

ABSOLUTE EXTREME AIR TEMPERATURES IN THE VAD-BOROD DEPRESSION

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Abstract

The study of extreme air temperatures in the Vad-Borod depression is based on data recorded at the weather station within the depression, in Borod. The data were extracted from the archives of the National Meteorological Administration (ANM). The analysis of the thermal regime in the Vad-Borod depression covered a period of 48 years.

The analysis of the air temperature regime was based on the extraction of extreme values (absolute minimums and maximums), which represent the possible variation limits of the element.

The multiannual mean of air temperature in the Vad-Borod depression is 9.5°C.

The absolute maximum temperature at the Borod weather station was 38.1°C, recorded on 20th July 2007. The annual absolute maximum occurs mainly in August, with a frequency of 54.2%.

The absolute minimum air temperature was -22.3°C, recorded on 23rd February 1983. The annual absolute minimum is recorded in most cases in January, with a frequency of 39.6%.

Key words: air temperature, absolute maximum, absolute minimum

INTRODUCTION

The Vad-Borod depression is an intermontane depression in the north-west of the Apuseni Mountains, along the upper course of the Crișul Repede river. In the north-east the depression is surrounded by the Plopișului Mountains (Șes), in the south-east the Pădurea Craiului Mountains can be found, while in the west it opens wide towards the Western Plains.

MATERIAL AND METHOD

The analysis of the extreme temperatures in the Vad-Borod depression was conducted using the air temperature data recorded at the Borod weather station over a period of 48 years, between 1970 and 2017.

The Borod weather station was established on 1st December 1967 and it is located on a terrace of the Crișul Repede river in the Vad-Borod depression, at an altitude of 333 m, having the following geographical coordinates: north latitude 46° 59' and east longitude 22° 36'.

RESULTS AND DISCUSSION

The thermal regime of air in the Vad-Borod depression is determined by the particularities of air circulation, of the radiative factors and of the subjacent surface (Pereş, Köteles, 2011, 2013).

The multiannual mean temperature for the period 1970-2017 in Borod has a value of 9.5°C. The highest annual mean value was recorded in 2014, 11.3°C. The lowest annual mean temperature was 8.1°C and it was recorded in 1985. The monthly minimum air temperature in Borod is recorded in January, with a mean value of -1.1°C, and the maximum in July, when it reaches 19.6°C, which gives a monthly amplitude of 20.7°C.

Absolute extreme air temperatures

Although they occur randomly, extreme temperatures have a significant practical and theoretical importance, as they show the possible limits within which temperatures can vary from the warm season of the year to the cold one (Costea M., 2014). These temperatures have a relative character, that is, they depend on the length of the monitoring interval and they are determined by the circulation of air masses, as well as the local conditions: landforms with their altitude and morphology, the presence of valleys etc. (Dragotă, Gaceu, 2002; Cristea, 2003; Köteles, Pereş, 2010)

Absolute maximum temperature

It represents the maximum value recorded during the entire monitoring period, at a certain moment. Just like the minimum temperature, it occurs randomly, showing the air temperature value which can be reached or even exceeded. The absolute maximum temperature at the Borod weather station was recorded on 20th July 2007, the value of 38.1°C (Table 1).

Table 1

Variation of monthly and annual absolute maximum temperatures in Borod, 1970 – 2017

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
t°C	17.9	20.6	26.0	30.3	30.8	35.2	38.1	38.0	34.2	30.5	25.0	19.4	38.1
Date	07.01	25.77	23.74	30.13	18.94	23.00	20.07	23.07	01.12	01.12	08.97	09.06	20.07.2007

Source: data provided for processing by the A.N.M archives

At the Borod weather station the annual absolute maximum temperature is recorded primarily in August, which means 54.2% of the years. In July, the absolute maximum temperature is recorded in 39,6% of the years, and in June in 6.2% of the years (Table 2).

In the case of winter months, the absolute maximum temperatures are positive in each year. Thus, the absolute maximum value for the cold season was recorded on 25th February 1977, when the air temperature in Borod went up to 20.6°C. As a matter of fact, February is the winter month with the highest frequency of highest air temperature, 52.1% of the years. The figures for December and January are 29.2% and 18.7% respectively.

In spring, the absolute maximum seasonal temperatures are recorded in most cases in May, in 91.6% of the years. The highest air temperatures can be recorded in April and May as well, but their frequency is much lower, only 4.2%. The highest air temperature recorded in the spring months was 30.8°C, on 18th May 1994.

Table 2

Absolute maximum values and the dates they were recorded on in Borod, 1970 – 2017

Month	June	July	August
Annual absolute maximum (°C)	35.2	38.1	38.0
Day / Year	23.2000	20.2007	23.2007
Frequency (%)	6.2%	39.6%	54.2%

Source: data provided for processing by the A.N.M archives

In autumn, the highest air temperatures are recorded in September, with a frequency of 89.6% of the years, the absolute maximum value being 34,2°C, recorded on 1st September 2012. Maxim values occur in October too, but their frequency is much lower, only 10.4% of the years.

A comparative analysis of the monthly absolute maximum air temperature values and of the monthly mean values shows that there are big differences between them, which means that the absolute maximum values occur randomly. A good example is July 2007, when the absolute maximum reached 38.1°C, while the thermal mean of the same month was 21.9°C.

The highest air temperature values were determined by the random invasion of the dry hot continental tropical air carried here as a result of the extension of the North African Anticyclone or that of the Arabian Peninsula (Ciulache, 2002; Moza, 2009).

Absolute minimum temperature

It represents the lowest air temperature value recorded during the monitoring period of the weather station. At the Borod weather station the absolute minimum air temperature value was -22.3°C, recorded on 23rd February 1983 (Table 3).

Table 3

Variation of monthly and annual absolute minimum temperatures in Borod, 1970 – 2017

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
t°C	-22.1	-22.3	-17.0	-6.0	-3.6	0.8	5.2	3.6	-2.4	-10.5	-15.2	-19.0	-22.3
Date	13.87	23.83	04.87	09.03	02.07	02.77	09.93	31.08	29.70	29.97	24.88	25.01	23.02.1983

Source: data provided for processing by the A.N.M archives

The absolute minimum temperatures show negative values in the cold season, while in the summer and in the transitional seasons these values are positive. The values vary between -22.3°C, recorded on 23rd February 1983, and 5.2°C, value recorded on 9th July 1993. In the summer, the absolute minimum value over the 48 years included in the study was recorded in June, that is, 2nd June 1977, 0.8°C. The highest value of the summer absolute minimum occurred in July, that is, 9th July 1993, 5.2°C. In the

winter, the absolute minimum occurred on 23rd February 1983, -22.3°C, and the highest value was recorded in December, -19.0°C, on 25th December 2001 (Table 3).

At the Borod weather station the annual absolute minimum was recorded primarily in January, which means 39.6% of the years. In December, the absolute minimum temperature is recorded in 31,2% of the years, and in February the frequency is 29.2% (Table 4).

Table 4

Absolute minimum values and the dates they were recorded on in Borod, 1970 – 2017

Month	December	January	February
Annual absolute minimum (°C)	-19.0	-22.1	-22.3
Day / Year	25.2001	13.1987	23.1983
Frequency (%)	31.2%	39.6%	29.2%

Source: data provided for processing by the A.N.M archives

The lowest thermal values occur due to the invasion of the cold Arctic air, carried by anticyclones: the East-European or the Scandinavian Anticyclone, synoptic situations during which the sky clears up, which favours nocturnal radiation, helped to a great extent by the snow (Măhăra, 2001; Gaceu, 2005; Pereş., 2012).

CONCLUSIONS

The absolute maximum temperature was recorded on 20th July 2007, the value of 38.1°C, and the absolute minimum air temperature value was -22.3°C, recorded on 23rd February 1983.

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