# THE THERMIC REGIME OF THE CRIŞURILOR PLAIN

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***Abstract***

*The homogenous aspect of the physical-geographical conditions of the Crişurilor Plain determines very reduced differences of the annual average temperatures, with almost identical average monthly amplitudes.*

*The area is situated in the moderate continental temperate climate with influences from the ocean, characterized by the domination of the west and south-west air masses to which we may add the accidental invasion of the continental tropical dry hot air present here due to the expansion of the North-African Anticyclone or to the Arabian Hollow (leading to sudden increases in temperature), as well as to the invasion of the arctic air trained by anticyclone formations: The East-European Anticyclone or the Scandinavian one which bring cold temperatures.*

**Key words:** thermic regime, absolute maximum values, absolute minimum values

## INTRODUCTION

Crişurilor Plain is situated in the middle of Romania's West Plain and in the north part it is bordered by Barcăului Plain, in the south part by Mureşului Plain (Aradului Plain) on the line of the Alb River, in the west part by the border with Hungary and in the east part by the Crişene Hills (Berindei and Măhăra, 1977).

After having analyzed all the geographical factors, Berindei and Măhăra, 1977, considers that the east limit of the Crişurilor Plain is given by the border line of the following localities: Pâncota, Moroda, Mocrea, Bocsig, Beliu, Craiva, Ucuriş, Olcea, Belfir, Tinca, Husasău de Tinca, Sititelec, Păuşa, Apateu, Sânmartin, Oradea, Episcopia-Bihor, Biharia. In the south part, the Crişurilor Plain is bordered by Mureşului Plain, by Crişului Alb Valley on the line of Pâncota through Olari, Şimand and Sânmartin localities.

The west delimitation of the Crişurilor Plain is given by the border with Hungary between the following localities: Santău Mare to the north and Sânmartin to the south. In the north part the limit of the Crişurilor Plain is given by the north limit of the localities Biharia and Santău Mare respectively.

## MATERIAL AND METHOD

I order to analyze the thermic regime of the Crişurilor Plain we have used data from the following weather stations: Oradea, Salonta and Chişineu Criş. Salonta weather station hasn't functioned over the period 1983-1998. The time period taken into study has been 1970-2012 (43 years).

## RESULTS AND DISCUSSIONS

### 1. The annual average temperature of the air

The values of the thermic regime from the Crişurilor Plain are formed under the influence of the particularities of the atmosphere circulation, of the radiative factors and of the underlying surface. The annual average temperature is divided relatively uniformly, with multiannual values between 10.2ºC in Chişineu Criş and 10.5ºC in Oradea. The average of this climate parameter in the Crişurilor Plain is of 10.3ºC (Table 1).

*Table 1*

The annual and monthly average temperature and the annual average thermic amplitude in the Crişurilor Plain

| Weather station | Alt.(m) | Month | | | | | | | | | | | | Med. | Ampl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | | |
| Oradea | 136 | **-0.9** | 0.6 | 5.5 | 10.9 | 16.4 | 19.3 | **21.2** | 20.7 | 16.0 | 10.6 | 5.0 | 0.7 | 10.5 | 22.1 |
| Chişineu Criş | 96 | **-1.4** | -0.1 | 5.2 | 10.3 | 16.1 | 19.1 | **20.9** | 20.4 | 15.9 | 10.3 | 4.3 | 0.8 | 10.2 | 22.3 |
| Salonta | 95 | **-0.8** | 0.3 | 4.9 | 10.9 | 16.3 | 19.1 | **21.5** | 20.9 | 15.9 | 10.5 | 4.4 | 0.1 | 10.3 | 22.3 |
| Average | | -1.0 | 0.3 | 5.2 | 10.7 | 16.3 | 19.2 | 21.2 | 20.7 | 15.9 | 10.5 | 4.6 | 0.5 | 10.3 | |

Source: data processed from the A.N.M's Archive

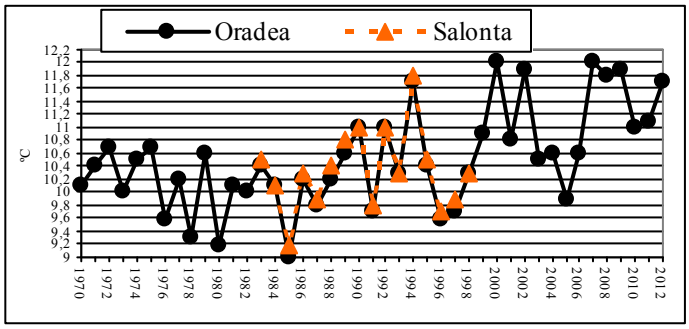


Fig. 1. Evolution of the annual average temperature

In Oradea the highest annual average value of the air temperature from the studied period has been registered in the years 2000 and 2007 respectively, being of 12.0ºC, close values being obtained also in 2002 and in 2009, those being of 11.9ºC. The lowest annual average temperature has been registered in 1985 and it has been of 9.0ºC (Fig. 1). According to these data the differences of the annual average temperatures are relatively small of 3.0ºC, value resulted from the difference between the highest annual average temperature (12.0ºC in the years 2000 and 2007) and the lowest annual average temperature (9.0ºC in the year 1985) from the above mentioned time interval.

In Salonta, while the weather station was still functioning the values of the air temperature have changed between 11.8ºC in 1994 and 9.2ºC, value registered in 1985 (Fig. 1).

### The deviations of the annual average temperatures in comparison to the multiannual average

In Oradea in 44.2% cases there have been values higher than the multiannual average ones (10.5ºC), the value of the deviations varying between 0.1ºC and 1.5ºC, the maximum value of the positive deviations being registered in 2000 and 2007 and the lowest in 1979, 1989, 2004 and 2006.

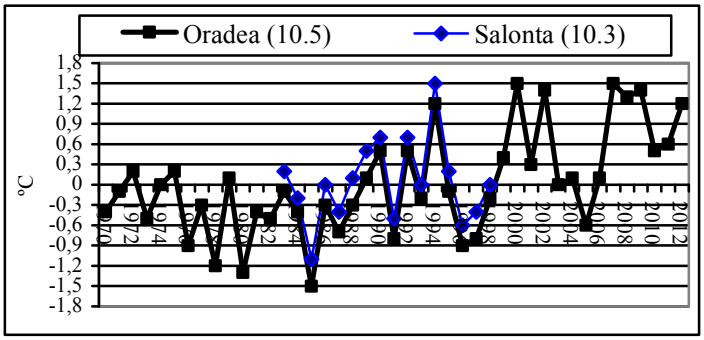


Fig. 2. The variation of the annual average temperature deviations in comparison to the multiannual average

The years with negative thermic deviations have been majoritary, representing 51.2% of the cases and the values of the negative deviations varied between -0.1ºC and -1.5ºC. The maximum value of the negative deviation has been registered in 1985 (the annual average has been of 9.0ºC), and the minimum one in 1971, 1983 and in 1995 (with an annual average of 10.4ºC). There have been years when there were no positive or negative deviations of any kind, that is in 1974 and in 2003 (Fig. 2).

Within Salonta area the positive deviations from the multiannual average (10.3ºC) have been majoritary, registering a frequency of 43.8% from the total of the years taken into study. The value of the deviations varying between 0.1ºC and 1.5ºC with a maximum deviation of the positive deviations in 1994 (Fig. 2).

The years with negative thermic deviations represent 37.5% of the cases and the value of the negative deviations varied between -0.2ºC -1.1ºC. The maximum value of the negative deviation has been registered in 1985 (the annual average has been of 9.2ºC), and the minimum one in 1984 (with an annual average of 10.1ºC). The years in which there were no deviations from the multiannual average have registered a frequency of 18.7%.

**2. The monthly average temperature of the air**

Following the annual evolution of the monthly average temperatures we can notice that these are included between: -1.4ºC at Chişineu Criş weather station in January and 21.5ºC at Salonta weather station in July from where a thermic amplitude of 22.9ºC results in the Crişurilor Plain.

In January the monthly average temperatures are negative at all the three weather stations, the lowest value, of -1.4ºC, is registered at Chişineu Criş weather station at an altitude of 96 m and the highest value of -0.8ºC is registered in Salonta at an altitude of 95 m (Fig. 3).

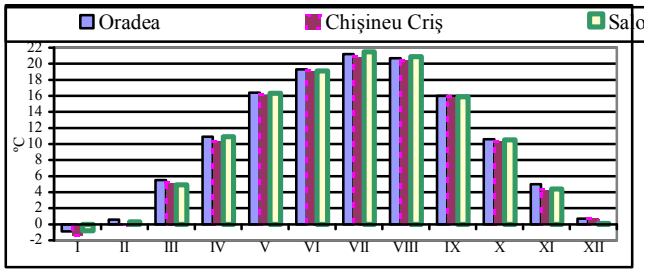


Fig. 3. The variation of the monthly average temperature in the Crişurilor Plain area

Starting with February the thermic values become positive at almost all the weather stations, and they remain negative only at Chişineu Criş. In March the monthly average temperature is positive all over the Crişurilor Plain.

In December and in February, in comparison with January the temperatures are higher with 1.0-2.0ºC, due to the intense cyclone circulation.

The rise in temperature maintains itself until July when the maximum value is reached in the Crişurilor Plain as a consequence of the maximum values of global solar radiation existant in this month. Thus, in this specific month the values are between 20.9ºC, in Chişineu Criş and 21.5ºC in Salonta.

During fall, staring with September the temperature falls all of a sudden , the multiannual average values of these months varying between 16.0ºC in September in Oradea and 4.3ºC in November in Chişineu Criş. This cooling of the air is due to the intensification of the air coolness through radiative processes and through the increase of the advection of cold air under the action of the Siberian anti cyclone.

In general the winters from the Crişurilor Plain area are moderate, without strong frosts due to the western circulation and due to the fact that the area is more protected from the invasions of the Polar – continental air from the east and north-east (Berindei and Măhăra, 1977).

*Table 2*

Inter monthly differences of the air temperatures in the Crişurilor Plain

| Weather station | Alt. (m) | +Δt°C | | | | | | -Δt°C | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | II-I | III-II | IV-III | V-IV | VI-V | VII-VI | VII-VIII | VIII-IX | IX-X | X-XI | XI-XII | XII-I |
| Salonta | 95 | 1.1 | 4.6 | 6.0 | 5.4 | 2.8 | 2.4 | 0.6 | 5.0 | 5.4 | 6.1 | 4.3 | 0.9 |
| Chişineu Criş | 96 | 1.3 | 5.3 | 5.1 | 5.8 | 3.0 | 1.8 | 0.5 | 4.5 | 5.6 | 6.0 | 3.5 | 2.2 |
| Oradea | 136 | 1.5 | 4.9 | 5.4 | 5.5 | 2.9 | 1.9 | 0.5 | 4.7 | 5.4 | 5.6 | 4.3 | 1.6 |

Source: data processed from the A.N.M's Archive

From the analysis of the thermic differences between the months of the year it comes out that, the change of the average values of air temperature from one month to another is a slow process during the summer months and the winter months (1-2ºC), more obvious thermic contrasts being noticed during the transition seasons (11-12ºC).

The highest positive inter monthly differences (+Δt°C) are produced in spring between April and May when the thermic leap in between 5.4ºC and 5.8ºC.

The highest negative inter monthly differences (-Δt°C) are produced during fall between October and November when they are between 5.6ºC in Oradea and 6.1ºC, in Salonta (Table 2).

### 3. Absolute extreme temperatures of the air

**Maximum absolute temperature**

At Oradea weather station the maximum absolute temperature was registered on 20th of July 2007 reaching the value of 40.4ºC (Table 3).

*Table 3*

Variation of the monthly and annual maximum absolute temperatures in Oradea for the period 1970 – 2012

| Month | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | An |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tºC | 17.4 | 19.0 | 26.4 | 31.0 | 32.9 | 37.8 | 40.4 | 40.0 | 36.6 | 30.5 | 26.0 | 17.9 | 40.4 |
| Date | 07.01 | 25.77 | 22.74 | 30.12 | 28.00 | 23.00 | 20.07 | 21.00 | 07.08 | 01.12 | 08.97 | 09.06 | 20.07.2007 |

Source: data processed from the A.N.M's Archive

At Oradea weather station the annual maximum absolute temperature is usually registered in July with a frequency of over 50% of the cases (51.2%), being registered in 22 years from the 43 analyzed years. A high frequency is also registered by the month of August with a frequency of 41.9% (18 cases), June has a frequency of 4.6% and September a frequency of 2.3%.

For the winter months the maximum absolute temperatures have got positive values in all the cases. Thus, the maximum absolute value for the cold season has been registered in February when in Oradea the air temperature has risen up to 19.0ºC, on the 25th of February 1977. The months from the cold season in which the highest numbers of years are produced (19 years) in which the temperature of the air registers the highest values are December and February with a frequency of 44.2%. January registers a frequency of 11.6%.

During the spring season the seasonal maximum absolute values are mostly registered in May with a number of 40 years from the total of the analyzed years, registering a frequency of 93.0% from the cases. The highest value of the air temperature registered in the spring months was of 32.9ºC on the 28th of May 2000. In April the maximum absolute values are produced in 2 years with a frequency of 4.7% and in March they have got a frequency of 2.3%.

During fall the highest air temperatures are registered in September when they have got a frequency of 93.0% (40 years) of the cases. In September the maximum absolute value is registered, of 36.6 ºC on the 7th of September 2008. Maximum values of temperature are produced in October, too, but their frequency is much more reduced, representing 7.0% (3 years) of the cases.

**The minimum absolute temperature**

The absolute minimum registered in Oradea area was of -22.5ºC, on January 13th, 1987 (Table 4).

The minimum absolute temperatures register negative values during the cold season and the transitional one while during summer these values are positive. The values are between -22.5ºC and 6.1ºC, value registered on July 20th, 1996.

*Table 4*

Variation of the monthly and annual minimum absolute values in Oradea for the period 1970 – 2012

| Month | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | An |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tºC | -22.5 | -21.6 | -16.0 | -6.2 | -0.6 | 1.9 | 6.1 | 4.4 | -1.9 | -12.1 | -18.9 | -21.2 | -22.5 |
| Date | 13.87 | 23.83 | 05.96 | 09.97 | 01.76 | 04.77 | 20.96 | 26.80 | 29.70 | 13.71 | 29.95 | 25.01 | 13.01.1987 |

Source: data processed from the A.N.M's Archive

During summer the minimum absolute value over the 43 years has been registered in June, on the 4th of June 1977, with a value of 1.9ºC.

During winter the minimum absolute value was produced on the 13th of January 1987 with a value of -22.5ºC, in February a value of -21.6ºC was registered and in December the minimum absolute was of -21.2ºC (Table 4).

At Oradea weather station the annual minimum absolute value has been registered, for the majority of the years taken into study, in January with a frequency of 46.5%. Thus, in January, over the period of the 43 years taken into study, the annual absolute minimum has been produced in 20 years. In February a frequency of 23.3% is registered, being produced in 10 years. A number of 9 years is registered in December, with a frequency of 20.9% and in November their frequency is of 9.3%.

## CONCLUSIONS

The multi annual average temperature of the air in Crisurilor Plain is of 10.3ºC, with average values between 10.2ºC, in Chişineu Criş and 10.5ºC, in Oradea. In Oradea, the positive deviations have registered in 44.2% of the years taken into study, the negative thermic deviations have represented 51.2% of the cases, while the years without deviations have represented 4.6%.

In Salonta, the positive thermic deviations from the multi annual average have registered a frequency of 43.8% from the total of the years taken into study, the negative ones have been of 37.5% of the cases and the years without deviations have had a frequency of 18.7%.

The monthly average values are between: -1.4ºC in January at Chişineu Criş and 21.5ºC in July, in Salonta resulting a thermal amplitude of 22.9ºC in the Crişurilor Plain.

The maximum absolute temperature in Oradea has been of 40.4ºC in July 2007 and the minimum absolute has decreased until reaching the value of -22.5ºC, in January 1987.

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