

## THE MONTHLY AND ANNUAL AIR TEMPERATURE REGIMES IN THE AREA OF ORADEA

Pereș Ana Cornelia\*, Kőteles Nandor\*

\*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: peresana35@yahoo.com

### Abstract

*The purpose of this paper is to analyze the multiannual air temperature regime in the area of Oradea.*

*The study was conducted using a great deal of climatic data sets, which were recorded at the Oradea weather station over a long period of time, that is, from 1970 to 2014.*

*The annual average of air temperature is 10.6°C, with the highest value recorded in 2014, 12.8°C, and the lowest value in 1985, 9.0°C, which gives a thermal amplitude of 3.8°C.*

*The majority of years had negative thermal deviations, 53.3% of the years included in the study, while the percentage of years with positive deviations was 37.8%.*

*The monthly minimum is recorded in January, with an average of -0.7°C, and the maximum in July, when it reaches 21.3°C.*

**Key words:** monthly and annual thermal regimes, temperature deviations.

### INTRODUCTION

The thermal regime is the result of atmospheric circulation patterns, of radiative factors and of the underlying surface. The characteristics of general atmospheric circulation, as well as solar radiation fluctuations over a year and from one year to another determine the annual variations in air temperature (Ciulache S., 2002; Dumiter Aurelia Florina, 2007; Gaceu O., 2002, 2005; Moza Ana Cornelia, 2009; Pereș Ana Cornelia, Kőteles N., 2010, 2011, 2012, 2013).

### MATERIAL AND METHODS

The main particularities of the thermal regime in the area of Oradea, was studied using data recorded at the Oradea weather station. The period included in the study was 1970-2014 (45 years).

The analysis of climatic elements was performed using data recorded on meteorological observation charts at the weather station chosen for the study. The data were obtained from the Archives of A.N.M. Bucharest.

The air temperature data were processed using statistical and mathematical methods. The results obtained were then graphed in order to clearly show the variation in time of air temperature values.

## RESULTS AND DISCUSSION

### 1. Average annual air temperature

The multiannual average of this climatic parameter in Oradea is 10.6°C.

The highest average annual temperature value in the period of the study was recorded in 2014, with a value of 12.8°C. Values close to this one were recorded in 2000 and 2007 as well, that is, 12.0°C. The lowest average annual temperature was 9.0°C and it was recorded in 1985 (see Figure 1).

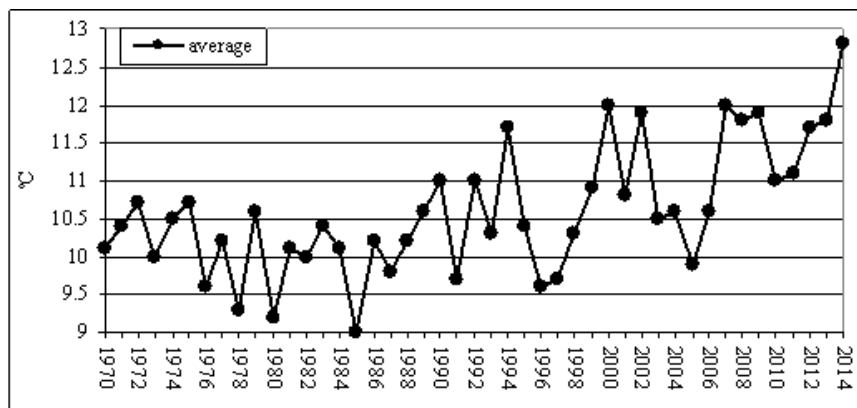


Fig. 1. The evolution of average annual temperatures in Oradea in the 1970-2014 period

These data show that for the whole area of Oradea the average annual temperature fluctuations are relatively small, i.e. 3.8°C, a value obtained by deducting from the highest average annual temperature (12.8°C in 2014) the lowest average annual temperature (9.0°C in 1985).

### Deviations of average annual temperatures from the multiannual average

In the 1970-2014 period, in Oradea, higher values than the multiannual average (10.6°C) were recorded in 37.8% of the years included in the study, with deviation fluctuating between 0.1°C and 2.2°C, with the highest positive deviation recorded in 2014 and the lowest in 1972 and 1975.

In the majority of the years the thermal deviations were negative, in 53.3% of the cases, and these negative deviation values fluctuated between -0.1°C and -1.6°C.

The highest negative deviation was recorded in 1985 (the annual average in that year was 9.0°C), and the lowest in 1974 and 2003 (with annual averages of 10.5°C). There were years with no positive or negative deviations, in 1979, 1989, 2004 and 2006 (see Figure 2).

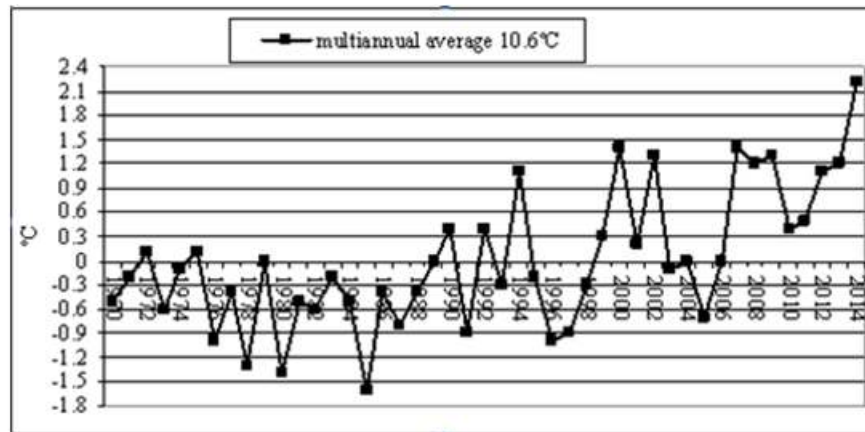


Fig. 2. Variation of the annual average temperature deviations against the multiannual average in Oradea in the 1970-2014 period

## 2. Average monthly air temperature

The monthly minimum air temperature in Oradea is recorded in January, -0.7°C, and the maximum in July, when it reaches 21.3°C (see Figure 3). This gives a monthly amplitude of 22.0°C.

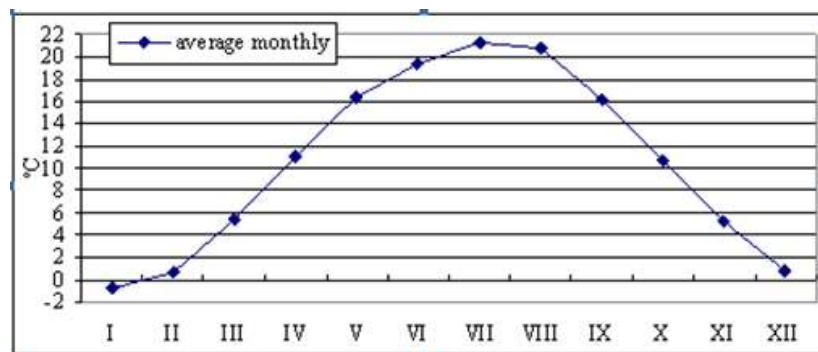


Fig. 3. Variation of the average monthly temperature in Oradea in the 1970-2014 period

In wintertime, the average temperature is negative only in January. As a result of intense cyclonic circulation, in December and in February, the temperatures are approximately 1.0°C higher than in January. In January the

cyclonic circulation is weaker and the north-east anti-cyclonic circulation becomes also stronger due to arctic or polar cold air flowing in, so the average monthly temperature has the lowest value. Winters are usually moderate in the area of Oradea, without strong frosts. This is due to western air circulation and also to the fact that the city is fairly well sheltered from polar-continental air coming in from east and north-east (Dumiter Aurelia Florina, 2007; Gaceu O., 2002, 2005; Moza Ana Cornelia, 2009; Pereş Ana Cornelia, Kőteles N., 2010, 2011, 2012, 2013).

In autumn, beginning with September, the temperature drops sharply, with variations in the multiannual averages of these months between 16.1°C in September and 5.2°C in November. The significant temperature drop in this period is due to radiative processes and to an increase in cold air advection under the influence of the Siberian anticyclon.

The differences in the temperatures over the months of the year show that the average values from one month to another change slowly in the summer and winter months (1-2°C), more obvious contrasts in temperature can be noticed in the transition season months (5-6°C) (see Table 1).

Table 1

Weather station	+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
Oradea	1.4	4.8	5.4	5.5	3.0	1.9	0.6	4.6	5.4	5.5	4.4	1.5

The highest positive intermonthly variations (+Δt°C) occur in spring, between April and May, when the temperature rise is 5,5°C.

The highest negative intermonthly variations (-Δt°C) occur in autumn, between October and November, when the temperature drop is 5,5°C (see Table 1).

## CONCLUSIONS

The multiannual average temperature is 10.6°C. The highest value, 12.8°C, was recorded in 2014, and the lowest, 9.0°C, was recorded in 1985.

Values higher than the multiannual average (10.6°C) were recorded in 37.8% of the years included in the study, while the lower values made up 53.3% of the cases.

The average monthly temperature has a normal annual course, increasing from January, when the lowest average monthly temperature is recorded, until July, the month with the maximum average monthly temperature, after which the course of the average monthly air temperature is a descending one until the end of the year.

## REFERENCES

1. Bacinschi D., Gabriela Alexandu, Aurelia Dăneț, Ecaterina Rădulescu, 1990, Particularități ale regimului temperaturii aerului în sezonul rece (noiembrie-martie) în ultimul secol în România cu posibilități de evaluare cantitativă a tendințelor, Stud. și Cercet. Meteorologice, I.N.M.H., București.
2. Ciulache S., 2002, Meteorologie și climatologie, Editura Universitară București.
3. Costea Mona, 2008, Estimarea potențialului eolian în zone cu orografie complexă, Editura Universității din Oradea.
4. Costea Monica, 2014, Analiza statistică pentru științele mediului, Editura Universității din Oradea.
5. Cristea Maria, 2003, Temperatura aerului în bazinul hidrografic al Crișurilor, Analele Universității din Oradea, Seria Geografie, Tom.XIII, pag.77-80.
6. Domuța C., R. Brejea, 2010, Monitoringul mediului, Editura Universității din Oradea.
7. Dumiter Aurelia Florina, 2007, Clima și topoclimatele orașului Oradea, Editura Universității din Oradea.
8. Erhan Elena, 1999, Meteorologie și climatologie practică, Editura Univ."Al. I. Cuza", Iași.
9. Gaceu O., 2002, Elemente de climatologie practică, Editura Universității din Oradea.
10. Gaceu O., 2005, Clima și riscurile climatice din Munții Bihor și Vlădeasa, Editura Universității din Oradea.
11. Giuliani M., 2003, La previsione meteorologica, Ed. Meteo Mursia, Milano.
12. Godard A., M. Tabeaud, 1993, Les climats Mecanismes et repartition, Armand Colin.
13. Köteles N., Ana Cornelia Pereș, 2010, Air's temperature at surface of the soil (level 0 m), in the area of Oradea City, Analele Universității din Oradea, Fascicula Protecția Mediului, Vol. XV, Anul 15, Editura Universității din Oradea, 2010, ISSN 1224-6255, pag. 661-667.
14. Lucchetti E., 2009, Meteorologia, Editore Technopress, Roma.
15. Măhăra Gh., 2001, Meteorologie, Editura Universității din Oradea.
16. Moza Ana Cornelia, 2009, Clima și poluarea aerului în bazinul hidrografic Crișul Repede, Editura Universității din Oradea.
17. Oneț Aurelia, 2012, Managementul mediului, Editura Universității din Oradea.
18. Oneț C., 2012, Igiena mediului, Editura Universității din Oradea.
19. Pereș Ana Cornelia, N. Köteles, 2010, Frequency of days with various characteristic temperatures in the area of Oradea city, Analele Universității din Oradea, Fascicula Protecția Mediului, Vol. XV, Anul 15, Editura Universității din Oradea, 2010, ISSN 1224-6255, pag. 729-734.
20. Pereș Ana Cornelia, N. Köteles, 2011, The yearly and monthly average temperature of the air in Borod Depression, Analele Universității din Oradea, Fascicula Protecția Mediului, Vol. XVII, Anul 16, Editura Universității din Oradea, 2011, ISSN 1224-6255, pag. 809-814.
21. Pereș Ana Cornelia, 2012, Meteorologie și climatologie, Editura Universității din Oradea.
22. Pereș Ana Cornelia, N. Köteles, 2012, Characteristics of the air temperature in Ștei city area. Analele Universității din Oradea, Fascicula Protecția Mediului Vol. XVIII, Anul 17, Editura Universității din Oradea 2012, ISSN 1224-6255, pag. 406-413.

23. Pereş Ana Cornelia, N. Köteles, 2013, The thermic regime from Băile Boghiş spa area, *Analele Universităţii din Oradea, Fascicula Protecţia Mediului* Vol. XX, Anul 18, Editura Universităţii din Oradea 2013, ISSN 1224-6255, pag. 219-222.
24. Pereş Ana Cornelia, N. Köteles, 2013, The frequency of the days with different temperature values from Holod inter hillock hollow area, *Analele Universităţii din Oradea, Fascicula Protecţia Mediului* Vol. XXI, Anul 18, Editura Universităţii din Oradea 2013, ISSN 1224-6255, pag. 679-684.
25. Pereş Ana Cornelia, N. Köteles, 2013, The thermic regime of the Crişurilor Plain, *Natural Resources and Sustainable Development*, Oradea, ISBN 978-3-902938-02-2; ISSN 2066-6276 pp. 399-404.
26. Pereş Ana Cornelia, 2015, *Meteorologie şi climatologie: lucrări practice*, Editura Universităţii din Oradea.