Climatological issues about the number of summer days (t ≥ 25 °C) on the territory of the Republic of Moldova

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ABSTRACT: This article presents the results of climatological research about the number of summer days on the territory of the Republic of Moldova during 1960-2012, collected from 16 meteorological stations. For this analysis were used indexes such as: annual and multiannual regime, monthly regime, maximum and minimum number of summer days with the temperature ≥ 25 °C, being determined the regions of maximum and minimum intensity of the number of summer days. It was fixed the general tendency of increasing the number of summer days, correlated with regional and global climatic changes.

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1. Introduction

The climate, together with soils, is the main natural resource of the Republic of Moldova, which determines agricultural productivity and ecosystem services, which in turn provides means for the life of about half the Moldovan population, especially in the conditions of transition economy and global economic and financial crisis.

Overall, Moldova is located in an area with insufficient humidity, which leads to a high frequency of drought, which adversely affects the economy of the country. For example, 10 droughts occurred in the country between 1990 and 2012. In 2007, an unprecedented catastrophic drought was observed, which affected 75-80% of the country's territory and had very serious consequences on the national economy.

Global evidence over the last decade shows that many natural systems are affected by regional climate change, especially by rising temperatures. As shown below, the number of days with t ≥ 25 °C may also be a relevant indicator for the Republic of Moldova.

There are obvious effects on aquatic systems, which are manifested by higher water leakage and early spring flow to many snow-filled rivers as well as surface water heating, which affects their thermal structure and water quality. Many terrestrial biological systems that are heavily affected, including such changes as earlier spring phenomena (nesting, bird migration, egg deposition etc.) and the displacement to the north and to higher heights of plant and animal habitats. Since the 1980s, there has been a tendency for early vegetation greening which has been associated with a longer vegetation season due to recent warming.

Such extreme situations of heating that have had repercussions on the environment and socio-economic activities have been the subject of numerous recordings over time in various publications such as: Chronicle of Grigore Ureche, Chronicle of the Country of Moldova; Descriptio Moldaviae (Chapter II) due to D. Cantemir (1673-1723), or in Pseudokinegheticos due to Alex. Odobescu (1874); in The Annals of Braşov, Albina Românească, Rural Economy, Gazeta de Moldova, etc., quoted by N. Topor, 1963, E. Erhan, 1979, O. Bogdan, 1980, E. Teodoreanu, 1980, C. Mihăilescu, 2004 etc.

In Albina Românească, July 26, 1840, it is clear: in Iaşi and in Ţara de Jos there is a drought that is injurious to the grain and hay and in August 29, 1849, it is recorded a continuous heat of 31-35 °C in the shade and a draining drought that hurt much of the grain and a few lands of the Ţara de Jos etc.

2. Materials and Research Methods

In this paper was used the analysis method, the comparative method, the deduction method, and the statistics one. The factual material was provided by the State Hydrometeorological Service for a homogeneous data series covering the 1960-2012 period on the climatic indicator - the number of summer days with t ≥ 25 °C, from 16 meteorological stations. The data of the 17th meteorological station in Ceadâr-Lunga were not taken into account, because the statistical series is inhomogeneous, intermittently in the observations, i.e. the lack of complete data for the years 1964, 1983 and 1987. Processing of the statistical and graphical material was done using Microsoft Excel. For the analysis were used indicators such as: annual and multiannual regime, monthly regime, maximum and minimum summer days with t ≥ 25 °C etc.

3. Results and Discussions

The Republic of Moldova is situated in the temperate climate zone and in a continental climate with multiple climatic influences. Tropical heat waves cause large positive air temperature deviations from normal, sometimes with unique or record climatic value. Summer days are frequently followed by heat waves due to continental tropical air adventures (or tropical sea air that has reached the already continental and non-precipitated Moldova), generated by continental anti-cyclones that develop in southeastern Europe on the territory of Southwestern Asia, in the Black Sea basin, the Balkan Peninsula, in the northwest of the African continent, etc. In the conditions of the persistence of anticyclonic baric formations, the local processes of insolation are intensified, which, together with the advection of the tropical air, contribute to the increase of the degree of heating and dryness, accentuating the positive thermal values.

Days with t ≥ 25 °C are usually recorded from March to October, but have a higher frequency in the summer months. The highest multiannual average of summer days is recorded in the Central-Eastern and South-Western part of Moldova (Bravicea - 12.38 days/year, Dubăsari - 12.83 days/year, Comrat - 12.51 days/ year), with the exception of the southern and south-eastern extremities (Cahul - 11,9 days/year, Ştefan-Vodă - 11,11 days/year), where the thermal regulating role of the Black Sea and other major aquatic basins in the region (the Prut, the Danube, the Nistru, Lake Beleu, Lake Katlabug etc.) (see tables 1 and 2, figure 1). The number of summer multiannual days records minimum values in northern Moldova - Briceni (7.89 days/year), Soroca (9.52 days/year). We also find minimal values of the multiannual media in the Central Moldavian Plateau (Codrii Plateau), where the increase of the altitude of the relief, as well as the increase of the forested areas, reach 9,8 days/year (Cornești).

Table 1 Statistics indices of the number of days with t ≥ 25 ° C on the territory of the Republic of Moldova (1960-2012).

Meteorological station	Multiannual average number of days with t ≥ 25 °C	The maximum number of days with t ≥ 25 °C/the year	The minimum number of days with t ≥ 25 °C/the year
1. Briceni	7.89	93/1963	**20/1976**
2. Soroca	9.52	101/1963	31/1978,1980
3. Camenca	10.63	112/2007	31/1978,1980
4. Râbnița	11.38	115/1975	39//1980
5. Bălți	11.62	115/1999	48/1978,1980
6. Fălești	11.02	117/2011	35/1980
7. Bravicea	12.38	121/2011	44/1980
8. Cornești	9.8	108/2007,2009,2011	29/1980
9. Dubăsari	**12.83**	122/1975,2007	51/1980
10. Bălțata	12.15	120/2011	45/1980
11. Chișinău	11.14	110/2007	39/1980
12. Tiraspol	11.7	**124/2007**	56/1980
13. Leova	11.95	116/2007,2011	51/1980
14. Șt.-Vodă	11.11	111/2007	42/1980
15. Comrat	12.51	119/1975	52/1978
16. Cahul	11.9	117/2007	50/1980

The analysis of the maximum multiannual number of summer days (1960-2012) highlights the year 2007, when the absolute records are recorded at 8 meteorological stations from 16 existing, culminating with the absolute maximum number of summer days of 124 in Tiraspol (33.9% of the total duration of a calendar year) (see Table 1). Other years with maximum number of summer days were 1975, 2009, 2011.

The minimum number of summer days reflects the coolness or even the coldness of some years, here being the 1980s, in most of the weather stations in the country. However, the lowest annual number of summer days was 1976 in Briceni, only - 20 days of summer.

According to table no. 2, which shows the statistical distribution of the months of the summer days, it is established that the largest number of such days is in July, on average by 22.3 days / year (71.93% of the calendar month). The statistical processing of the factual material was highlighted during the study period (1960-2012), a summer-time case recorded in November at the Tiraspol meteorological station in 1963. Working with the meteorological statistics on the number of

summer days, allowed one more day to be identified in November in Chisinau in 1926, but this case is not part of the homogeneous data period (1960-2012) taken in the study.

Table 2 Monthly average of the number of days t ≥ 25 ° C on the territory of the Republic of Moldova (1960-2012).

Meteorological station	April	May	June	July	August	September	October
1. Briceni	0.6	5.9	11.8	16.9	14.7	4.7	0.4
2. Soroca	1.1	7.3	13.9	19.6	17.8	6.2	0.4
3. Camenca	1.3	8.3	15.4	21.5	19.9	7.2	0.6
4. Râbnița	1.2	9.2	16.2	22.7	21.6	8.3	0.7
5. Bălți	1.4	9.9	17.0	22.4	21.1	8.3	0.9
6. Fălești	1.2	8.9	16.2	21.7	20.6	7.6	0.7
7. Bravicea	1.7	10.5	17.9	23.3	22.5	9.4	1.1
8. Cornești	0.8	7.2	14.5	20.0	19.1	6.1	0.6
9. Dubăsari	1.3	10.6	18.7	24.5	23.5	10.0	0.8
10. Bălțata	1.4	9.6	17.5	23.7	22.4	9.3	0.9
11.Chișinău	1.1	8.2	16.2	22.4	21.2	7.6	0.9
12.Tiraspol	1.6	11.0	19.6	25.2	24.2	10.5	1.2
13.Leova	1.3	9.4	17.4	23.0	22.4	8.9	1.0
14.Șt.-Vodă	0.6	7.5	16.3	23.2	21.7	7.5	0.6
15.Comrat	1.4	9.7	18.2	24.3	23.1	9.4	1.1
16.Cahul	1.0	8.2	17.2	23.9	22.7	9.2	0.9
Average	**0.6**	**5.9**	**11.8**	**22.3**	**14.7**	**4.7**	**0.4**

In order to determine the future trend of the number of summer days, Figures 1, 2 and 3 were made with the linear trend executed automatically by the Microsoft Excel program, establishing a relatively constant increase of these, being in the current context with the regional and global climate changes.

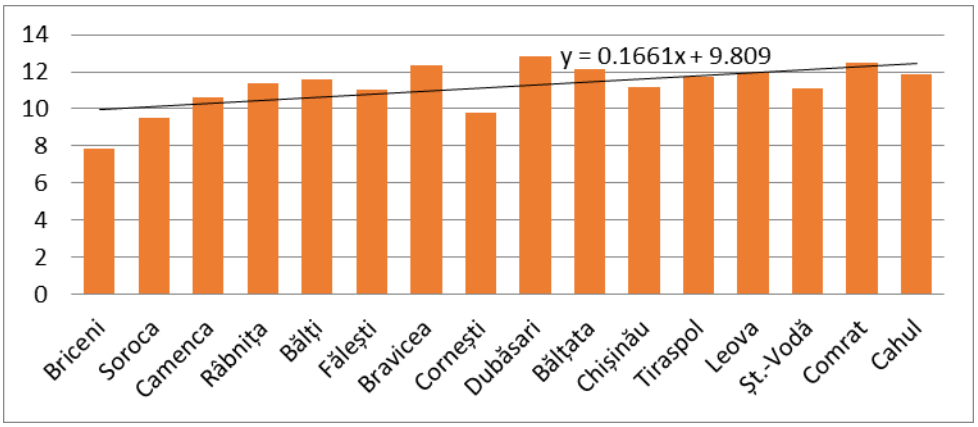

Figure 1 Multiannual average of the number of days with t ≥ 25 °C on the territory of the Republic of Moldova (1960-2012).

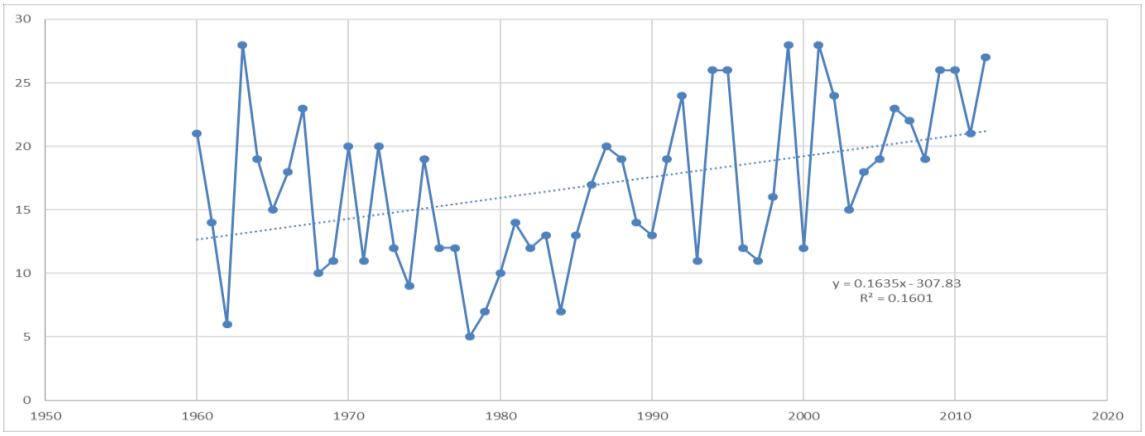

Figure 2 Dynamics of the number of days with t ≥ 25 ° C in Briceni in July (1960-2012).

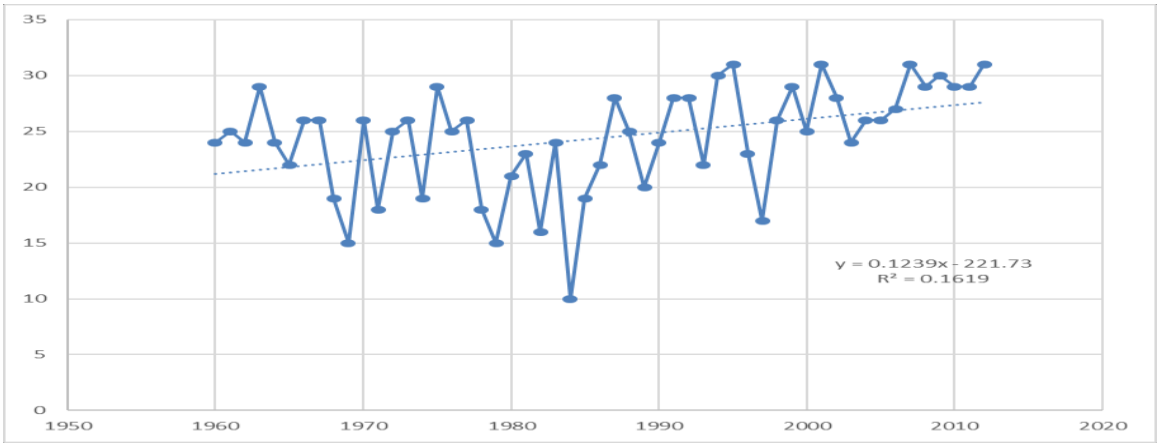

Figure 3 Dynamics of the number of days t ≥ 25 ° C in Comrat in July (1960-2012).

4. Conclusions

The increase of the number of summer days with t ≥ 25 °C on the territory of the Republic of Moldova is in the context of the current climate change and this urges us to adapt to the new atmospheric conditions, applying at present and in the near future good practices such as: irrigation systems (the Millennium Challenge Project), the extension of wooded areas, the cultivation of dry drought-tolerant agricultural hybrids, etc.

References

Apostol L., (2000), *Meteorologie și climatologie*, Editura Universității „Ștefan cel Mare”, Suceava, 133 p.;

Ciulache S., (2004), *Meteorologie și climatologie*, Editura Universitară, București, 466 p.;

Mihăilă D., (2014), *Atmosfera terestră. Elemente de favorabilitate sau nefavorabilitate pentru organismul uman și activitățile turistice*, Editura Sedcom Libris, Iași, 234 p.;

Teodoreanu E., (2004), *Geografie medicală*, Editura Academiei Române, București;

Бабиченко В.Н., *Стихийные метеорологические явление на Украине и Молдавии*, Ленинград, 1991, с. 223;

Константинова Т.С., *Жаркие и душные дни в центральной чясти Молдавии* // Сб. Проблемы географии Молдавии, 1972;

Лассе Г.Ф., *Климат Молдавской ССР*, Ленинград, 1978, с. 372;

Statistica meteorologică a Serviciului Hidrometeorologic de Stat (SHS);

Научно-прикладной справочник по климату СССР, выпуск II: Молдавская ССР, Ленинград, 1990, с. 192;

www.meteoromania.ro;

www.dexonline.ro;

www.meteo.md.