscillated between 37.7 l/ sq m at Bechet in Dolj County and 157.6 l/ sq m at Apa Neagră in Gorj County.

Their deviations from the multiannual means were comprised between -15.4 l/ sq m at Calafat and 70.5 l/ sq m at Apa Neagră, while the percentage deviations compared to the multiannual means oscillated between -28.4% at Calafat and 81.0% at Craiova.

According to Hellmann criterion, the pluviometric types varied from dry (D) in the south-west of the Oltenia Plain (Calafat and Băilești) to excessively rainy (ER) within the hilly area.

The pluviometric deficit was characteristic to the area with altitudes  $\leq 150$  m.

### 3.4. Pluviometric features of the autumn 2010

The deviation of the general mean of the precipitation amounts compared to the multiannual mean was of 43.0 l/ sq m, while the percentage deviation reached 27.2%, which allows us to classify the entire autumn 2010 as rainy (R). Thus, the precipitation registered in October and November compensated the other months and contributed to the exceeding of the normal autumn amounts.

Seasonal precipitation amounts for the autumn 2010 oscillated between 134.3 l/ sq m at Bechet and 453.0 l/ sq m at Apa Neagră.

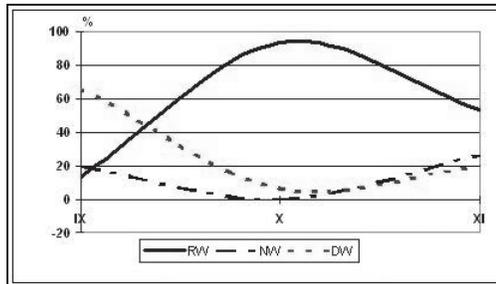
Within the territory, the quantitative deviations compared to the multiannual means oscillated between -3.7 l/ sq m at Calafat and 238.7 l/ sq m at Apa Neagră, while the percentage deviations were comprised between -2.6% at Calafat and 111.4% at Apa Neagră.

Within the Oltenia Plain, the classification of the pluviometric weather according to the criterion varied from normal (N) at Calafat and Bechet in the south and south-west to very rainy (VR) within Băilești Plain. In the hilly area and the Olt Couloir, at la Rm. Vâlcea, it was normal, while in the Subcarpathian depressions, it was very rainy (VR) and excessively rainy (ER).

In Figure no. 1, we render the spatial-temporal extension of the types of pluviometric weather in Oltenia for the autumn 2010. We may notice that the rainy



weather (RW) rapidly increased, while the dry (DW) and normal pluviometric weather (NW) types decreased rapidly.



**Figure no. 1. Spatial-temporal extension of the types of pluviometric weather in the autumn 2010 in Oltenia in percents of weather type months /meteorological station (Source: processed data).**

#### 4. THERMAL FEATURES OF THE AUTUMN 2010

##### 4.1. Thermal features of September 2010

The temperature mean monthly values varied between 15.0°C at Polovragi and 18.4°C at Calafat, while their deviations compared to the multiannual means oscillated between -0.6°C at Polovragi and 1.1°C at Bâcleș. According to Hellmann criterion, it means a thermal normal month at all the meteorological stations.

The minimum monthly temperatures were comprised between 3.8°C at Polovragi and Apa Neagră and 8.9°C la Dr. Tr. Severin, most of them being registered in the last decade of the month (September 22, 24, and 30). Some of them registered at the beginning of the month, on the 3<sup>rd</sup>.

The maximum monthly temperature values varied between 24.8°C at Polovragi and 33.0°C at Bechet, most of them being registered by the middle of the month, on the 16<sup>th</sup>, 17<sup>th</sup>, and 18<sup>th</sup>. Only two values registered in the first decade of the month, on the 8<sup>th</sup>.

The graph of the variance of the daily means calculated for the entire region – minimum, normal, and maximum daily mean, emphasizes two warming intervals in the first and second decade and two cooling periods, the most significant and sudden being registered by the end of the month (figure no. 3).

The decrease slope of the three temperature curves were smooth overall, the daily means registering the most rapid decrease.

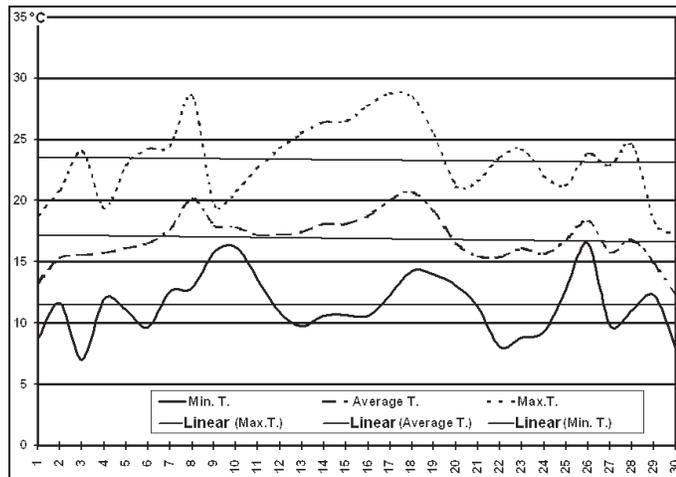
##### 4.2. Thermal features of October 2010

The deviation of the monthly temperature mean for the entire region compared to the multiannual mean was of -2.3°C, which according to Hellmann criterion is a cold month (C), fact confirmed by the deviations of the monthly mean temperatures registered at each meteorological station.

Monthly mean temperatures oscillated between 7.2°C at Polovragi and 9.4°C at Dr. Tr. Severin, while the deviations of the mean temperatures compared to the multiannual means varied between -3.0°C at Polovragi and -1.8°C at Rm.



Vâlcea and Bâcleș. According to Hellmann criterion October 2010 was cold (C) at all the meteorological stations.



**Figure no. 2, Variance of daily means of minimum, mean temperatures, and maximum temperatures calculated for the entire region Oltenia in September**

*Minimum monthly temperatures* varied between  $-5.4^{\circ}\text{C}$  at Tg. Logrești and Apa Neagră and  $-1.0^{\circ}\text{C}$  at Dr. Tr. Severin; all these values were registered on the 29<sup>th</sup> and 30<sup>th</sup>.

*Maximum monthly temperatures* varied between  $16.5^{\circ}\text{C}$  at Polovragi and  $20.7^{\circ}\text{C}$  at Calafat. The highest values (in the plain area) were registered on the 2<sup>nd</sup>, in the hilly area between the 10<sup>th</sup> and the 13<sup>th</sup>, while in the mountains, on the 31<sup>st</sup> (Parâng).

*The graph of the variance of the daily means* of the thermal minimum, normal, and maximum values, calculated for the entire Oltenia, emphasizes warm periods - October 1-3, October 12-21 and cooling intervals: October 4-9 and October 22-31.

Of the three analysed thermal parameters (minimum, mean, and maximum values), the most rapidly decreasing one was the minimum temperature (fig. no. 3).

*At a global scale, October 2010 is the warmest month registered since 1880*, the year when the first temperature measurements were performed (Source : NASA).

#### 4.3. Thermal features of November 2010

*The temperature mean monthly values* varied between  $7.9^{\circ}\text{C}$  at Apa Neagră and  $12.6^{\circ}\text{C}$  at Bâcleș, being  $1.3^{\circ}\text{C}$  higher than the ones registered in October for the entire region (Table no. 1).

*The deviations of the monthly temperature means* compared to the multiannual means were comprised between  $3.1^{\circ}\text{C}$  at Apa Neagră and  $12.6^{\circ}\text{C}$  at Bâcleș. According to Hellmann criterion, at most of the meteorological stations from Oltenia, November was warm (W). There was an exception – the



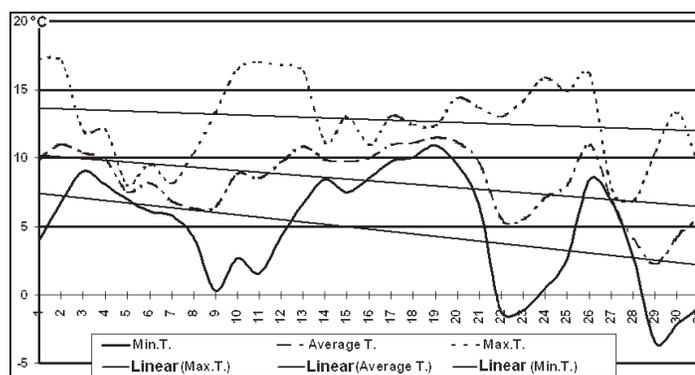
meteorological stations Târgul Logrești and Bâcleș, where the weather was very warm (VW).

The monthly mean temperature for the entire region was of 9.5°C, while its deviation compared to the multiannual monthly mean reached 4.5°C, which according to Hellmann criterion, allows us to classify this month as warm (W) within the entire region.

The minimum monthly temperatures oscillated between -4.4°C at Apa Neagră and -0.1°C at Dr. Tr. Severin, namely higher than those registered in October.

The monthly maximum temperatures varied between 22.8°C at Polovragi and 27.9°C at Bechet, namely higher than those registered in October.

In November 2010, we remark the registration of certain thermal records for the last 50 years at 9 meteorological stations: Craiova, Bechet, Calafat, Băilești, Caracal, Tg. Jiu, Drăgășani, Rm. Vâlcea, and Slatina.



**Figure no. 3,**  
*Variance of daily means of minimum, mean temperatures, and maximum temperatures calculated for the entire region Oltenia in October 2010*  
(Source: processed data).

**Table<sup>4</sup> no. 1 Thermal features of November 2010**

Meteorological Stations	Hm	NXI	MXI	$\Delta=M-N$	CrH	MinXI	Data TMin	MaxXI	Data TMax
Dr. Tr. Severin	77	<b>6,4</b>	10,1	3,7	<b>W</b>	<b>-0,1</b>	28.XI.2010	25,4 <sup>+</sup>	6.XI.2010
<b>Calafat</b>	66	6,0	10,0	4,0	<b>W</b>	-0,3	1.XI.2010	26,2 <sup>*</sup>	<b>10.XI.2010</b>
<b>Bechet</b>	65	5,6	9,8	4,2	<b>W</b>	-0,3	1.XI.2010	<b>27,9<sup>*</sup></b>	<b>10.XI.2010</b>
<b>Băilești</b>	56	5,5	9,8	4,3	<b>W</b>	-1,6	1.XI.2010	26,6 <sup>*</sup>	<b>10.XI.2010</b>
<b>Caracal</b>	112	5,5	9,8	4,3	<b>W</b>	-0,2	25.XI.2010	26,5 <sup>*</sup>	<b>10.XI.2010</b>
<b>Craiova</b>	190	5,5	9,7	4,2	<b>W</b>	-1,0	1.XI.2010	25,6 <sup>*</sup>	<b>10.XI.2010</b>
<b>Slatina</b>	165	5,6	9,7	4,1	<b>W</b>	-1,5	25.XI.2010	25,0	<b>10.XI.2010</b>
Bâcleș	309	<b>4,8</b>	<b>12,6</b>	<b>7,8</b>	<b>VW</b>	-0,8	2.XI.2010	23,8	10.XI.2010
Tg. Logrești	262	<b>4,8</b>	10,2	5,4	<b>VW</b>	-3,7	1;25.XI.2010	24,1	15.XI.2010

<sup>4</sup> NXI= mean monthly multiannual temperatures (°C) of November (calculated for the period 1901-1990); MXI= temperature means (°C) for November 2010;  $\Delta=M-N$  deviation of mean monthly temperature compared to the mean multiannual values (°C); MinXI= minimum monthly temperature in November 2010 (°C); Data Tmin= date when monthly minimum temperature was registered; MaxXI = maximum monthly temperature in November 2010 (°C). Data Tmax = date when monthly maximum temperature was registered; Values with <sup>\*</sup> became absolute maximum thermal records for November for the respective meteorological stations.

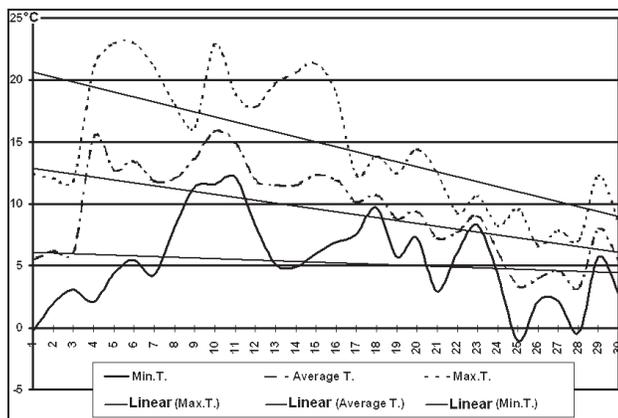


Meteorological Stations	Hm	NXI	MXI	$\Delta=M-N$	CrH	MinXI	Data TMin	MaxXI	Data TMax
<b>Drăgășani</b>	280	5,6	10,5	4,9	<b>W</b>	-1,0	25.XI.2010	23,6*	<b>5.XI.2010</b>
Apa Neagră	250	<b>4,8</b>	<b>7,9</b>	<b>3,1</b>	<b>W</b>	<b>-4,4</b>	1.XI.2010	24,6	6.XI.2010
<b>Tg. Jiu</b>	210	5,1	8,6	3,5	<b>W</b>	-2,7	1.XI.2010	24,5	<b>5.XI.2010</b>
Polovragi	546	<b>4,8</b>	8,8	4,0	<b>W</b>	-2,4	25.XI.2010	<b>22,8</b>	15.XI.2010
<b>Rm. Vâlcea</b>	243	5,2	9,6	4,4	<b>W</b>	-1,0	25.XI.2010	25,2*	<b>15.XI.2010</b>
Parâng	1585	0,4	4,8	4,4	<b>W</b>	-7,4	25.XI.2010	16,5	3.XI.2010
Oltenia - Average		5,0	9,5	4,5	<b>W</b>				

All the values were registered in the *compact warm period November 4-16*. At the level of the entire country, in November 2010, there were registered many thermal records, while in the southeast of the country, the extremely warm weather was characteristic to November 23-24 and 29. We exemplify with the maximum temperature of 25.4°C registered at Oltenița on November 29, 2010, which confirms that the month was warm within the entire country.

The extremely warm weather from November 2010 confirmed for Romania the thermal record registered in 2010.

The graph rendering the daily mean values of the minimum, normal, and maximum temperatures for the entire region emphasizes the aforementioned warm period. The variance tendencies of the three curves were decreasing; the most rapidly decreasing one was that rendering the daily minimum temperatures, which is mainly induced by the progressive increase of the night duration (fig. no. 4) and the gradual weather cooling on the entire continent.



**Figure no. 4, Variance of daily means of minimum, mean temperatures, and maximum temperatures calculated for the entire region Oltenia in November 2010 (Source: processed data).**

## 5. CONCLUSIONS

The autumn 2010 was generally rainy and warm. Rainy weather registered in October and November. Even if September was nice and warm, drought hindered the carrying out of agricultural works in due time, and it is especially about sowing, but it favoured the harvest, transport and storing process of agricultural products.



In the first part of October, weather got cold and rainy, when moisture excess in the soil and pool formation made specific agricultural works difficult.

Warm weather was characteristic to November, but it continued to rain, and certain autumn sowing was delayed. Consequently, plants confronted with winter weather insufficiently grown. The appearance of the winter thermal regime and of winter phenomena characterized by an insignificant snow layer starting with December 11 surprised autumn crops mostly unprepared for wintering.

**November 2010 was the warmest in the last 50 years**, but the old thermal record for the entire country of 30.5°C (the only value  $\geq 30^\circ\text{C}$  since the beginning of measurements at all the meteorological stations), registered the last century at Călărași on November 1, 1926, was not exceeded. However, at numerous meteorological stations, the maximum temperatures registered this month became new thermal records.

The maximum temperatures registered at Calafat, Bechet, Băilești, Caracal, Craiova Drăgășani, and Rm. Vâlcea became absolute maximum temperatures for November, significantly exceeding those registered before.

The value of 27.9°C, registered at Bechet became the absolute maximum temperature of November in Oltenia, the former maximum value being 27.5°C, registered on November 1, 1926 at Băile Olănești in Vâlcea County. We also remark that this value (27.9°C) was registered on November 10, (Table no. 1), which emphasizes a significant 10-day delay of the heat waves in November. The value registered at Oltenița on November 29, 2010 indicates an even greater delay and confirms the continuation of global warming.

The frequent warming in the south and especially the southeast of the country registered this month confirms the thermal potential of the region.

The combination of the warm and excessively dry September with October (excessively rainy - ER) and November (very rainy – VR or even excessively rainy) represents a climatic and agroclimatic risk for autumn crops.

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