AIR TEMPERATURE VARIABILITY DURING THE AUTUMN BETWEEN 1961-2023 IN SOUTH - WESTERN ROMANIA

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Abstract. Air temperature variability during the autumn between 1961 - 2023 in South - Western Romania. The variability of air temperature was marked by periods of climate warming and cooling with random intensities and durations but they maintained the living existence and especially of the human species. They are determined by the variability of the cosmic factors that essentially determine the earth's climate. In this paper we analyzed the variation of the air temperature in Oltenia during the autumns for the interval 1961-2023. A series of our other works analyzed climate variability in this part of Romania. The warm interval 1945-1955 was followed by a gradual cooling of the climate, and in the interval 1968-2000 (for 38 years), there were only three warm autumns (c – 1984, 1987 and 1994) and only 5 warm autumns (warmish) (cl - slightly warmer than normal – 1969, 1976, 1981, 2000 and 2004). Then the frequency of warmer than normal months and autumns gradually increased with the year 2006, reaching a maximum in the interval 2009-2023 in which two very warm autumns were also recorded (fc – 2019 and 2023). Several daily temperature climate records were broken but seasonal ones were not. At the same time, in the analyzed interval, the pace of ice melting intensified in the polar areas and exceptional thermal maxima were recorded in the cold season. Early autumn frosts also occurred in warm autumns and did significant damage to unprotected vegetable crops. Random variability of air temperature determined by random variability of cosmic factors is the main cause of these thermal variations. The paper is useful to all those interested in climate variability in Oltenia.

Keywords: climate warming, thermal records, climate variability, warm autumns.

1. INTRODUCTORY REMARKS

Autumn is the season of transition in which a special astronomical process occurs - the change in the weight of the Earth's heating from the Northern Hemisphere to the Southern Hemisphere, due to the movement of the Earth's precession. In autumn, due to this precessional movement, the Autumnal Equinox[3] occurs. At the time of the ***autumnal equinox***, the astronomical

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[3] Equinox is the time when day and night are equal in any place on Earth, due to the fact that the Sun, in its apparent movement in the sky, is exactly on the celestial equator. (The equinox should be understood in the sense that the part of the Earth illuminated by the Sun is equal to the shaded part. This aspect occurs at a certain time for each latitude on Earth).

longitude of the Sun reaches the value of 180°. The autumnal equinox point is called the "autumnal point" and is located on the celestial sphere at the intersection of the ecliptic (which represents the projection on the celestial sphere of the plane of the Earth's orbit) with the celestial equator, which the Sun crosses on this date, passing from the northern hemisphere of the celestial sphere in the southern one. So on this date, the Sun is near the celestial equator and will rise and set right at the cardinal points east and west, ***the duration of the days being thus equal, regardless of the latitude, to that of the nights***. The only exceptions are found in the polar regions, in the area of the North Pole, where the long polar night begins, and in that of the South Pole, where the Sun remains above the horizon for 6 months, until the time of the spring equinox.

The points of intersection of the ecliptic (the path of the apparent movement of the Sun on the celestial sphere) with the celestial equator are called *equinoctial points*. The equinoctial points change their position on the ecliptic due to precessional motion. In the southern hemisphere of the Earth, September 22nd marks the beginning of spring. At the latitudes of Romania, on these days the Sun peaks at noon at an average height of 45°, which represents half of the angular distance between the zenith and the horizon. Starting from this date, the length of the days will continue to decrease, and that of the nights to increase, until December 21st, when the time of the winter solstice will occur.

In September for the central latitude of Oltenia (Craiova) the altitude of the Sun at solar noon for each day (maximum altitude angle) in 2023 varied from ***the value of 54.12°*** on 1.IX.2023 at 13:24 :54 at ***43.06°*** on 30.IX. 2023, 13:14:53, which means a decrease of 11.06° in 30 days. The shortest day of this month was on the 30th of IX for ***11 hours, 47 minutes, 44 seconds***, and the longest day on the 01.IX, ***13 hours, 15 minutes, 6 seconds***. These values vary slightly from year to year. In September, the decrease in the length of the day is one hour 20 minutes and 18 seconds. As a result of the decrease in the length of the day in the northern hemisphere, especially in the last decade of the month, the air temperature begins to decrease. Normally, the maximum monthly temperature is recorded in the first part of the month, and the minimum in the last part, frequently in the last pentad. September saw the second decrease in average monthly temperature of the year after the modest decrease of ***0.5 °C from July to August***. ***September is the last month of the warm season, and the decrease in average monthly temperature compared to August of -4.2°C, is the first large decrease in average monthly temperature during the year that occurs imediately after the hot summer season.***

The general average for the entire Oltenia region is 15.8°C, registering a decrease of 4.2°C compared to August.

The decreases in the average monthly temperature in September compared to the last month of summer – August, are significant and range between -4.8°C at Băilești in the Oltenia Plain and -3.8°C at Dr. Tr. Severin in

the extreme west and Polovragi in the Subcarpathian Depression. In the mountain area, the decrease is -3.3°C at Parâng, lower than in the low altitude area, as an effect of the thermal inversion phenomenon.

The high daily and monthly thermal averages indicate a particularly good thermal potential for the establishment of autumn agricultural crops.

The absolute monthly maximum temperature in September is 43.5°C recorded on 8.IX.1946, a value that is also ***the absolute maximum temperature in September for the entire country***. Thus, Oltenia holds ***the absolute thermal record for three months of the year: April, July and September***.

The absolute minimum thermal temperature in Oltenia is -4.7°C recorded in Voineasa on 30.IX1970, and in the mountain area -6.3°C in Parâng on 29.IX.1970[4]. Low thermal minimums were also recorded in 1906 at: Tg. Friday, -4.0°C; in the Rm. Vâlcea and Călimăneşti, -3.5°C; in Slatina -3.1°C; in Caracal -3.0°C, in Corabia -1.2°C and in Dragăsani, -1.0°C. In the specialized literature, it is shown that in September the thermal minimums dropped below 0°C at most meteorological stations in Romania. In Oltenia, the exception is the meteorological station Dr. Tr. Severin with a minimum of 0.0°C, recorded in 1931, and here only one close value has been recorded over time, namely 0.4°C on 30.IX.1977. In September, on the 22nd or 23rd, the autumnal equinox occurs, the date from which astronomical autumn begins, and the air temperature registers a noticeable drop.

The absolute temperature amplitude in September for the entire region is 48.2°C, 5.7°C higher than in August.

Among the excessively hot September months, in which the air temperature in Oltenia reached or exceeded 35.0°C, we mention those of 1946, 1962, 1968, 1986, 1987, 1993, 1994, 1999, 2008 and 2009.

Among the months of September in which the air temperature was ≤ -1.0°C, in Oltenia (at some stations in the area of the hills and the Subcarpathians even ≤ -3.0°C), we mention those of 1900, 1906, 1933, 1968, 1970, 1979, 1985, 1992.

In October, for the central latitude of Oltenia (Craiova) the altitude of the Sun at solar noon for each day of this month, in 2023, varied from the maximum angle of ***42.67°*** on 1.X.2023 at 13:14:33 at the minimum elevation angle of ***31.73°*** on 31.X.2023 at 12:08:25, registering a decrease of 10.94°. As a result, the shortest day of this month was ***10 hours, 16 minutes, 36 seconds*** on 31.X.2023, and the longest was ***11 hours, 44 minutes, 42 seconds*** on 1.X. 2023, the length of the day decreasing by 1 hour, 31 minutes and 8 seconds. The year-to-year variations of these values are small. As a result, the heating becomes weaker and the intensity of UV radiation decreases. October is the first month of

[4] The absolute minimum temperature in September, in the Romanian Carpathians, is -15.0°C, recorded on 18.IX.1935 at Omu Peak.

the cold season and most of the time even from the 1.X, the cooling of the weather is significant with mists and negative thermal minima.

It is the most stable month of the autumn season, the middle month of autumn and ***the first month of the cold season***. Although there are many beautiful and warm days, the average temperature drops from one day to the next, the nights are getting colder, there are frequent morning frosts and in some years, superficial frost on the ground.

The monthly temperature averages are between 7.2°C at Voineasa and 12.2°C at Dr. Tr. Severin. Values higher than 11.0°C are recorded in the southern half of the region: 11.2°C in Slatina and Băileşti, 11.3°C in Bechet, 11.4°C in Craiova, 11.5°C in Caracal, 11.7°C in Drăgăşani, 11.9°C at Calafat and 12.2°C at Dr. Tr. Severin.

In the east of the region, the eastern and southern continental influence is observed and higher values are recorded than in the central part of the region (10.6°C in Rm. Valcea, 11.2°C in Slatina, 11.5°C in Caracal and 11.7°C in Drăgăşani).

In the south and west, the sub-Mediterranean influence is observed (11.2°C in Băileşti, 11.3°C in Bechet, 11.4°C in Craiova, and 12.2 in Dr. Tr. Severin).

In Gorj and the extreme west of Mehedinţi County, the influence of foehn phenomena is observed: 10.1°C at Tg. Logreşti, 10.2°C at Polovragi and Black Water, 10.6°C at Tg. Friday and 10.9°C in Bâcleş.

October is the second month of autumn, and the decrease in the average monthly temperature compared to September of -5.9°C, is the biggest decrease in the average monthly temperature throughout the year. The decreases in the average monthly temperature in October compared to the first month of autumn – September, are significant and range between -6.7°C in Slatina in the Getic Piedmont and -5.1°C in Voineasa in the intramontane depression. In the mountain area, the decrease is -4.0°C at Parâng, lower than in the low altitude area, as an effect of the thermal inversion phenomenon.

The average monthly temperature for the whole region is 10.4°C, registering a decrease of -5.9°C compared to September, being ***the largest temperature decrease from one month to another, which creates the impression that the cold season is starting suddenly***. The high daily and monthly thermal averages indicate a particularly good thermal potential for the establishment of autumn agricultural crops. ***The absolute monthly thermal maximum in October is 37.5°C recorded on 3.X.1952 in the South - East of the region at Studina (Olt County)*** (43°57′26″N 24°24′52″E), and in mountain area 21.2°C in Parâng in 1943. Also on the same date (3.X.1952) in Oltenia, exceptional temperature values were also recorded: 36.7°C in Cezieni, 35.2°C in Corabia, 35.0°C in Leu and Segarcea, 34.5°C in Băileşti, 34.0°C in Slatina Strihareţ, 33.6°C in Drăgăşani, 30.7°C in Aninoasa (Gorj county). In Oltenia, the frequency of

monthly maximum temperatures ≥30.0°C is between 8-24%.

October is thus the last month of the year, after the hot season, when the air temperature can exceed 37.0°C, and at the level of the whole country, with the frequency of 1/100 years, it can approach 40.0°C[5].

As a rule, the monthly thermal maxima are recorded in the first decade and most frequently in the first pentad of the month. The number of hot and excessively hot days in October is small, usually between 1-5 days.

The absolute minimum monthly temperature in October for Oltenia is -11.4°C recorded on 11.X.2011 at Apa Neagra[6], and in the mountain area -11.5°C at Parâng on 25.X.1979, which confirms the trend to exceed of thermal extremes in both directions for this month.

Low minimum temperature values were also recorded: -8.4°C at Apa Neagră on 29.X.1991, -8.0°C recorded in 1947 in Bălcesti (Vâlcea County, on Olteț Valley), -7.5°C at Strehaia in 1947, -7.3°C at Baia de Aramă in 1947, -7.0°C at Iancu Jianu in 1951, -5.8°C at Băileşti on 28.X.1988, at Tg. Jiu in 1903, Rm. Vâlcea in 1946, -5.5°C in Craiova on 29.X.1991, Slatina Strihareț in 1903 and Băileşti in 1950, -5.0°C in Drăgăşani in 1935 and 1947, etc. The monthly thermal minimums are usually recorded in the last decade of the month and even in the last pentad. *Starting from the 20.X, the frost is considered a normal phenomenon.*

The absolute monthly amplitude of the air temperature for the entire Oltenia region, in October, is 48.9°C, 0.7°C higher than in September.

Among the excessively hot October months, in which the air temperature in Oltenia reached or exceeded 32.0°C, we mention those of 1932, 1935, 1952, 1964, 1973 and 1984.

Among *the October months in which the air temperature was ≤ -1.0°C*, in Oltenia (at some stations in the area of the hills and the Subcarpathians even ≤ -7.0°C), we mention those of 1903, 1935, 1946, 1947, 1950, 1965, 1967, 1968, 1971, 1973, 1979, 1983, 1987, 1988, 1991, 1997 and 2011.

In November for the central latitude of Oltenia (Craiova) the altitude of the Sun at solar noon for each day of this month varies between: the maximum angle of ***31.4°*** on 1.XI.2023 at 12:08:23 and the minimum angle of ***24.12°*** in on 30.XI.2023, 12:13:19, registering ***a decrease of 7.28°***. The shortest day of this month has 9 hours 8 minutes 50 seconds on 30.XI.2023, and the longest day of the month 10 hours 13 minutes 52 seconds on 1.XI.2023. In November, the length of the day registers a decrease of 1 hour, 7 minutes and 46 seconds.

It is the last month of autumn and at least in the first decade it retains the characteristics of the autumn season, and towards the end of the month, in some

[5] The absolute thermal maximum of October in Romania is 39.0°C recorded on October 3, 1952 in Armăşeşti, Ialomiţa County.

[6] The absolute minimum thermal temperature in Romania in October is -21.3°C recorded on 27.X.1988 at Intorsura Buzăului. October is thus the first calendar month of the year, after the hot season, in which the minimum temperature can drop below -20.0°C.

years, winter-specific phenomena gradually appear: sleet and snow. In November, a varied range of meteorological phenomena is encountered, from drizzle and rain to snow and blizzards. Extremely rare, with a frequency of 1/120 years, winter can set in as early as the beginning of November (e.g.: in the winter of 1995-1996, it set in Oltenia as in the whole country after the blizzard of 4.XI.1995, (Marinică 2006, Bogdan and Marinică 2007).

The monthly temperature averages are between 2.2°C at Voineasa and 6.4°C at Dr. Tr. Severin. The highest average temperature values are recorded in the south and west of the region (6.0°C in Calafat and 6.4°C in Dr. Tr. Severin). High values of the monthly averages are also recorded in the east of the region and especially in the Olt corridor, where the southern and eastern continental influence is felt: 5.2°C in the Rm. Vâlcea, 5.5°C in Caracal and 5.6°C in Drăgăşani and Slatina. The influence of the foehn phenomena is felt in Gorj, the west of Vâlcea county and up to the Bălăciţi Plateau at Bâcleş: 4.8°C at Apa Neagră, Tg, Logreşti, Polovragi and Bâcleş and 5.1°C at Tg. Jiu.

The monthly average for the entire region is 4.5°C, registering ***a decrease of 5.6°C compared to October***, 0.1°C lower than the decrease in temperature from September to October.

November is the last month of autumn, and the decrease in the average monthly temperature compared to October of -5.5°C, is the second largest decrease in the average monthly temperature throughout the year, greatly accentuating the cooling of the weather and foreshadowing the arrival of winter. The decreases in the average monthly temperature in November compared to the second autumn month – October, are significant and range between -6.1°C in Drăgășani and Bâcleș and -5.0°C in Voineasa in the intramontane depression (Table 29). In the mountain area, the decrease is -4.3°C at Parâng, lower than in the low altitude area, as an effect of the thermal inversion phenomenon.

The absolute monthly thermal maximum in November is 27.9°C recorded at Bechet in the extreme south, on 10.XI.2010. It should be noted that in November almost all the monthly maximums recorded at meteorological stations before 1961 were surpassed or equaled after the 1990s, thus confirming the phenomenon of global climate warming. Among the monthly thermal maxima of ≥25.0°C we mention: 26.5°C in Băileşti and Caracal on 10.XI.2010, 26.2°C in Calafat recorded on the same date, 25.6°C in Craiova (same date), 25.4°C in Mr. Logreşti on 1.XI.2004, 25.2°C in Rm. Vâlcea on 14.XI.1969 and 15.XI.2010, etc.

The monthly thermal maxima are usually recorded in the first half of the month, but in some years after 1990, maximum thermal values close to or equal to the monthly ones were also recorded in the last pentad of the month.

Which means that in some years November is warmer than October, having a beneficial role for late established autumn crops (e.g. November 2010). November is the last month of the year, after the hot season, when the air

temperature exceeds 25.0°C, registering summer days in the last autumn[7] month, and in Romania in some years, with a frequency of 1/100 years, the air temperature slightly exceeded 30.0°C[8].

The absolute monthly minimum temperature in November is -21.2°C recorded on 27.XI.1993, and in the mountain area -20.2°C in Parâng recorded in 1957. As a rule, monthly minimums are recorded in the last decade of the month. Minimum monthly absolute low temperature values at the weather stations in Oltenia are: -20.0°C recorded at Bechet on 26.XI.1993, -19.1°C at Tg. Logresti on 19.XI.1993 etc. The monthly thermal minimums are usually recorded in the last decade of the month and even in the last pentad.

The absolute monthly amplitude of the air temperature for the entire Oltenia region, in November, is 49.2°C, 0.3°C higher than in October.

Among the excessively hot November months, in which the air temperature in Oltenia reached or exceeded 25.0°C, we mention those of 1905, 1926, 1963, 1965, 1969, 1998, 2008 and 2010.

Among the excessively cold November months in which the air temperature was ≤ -15.0°C, in Oltenia (at some stations in the area of the hills and the Subcarpathians even ≤ -20.0°C) we mention those of 1896, 1904, 1908, 1941, 1948 , 1975, 1988, 1989, 1993 and 1995.

The "equatorial horn[9]" does not allow the direct exchange of air masses between the two hemispheres except through the complicated mechanism of atmospheric circulation at altitude and circulatory cells. The work is a continuation of extensive studies on climate variability in southwest Romania (Oltenia) (Marinică 2006, Marinică & A.F. Marinică 2016, 2019).

2. DATA AND METHODS USED

To carry out the work, we used the data from the synoptic archives, the synoptic maps available on the Internet from the international weather forecasting centers, the ANM website, satellite information as well as the information published in the written press (Marin et. al. 2014, Dumitrescu et. al. 2015). After data processing and comparisons, the Hellmann Criterion[10] was used, and the

[7] According to meteorological terminology, the day when the air temperature is ≥25.0°C is called a summer day.

[8] The absolute thermal maximum of November in Romania is 30.6°C recorded on 1.XI.1926 in Călăraşi, the date on which Tg. Jiu recorded 26.4°C, which is still today the absolute maximum temperature of November for this meteorological station.

[9] ***The Equatorial Horn*** is the equatorial circulation area of the Earth where vertical air currents predominate and which thus separates the air circulation of the two terrestrial hemispheres, actually separating the warm season of the Northern Hemisphere from the cold season of the Southern Hemisphere and vice versa.

[10] Typically, comparisons in most scientific papers are made using multi-year averages of air temperature over the past 30 years. But the average for the last 30 years is a moving average that

multi-year averages for the interval 1901-1990 (last century) were considered as normal values (Twardosz et. al. 2021). Experience working with the Hellmann Criterion has shown that it is to climatology what the Pythagorean Theorem is to mathematics.

3. RESULTS AND ASSESSMENTS

3.1. Analysis of the autumn seasonal averages of air temperature, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2023

In the 63 years taken into account, it is observed that the seasonal temperature average of autumns, calculated for the entire Oltenia region, was between ***8.56°C in 1988 - the coldest autumn****, with a deviation from normal of -2.05°C, and 13.79°C in 2023 - the warmest autumn, classified by the Hellmann Cristerion as a very warm autumn (FC), with a deviation from normal of 3.19°C. The variance of the seasonal temperature averages was 5.23°C* (Table 1).

26 autumns were recorded in the class of warm autumns (41.3%) (which includes warmish (CL), warm (C), very warm (FC) and excessively warm (EC) autumns), ***25 normal autumns*** (N), i.e. 39.7% ***and 12 autumns in the class of cold autumns*** (19.0%) (which includes cool (RC), cold (R), very cold (FR) and exceptionally cold (ER) autumns of these, the warmest was in the fall of 2023 with a seasonal average of 13.79°C and a deviation from normal of 3.19°C (***the highest seasonal fall deviation recorded so far - no absolute climate record***). one autumn did not record a seasonal mean of 14.0°C and only 12 autumns had a seasonal mean ≥12.0°C.

No excessively warm (EC) and only two very warm (FC) autumns were recorded, indicating that seasonal deviations greater than 3.19°C are possible in the future.

Climate warming is highlighted by the 2004-2023 interval when, out of the 20 years, one autumn was cool (RC), 5 thermally normal autumns, two warm (CL - warmish) (slightly warmer than normal) and 10 warm autumns (C) (Table 1). We note that climate warming is not climate change, because climate warming has occurred in other periods and will occur in the future, which means climate variability within certain limits so as to maintain the existence of life on Earth and especially of man.

For the interval 2004-2023 we note the solar activity in its maximum phase peaking in 2022-2023 and the El Nino in its maximum phase with the prospect of becoming a super El Nino in 2023-2024.

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also has an upward trend, like the temperature. So the results of these comparisons are slightly significant, indicating increases or decreases compared to what has been recorded in the last 30 years.

Table 1, *Seasonal temperature averages in autumn and Autumn Type according to the Hellmann Criterion, in the interval 1961-2023 (63 years)* (ΔT = deviation of the seasonal average temperature from normal (n=10.59°C) (°C), Types of autumn: N=normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	11,91	1,35	C	1982	11,05	0,45	N	2003	9,92	-0,68	RC
1962	12,02	1,46	C	1983	9,39	-1,21	R	2004	11,60	1,00	CL
1963	12,18	1,62	C	1984	11,84	1,24	C	2005	10,43	-0,17	N
1964	11,09	0,53	N	1985	9,86	-0,74	RC	2006	11,95	1,35	C
1965	10,84	0,28	N	1986	10,19	-0,41	N	2007	9,71	-0,89	RC
1966	12,20	1,64	C	1987	11,68	1,08	C	2008	11,13	0,53	N
1967	12,17	1,61	C	1988	**8,56**	-2,04	R	2009	12,05	1,45	C
1968	10,94	0,38	N	1989	10,31	-0,29	N	2010	11,67	1,07	C
1969	11,47	0,91	CL	1990	10,94	0,34	N	2011	10,77	0,17	N
1970	10,61	0,05	N	1991	10,67	0,07	N	2012	13,07	2,47	C
1971	9,42	-1,14	R	1992	11,11	0,51	N	2013	11,65	1,05	C
1972	9,33	-1,23	R	1993	9,55	-1,05	R	2014	11,16	0,56	CL
1973	10,03	-0,53	N	1994	12,04	1,44	C	2015	12,22	1,62	C
1974	10,47	-0,09	N	1995	9,10	-1,50	R	2016	10,74	0,14	N
1975	10,47	-0,09	N	1996	10,32	-0,28	N	2017	11,77	1,17	C
1976	11,48	0,92	CL	1997	9,27	-1,33	R	2018	11,97	1,37	C
1977	10,56	-0,10	N	1998	9,55	-1,05	R	2019	13,53	2,93	FC
1978	9,19	-1,47	R	1999	10,86	0,26	N	2020	12,53	1,93	C
1979	10,40	-0,26	N	2000	11,53	0,93	CL	2021	11,07	0,47	N
1980	10,75	0,09	N	2001	11,13	0,53	N	2022	12,40	1,80	C
1981	11,18	0,58	CL	2002	10,88	0,28	N	2023	**13,79**	3,19	FC

(Source: ANM Archive)

The class of warmer-than-normal autumns predominates, comprising 41.3% of the total number of autumns approaching 50.0%, which is normal since one of the autumn months is part of the warm season. The 10 warmest autumns compared to normal (Table 2) have been recorded since 1963, and their occurrence is in random order, interspersed with cold, cool and thermally normal autumns.

Table 2, *The warmest 10 autumns and the coldest 10 autumns and the Type of autumns according to the Hellmann Criterion, in the interval 1961-2023* (md= Average, ΔT = deviation of the seasonal average temperature from normal, N=normal; R=cold, RC= cool, Cl=warmish, C=warm, FC=very warm)

No. crt.	The warmest 10 autumns				The coldest 10 autumns			
	Year	md	Δt	CH	Year	md	Δt	CH
1	2023	**13,79**	3,19	**FC**	1988	**8,56**	-2,04	**R**
2	2019	13,53	2,93	**FC**	1995	9,10	-1,5	**R**
3	2012	13,07	2,47	**C**	1978	9,19	-1,47	**R**
4	2020	12,53	1,93	**C**	1997	9,27	-1,33	**R**
5	2022	12,40	1,8	**C**	1972	9,33	-1,23	**R**
6	2015	12,22	1,62	**C**	1983	9,39	-1,21	**R**
7	1966	12,20	1,64	**C**	1971	9,42	-1,14	**R**
8	1963	12,18	1,62	**C**	1993	9,55	-1,05	**R**
9	1967	12,17	1,61	**C**	1998	9,55	-1,05	**R**
10	2009	***12,05***	1,45	**C**	2007	***9,71***	-0,89	RC

(Source: ANM Archive)

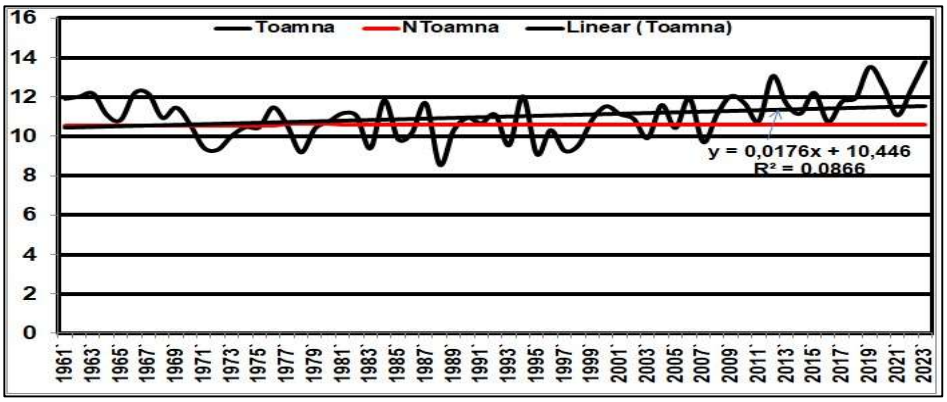

Fig. 1. *variația temperaturii medii anotimpuale a aerului pentru toamnele din intervalul 1961-2023*. (Sursa: date prelucrate).

No autumn was very cold (FR) nor excessively cold (ER) and only two autumns were very warm (FC – 2019 and 2023), ***which shows some climate stability***. The classes of cool autumns (RC) and warm (CL - warmish) are close to normal and therefore the class of autumns close to normal (APN) includes 34 autumns (54.0% of the total). This aspect is normal considering that autumn marks the transition from the warm to the cold season, and the autumnal equinox marks the transition from the positive to the negative thermal balance, an aspect directly related to the radiative balance, and the warm time is prolonged after half autumn as a result of the heat stored in the soil, hydrosphere and environment in general. The cluster of warm autumns (C), 1963, 1966 and 1967 ranked 8, 7, 9 in descending order with averages of 12.18°C, 12.20°C and 12.17°C shows that

warm autumns have been and prior to the 2004-2023 range. No autumn was very cold (FR), only 9 autumns were cold (R), and only one had a seasonal mean ≤ 9.0°C (1988 with mean 8.56°C). The graph of the average seasonal temperature variation calculated for the entire Oltenia region has a linear increasing trend (Fig. 1) with the growth coefficient of 0.0176. We note on this graph the 17 maxima located in the range of values [8.56°C,13.79°C], and of these 12 were higher than 12.0°C but very close to 12.0°C. To these we can add another 20 values close to 12.0°C but lower from the years 1961, 1964, 1969, 1976, 1981, 1982, 1984, 1987, 1992, 2000, 2001, 2004, 2006, 2008, 2010, 2013 , 2014, 2017, 2018, 2021, we obtain a total of 29 values distributed relatively evenly throughout the 63-year interval studied. For the entire period of 63 years, the average autumn season calculated for the entire Oltenia region is 11.01°C with a deviation from normal of 0.42°C, which according to the Hellmann Criterion means a period with thermally normal autumns on average[11].

Table 3, *Temperature averages recorded in **September** and Type of the month according to the Hellmann Criterion, in the interval 1961-2023* (ΔT = deviation of the seasonal average temperature from normal (n=15.82°C), N=normal; R=cold, RC =cool, CL=warmish, C=warm, FC=very warm)

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	16,78	1,0	CL	1982	19,01	3,2	C	2003	15,87	0,0	N
1962	17,07	1,3	CL	1983	16,68	0,9	N	2004	16,30	0,5	N
1963	17,64	1,9	CL	1984	17,73	1,9	CL	2005	16,64	0,8	N
1964	15,83	0,1	N	1985	16,11	0,3	N	2006	16,88	1,1	CL
1965	18,15	2,4	C	1986	17,28	1,5	CL	2007	15,21	-0,6	N
1966	16,32	0,6	N	1987	19,67	3,8	C	2008	15,77	-0,1	N
1967	17,67	1,9	CL	1988	16,95	1,1	CL	2009	17,78	2,0	C
1968	16,50	0,7	N	1989	16,12	0,3	N	2010	17,11	1,3	CL
1969	16,59	0,8	N	1990	15,42	-0,4	N	2011	20,23	4,4	C
1970	16,16	0,4	N	1991	16,53	0,7	N	2012	19,21	3,4	C
1971	14,38	-1,4	RC	1992	15,91	0,1	N	2013	15,95	0,1	N
1972	13,79	-2,0	R	1993	16,09	0,3	N	2014	16,78	1,0	CL
1973	17,25	1,5	CL	1994	**20,58**	4,8	C	2015	18,76	2,9	C
1974	17,47	1,7	CL	1995	15,13	-0,7	N	2016	18,17	2,3	C
1975	18,14	2,4	C	1996	**13,49**	-2,3	R	2017	17,71	1,9	CL
1976	18,94	3,2	C	1997	14,76	-1,1	RC	2018	17,88	2,1	C
1977	14,81	-1,1	RC	1998	14,80	-1,0	RC	2019	18,58	2,8	C
1978	14,89	-1,0	RC	1999	17,80	2,0	C	2020	19,51	3,7	C
1979	17,16	1,2	CL	2000	15,85	0,0	N	2021	16,93	1,1	CL
1980	15,55	-0,4	N	2001	16,31	0,5	N	2022	16,21	0,4	N
1981	16,99	1,2	CL	2002	15,87	0,0	N	2023	19,90	4,1	C

3.2. Analysis of monthly air temperature averages in September, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2023

[11] Not only the Hellmann criterion confirms this normality, in general we have the following principle of instrumental measurements: "for instrumental measurements in any field, a deviation of +/- one scale division is considered normal and therefore acceptable".

The monthly air temperature averages in September ranged from 13.49°C in 1996 to 19.90°C in 2023 (a temperature range of 6.41°C), and the deviations of these values from normal (n) ranged from -2.3°C to 4.8°C (asymmetric limits with respect to 0°C) (Table 3). According to the Hellmann Criterion, a number of 7 months colder than normal (R+RC) were recorded (11.1%); 24 months thermally normal (N) (38.1%) and 32 months warmer than normal (50.8%) (CL+C). Neither a very cold (FR) nor excessively cold (ER) September, nor a very warm (FC) nor excessively warm (EC) September was recorded. The number of Septembers close to normal (APN=RC+N+CL) was 55 (87.3%), normal aspect considering the great transformations occurring in cosmic causes and showing a certain stability of climatic conditions in September.

There have been 32 warm Septembers (C) (50.8%), and most of the 10 warmest Septembers (except for 6 months recorded between 1965 - 1999) have been recorded since 2009. In period 2006-2023 (over 18 years), most Septembers (14) were warmer than normal, highlighting climate warming in September. Only 2 cold Septembers (R) (3.2%) were recorded, all before 1997 and 5 cool Septembers (RC) (7.9%).

Table 4, *The warmest 10 months of September and the coldest 10 months of September and the Type of months according to the Hellmann Criterion, in the interval 1961-2021* (ΔT = deviation of the seasonal average temperature from normal, N=normal; R=cold, RC=cool, Cl=warmish, C=warm, FC=very warm)

No. crt.	The warmest 10 *September* months				The coldest 10 *September* months			
	Year	md	Δt	CH	Year	md	Δt	CH
1	1994	**20,58**	4,8	**C**	1996	**13,49**	-2,3	**R**
2	2011	20,23	4,4	**C**	1972	13,79	-2,0	**R**
3	2023	19,90	4,1	**C**	1971	14,38	-1,4	**RC**
4	1987	19,67	3,8	**C**	1997	14,76	-1,1	**RC**
5	2020	19,51	3,7	**C**	1998	14,80	-1,0	**RC**
6	2012	19,21	3,4	**C**	1977	14,81	-1,1	**RC**
7	1982	19,01	3,2	**C**	1978	14,89	-1,0	**RC**
8	1976	18,94	3,2	**C**	1995	15,13	-0,7	**N**
9	2015	18,76	2,9	**C**	2007	15,21	-0,6	**N**
10	2019	18,58	2,8	**C**	1990	15,42	-0,4	**N**

(Source: ANM Archive)

The variation graph of the average monthly temperature in September for the 63 years shows a slight increasing trend with the highest coefficient of increase among all three months 0.0184 (Fig. 2). In fig. 2 we note that no curve of variation of the three months intersects with another with one exception, which shows that no month of September was as warm as October or as November, and so we can say that neither October was not as cold as November, etc., with one exception, October 2010 (monthly average 8.58°C) was colder than November 2010 (monthly average 9.32°C), which it shows how intensely the air can cool in the polar zone in some autumns already from the first autumn month and the fact that the cooling of the polar zone works normally.

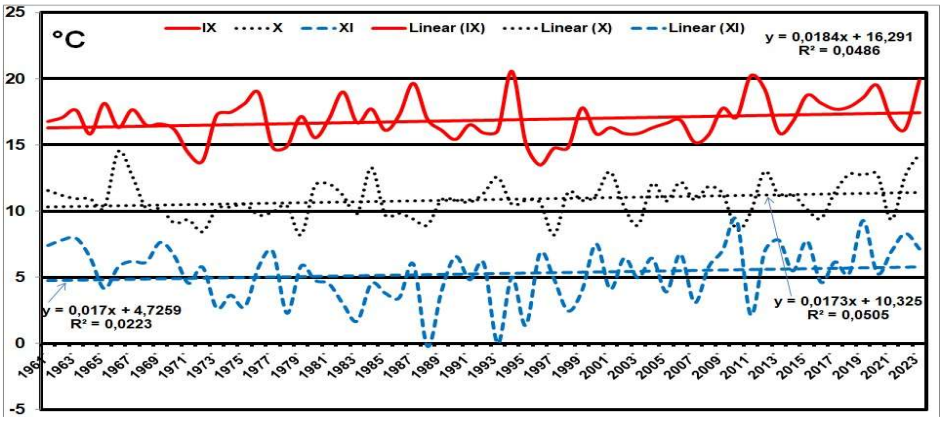

Fig. 2, *Variation of mean monthly air temperature in autumn months from 1961-2023.*
(Source: processed data).

This aspect has been maintained and will always be maintained on Earth supported by the cosmic causes shown in the introduction. The long-term average temperature difference between seasonal averages (winter-spring, summer-spring, summer-autumn, autumn-winter) is 10°C (double the inter-month average difference) and never has a season been and never will be as hot as another and so it always will be, an aspect supported by cosmic causes mainly the precession and rotation movement around the Sun (which together with the Sun constitutes the main source of energy of our planet).

3.3. Analysis of the monthly air temperature averages in October, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2023

The monthly air temperature averages in October were between 8.19°C in 1997 and 14.51°C in 1966, this average maximum value being recorded in the first part of the analyzed interval (Table 5) and only value of 14.32°C recorded in the warmest autumn of 2023 is close to this. Only in two years - 1966 and 2023 located at an interval of 58 years - the average monthly temperature exceeded 14.0°C The deviations of these values from normal (n=10.81°C) were between -2.6 °C in 1997 and 3.5°C in 2023, asymmetric range of values from the 0°C deviation, showing that negative deviations are offset by positive ones and a positive surplus remains. The overall average for the 63 years of October is 10.88°C and with a deviation from normal of 0.1°C, which according to the Hellmann Criterion shows that on average in these 63 years October was thermally normal (N). All this shows a random variability of the monthly temperature averages in October

The 10 warmest October months have been recorded since 1966, and 6 of them have been recorded since 2012. The distance between the average values is small, on the order of hundredths or tenths of a degree (Table 6), which shows that the variability of the mean monthly temperature is small. ***October 1966 was the warmest in the entire history of climate observations*** (by monthly averages and deviations from normals). ***The monthly average for the whole of Oltenia*** in 1966 of ***14.51°C is the absolute climate record*** for the entire observation period (1894-2018), for this parameter.

Table 5, *Temperature averages recorded in October and Type of month according to the Hellmann Criterion, in the interval 1961-2023* (md = Average, n=10.81°C, ΔT = deviation of the seasonal average temperature from normal (n), N=normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	11,56	0,8	**N**	1982	11,18	0,4	**N**	2003	8,96	-1,9	**RC**
1962	11,19	0,4	**N**	1983	9,81	-1,0	**RC**	2004	12,08	1,3	**CL**
1963	10,94	0,2	**N**	1984	13,29	2,5	**C**	2005	10,76	-0,1	**N**
1964	10,94	0,2	**N**	1985	9,69	-1,1	**RC**	2006	12,21	1,4	**CL**
1965	10,25	-0,5	**N**	1986	9,83	-1,0	**RC**	2007	10,85	0,0	**N**
1966	**14,51**	3,7	**C**	1987	9,39	-1,4	**RC**	2008	11,86	1,1	**CL**
1967	12,64	1,9	**CL**	1988	8,95	-1,9	**RC**	2009	11,33	0,5	**N**
1968	10,18	-0,6	**N**	1989	10,85	0,0	**N**	2010	8,58	-2,2	**R**
1969	10,19	-0,6	**N**	1990	10,83	0,0	**N**	2011	9,93	-0,9	**N**
1970	9,09	-1,7	**RC**	1991	10,67	-0,1	**N**	2012	13,01	2,2	**C**
1971	9,34	-1,5	**RC**	1992	11,35	0,5	**N**	2013	11,18	0,4	**N**
1972	8,44	-2,4	**R**	1993	12,57	1,8	**CL**	2014	11,21	0,4	**N**
1973	10,17	-0,6	**N**	1994	10,52	-0,3	**N**	2015	10,14	-0,7	**N**
1974	10,31	-0,5	**N**	1995	10,81	0,0	**N**	2016	9,44	-1,4	**RC**
1975	10,51	-0,3	**N**	1996	10,67	-0,1	**N**	2017	11,45	0,6	**N**
1976	9,69	-1,1	**RC**	1997	**8,19**	**-2,6**	**R**	2018	12,78	2,0	**C**
1977	9,94	-0,9	**N**	1998	11,41	0,6	**N**	2019	12,72	1,9	**CL**
1978	10,40	-0,5	**N**	1999	10,80	0,0	**N**	2020	12,79	2,0	**C**
1979	8,20	-2,7	**R**	2000	11,21	0,4	**N**	2021	9,35	-1,5	**RC**
1980	11,94	1,1	**CL**	2001	12,98	2,2	**C**	2022	12,68	1,9	**CL**
1981	12,05	1,2	**CL**	2002	10,33	-0,5	**N**	2023	14,32	**3,5**	**C**

(Source: ANM Archive)

Table 6, *The warmest 10 October months and the coldest 10 October months and the Type of months according to the Hellmann Criterion, in the interval 1961-2023* (md= Average, n=10.81°C, ΔT = deviation of the seasonal average temperature from normal, N=normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

No. crt.	The warmest 10 *October* months				The coldest 10 *October* months			
	Year	md	Δt	CH	Year	md	Δt	CH
1	1966	**14,51**	3,7	**C**	1997	**8,19**	-2,6	**R**
2	2023	14,32	3,5	**C**	1979	8,20	-2,7	**R**
3	1984	13,29	2,5	**C**	1972	8,44	-2,4	**R**
4	2012	13,01	2,2	**C**	2010	8,58	-2,2	**R**
5	2020	12,79	2,0	**C**	1988	8,95	-1,9	**RC**
6	2018	12,78	2,0	**C**	2003	8,96	-1,9	**RC**
7	2019	12,72	1,9	**CL**	1970	9,09	-1,7	**RC**
8	2022	12,68	1,9	**CL**	1971	9,34	-1,5	**RC**
9	1967	12,64	1,9	**CL**	2021	9,35	-1,5	**RC**
10	1993	***12,57***	1,8	**CL**	1987	***9,39***	-1,4	**RC**

(Source: ANM Archive)

The 10 coldest Octobers were recorded in different years located throughout the studied range at variable time intervals. We note the 1997-2010 interval that includes the 4 coldest October months (R) (Table 5). In ***October, the climate warming was not spectacular and there is no reason to declare a climate emergency.***

The graph of monthly temperature averages in October has a slightly increasing linear trend, and the growth coefficient is 0.0173, which is slightly lower than that of September with 0.0184.

3.4. ***Analysis of monthly air temperature averages in November, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2023***

The monthly air temperature averages in November, in the analyzed interval, fell between -0.22°C (the lowest monthly average) recorded in 1988 and 9.32°C (the highest average) recorded in 2010 (which was the only monthly average of November higher than that of October. This situation is extremely rare and we can say that it ***has a frequency of less than 1/100 years***.). Therefore, all 63 average monthly values were distributed over an interval with the length of 9.54°C (Table 7). 25 warmer-than-normal Mays (CL + C) were recorded (39.7%), No very warm November (FC) and no excessively warm November (EC) were recorded.

Table 7, *Temperature averages recorded in November and Type of month according to the Hellmann Criterion, in the interval 1961-2023* (normal n=5.15°C ΔT = deviation of the seasonal average temperature from normal (°C), N=normal; R= cold, RC=cool, CL=warmish, C=warm, FC=very warm)

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	7,40	2,3	C	1982	2,97	-2,2	R	2003	4,93	-0,2	**N**
1962	7,81	2,7	C	1983	1,68	-3,5	R	2004	6,43	1,3	CL
1963	7,95	2,8	C	1984	4,51	-0,7	**N**	2005	3,89	-1,3	RC
1964	6,49	1,4	CL	1985	3,79	-1,4	RC	2006	6,76	1,6	CL
1965	4,13	-1,0	RC	1986	3,45	-1,7	RC	2007	3,07	-2,1	R
1966	5,77	0,6	**N**	1987	5,99	0,8	**N**	2008	5,77	0,6	**N**
1967	6,21	1,1	CL	1988	**-0,22**	-5,4	FR	2009	7,03	1,9	CL
1968	6,15	1,0	CL	1989	3,95	-1,2	RC	2010	**9,32**	**4,2**	C
1969	7,64	2,5	C	1990	6,56	1,4	CL	2011	2,15	-3,0	R
1970	6,59	1,5	CL	1991	4,81	-0,4	**N**	2012	6,98	1,8	CL
1971	4,54	-0,6	**N**	1992	6,07	0,9	**N**	2013	7,81	2,7	C
1972	5,76	0,6	**N**	1993	-0,01	-5,2	FR	2014	5,48	0,3	**N**
1973	2,66	-2,5	R	1994	5,01	-0,2	**N**	2015	7,75	2,6	C
1974	3,64	-1,5	RC	1995	1,35	-3,8	R	2016	4,62	-0,5	**N**
1975	2,75	-2,4	R	1996	6,81	1,7	CL	2017	6,16	1,0	CL
1976	5,81	0,7	**N**	1997	4,87	-0,3	**N**	2018	5,26	0,1	**N**
1977	6,94	1,8	CL	1998	2,45	-2,7	R	2019	9,29	4,1	C
1978	2,28	-2,9	R	1999	3,99	-1,2	RC	2020	5,30	0,1	**N**
1979	5,84	0,6	**N**	2000	7,52	2,4	C	2021	6,93	1,8	CL
1980	4,76	-0,4	**N**	2001	4,09	-1,1	RC	2022	8,31	3,2	C
1981	4,49	-0,7	**N**	2002	6,45	1,3	CL	2023	7,14	2,0	C

(Source: ANM Archive)

We notice the random distribution of thermal weather types in November. Of the 25 months warmer than normal, 14 (22.2%) were recorded in the period 2000-2023, i.e. over 24 years, an aspect that can be considered related

to climate warming. *The 10 warmest Novembers* were randomly distributed over the entire 63-year interval. *The 10 colder-than-normal Mays* randomly distributed over a 39-year period (1973-2011), of which only 2 Novembers were very cold (FR), and the others cold (R).

The largest deviation from normal was 4.2°C in 2010, and the smallest was -5.4°C in 1988. The range of deviations [-5.4°C, 4.2°C] is skewed to 0°C, i.e. 1.2°C longer on the side of negative deviations than on the side of positive deviations, directly related to the rapid cooling of the weather in November and the more intense and longer early autumn cold waves, in November that bring the air temperature to values close to those of the first part of December, which shows that this is how the climate will always evolve in November.

Table 8, ***The warmest 10 months of November and the coldest 10 months of November*** and the Type of months according to the Hellmann Criterion, in the interval 1961-2023 (ΔT = deviation of the seasonal average temperature from normal (normal n=5.15°C), N= normal; R=cold, RC=cool, CL=warm, C=warm, FC=very warm)

No. crt.	The warmest 10 *November* months				The coldest 10 *November* months			
	Year	md	Δt	CH	Year	md	Δt	CH
1	2010	**9,32**	4,2	C	1988	**-0,22**	-5,4	FR
2	2019	9,29	4,1	C	1993	-0,01	-5,2	FR
3	2022	8,31	3,2	C	1995	1,35	-3,8	R
4	1963	7,95	2,8	C	1983	1,68	-3,5	R
5	1962 2013	7,81	2,7	C	2011	2,15	-3,0	R
6	2015	7,75	2,6	C	1978	2,28	-2,9	R
7	1969	7,64	2,5	C	1998	2,45	-2,7	R
8	2000	7,52	2,4	C	1973	2,66	-2,5	R
9	1961	7,40	2,3	C	1975	2,75	-2,4	R
10	2009	***7,03***	1,9	CL	1982	***2,97***	-2,2	R

(Source: ANM Archive)

November months close to normal (APN=N+CL+RC) were 41, i.e. 65.1% of the total. They show that the November thermal patterns follow a normal statistical distribution with a slight asymmetry towards colder than normal months. The average air temperature in November for the entire studied interval is 5.3°C, and the deviation from normal is 0.1°C, which shows that on average, in the 63 years, the month of November was thermally normal.

3.5. Analysis of the seasonal thermal minimums of the autumns, in Oltenia (excluding the mountain area) for the interval 1961-2023

Due to the astronomical processes discussed above, the seasonal minimum temperatures are always recorded in November, and in the entire history of climate observations, this rule has not been and will never be disproved. So this analysis coincides with the analysis of the thermal minimums of November. In the month of November, the minimum temperatures are recorded

most frequently in the last two decades and less often in the first decade, and the area in which it is recorded is the one in the north of Oltenia, the Voineasa Intramontane Depression (26 cases, i.e. 41.3%), in the Depressions Subcarpathian Apa Neagră (16 cases, i.e. 25.4%) and Polovragi (located at the foot of Muierii Hill[12] to the East of it) (6 cases, i.e. 9.5%), with a lower frequency at Tg. Logrești located at the foot of Muierii Hill to the west of it in the area of descent of the foehn (4 cases i.e. 6.3%; Table 9) to Bechet in the extreme south where the descent of cold air from the Balkans arrives in autumn, winter and spring (4 cases i.e. 6.3%) and very rarely in Craiova, also located at the foot of Muierii Hill to the west of it, at the maximum southern limit of Foehn descent, Caracal and Băilești (1 case each, i.e. 1.6%).

Table 9, Minimum temperatures recorded during the autumns, in the interval 1961-2023 (°C, Station = weather station, 319=Voineasa, 369=Tg. Logrești; 344= Polovragi; 341=Apa Neagră; 482=Calafat, 494=Bechet, 465 =Băilești, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg.Jiu)

Year	Tmin	Date	Station	Year	Tmin	Date	Station	Year	Tmin	Date	Station
1961	-6,9	22.XI	346	1982	-10,3	8.XI	494	2003	-5,2	14.XI	319
1962	-7,4	27.XI	450	1983	-12,9	23.XI	319	2004	-7,0	26.XI	319
1963	-8,1	30.XI	319	1984	-10,6	15.XI	319	2005	-9,2	23.XI	319
1964	-4,7	24.XI	319	1985	-8,6	30.XI	319	2006	-9,6	4.XI	341
1965	-10,8	26.XI	346	1986	-8,8	21.XI	344	2007	-11,0	29.XI	319
1966	-7,5	30.XI	319	1987	-6,7	2.XI	344	2008	-9,4	24.XI	319
1967	-8,7	27.XI	319	1988	-16,2	26.XI	482	2009	-5,0	1.XI	341
1968	-4,5	27.XI	319	1989	-17,5	30.XI	494	2010	-5,4	29.X	369
1969	-7,0	29.XI	369	1990	-7,6	12.XI	341	2011	-10,7	22.XI	344
1970	-5,7	12.XI	319	1991	-10,2	2.XI	341	2012	-3,8	8.XI 27.XI	341 319
1971	-9,3	28.XI	319	1992	-8,6	11.XI	319	2013	-9,9	30.XI	469
1972	-6,1	30.XI	319	1993	***-21,2***	27.XI	341	2014	-4,3	25.XI	494
1973	-19,4	29.XI	341	1994	-9,0	7.XI	344	2015	-6,6	2.XI	341
1974	-5,8	27.XI	344	1995	-15,6	10.XI	369	2016	-13	30.XI	482
1975	-16,5	28.XI	465	1996	-4,9	10.XI	319	2017	-5,1	1.XI	369
1976	-15,8	26.XI	341	1997	-9,0	21.XI	344	2018	-13,6	30.XI	494
1977	-9,7	30.XI	319	1998	-7,8	19.XI	341	2019	**-2,7**	28.XI	341
1978	-8,5	16.XI	341	1999	-9,6	28.XI	340	2020	-7,7	26.XI	341
1979	-4,8	29.XI	341	2000	-5,4	12.XI	319	2021	-5,8	26.XI	319
1980	-5,5	21.XI	319	2001	-9,7	27.XI	319	2022	-4,4	26.XI	341
1981	-8,9	28.XI	319	2002	-8,6	13.XI	319	2023	-11,2	30.IX	341

(Source: ANM Archive)

In the 63 years analyzed, the absolute minimum temperature was ***-21.2°C recorded at Apa Neagră on 27.XI.1993, which is the second lowest minimum temperature in November in Romania, after the minimum value for Romania***

[12] ***The Muierii Hill*** is the longest hill in Romania (over 120 km long and is the water divide between the hydrographic basins of Jiu and Olteț rivers, this having an important role in the distribution of air temperatures in Oltenia and the evolution of atmospheric fronts as well as in the distribution of precipitation.

which is -22.3°C *recorded in Cluj Napoca in 1948. For the high area we note that the absolute minimum temperature in November* is -27.4°C in Gheorghieni in 1948; and the value of -26.4°C at Intorsura Buzăului in 1948.

In November, around the 20.XI, intense cooling of the weather occurs frequently. So in November the monthly minimum temperatures have never been positive and never will be. The 10 lowest seasonal minimum temperatures were mostly ≤ -15°C (7 out of 10, i.e. 70.0%) (Table 10). The 10 highest seasonal minimums were all ≥−2.5°C, which confirms the above statement.

Table 10, *Cele mai mari 10 minime termice ale toamnelor şi cele mai mici 10 minime termice ale toamnelor, în intervalul 1961-2023* (°C, Stația = stația meteo, 319=Voineasa, 369=Tg. Logrești; 344= Polovragi; 341=Apa Neagră; 482=Calafat, 494=Bechet, 465=Băilești, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg. Jiu)

No. crt.	The highest 10 minima				The lowest 10 minima			
	Year	Tmin	Date	Station	Year	Tmin	Date	Station
1	2019	***-2,7***	28.XI	341	1993	***-21,2***	27.XI	341
2	2012	-3,8	8.XI	341	1973	-19,4	29.XI	341
3	2014	-4,3	25.XI	494	1989	-17,5	30.XI	494
4	2010 2022	-4,4	1.XI 26.XI	341	1975	-16,5	28.XI	465
5	1968	-4,5	27.XI	319	1988	-16,2	26.XI	482
6	1964	-4,7	24.XI	319	1976	-15,8	26.XI	341
7	1979	-4,8	29.XI	341	1995	-15,6	10.XI	369
8	1996	-4,9	10.XI	319	2018	-13,6	30.XI	494
9	2009	-5,0	1.XI	341	2016	-13,0	30.XI	482
10	2017	***-5,1***	1.XI	369	1983	***-12,9***	23.XI	319

(Source: ANM Archive)

In November, maximum temperatures ***are usually recorded in the first decade or even in the first pentad. For the analyzed interval (1961-2023), the 10 highest temperature maxima in November were between 28.1°C recorded at Dr. Tr. Severin on 3.XI.1989. In Oltenia, the absolute maximum temperature of November is 27.9°C recorded on 10.XI.2010 in Bechet.*** Exceptional maximum temperature values in November for Romania was 30.5°C in Călăraşi on 1.X.1926 (*value not surpassed until now for 98 years,* ***i.e. in the last century it was even warmer in November in certain periods of time***); on the same date, 30.2°C in Botoşani, 30.0°C in Piatra Neamţ, 29.4°C in Bucharest; 28.9°C in Calarasi on 5.XI.2021, 28.0°C in Pâtârlagele on 5.XI.2021. ***November is the last month of the year in which the maximum air temperature in Romania, in some years, reaches and slightly exceeds 30°C, in the first pentad of the month*** (with a frequency of once per century).

The 10 lowest monthly maximum temperatures in November were between 15.0°C recorded on 6.XI.1975 at Dr. Tr. Severin and 18.9°C at Bechet on 5.XI.1966, distributing on an interval with the length of 3.9°C. The time distribution of these values is random and disproves the existence of climate

warming in November.

3.6. Analysis of the seasonal thermal maxima of the autumns, in Oltenia (excluding the mountain area) for the interval 1961-2023

Due to the astronomical processes discussed above, the seasonal thermal maxima for autumn are always recorded in September, and in the entire history of climate observations, this rule has not and will never be disproved. So this analysis coincides with the analysis of the thermal maximums of September. The presence of the relief steps in Oltenia, as well as other processes of air circulation on the continent of Europe determine the realization of these values in the area of low altitude, in the Oltenia Plain at the weather stations: Bechet 27 years (48.9% of years), Băilești 11 years (17 .5%), Calafat 10 years (15.9.0%), Caracal 8 years (12.7%); Dr. Tr. Severin 6 years (9.5%), Craiova 3 years (4.8%); Rm. Vâlcea and Bâcles 1 year each (1.6%). We note that in the period 1997-2023 for 27 years, in Băilești, the seasonal autumn thermal maximum has never been achieved, which shows that the Mediterranean influence, autumn in September was no longer as intense as in other years in the center of the Oltenia Plain, and in that interval the seasonal maximum was most frequently recorded in Bechet (12 years, i.e. 19.0%) and Calafat 11 years (17.5%), so in the last 27 years, the Mediterranean influence in autumn in September it was more intense in the southern bordering part of Oltenia, at Bechet and Calafat (Table 11), a normal aspect for several reasons, including the distance from the Mediterranean region but also the frequency of southern and southwestern circulations. Another aspect is that the seasonal thermal maximum occurred in the Romanațiului Plain at Caracal on average once every 10 years, the causes are the same as those cited above. In 51 cases (81.0%), the seasonal thermal maximum in autumn was achieved at the weather stations in Dolj County.

The highest autumn temperature for this interval in Oltenia was ***39.2°C*** recorded on 13.IX.1962 ***in Bechet (Dolj County***). The 10 highest seasonal maximum temperatures were between 36.1°C recorded on 18.IX.1986 at Dr. Tr. Severin and 39.2°C recorded on 13.IX.1962 at Bechet. So they were recorded at the weather stations Dr. Tr. Severin, Calafat and Bechet in the west, south-west and south of Otenia. The distribution over time, by year, is random (from 1962 to 2020). ***The absolute maximum temperature of September in Oltenia is 43.5°C*** *recorded in Strehaia on 8.IX.1946. We therefore note that* ***for 78 years (1946-2024) this value was not exceeded, disproving climate warming in September and confirming the variability of temperature values.*** We note the significant difference of 4.3°C between the two values, which even allows us to say that in September there was a decrease in the maximum temperature values[13]. *At the*

[13] Weather forecasting terminology says that for a drop ≥5.0°C in air temperature, the term cooling weather is used. So the difference of 4.3°C between the two values brings us closer to a cooling of the weather in September in the 78 years, from the point of view of thermal maxima.

level of Romania, the absolute maximum monthly temperature of September is also this value in Oltenia (43.5°C recorded in Strehaia on 8.IX.1946).

Table 11, Maximum temperatures recorded during the autumns, in the interval 1961-2023 (°C, Station = weather station, 482=Calafat, 494=Bechet, 465=Băilești, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg. Jiu)

Year	Tmax	Date	Station	Year	Tmax	Date	Station	Year	Tmax	Date	Station
1961	35,7	19.IX	465	1982	32,6	24.IX	494	2003	31,6	1.IX	469
1962	**39,2**	**13.IX**	**494**	1983	35,7	12.IX	494	2004	33,8	1.IX	482
1963	35,8	6.IX	465	1984	33,6	7.IX	410	2005	30,6	13.IX	469
1964	32,0	13.IX	494	1985	32,0	2.IX	494	2006	31,6	4.IX	482
1965	34,6	11.IX	465	1986	36,1	18IX	410	2007	32,4	28.IX	494
1966	30,2	4.IX	465	1987	39,0	14.IX	410	2008	37,1	6.IX	494
1967	31,3	5.IX	465	1988	31,4	5.IX	494;450	2009	36	4.IX	494
1968	35,5	17.IX	465	1989	29,0	18.IX 19.IX	494 465	2010	33	17.IX	494
1969	32,4	4.IX	465	1990	34,6	1.IX	494	2011	36,8	14.IX	482
1970	33,9	12.IX	465	1991	32,0	30.IX	494	2012	35,4	28.IX	482
1971	30,2	1.IX	450	1992	35,3	1.IX	494	2013	31,8	12.IX	482
1972	28,6	8.IX	494;469	1993	37,3	10.IX	494	2014	31,1	2.IX	494
1973	33,2	8.IX	410	1994	36,4	15.IX	494	2015	37,7	1.IX	482
1974	33,2	4.IX	465	1995	30,5	14.IX	469	2016	33,6	5.IX	469
1975	31,6	17.IX	410	1996	29,0	1.IX	494; 465	2017	36,2	2.IX	482
1976	32,2	30.IX	469	1997	29,8	1.IX	494	2018	35,9	2.IX	482
1977	32,0	9.IX	469	1998	***28,4***	12.IX	412	2019	34,6	2;3.X	494
1978	31,7	12.IX	494	1999	35,3	27.IX	482	2020	36,5	1.IX	494
1979	32,6	24.IX	469;450	2000	34,8	21.IX	494	2021	34,2	17.IX	482
1980	30,4	23.IX	410	2001	32,8	2.IX	494	2022	34,4	15.IX	482
1981	32,2	24.IX	346	2002	30,1	8.IX	494	2023	35,2	23.IX	494

The 10 lowest maximum temperatures in September were between 28.4°C, recorded on 12.IX.1998 in Bâcleș and 31.1°C recorded on 2.IX.2014 at the meteorological station Bechet, all these values fell within a temperature range of 2.7°C.

Table 12, *The 10 highest thermal maxima of autumns and the 10 lowest thermal maxima of autumns, in the interval 1961-2023* (°C, Station = weather station, 482=Calafat, 494=Bechet, 465=Băilești, 469=Caracal, 450= Craiova, 434=Slatina, 340=Tg. Jiu)

No. crt.	The highesr 10 maxima				The lowest 10 maxima			
	Year	Tmax	Date	Station	Year	Tmax	Date	Station
1	1962`	**39,2**	13.IX	494	1998`	**28,4**	12.IX	412
2	1987`	39,0	14.IX	410	1972`	28,6	8.IX	494;469
3	2015`	37,7	1.IX	482	1989` 1989` 1996`	29,0	18.IX 19.IX 1.IX	494 465 494 465
4	1993`	37,3	10.IX	494	1997`	29,8	1.IX	494
5	2008`	37,1	6.IX	494	2002`	30,1	8.IX	494
6	2011`	36,8	14.IX	482	1966` 1971`	30,2	4.IX 1.IX	465 450
7	2020`	36,5	1.IX	494	1980`	30,4	23.IX	410
8	1994`	36,4	15.IX	494	1995`	30,5	14.IX	469
9	2017`	36,2	2.IX	482	2005`	30,6	13.IX	469
10	1986`	***36,1***	18.IX	410	2014`	***31,1***	2.IX	494

The minimum monthly temperatures in the warmest month of autumn – ***September***, during the analyzed period, calculated for the entire Oltenia region, were between -4.7°C recorded in Voineasa on 30.IX.1970 and 5.8°C recorded on 27.IX.1982 in Voineasa. We mention that the Voineasa meteorological station is located in the intramontane depression of the same name and has an altitude of 587.0 m, which means that this value was achieved under the influence of the thermal inversion that is present almost permanently in Oltenia.

In 16 years out of the 63, the monthly minimum temperatures in September were negative (25.4%), and half of them occurred in the 1961-1979 interval (in the first 19 years of the analyzed interval). The analysis of temperature data shows that in every month of the year there is at least one important cooling of the weather and at least one warming, this means that alternations between cooling and warming are a natural way of climate evolution. The dates on which monthly lows occur are random and can be any day of the month. Therefore, early autumn frosts are quite frequent in September (25.4%), that is, in one year out of four, early autumn frosts can be recorded, especially in the north of the region. The weather stations where these September minimum temperatures were recorded are: Voineasa located in the intramontane depression of the same name (587m above sea level), in 45 years (71.4%), Apa Neagră (located in the Subcarpathian depression) 11 years (17.5%), Polovragi (at the foot of Muierii Hill in the East) with 5 years (7.9%), Tg. Logrești (located at the foot of Muierii Hill

in the West) with 3 years (4.8%), Calafat with one year (1.6%), located in the extreme southwest where the cold air from the Balkans arrives during the nights, and during the day the warm from the Mediterranean region. In the 63 years, the monthly minimum temperatures in September for the entire region were distributed along an interval of length 10.5°C (-4.7°C, 5.8°C). ***The absolute minimum temperature of September in Oltenia***, for the entire period of climate observations, is -4.7°C recorded on 30.IX.1970 in Voineasa, equal to that in Satu Mare (124 m above sea level, 47.80 °N, 22.86°E) recorded on the same date, ***September being the first month of the year after the summer season when the thermal minimums can be negative in Romania. For all of Romania, the absolute minimum thermal air temperature in September in the low altitude area is -11.0°C,*** recorded at Topliţa (658m dNM[14], 46.92°N; 25.35°E, on the night of 28/29. IX.177, i.e. at the lower limit of the mountain area and 71 m higher than Voineasa). These values show that we have random temperature variability and confirm the idea of climate warming, and the slightly increasing trend of the graph is insignificant, its meaning (increase or decrease) can change at any time depending on the values that will be recorded in different periods.

3.7. Analysis of monthly thermal extremes in October, in Oltenia (excluding the mountain area) for the interval 1961-2023

The monthly minimums for the entire Oltenia region in October were all negative, except for one value, namely 0.5°C, the monthly minimum since October 1966, and they fell between -11.4°C recorded on 18.X .2011 at Apa Neagră and 0.5°C recorded on 23.X.1966 at the Voineasa meteorological station. For the analyzed interval, the monthly minimum temperatures fell within an interval of 11.9°C. This means that there has not been a year in which at least in the north of the region in October we do not have autumn frosts in October. Over time, throughout the Northern Hemisphere, the month of October has been very generally stable in terms of weather, it is the most stable month of the year, marked by high variability in air temperature with heat waves and cold and every year, with early autumn snows in some areas and especially in hilly and mountainous areas. So everything that happens in October is climate variability and not climate change. ***The absolute minimum temperature of October, in Oltenia, is -11.4°C recorded on 18.X.2011 at Apa Neagră, and in Romania the absolute minimum temperature in October is -21.3°C at 27.X.1988 at Intorsura Buzăului. The 10 lowest thermal minimums*** were between -11.4°C at Apa Neagră on 18.X.2011 and between -6.2°C at Apa Neagră in 2000.

[14] dNM=above sea level

Table 13, Minimum temperatures recorded in October, in the interval 1961-2023 (°C, Station = weather station, 319=Voineasa, 369=Tg. Logreşti; 344= Polovragi; 341=Apa Neagră; 482=Calafat, 494=Bechet, 465 =Băileşti, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg. Jiu)

Year	Tmin	Date	Station	Year	Tmin	Date	Station	Year	Tmin	Date	Station
1961	-1,9	26.X	319	1982	-5,1	31.X	319	2003	-5,9	26.X	319
1962	-4,9	28.X	319	1983	-6,0	24.X	319	2004	-0,1	13.X	319
1963	-2,5	16.X	319	1984	-4,4	18.X	319	2005	-5,6	31.X	369
1964	-2,5	31.X	319	1985	-6,5	30.X	319	2006	-4,5	19.X	341
1965	-6,7	23.X	369	1986	-3,0	15.X	341	2007	-3,3	15.X	369
1966	**0,5**	23.X	319	1987	-7,2	30.X	341	2008	-1,5	19.X	319
1967	-4,8	21.X	319	1988	-7,8	28.X	341	2009	-3,2	16.X	341
1968	-5,6	22.X	319	1989	-2,2	5.X 2.X	369 319	2010	-5,4	29.X	369 341
1969	-2,3	23.X	319	1990	-5,7	25.X	319	2011	***-11,4***	18.X	341
1970	-4,1	25.X	340	1991	-8,4	29.X	341	2012	-5,4	31.X	341
1971	-8,1	30.X	319	1992	-3,0	20.X	319	2013	-4,5	5.X	319
1972	-3,4	20.X	346	1993	-3,5	30.X	319	2014	-2,4	28.X	341
1973	-5,6	30.X	494	1994	-1,1	13.X	319	2015	-3,7	30.X	319
1974	-4,6	28.X	319	1995	-4,8	25.X	319	2016	-5,1	6.X	341
1975	-1,7	26.X	319	1996	-3,4	27.X	341	2017	-4,1	31.X	369
1976	-3,0	21.X	344	1997	-9,6	30.X	346	2018	-1,6	15.X	341
1977	-2,4	18.X	341	1998	-3,3	31.X	319	2019	-2,7	28.X	341
1978	-6,3	29.X	319	1999	-4,8	18.X	341	2020	-2,3	20.X	341
1979	-8,5	27.X	319	2000	-6,2	23.X	341	*2021*	-4,7	26.X	341
1980	-2,1	5.X	319	2001	-4,8	27.X	319	2022	-3,2	21.X	341
1981	-3,5	26.X	340	2002	-3,6	30.X	369	2023	-3,3	17.X	341

(Source: ANM Archive)

The 10 highest thermal minimums of October fell between -2.3°C recorded in Voineasa on 23.X.1969 and 20.X.2020 at Apa Neagră and 0.5°C recorded in 1966 at Voineasa (Table 14).

Table 14, *The 10 highest thermal minimums of October and the 10 lowest thermal minimums of October, in the interval 1961-2023* (°C, Station = weather station, 319=Voineasa, 369=Tg. Logreşti; 344= Polovragi; 341= Apa Neagră; 482=Calafat, 465=Băileşti, 450=Craiova, 434=Tg. Jiu)

No. crt.	***The highest 10 minima***				***The lowest 10 minima***			
	Year	Tmin	Date	Station	Year	Tmin	Date	Station
1	1966	**0,5**	23.X	319	2011	***-11,4***	18.X	341
2	2004	-0,1	13.X	319	1997	-9,6	30.X	346
3	1994	-1,1	13.X	319	1979	-8,5	27.X	319
4	2008	-1,5	19.X	319	1991	-8,4	29.X	341
5	2018	-1,6	15.X	341	1971	-8,1	30.X	319
6	1975	-1,7	26.X	319	1988	-7,8	28.X	341
7	1961	-1,9	26.X	319	1987	-7,2	30.X	341
8	1980	-2,1	5.X	319	1965	-6,7	23.X	369
9	1989	-2,2	5.X	369	1985	-6,5	30.X	319
10	1969 2020	***-2,3***	23.X 20.X	319 341	2000	***-6,2***	23.X	341

(Source: ANM Archive)

The monthly maximums for the entire Oltenia region in ***October*** were between 20.7°C recorded in Calafat on 2.X.2010 and 35.0°C recorded on 21.X.2023 in Bechet (Table 15).

Table 15, Maximum temperatures recorded in October, in the interval 1961-2023 (°C, Station = weather station, 319=Voineasa, 369=Tg. Logrești; 344= Polovragi; 341=Apa Neagră; 482=Calafat, 494=Bechet, 465 =Băilești, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg. Jiu)

Year	Tmax	Date	Station	Year	Tmax	Date	Station	Year	Tmax	Date	Station
1961	29,7	1.X	465	1982	26,6	15.X	469	2003	30,8	4.X	482
1962	25,6	6.X	465	1983	31,6	6.X	469	2004	26,8	10.X	494
1963	27,9	4.X	412	1984	33,0	6.X	469	2005	25,5	23.X	494
1964	33,6	13.X	494	1985	28,2	4.X	410	2006	31,5	4.X	494
1965	31,2	2.X	465	1986	29,0	3.X	410	2007	29,1	5.X	482
1966	29,4	12.X	494	1987	**24,1**	6.X	346	2008	26,1	3.X	465
1967	28,6	17.X	465	1988	25,5	1.X	410	2009	28,8	9.IX	482
1968	27,1	15.X	340	1989	24,4	25.X	410	2010	**20,7**	2.X	482
1969	24,6	1.X	465	1990	31,5	8.X	494	2011	30,4	1.X	482
1970	27,0	7.X	482;465	1991	33,8	1.X	494	2012	32,6	1.X	494
1971	26,7	15.X	465	1992	28,2	10.X	494	2013	26,4	21.X	494
1972	26,6	13.X	482	1993	31,5	15.X	465	2014	26,3	21.X	482
1973	32,5	17.X	494	1994	31,7	3.X	494	2015	24,7	5.X	482
1974	28,8	8.X	494	1995	27,7	14.X	469	2016	28,2	2.X	494
1975	28,3	1.X	494	1996	25,3	3.X	465	2017	29,6	20.X	482
1976	28,2	10.X	410	1997	30,8	10.X	482	2018	28,0	29.X	494
1977	25,6	1.X	482	1998	25,8	1.X	482	2019	32,0	2.X	494
1978	29,6	3.X	494	1999	31,0	1.X	494	2020	30,6	5.X	469
1979	25,7	15.X	494	2000	25,5	4.X	340;346	2021	24,2	22.X	482
1980	30,4	9.X	450	2001	31,5	4.X	395	2022	28,6	31.X	482
1981	30,0	6.X	469	2002	24,2	27.X	494	2023	**35,0**	21.X	494

(Source: ANM Archive)

The absolute thermal maximum for Oltenia in October is 37.5°C recorded at Studina (Olt County) on 3.X.1952, so in other periods it was even warmer in Oltenia (and only) than in the current stage, which which shows that the current climate warming is just a normal episode not as intense as many others. In Romania, the absolute maximum temperature for October is 39.0°C recorded in Armășești (Ialomița County) on October 3, 1952, and also then 38.2°C was recorded in Giurgiu and 37.8°C in Alexandria. Closer to this year (2024), the heat wave that affected Romania in mid-October of 1993, on October 15, the maximum temperature in the country reached 38.4ºC in Zimnicea. In autumn in October these high temperature values do not last long and are particularly beneficial for the development of plants that react quickly to temperature increases and thus are useful for newly established autumn agricultural crops. All this actually shows a large variability of temperature values in October between certain limits favorable to biotic processes and does not support the idea of continuous and unlimited climate warming.

Table 16, *The 10 highest thermal maxima of October and the 10 lowest thermal maxima of October, in the interval 1961-2023* (°C, Station = weather station, 319=Voineasa, 369=Tg. Logrești; 344= Polovragi; 341=Apa Neagră; 482=Calafat, 465=Băilești, 450=Craiova, 434=Tg. Jiu)

No. crt.	Cele mai mari 10 maxime				Cele mai mici 10 maxime			
	Year	Tmax	Date	Station	Year	Tmax	Date	Station
1	2023	**35,0**	21.X	494	2010	**20,7**	2.X	482
2	1991	33,8	1.X	494	1987	**24,1**	6.X	346
3	1964	33,6	13.X	494	2002 2021	24,2	27.X	494 482
4	1984	33,0	6.X	469	1989	24,4	25.X	410
5	2012	32,6	1.X	494	1969	24,6	1.X	465
6	1973	32,5	17.X	494	2015	24,7	5.X	482
7	1994	31,7	3.X	494	1996	25,3	3.X	465
8	1983	31,6	6.X	469	1988 2000 2005	25,5	1.X 4.X 23.X	410 340; 346 494
9	1990 1993 2001 2006	31,5	8.X 15.X 4.X 4.X	494 465 395 494	1962 1977	25,6	6.X 1.X	465 482
10	1965	***31,2***	2.X	465	1979	***25,7***	15.X	494

(Source: ANM Archive)

4. CONCLUSIONS

In the autumn season, the greatest decrease in the angle of maximum elevation of the Sun at noon is recorded, of 29.28°. Corresponding to this decrease, the length of the day decreases from 13 hours and 18 minutes and 2 seconds on 31.VIII to 9 hours 8 minutes and 50 seconds on 30.XI, registering a decrease of 4 hours 9 minutes and 12 seconds and as a result the averages monthly temperatures, calculated for the whole of Oltenia, normally decrease, registering decreases of 4.2°C in September compared to August, 5.9°C in October compared to September and 5.5°C in November compared to October.

Table 17. *Matrix of weather types in the autumn months and the autumn season as a whole in the interval 1961-2023* (IX, X, XI= Thermal weather type in the autumn months; T= Thermal weather type for the autumn season as a whole)

Year	IX	X	XI	T	Year	IX	X	XI	T	Year	IX	X	XI	T
1961	CL	N	C	C	1982	C	N	R	N	2003	N	RC	N	RC
1962	CL	N	C	C	1983	N	RC	R	R	2004	N	CL	CL	CL
1963	CL	N	C	C	1984	CL	C	N	C	2005	N	N	RC	N
1964	N	N	CL	N	1985	N	RC	RC	RC	2006	CL	CL	CL	C
1965	C	N	RC	N	1986	CL	RC	RC	N	2007	N	N	R	RC
1966	N	C	N	C	1987	C	RC	N	C	2008	N	CL	N	N
1967	CL	CL	CL	C	1988	CL	RC	FR	R	2009	C	N	CL	C
1968	N	N	CL	N	1989	N	N	RC	N	2010	CL	R	C	C
1969	N	N	C	CL	1990	N	N	CL	N	2011	C	N	R	N
1970	N	RC	CL	N	1991	N	N	N	N	2012	C	C	CL	C
1971	RC	RC	N	R	1992	N	N	N	N	2013	N	N	C	C
1972	R	R	N	R	1993	N	CL	FR	R	2014	CL	N	N	CL
1973	CL	N	R	N	1994	C	N	N	C	2015	C	N	C	C
1974	CL	N	RC	N	1995	N	N	R	R	2016	C	RC	N	N
1975	C	N	R	N	1996	R	N	CL	N	2017	CL	N	CL	C
1976	C	RC	N	CL	1997	RC	R	N	R	2018	C	C	N	C
1977	RC	N	CL	N	1998	RC	N	R	R	2019	C	CL	C	FC
1978	RC	N	R	R	1999	C	N	RC	N	2020	C	C	N	C
1979	CL	R	N	N	2000	N	N	C	CL	2021	CL	RC	CL	N
1980	N	CL	N	N	2001	N	C	RC	N	2022	N	CL	C	C
1981	CL	CL	N	CL	2002	N	N	CL	N	2023	C	C	C	FC

Over the period under review, decreases were 5.58°C in September vs. August, 6.00°C in October vs. September, and 5.61°C in November vs. October, all within normal deviation ranges.

Of the 63 years studied, in only 5 autumns (7.9%) (1967, 2006, 2012, 2019, 2023) all autumn months were CL (warmish) or C (warm). The most warmer-than-normal autumns occurred in the period 2004-2023. Warmish autumns (CL, 6 in total – 9.5%) with deviations from normal between 0.6-1.0°C) belong to the class of those close to normal (APN). There were 18 warm autumns (C, whose deviations from normal were between 1.1-2.5°C) (28.6%) and two autumns were very warm (3.2%) (FC - 2023) which shows a trend of climate

warming compared to the last century, but in a certain sense it is a normal aspect because the warming of the weather, autumn is an extension of the summer heat especially in September, and the percentage of 28.6% is close to 1/3, the ideal distribution would be 1/3 colder than normal autumns, 1/3 thermally normal autumns and 1/3 warmer than normal autumns but the variability of air temperature is random in all months and seasons not just autumn. In the period 1982-2002 (21 years) only four autumns were warmer than normal (6.3%). The old absolute thermal records for Oltenia and for the entire country were not surpassed, which shows that everything is within normal limits. In October, climate warming is irrelevant, and one of the months was colder than November (2010). The systematic climate data are over a short interval, recorded since 1960, and are inhomogeneous in sampling, and local conditions at each station have changed, and at many stations even the locations have changed. So their comparability is poor and the conclusions regarding climate warming are irrelevant. Thermal alternations that show that after warmer than normal or normal months were followed by colder than normal months and the same thermal alternations occur at the level of seasons and years, are a natural and normal way of climate evolution over longer or longer periods of time.

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