

EXTREME TEMPERATURES IN THE CITY OF SĂCUIENI BIHOR**Pereș Ana Cornelia*, Köteles Nandor*, Popovici Mariana***

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Abstract

The meteorological data used in this study came from Săcueni weather station, and the period of the study was 1970-2014. The averages of the maximum and minimum temperatures were calculated, the absolute maximum and minimum air temperatures were also extracted, as well as the dates when they occurred.

The multiannual average of the daily maximum temperatures in Săcueni is 15.9°C, with variations from one year to another between 13.6°C (1980) and 18.3°C (2014).

The multiannual average of the daily minimum temperatures is 6.1°C, with annual fluctuations between 3.4°C (1997) and 7.9°C (2014).

The absolute maximum air temperature was 39.6°C, recorded on 20th July 2007, and the absolute minimum one was -26.4°C, recorded on 14th January 1982.

Key words: absolute maximum, absolute minimum, average of maximums, average of minimums

INTRODUCTION

The averages of maximums and minimums are the average values of the daily maximum and minimum temperatures.

The absolute maximum temperature and the absolute minimum one are the highest and the lowest air temperatures recorded at the weather station over the entire period included in the study, at a certain moment. These readings occur randomly, and they show the values which can be reached or even exceeded by the air temperature.

The highest air temperature values are the result of the accidental invasions of hot, dry continental tropical air brought here by the expansion in this area of anticyclones formed over North Africa or over the Arabian Peninsula. The lowest temperatures occur due to the invasion of cold arctic air carried by anticyclonic formations: the Eastern European anticyclone or the Scandinavian one, as well as synoptic situations with clear sky, which help nocturnal radiation processes (Dumiter, 2007; Gaceu, 2002, 2005; Moza, 2009; Pereș, Köteles, 2010, 2011, 2012, 2013, 2015).

MATERIAL AND METHOD

In this study, air temperature readings recorded at the Săcueni weather station over a period of 45 years (1970-2014) were used. All data came from the Archives of the National Meteorological Administration (A.N.M.).

The monthly averages of daily maximum and minimum temperature readings were used to calculate the average values for the period included in the study, as well as the highest and lowest values of the averages of the maximums and minimums. The absolute maximum and minimum air temperature values were also extracted, as well as the dates when they occurred.

RESULTS AND DISCUSSION

Averages of maximum temperatures

The multiannual average of the daily maximum temperatures in Săcueni, calculated for a period of 45 years, that is, 1970-2014, is 15.9°C.

The multiannual monthly averages of the daily maximum temperatures are positive for the whole year. In the period included in the study there were also months with negative averages of the maximum daily temperatures. Such cases occur in the cold season of the year. The lowest average of daily maximums was recorded in February 1985, a value of -3.9°C. In the same year the next lowest average was recorded, the value of -2.7°C, in January.

In most winter months the average of maximums was positive, but there were also months with negative values. In the period of the study, the frequency of negative values for January is 15.6%, which means 7 years with negative averages for this month. In February there were 3 such years, which gives a percentage of 6.7% of averages below zero. In December, there were fewer negative averages than in January, five altogether, which means 11.1%. These negative values for the averages of maximum temperatures in the winter months were the result of cold, polar air advections reaching the western part of the country from the north, north-east and north-west of Europe (Dumiter, 2007; Pereş, Köteles, 2015).

In winter, the highest average of maximum temperatures was 12.6°C, recorded in December 1996. In January, the highest average of the maximum readings was 12.5°C, which occurred in 1970, and in February it was 10.6°C, in 1974 (Fig. 1).

In spring, the highest value of the average of the maximums was recorded in May, 27.5°C, in 2003. The lowest values of the averages of maximums occur in March, with the minimum value in 1987, 4.6°C.

In the summer months, the highest value of the average of maximums reached 33.9°C, in June 1971. The multiannual monthly average of this month is 25.6°C. In August, the highest value was recorded in 1992, 32.8°C, and in July the maximum average occurred in 2012, the value of 32.1°C.

In the autumn months, the highest value of the average of maximum temperatures was recorded in September 2011, 27.6°C. The multiannual

monthly average for September is 22.7°C, for October 16.6°C, and for November these values drop to 9.4°C (Fig. 1).

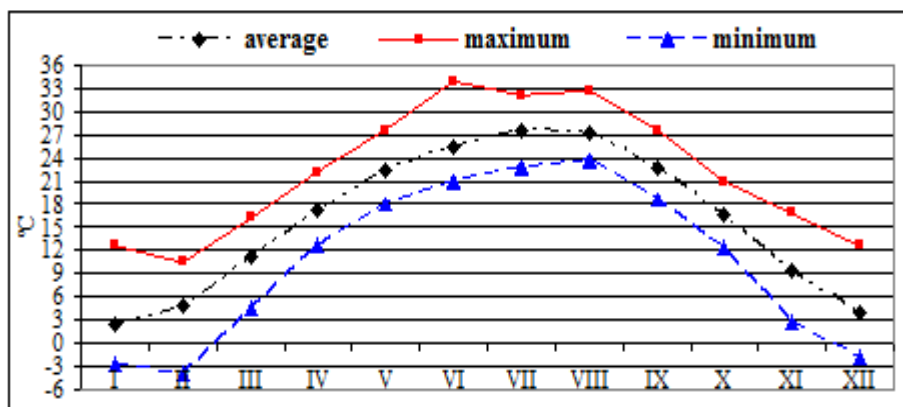


Fig. 1. Monthly evolution of the averages of maximum temperatures (average, maximum and minimum values) in Săcueni between 1970 and 2014

The annual values of the averages of maximum temperatures varied from one year to another, the lowest value being recorded in 1980 and the highest in 2014, 13.6°C and 18.3°C respectively, which gives an amplitude of 4.7°C.

Averages of minimum temperatures

The multiannual average of the daily minimum temperatures is 6.1°C. Over the year, the negative values are recorded between December and February.

In winter, the lowest average was -11.5°C, recorded in February 1985, and the highest value of the average of minimums was 2.3°C, recorded in February 1995 and 2007.

In spring, the multiannual averages of minimums are always positive. There were years when in March the averages of minimums were negative. Thus, in the period included in the study, in March the frequency of negative averages of minimums was 22.2%, which means 10 such years. In the spring months, the lowest value of the averages of minimums was -4.0°C, recorded in March 1987, and the highest value was 13.9°C, which occurred in May 2003.

In summer, the average values of the monthly averages of minimum temperatures varied between 13.8°C, in June, and 15.3°C, in July. The lowest average value was 11.6°C, recorded in August 1976, and the highest one 17.8°C, which occurred in August 1992 (Fig. 2).

In the autumn months both positive and negative averages of minimum temperatures are recorded. The positive values occur in

September and October, while in November the frequency of negative values is 17.8%, which means 8 years with such values, and there were 37 years with positive values, which means 82.2%. The highest values of the average of minimums occur in September, with a multiannual monthly average value of 10.9°C and a maximum average of 14.9°C, recorded in 1994. November is the month with the lowest values of the averages of minimums, with a multiannual average of 1.9°C and a minimum average of -4.0°C, recorded in 1988 (Fig. 2).

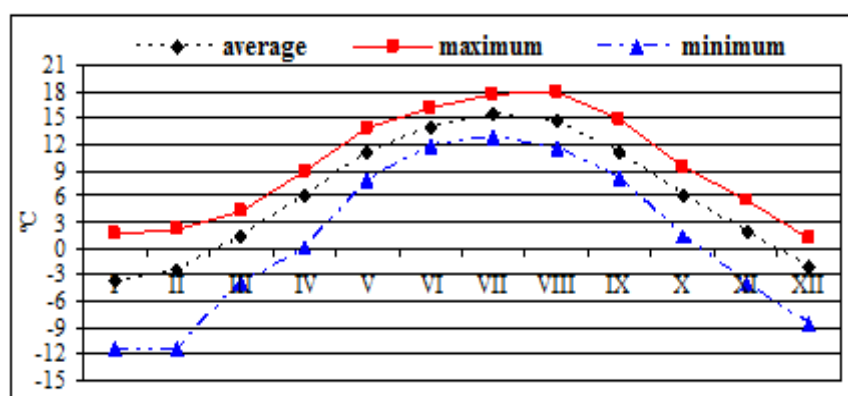


Fig. 2. Monthly evolution of the averages of minimum temperatures (average, maximum and minimum values) in Săcueni between 1970 and 2014

The annual averages of minimum temperatures varied from 3.4°C, a value which occurred in 1997, and 7.9°C, recorded in 2014, which gives an amplitude of 4.5°C.

Absolute maximum and minimum temperatures

Absolute maximum temperature

The absolute maximum air temperature was recorded on 20th July 2007, when the mercury of the thermometer rose to 39.6°C (Tab. 1). The occurrence of this value was the result of the atmospheric circulation of some very hot air masses coming from the north-west of Africa (Fig. 3, 4).

The annual absolute maximum was recorded in most cases in August, with a frequency of 44.4% of the years. In July, maximum absolute temperatures were recorded in 42.2% of the years, in June 11.1% and in September 2.2%.

In the cold season of the year, the absolute maximum temperatures recorded were always positive. The absolute maximum temperature for winter was recorded on 16th February 1974, a value of 20.6°C (Tab. 1). The absolute maximums were recorded mainly in December and February, with a frequency of 42.2%, which means a total of 19 years.

There are 7 years when the absolute maximums occur in January, which means a frequency of 15.6%.

Table 1

Variation of monthly and annual absolute maximum temperatures in
la Săuceni between 1970 and 2014

Mo.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
t°C	16.7	20.6	29.0	31.4	33.2	36.3	39.6	39.0	36.0	30.7	24.4	19.1	39.6
Date	07.94	16.74	21.74	30.13	18.94	23.00	20.07	26.12	07.08 01.12	01.12	07.14	09.06	20.07.2007

Source of data: the A.N.M. Archives

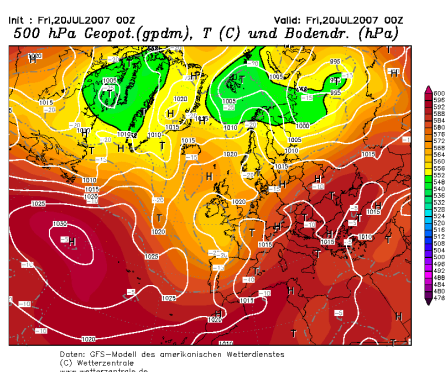


Fig. 3. Barometric pressure map of Europe on 20th July 2007
(www.wetterzentrale.de)

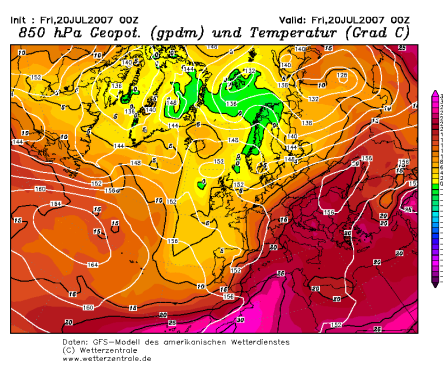


Fig. 4. Air temperature at 859 hPa in Europe on 20th July 2007
(www.wetterzentrale.de)

In spring, the absolute maximum temperature was 33.2°C and it occurred on 18th May 1994. Such values for spring occurred most frequently in May, in 91.1% of the cases.

In the autumn months, over the 45 years included in the study, the absolute maximum temperature was recorded in two years, on 7th September 2008 and 1st September 2012, when the mercury of the thermometer went up to 36.0°C. In this season of the year, the absolute maximum values were recorded most frequently in September, a percentage of 91.1% of the years, which means 41 of the total number of years. Maximum temperature values were recorded in October too, their percentage being 8.9%.

There are significant differences between the absolute maximum temperatures and the monthly averages, which shows the random occurrence of absolute maximum readings. A good example is July 2007, when the absolute maximum reached was 39.6°C, while the average of the daily maximum values for that month was 23.7°C.

Absolute minimum temperature

At the Săcueni weather station the absolute minimum temperature was -26.4°C, recorded on 14th January 1982 (Tab. 2). In December, the absolute minimum was reached on 29th December 1995, when the alcohol of the thermometer went down to -21.2°C (Tab. 2).

Table 2

Variation of monthly and annual absolute minimum temperatures in
la Săcueni between 1970 and 2014

Mo.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
t°C	-26.4	-23.0	-16.1	-10.5	-2.6	3.8	8.2	5.2	-1.6	-9.2	-18.6	-21.2	-26.4
Date	14.82	06.05	04.87	09.97	02.07	04.77	18.96	31.81	28.77	29.97	24.88	29.95	14.01.1982

Source of data: the A.N.M. Archives

The absolute minimum temperatures have negative values between September and May, while they are positive in the summer months. The absolute minimum temperatures vary on a large scale, from -26.4°C, a value recorded on 14th January 1982, to 8.2°C, recorded on 18th July 1996.

In summer, the absolute minimum temperature of the 45 years was 3.8°C, a value recorded on 4th June 1977 (Tab. 2).

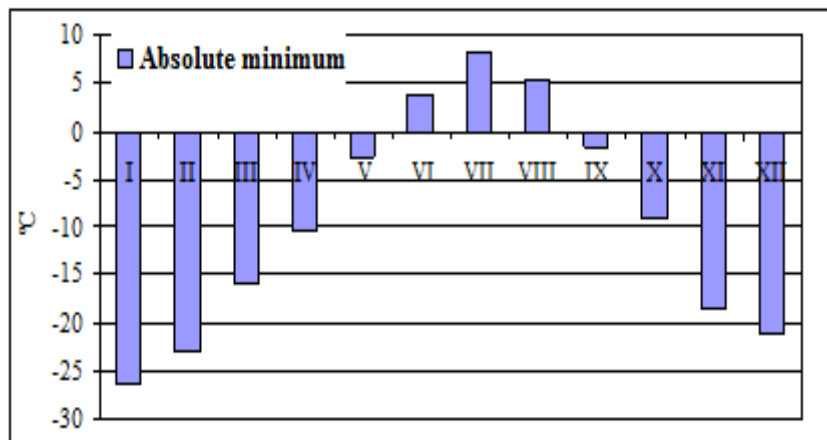


Fig. 5. Absolute minimum temperatures in Săcueni between 1970 and 2014

In the period included in the study, the absolute minimum air temperature was recorded mainly in January, with a frequency of 42.2%, which means 19 of the 45 years. The frequency for February is 28.9%, which gives 13 years. A close value to this one was obtained for December (11 years), a frequency of 24.4%, while November is the month with the lowest years of absolute minimum values, only 2, which means a frequency of 4.4%.

CONCLUSIONS

The monthly averages of maximum temperatures vary between -3.9°C (February 1985) and 33.9°C (June 1971).

Over the year, the averages of minimum daily temperatures vary between -11.5°C (February 1985) and 17.8°C (August 1992).

The annual absolute maximum temperature was recorded mainly in August, with a frequency of 44.4%, and the absolute minimum was recorded most frequently in January, with a frequency of 42.2%.

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