

THE MONTHLY AND ANNUAL AIR TEMPERATURE REGIMES IN THE AREA OF ORADEA, BIHOR COUNTY

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Abstract

The study of air temperature in the area of Oradea is based on data recorded at the Oradea weather station. The data were obtained from the Archives of the National Meteorological Administration (ANM). The analysis of the thermal regime covered a period of 51 years.

The multiannual average of this climatic parameter in the city of Oradea is 10.8°C.

The highest annual average air temperature value for the period included in the study was recorded in 2014 and 2019, a value of 12.8°C, followed by 12.6°C in 2018. The lowest annual average temperature was 9.0°C, and it was recorded in 1985. According to these data, on the entire area of Oradea the fluctuation of the annual average temperatures is relatively small, 3.8°C.

Over the year, the lowest monthly average is recorded in January, -0.7°C, and the highest in July, 21.4°C, which gives a monthly amplitude of 22.1°C.

Over the 51 years included in the study, negative deviations were recorded in 58.8% of the cases, while positive deviations were reported in 39.2% of the years.

Key words: air temperature, negative deviation, positive deviation

INTRODUCTION

Located only 13 km away from the western border of Romania, the municipality of Oradea is the administrative centre of Bihor county. Within the county, Oradea is located in its central-western part, on the Crișul Repede river (Berindei, et al., 1977).

A northern latitude of 47° 03' and an eastern longitude of 21° 55' places Oradea on the course of the Crișul Repede river within a hilly area that is an extension of the Western Carpathians and opens widely, along the valley of the Crișul Repede river, towards the plains (Dragotă, Gaceu, 2002; Ciulache, 2002; Cristea, 2003; Dumiter, 2007; Köteles, Pereș, 2010).

Within the Western Plain, the city of Oradea is located in its central-northern part, in the Crișurilor Plain (Posea, 1977; Pereș, et al., 2019).

MATERIAL AND METHOD

Analysis of the air temperature regimes in the area of Oradea was conducted using data recorded in meteorological observation tables at Oradea weather station. The air temperature data were recorded from 1970 to 2020 (51 years) during instrumental observations performed at the weather station with.

The weather station of Oradea was set up in 1881, it is located at an altitude of 136 m and its geographical coordinates are 47° 02' northern latitude and 21° 54' eastern longitude.

RESULTS AND DISCUSSION

Annual average air temperature

The thermal regime of air in the area of Oradea is determined by the particularities of air circulation, of the radiative factors and of the subjacent surface (Pereş A. C., Köteles N., 2011, 2013, 2015). The multiannual average of this climatic parameter in Oradea is 10.8°C.

In Oradea, the highest annual average air temperature value for the period included in the study was recorded in 2014 and 2019, 12.8°C, followed by 12.6°C in 2018. Values close to those mentioned were recorded in 2015, 12.3°C, in 2000 and 2007, 12.0°C. The lowest annual average temperature was 9.0°C and it was recorded in 1985 (Fig. 1). According to these data, on the entire area of Oradea the fluctuation of annual average temperatures is relatively small, 3.8°C, a value obtained as the difference between the highest annual average temperature (12.8°C in 2014 and in 2019) and the lowest annual average temperature (9.0°C in 1985).

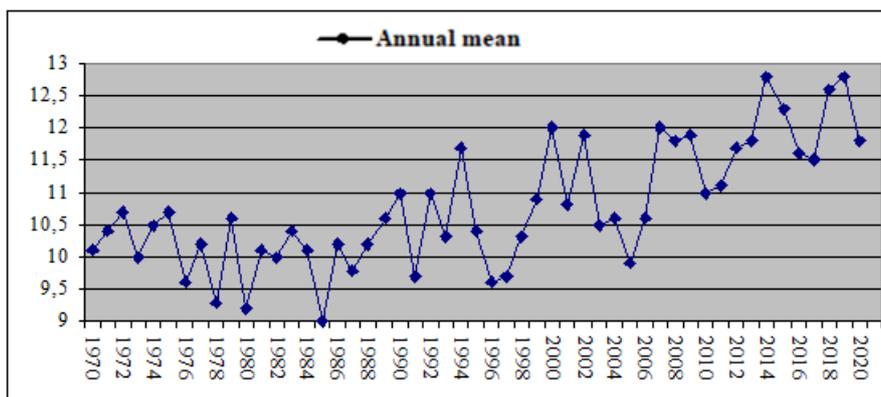


Fig. 1. Evolution of annual average temperature in Oradea, 1970-2020

Deviations of annual average temperatures from the multiannual average

The annual average temperatures for the 1970-2020 period represent the „normal” or the multiannual middleness of temperature at the Oradea weather station, against which it is possible to show the direction and the value of deviations from one year to another. In order to highlight that, the deviations of annual values against the multiannual average were calculated for the 1970-2020 period.

In Oradea, values higher than the multiannual average (10.8°C) were recorded in 39.2% of the years included in the study, the deviation values varied between 0.1°C and 2.0°C, the highest positive deviation being recorded 2014 and 2019, while the lowest in 1999 (Fig. 2).

There were more years with negative thermal deviations, 58.8% of the cases, and the value of the negative deviations varied between -0.1°C and -1.8°C. The highest negative deviation was recorded in 1985 (the annual average was 9.0°C), and the lowest in 1972 and 1975 (years with an annual average of 10.7°C). There was only one year with no positive and negative deviations, the year 2001, when the annual average was 10.8°C (Fig. 2).

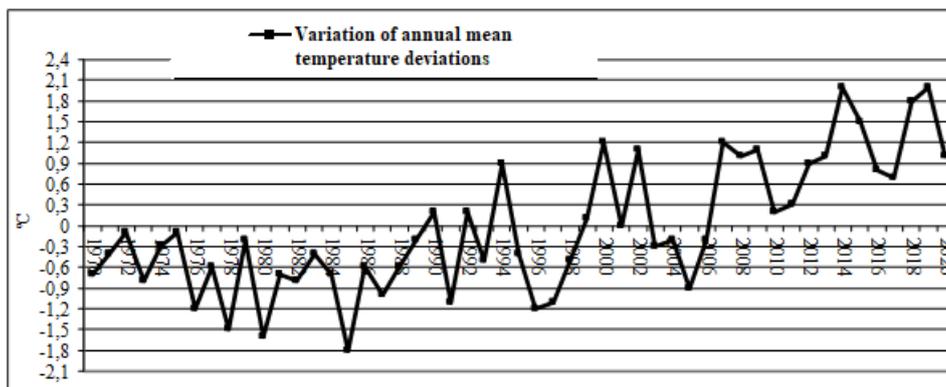


Fig. 2. Variation of annual average temperature deviations against the multiannual average in Oradea, 1970 – 2020

Monthly average air temperature

The monthly average temperature follows a natural yearly pattern, it increases beginning with January, when the lowest monthly thermal average is recorded, until July, a month with the highest monthly average temperature, after which the monthly average air temperature pattern is a decreasing one until the end of the year. So, the lowest monthly air temperature value in Oradea is recorded in January, a value of -0.7°C, and the highest in July, when it reaches 21.4°C, which gives a monthly amplitude of 22.1°C.

The analysis of the monthly average thermal values in Oradea shows that after reaching the lowest average value in January, the temperatures start to increase beginning with February, when they become positive, then they reach the maximum in July, after which they will decrease until December. (Fig. 3).

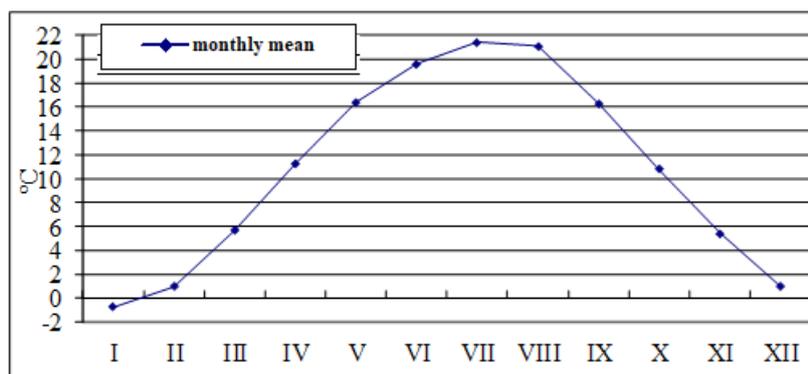


Fig. 3. Variation of monthly average temperature in Oradea, 1970 – 2020

In winter, the average temperature is negative only in January, while in December and February as compared to January the temperatures are higher by approximately 1°C, which is due to an intense cyclonic circulation. In January the cyclonic circulation is less active, while the anticyclonic circulation from north-east becomes stronger and the invasion of arctic or polar cold air leads to the lowest monthly average temperature.

The winters in the area of Oradea are usually moderate, without strong frosts, due to the western circulation and due to the fact that it is more protected from the invasions of polar – continental air from east and north-east (Gaceu O., 2005; Pereş A. C., et al., 2020).

In autumn, beginning with September, the temperature decreases sharply, the annual averages of these months vary between 16.3°C in September and 5.4°C in November. This cooling of the air temperature is due to the intensification of air cooling through radiative processes and to the increase of cold air advection as a result of the influence of the Siberian anticyclone (Dragotă, 1995; Măhăra, 2001, 2006; Moza, 2009; Pereş, 2012).

The analysis of the thermal differences between the months of the year shows that the changes of average air temperature values from one month to another happen slowly in the summer and winter months (1-2°C), more obvious thermal contrasts occur in the months of the transition seasons (5-6°C).

The highest positive difference (+ $\Delta t^{\circ}\text{C}$) between two months occurs in spring, between March and April, when the thermal increase is 5.5°C.

The highest negative difference ($-\Delta t^{\circ}\text{C}$) between two months occurs during autumn, between September and October, when it is 5.5°C .

CONCLUSIONS

In Oradea, the multiannual average temperature for the period included in the study is 10.8°C . The highest annual average air temperature value for the period included in the study was recorded in 2014 and 2019, a value of 12.8°C , while the lowest was 9.0°C and it was recorded in 1985.

Values higher than the multiannual average (10.8°C) were recorded in 39.2% of the years included in the study, while the negative thermal deviations made up 58.8% of the cases.

The lowest monthly air temperature is recorded in *January*, with an average of -0.7°C , and the highest in *July*, when it reaches 21.4°C , which gives a monthly amplitude of 22.1°C .

The winters in the area of Oradea are usually moderate, without strong frosts, due to the western circulation and due to the fact that it is more protected from the invasions of polar – continental air from east and north-east.

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