

THE MONTHLY AND ANNUAL AIR TEMPERATURE REGIMES IN THE AREA OF SĂCUIENI

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Abstract

The purpose of this study is to provide a complex analysis of the monthly and annual air temperature regimes in the area of Săcuieni over a period of 45 years, that is, from 1970 to 2014.

The multiannual air temperature average is 10.6°C. There were more years with annual values below the multiannual average, 51.1%, while in 42.2% of the cases the values were above it. The lowest temperature is recorded in January, with a multiannual average of -0.8°C, and the highest in July, an average of 21.3°C.

Key words: air temperature, deviation of temperatures, monthly and multiannual averages

INTRODUCTION

Air temperature is not a constant measure, but one that varies both in time and space, depending directly on the flux of the solar radiation reaching the Earth. The temporal variations can be periodic, that is, diurnal and annual, as well as nonperiodic or random. The nonperiodic or random variations are deviations from the normal temperatures and they are caused by the advection of warm or cold air masses, by the variation in the transparency of air or by cosmic causes (Măhăra, 2001; Ciulache, 2002; Dumiter, 2007; Gaceu, 2005; Moza, 2009; Pereş, 2012).

MATERIAL AND METHOD

In order to study the multiannual regime of air temperature in the area of Săcuieni data recorded by the instruments of the Săcuieni weather station between 1970 and 2014 were used.

The characteristics concerning the monthly and annual regimes of air temperature in the area of Săcuieni were presented 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. After processing them using statistical and mathematical methods, the data were graphed.

RESULTS AND DISCUSSION

1. Average annual temperature

In the town of Săcueni the multiannual average temperature for the period 1970-2014 is 10.6°C.

In the period included in the study the highest average annual air temperature was recorded in 2014, the value of 12.6°C. Values that reach or exceed 12°C were recorded in 2007, when the average was 12.2°C, and close values were recorded in 2000 and in 1994, 12.1°C and 12.0°C respectively. The lowest average annual temperature was 8.9°C and it was recorded in 1978, a value close to this one being recorded in 1980 as well, that is, 9.0°C (Fig. 1). The variations of the average annual temperatures in the town of Săcueni during the period of the study are fairly small. The difference between the highest average annual temperature (12.6°C in 2014) and the lowest one (8.9°C in 1978) is 3.7°C.

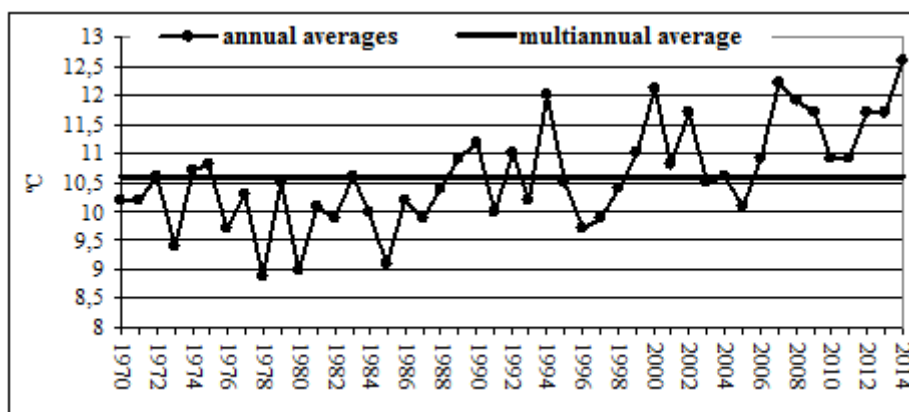


Fig. 1. Evolution of the average annual temperature in Săcueni in the 1970-2014 period

Looking at the graph, it can be seen that the average annual temperature had an upward trend, which can be explained by the development of the city and the increase in traffic.

Deviations of average annual temperatures from the multiannual average

The deviations of annual averages against the multiannual average were calculated for the 1970-2014 period.

Positive deviations were recorded in 42.2% of the years included in the study, with values between 0.1°C and 2.0°C, the highest figure being recorded in 2014 and the lowest in 1974 (Fig. 2).

Negative deviations were recorded in 51.1% of the cases, with values between -0.1°C and -1.7°C. The highest negative deviation was recorded in

1978 (the average of that year was 8.9°C), and the lowest in 1979, 1995 and 2003 (with average values of 10.5°C) (Fig. 2).

It is worth mentioning that in 1972, 1983 and 2004 the average annual temperature was equal to the multiannual average, that is, 10.6°C (in those three years there were no deviations). These three years represent 6.7% of cases with no deviations against the multiannual average (10.6°C).

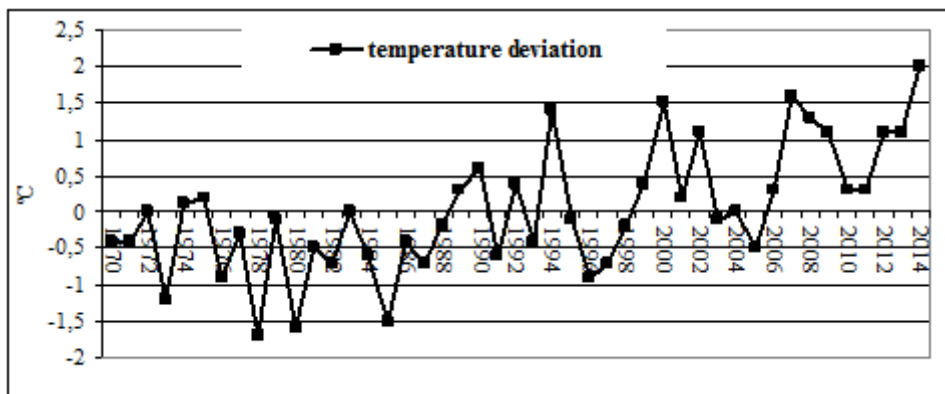


Fig. 2. Variation of the annual average temperature deviations against the multiannual average in Săcueni in the 1970-2014 period

2. Average monthly temperature

The average monthly temperature varies in relation to the solar energy amount reaching the Earth surface during a year.

Looking at the monthly averages in Săcueni, it can be seen that after the lowest average is reached in January (-0.8°C), the temperatures begin to increase with February, when they become positive, and then they reach the highest value in July (21.3°C), from where they keep decreasing till December (Fig. 3). The annual amplitude which results is 22.1°C.

In wintertime, the average temperature is negative only in January, in December and in February the temperatures are above zero degrees by 1.4°C-1.5°C, which is due to intense cyclonic circulations.

The positive average values for the winter months show the presence of a moderate climate, which is strongly influenced by the oceanic climate of western Europe and the Mediterranean one at its south (Dumiter, 2007; Gaceu, 2005; Moza, 2009; Pereş, Kőteles, 2011, 2012, 2013, 2015). At the same time, these temperature values show that in the are of Săcueni the influence of the excessive continental climate of eastern Europe is very low, the air masses of the Siberian anticyclone rarely reach that far (Dumiter, 2007; Moza, 2009). However, a more detailed study of the average monthly temperature values in each year included in the study shows that there were also years with negative values in all winter months, as it happened in 1978 and 1996. An unusual year was 1988, when a negative value was recorded

only in November (-0.7°C). The averages also show that there were four years with positive values over the whole years, that is, in 1994, 2008, 2013 and 2014.

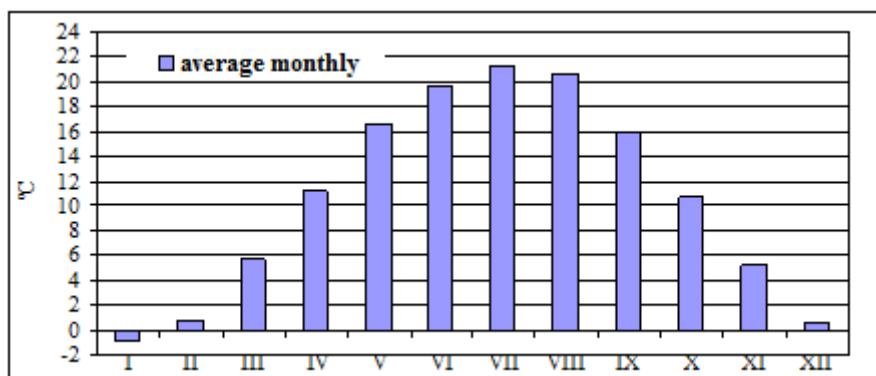


Fig. 3. Variation of the average monthly temperatures in Săcueni in the 1970- 2014 period

In summer the multiannual average temperature varies between 21.3°C in July and 19.6°C in June.

The highest positive intermonthly variation can be noticed in spring (+Δt°C). Thus, the highest jump in temperature occurs between March and April, with a value 5.5°C (Tab. 1). This jump is caused by the increase in the value of the radiative heat balance, as well as by the changes which take place in the dynamics of the atmosphere at the level of Europe when the Azores anticyclone begins to expand eastwards.

The highest negative intermonthly variations (-Δt°C) occur between September-October and October-November, when the difference is 5.4°C (Tab. 1). This decrease is due to changes in the values of the radiative heat balance and in those of the atmospheric circulation.

Table 1

Intermonthly variation in air temperature in Săcueni in the 1970-2014 period

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
Săcueni	1.5	5.0	5.5	5.4	3.0	1.7	0.6	4.7	5.4	5.4	4.6	1.4

Source: A.N.M. Archives

CONCLUSIONS

In the town of Săcueni the multiannual average air temperature is 10.6°C, which shows well that the town is located in an area with temperate continental climate. The highest average annual temperature was recorded

in 2014, 12.6°C. The lowest average annual temperature was logged in 1978, a value of 8.9°C.

Positive deviations from the multiannual average were recorded in 42.2% of the years included in the study, while negative ones in 51.1% of the cases.

The lowest average monthly air temperature in Săcueni is recorded in January, -0.8°C, and the highest in July, when it reaches 21.3°C.

The highest contrasts over the year occur in the month belonging to transition seasons (5-6°C), while in the summer and winter months the lowest differences are recorded (1-2°C).

REFERENCES

1. Ciulache S., 2002, Meteorologie și climatologie. Editura Universitară București
2. Costea M., 2014, Analiza statistică pentru științele mediului. Editura Universității din Oradea
3. Domuța C., Brejea R., 2010, Monitoringul mediului. Editura Universității din Oradea
4. Domuța C., Șandor M., Ciobanu Gh., Domuța Cr., Borza I., Brejea R., Vușcan A., 2012, Influences of the long term irrigation use (1976-2008) on the physical and chemical properties of the preluvosoil in the Crisurilor Plain conditions. Journal of Environmental Protection and Ecology, Vol. 13, Issue 1, pp.135-143
5. Dumiter A.F., 2007, Clima și topoclimatele orașului Oradea. Editura Universității din Oradea
6. Erhan E., 1999, Meteorologie și climatologie practică. Editura Univ."Al. I. Cuza", Iași
7. Gaceu O., 2002, Elemente de climatologie practică. Editura Universității din Oradea
8. Gaceu O., 2005, Clima și riscurile climatice din Munții Bihor și Vlădeasa. Editura Universității din Oradea
9. Giuliacci M., 2003, La previsionone meteorologica. Ed. Meteo Mursia, Milano
10. Godard A., Tabeaud M., 1993, Les climats Mecanismes et repartition. Armand Colin
11. Köteles N., Pereș A.C., 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, ISSN 1224-6255, pp.661-667
12. Lucchetti E., 2009, Meteorologia. Editore Technopress, Roma
13. Măhăra Gh., 2001, Meteorologie. Editura Universității din Oradea
14. Moza A.C., 2009, Clima și poluarea aerului în bazinul hidrografic Crișul Repede. Editura Universității din Oradea
15. Pereș A.C., 2012, Meteorologie și climatologie. Editura Universității din Oradea
16. Pereș A.C., 2015, Meteorologie și climatologie: lucrări practice. Editura Universității din Oradea
17. Pereș A.C., Köteles N., 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, ISSN 1224-6255, pp.809-814

18. Pereş A.C., Köteles N., 2012, Characteristics of the Air Temperature in Ştei City Area. *Analele Universităţii din Oradea, Fascicula Protecţia Mediului* Vol. XVIII, Anul 17, Editura Universităţii din Oradea, ISSN 1224-6255, pp.406-413
19. Pereş A.C., Köteles N., 2013, The Thermic Regime of the Crişurilor Plain. *Natural Resources and Sustainable Development*, University of Oradea Publishing House Oradea, ISBN 978-3-902938-02-2; ISSN 2066-6276, pp.399-404
20. Pereş A.C., Köteles N., 2015, Extreme Temperatures in the City of Oradea. *Analele Universităţii din Oradea, Fascicula Protecţia Mediului* Vol. XXV, Anul 20, Editura Universităţii din Oradea, ISSN 1224-6255, pp.261-266
21. Pereş A.C., Köteles N., 2015, The Monthly and Annual Air Temperature Regimes in the Area of Oradea. *Analele Universităţii din Oradea, Fascicula Protecţia Mediului* Vol. XXV, Anul 20, Editura Universităţii din Oradea, ISSN 1224-6255, pp.255-260
22. Romocea T., 2009, *Chimia şi poluarea mediului acvatic*. Editura Universităţii din Oradea