SPRINGTIME AIR TEMPERATURE VARIATIONS IN SOUTH-WESTERN ROMANIA (1961-2023)

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ABSTRACT. ***Springtime Air Temperature variations in South-Western Romania (1961-2023)***. Over time, the warming and cooling periods of the climate on Earth followed each other with great irregularity and caused significant variations in air temperature, but allowed the existence of life and especially of the human species. They are determined by the variability of the cosmic factors that essentially determine the Earth's climate. In the following paper I've analyzed the variation of the air temperature in Oltenia during the springs for the interval 1961-2023. A number of other works have analyzed climate variability in this part of Romania. The warm 1945-1955 period was followed by a gradual cooling of the weather, and in the 1961-1998 period (39 years), there was only one spring in which all three months were warmer than normal (1983). Then the frequency of warmer-than-normal months and springs gradually increased starting in 1999, peaking in the 2007-2020 range. Several daily temperature climate records were broken, but seasonal records were not. At the same time, in the analyzed interval, in the polar areas the rate of melting of the ice increased a lot and exceptional thermal maxima were recorded in the cold season. Late spring frosts also occurred in warm springs and did significant damage. The random variability of air temperature determined by the random variability of cosmic factors is the main cause of these thermal variations. The work is useful to all those interested in climate variability in Oltenia.

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

1. INTRODUCTION

Spring is the transition season in which a special astronomical process of changing the share of the Earth's heating from the Southern Hemisphere to the Northern Hemisphere occurs, due to the precessional movement of the Earth. A year on Earth lasts one polar day and one polar night. In the spring, due to this precessional movement, the Vernal Equinox occurs. *The equinox (echinox)* is the time when day and night are equal at 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 is to be understood in the sense that the part of the Earth illuminated by the Sun is equal to the shadowed part. This aspect occurs at a certain time for each latitude on Earth.). The points of intersection of the ecliptic (the path of the

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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. At the Vernal Equinox, the Sun crosses the celestial equator from the Southern Hemisphere to the Northern Hemisphere, around March 21. This point of intersection of the ecliptic with the celestial equator is called the Vernal point. The vernal point is used to define equatorial astronomical coordinates. Because the point moves on the ecliptic, the coordinates are defined for the position of the point in a particular year, for example (1990,0) or (2023,0). On this day the Sun passes exactly at the zenith[2] on the terrestrial equator. After the Winter Solstice, for 6 months, the maximum daily height of the Sun above the horizon increases from day to day until the Summer Solstice and then begins to decrease. This exceptional variability determined by astronomical causes determines the variability of the heating of the Earth's surface and therefore the variability of the temperature of air, soil, water, etc. The laws of planetary motion show that near the equinoxes the planet's motion is faster, and near the solstices the motion is slower (according to the areolar derivative).

In the month of March for the central latitude of Oltenia (Craiova) the altitude of the Sun at solar noon for each day (maximum altitude angle) in the year 2023 varied from ***the value of 37.93°*** on 1.III.2023 at 12:37`10" at ***49.67°*** on 31.III. 2023, 13:22`04``, which means an increase of 11.74° in 31 days. The shortest day of this month was on March 1, ***11 hours, 9 minutes, 48 seconds***, and the longest day on March 31, ***12 hours, 41 minutes, 59 seconds***. These values vary slightly from year to year. As a result of the increase in the length of the day in the northern hemisphere, especially in the last decade of the month, the air temperature begins to rise. Normally, the minimum monthly temperatures are recorded in the first part of the month, and the maximum in the last part, frequently in the last pentad. In March, the second increase in the average monthly temperature during the year is recorded. *The average monthly temperature increases* in March compared to the last winter month (February) are between 4.3°C at Tg. Logreşti and 5.6°C in Caracal, and the *increase in the overall monthly average* is 5.0°C, being the first big increase in the average monthly temperature during the year, thus confirming the arrival of spring and announcing that the hot season will follow. *The general average temperature*, *for the entire region*, is 4.2°C, registering an increase of 5.0°C compared to February and in many areas by more than 5°C (for example in Bâcleş the increase is 5.4°C). *The absolute minimum thermal temperature in Oltenia is -27.0°C recorded at Apa Neagră on 5.III.1987,* i.e. a value specific to January or February. *The absolute maximum monthly temperature in March is 29.5°C recorded at Dr. Tr. Severin* in the west of Oltenia on 23.III.1927,

[2] *Zenith* = The point of intersection of the vertical of the place with the upper celestial hemisphere located above the observer's head and opposite the nadir. Nadir = Point on the celestial vault, opposite the zenith, located at the vertical intersection of the place we are referring to with the lower celestial hemisphere.

confirming the spectacular and rapid temperature jump after the spring equinox. March is thus the first month of the year[3] in which thermal maxima ≥25.0°C are recorded (that is, days specific to the summer season[4]). *According to popular tradition*, March is not absent from fasting (Easter fasting) but also from winter (it often has winter phenomena).

In the month of April, 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 minimum angle of 50.06° on 1.IV.2023 at 13:28'45'' at the maximum elevation angle of 60.32° on 30.IV.2023 at 13:22'04'', registering an increase of 10.26°. As a result, the shortest day of this month was 12 hours, 45 minutes, 2 seconds on 1.IV.2023, and the longest was 14 hours, 9 minutes, 27 seconds on 30.IV. 2023, the length of the day increasing by 1 hour, 27 minutes and 28 seconds. The year-to-year variations of these values are small. As a result, the heating becomes persistent and more intense, the intensity of UV radiation increases. April is the fiery month of spring. The length of the day exceeds, during 20 days, two important thresholds: 13 hours (6.IV) and 14 hours (27.IV). April is the first month of the hot season (the hot season includes the months: April, May, June, July, August, September), but also the first month of the year in which daytime maximum temperatures can reach and exceed 35°C, thus registering the phenomenon of heatwave. The absolute thermal extremes of April in Oltenia are; -7.8°C recorded on April 7, 2003 in Bâcleș and 35.5°C on April 10, 1985, *Oltenia holding the absolute maximum temperature record for April for the whole of Romania. The average monthly temperature increases* in April compared to the first spring month - March are between 5.3°C in Voineasa and 7.4°C in Polovragi, and the increase in the overall monthly average for the entire region is 6.2°C, being ***the biggest increase since one month to another, of the average monthly temperature throughout the year***, which justifies the rapid arrival of the warm season and the "explosion" of vegetation creating the impression that summer has arrived directly.

In May for the central latitude of Oltenia (Craiova) the altitude of the Sun at solar noon for each day of this month varies between: the minimum angle of 60.63° on 1.V.2023 at 13:21'56'' and the maximum angle of 67.53° on 31.V.2023, at 13:22'27'', registering an increase of 6.90°. The shortest day of this month is 14 hours, 12 minutes, 7 seconds on May 1, 2023, and the longest day of the month is 15 hours, 16 minutes, 8 seconds on May 31, 2023, approaching -more than the maximum length of the day of the year of ***15 hours, 31 minutes, 47 seconds*** which was reached on 21.VI.2023. In May, the length of the day registers an increase of 1 hour, 6 minutes and 46 seconds. As a result, from 21.V to 22.VII, the length of the day is ≥15 hours (for 62 days). From the date of 22.VII to the date of 23.VIII

[3] ***March is the first month of the year when, in Romania, the air temperature can reach and exceed 30°C*** (32.8°C in Odobesti in March 1952 and 30.8°C in Constanta).

[4] ***The day when the maximum air temperature is ≥25°C is called "summer day"*** (cf. meteorological terminology).

(for 33 days) the star Sirius rises and sets with the Sun, an aspect called the astronomical canicula, from the name of the Sirius star. So in the course of a year, the hot season starts with 22.V and ends on 9.IX or even 15.IX lasting 117 days. Summer holidays (beginning on 26.V) signify the beginning of the warm season in popular tradition. For Romania, *the absolute maximum monthly temperature of May is 40.8°C* recorded in Mărculeşti in Bărăgan on 27.05.1950, thus being *the first month of the year in which in Romania the air temperature can reach and exceed 40°C*. At the same time, 36.6°C was recorded in Bucharest. *The absolute thermal maximum of May in Oltenia is 39.6°C recorded in Corabia on 27.V.1950.* Also on that date: 37.7°C at Leu, 38.0°C at Caracal, 37.5°C at Tg were also recorded. Jiu, and in Calafat 36.5°C in 1908. *May 6 is the first day of May when the earliest heat waves of May can occur* (eg: 6.V.1968, 6.V.2015). *The absolute minimum monthly temperature of May in Romania is -9.6°C* recorded on the night of 14-15.05.1940 at Câmpulung Moldovenesc, being the last month of the year when the thermal minimums can be negative in our country. On 05.03.2007 at Miercurea Ciuc, a minimum of -7.7°C was recorded, being the lowest May temperature at this station in the last 13 years. In some years, especially in the first part of the month (in the first half), there is still frost and snow in the mountain area. Snowfall in the mountain area in May occurs in almost all countries on the European continent (eg: snowfall in the area with an altitude of ≥700 m on 4.05.2010 in eastern Spain). *The multiannual monthly average of the air temperature* calculated for the entire Oltenia region with the values from all the relief steps and data from the meteorological stations with long strings, *in May, is 15.4°C*, recording an average increase of 5°C compared to April, being the third large increase in temperature (≥5.0°C) during the year after the increase in temperature in March and April, foreshadowing the arrival of hot summer time. The "*equatorial horn*[5]" does not allow the direct exchange of air masses between the two spheres 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 southwestern Romania (Oltenia) (Marinică 2006, Marinică & A.F. Marinică 2016, 2019, 2022).

2. DATA AND METHODS USED

To carry out the work, I used the data from the synoptic archives, the synoptic maps available on the Internet from international weather forecasting centers, the ANM website, satellite information as well as information published

[5] ***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.

in the written press. After data processing and comparisons, the Hellmann Criterion[6] was used, and the multi-year averages for the interval 1901-1990 (last century) were considered as normal values. 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 seasonal air temperature averages, 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 average of the springs, calculated for the entire Oltenia region, was between ***8.01°C in 1987, the coldest spring***, *with a deviation from the normal of -2.49°C and 12.77°C in 2007 the warmest spring, classified by the Hellmann criterion as a warm spring (C), with a deviation from normal of 2.27°C. The variance of the seasonal temperature averages was 4.77°C* (Table 1).

There were ***29 summers in the warm spring class (46.0%)*** (comprising warm (CL), warm (C), very warm (FC) and excessively warm springs (EC)), ***21 normal springs (N)***, i.e. 33.33%m and ***13 springs in the cold spring class*** (which includes cool (RC), cold (R), very cold (FR) and exceptionally cold (ER) summers). Of these, the warmest was in the spring of 2007 with the seasonal average of 12.77°C and ***the deviation from the normal of 2.27°C (the largest spring seasonal deviation recorded so far - absolute climate record). No spring had a seasonal mean of 13.0°C and only 12 springs had a seasonal mean ≥12.0°C.***

Neither very warm (FC) nor excessively warm (EC) spring was recorded, indicating that seasonal deviations greater than 2.27°C are possible in the future.

Climate warming is highlighted by the 2007-2020 interval when, of the 14 years, one spring was thermally normal, two warmish (slightly warmer than normal) and 11 warm springs (Table 1). We note that climate warming is not climate change, because climate warming has happened in other periods and will in the future, which means climate variability within certain limits so as to maintain the existence of life on Earth and especially of man.

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

Table 1. Seasonal temperature averages in spring and the type of springs according to the Hellmann criterion, in the interval 1961-2023 (63 years)

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	11,84	1,36	C	1982	9,97	-0,53	N	2003	10,98	0,48	N
1962	10,08	-0,38	N	1983	12,54	2,04	C	2004	10,80	0,30	N
1963	9,79	-0,67	RC	1984	9,67	-0,83	RC	2005	10,35	-0,15	N
1964	9,43	-1,03	RC	1985	10,79	0,29	N	2006	10,97	0,47	N
1965	*8,84*	-1,62	R	1986	11,42	0,92	CL	2007	**12,77**	2,27	C
1966	11,50	1,04	CL	1987	***8,01***	-2,49	R	2008	12,17	1,67	C
1967	11,13	0,67	CL	1988	10,26	-0,24	N	2009	11,73	1,23	C
1968	12,48	2,02	C	1989	12,25	1,75	C	2010	11,34	0,62	CL
1969	9,63	-0,83	RC	1990	12,04	1,54	C	2011	10,70	0,20	N
1970	10,37	-0,09	N	1991	9,33	-1,17	R	2012	12,31	1,81	C
1971	10,44	-0,02	N	1992	10,86	0,36	N	2013	11,84	1,34	C
1972	11,63	1,17	C	1993	10,43	-0,07	N	2014	11,95	1,45	C
1973	10,18	-0,28	N	1994	12,17	1,67	C	2015	11,62	1,12	C
1974	9,37	-1,09	R	1995	10,49	-0,01	N	2016	11,98	1,48	C
1975	12,02	1,56	C	1996	9,67	-0,83	RC	2017	12,08	1,58	C
1976	9,81	-0,65	RC	1997	9,70	-0,80	RC	2018	12,63	2,13	C
1977	11,29	0,79	CL	1998	10,79	0,29	N	2019	11,97	1,47	C
1978	10,10	-0,49	N	1999	11,18	0,68	CL	2020	11,45	0,95	CL
1979	11,01	0,42	N	2000	12,45	1,95	C	2021	9,22	-1,28	R
1980	9,11	-1,48	R	2001	11,89	1,36	C	2022	10,69	0,19	N
1981	10,53	-0,06	N	2002	12,34	1,84	C	2023	10,97	0,47	N

(ΔT = deviation of the seasonal average temperature from normal (n=10.50°C) (°C), types of springs: N=normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

Until 1999, after an interval of 2-4 cool, cold or normal springs in the series of values appeared an interval of 1-3 warmer-than-normal springs, then the sequence changed and 4 warmer-than-normal springs appeared (1999 -2002), then 4 thermally normal springs (2003-2006) and then the 14-year interval we talked about, which shows that there is no rule of occurrence of the type of springs, and these occurrences are random according to the combinations of cosmic factors and terrestrials that determine the type of spring. For the period 2007-2020 we note solar activity at its peak with a peak in 2022-2023 and El Nino at its peak with the prospect of becoming a super El Nino in 2023-2024.

The class of warmer-than-normal springs predominates, comprising 46.0% of the total number of springs approaching 50.0%, which is normal since two of the spring months are part of the warm season. The 10 warmest springs compared to normal (Table no. 2) have been recorded since 1968, and their occurrence is in random order, interspersed with cold, cool and thermally normal springs.

Neither spring was very cold (FR) nor excessively cold (ER), which shows ***a certain stability of the climate***. The classes of cool (RC) and warmish (CL) springs are close to normal and therefore the class of near-normal springs (APN) comprises 35 springs (55.56% of the total).

Table 2. The 10 warmest springs and the 10 coldest springs and the type of springs according to the Hellmann criterion, in the interval 1961-2023

No. crt.	The 10 warmest springs				The 10 coldest springs			
	Year	md	Δt	CH	Year	md	Δt	CH
1	2007	**12,77**	2,27	C	1987	**8,01**	-2,49	R
2	2018	12,63	2,13	C	1965	8,84	-1,62	R
3	1983	12,54	2,04	C	1980	9,11	-1,48	R
4	1968	12,48	2,02	C	2021	9,22	-1,28	R
5	2000	12,45	1,95	C	1991	9,33	-1,17	R
6	2002	12,34	1,84	C	1974	9,37	-1,09	R
7	2012	12,31	1,81	C	1964	9,43	-1,03	RC
8	1989	12,25	1,75	C	1969	9,63	-0,83	RC
9	1994 2008	12,17	1,67	C	1984; 1996	9,67	-0,83	RC
10	2017	***12,08***	1,58	C	1997	***9,70***	-0,80	RC

(md= mean, ΔT = deviation of the seasonal average temperature from normal, N=normal; R=cold, RC= cool, CL=warmish, C=warm, FC=very warm)

This aspect is normal considering that spring marks the transition from the cold to the warm season, and the spring equinox marks the transition from the negative to the positive thermal balance, an aspect directly related to the radiative balance. The spring of 1968 ranked 4th in descending order with an average of 12.48°C shows that there were also warm springs before the 2007-2020 interval. Only 6 springs were cold (R) and only two had seasonal mean ≤ 9.0°C.

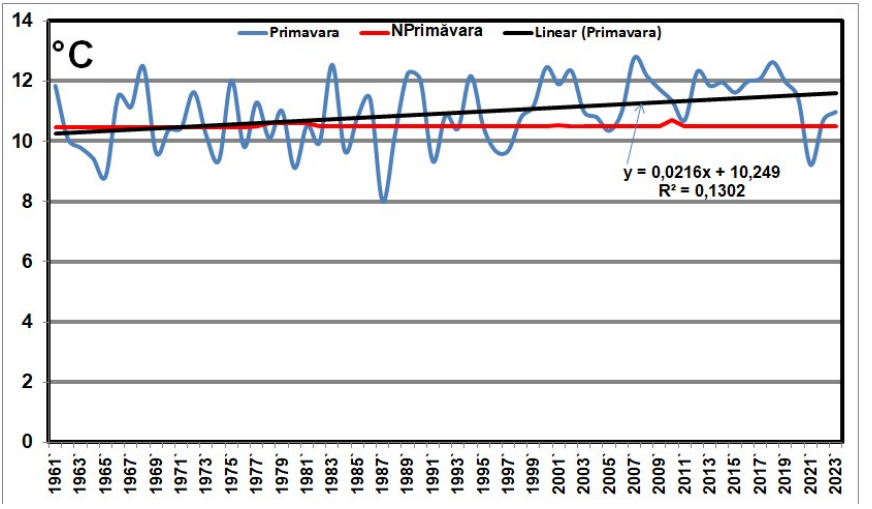

Fig. 1. Variation of the seasonal mean air temperature for springs in the interval 1961-2023 (Source: processed data).

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 0.0216. We note on this graph the 12 maxima located in the range of values [12.02°C, 12.77°C], i.e. higher than 12.0°C but very close to 12.0°C.

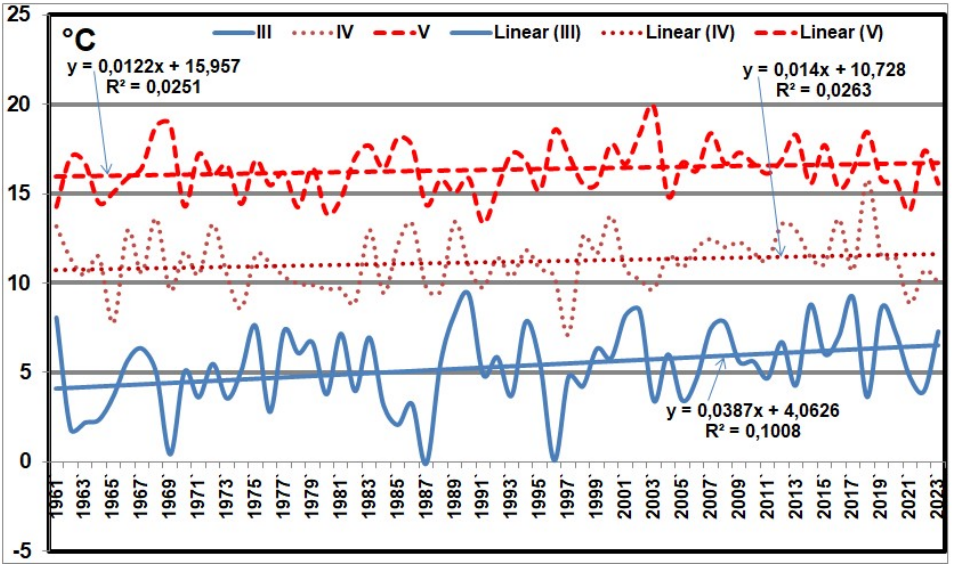

Fig. 2. The variation of the average monthly air temperature in the spring months from the interval 1961-2023. (Source: processed data).

To these we can add 6 more values close to 12.0°C but lower: 11.84°C (for the springs of 1961 and 2013), 11.89°C (for the spring of 2001); 11.95°C (for spring 2014), 11.97°C (for spring 2019) and 11.98°C (for spring 2016), we get a total of 18 maxima distributed relatively evenly over the 63-year interval taken into study. For the entire period of 63 years, the average spring season calculated for the entire Oltenia region is 10.94°C with a deviation from normal of 0.44°C, which according to the Hellmann criterion means a period with thermally normal springs on average[7].

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

Monthly air temperature averages in March ranged from -0.1°C in 1987 to 9.35°C in 1990 (a temperature range of 9.46°C), and the deviations of these values

[7] 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".***

from of normal (n) were between -4.73°C to 4.72°C (almost symmetrical limits compared to 0°C) (Table 3). According to the Hellmann criterion, 16 colder months were recorded than normal (R+RC) (25.4%); 16 months thermally normal (N) (25.4%) and 31 months warmer than normal (49.2%) (CL+C). Not recorded neither very cold (FR) nor excessively cold (ER) March, nor very warm (FC) nor excessively warm (EC) March Number of near-normal Marches (APN=RC+N+CL) was 36 (57.1%), a normal aspect considering the great transformations occurring in cosmic causes.

There have been 20 warm Marches (C) (31.7%), and most of the 10 warmest Marches (except for one in 1961) have occurred since 1989. In the period 1999-2023 (over 25 years), most Marches (17) were warmer than normal, highlighting climate warming in March. There were only 7 cold Marches (R) (11.1%), all before 1997 and 9 cool Marches (14.3%).

The graph of the variation of the average monthly temperature in March for the 63 years shows a slight upward trend with the lowest coefficient of increase among all three months at 0.0122 (Fig. 2). In Fig. 2, we note that no curve of variation of the three months intersects another, which shows that no month of March was as warm as April or as May, and so we can say that no month of April it was as cold as March, &c.

Table 3. Temperature averages recorded in March and month type according to the Hellmann criterion, in the interval 1961-2021

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	**8,07**	3,45	C	1982	3,96	-0,67	N	2003	3,41	-1,22	RC
1962	1,82	-2,79	R	1983	6,96	2,33	C	2004	6,01	1,38	CL
1963	2,19	-2,42	R	1984	3,15	-1,48	RC	2005	3,43	-1,20	RC
1964	2,36	-2,25	R	1985	2,07	-2,56	R	2006	4,65	0,02	N
1965	3,66	-0,95	RC	1986	3,24	-1,39	RC	2007	7,45	2,82	C
1966	5,66	1,05	CL	1987	***-0,10***	-4,73	R	2008	7,81	3,18	C
1967	6,34	1,73	CL	1988	5,51	0,88	N	2009	5,60	0,97	CL
1968	5,03	0,42	N	1989	8,28	3,65	C	2010	5,62	0,83	N
1969	0,42	-4,19	R	1990	**9,35**	4,72	C	2011	4,68	0,05	N
1970	5,04	0,43	N	1991	4,88	0,25	N	2012	7,25	2,62	C
1971	3,61	-1,00	RC	1992	5,85	1,22	CL	2013	4,29	-0,34	C
1972	5,48	0,87	CL	1993	3,70	-0,93	N	2014	8,79	4,16	C
1973	3,54	-1,07	RC	1994	7,85	3,22	C	2015	6,04	1,41	CL
1974	5,11	0,50	N	1995	5,49	0,86	N	2016	7,01	2,38	C
1975	7,61	3,00	C	1996	0,07	-4,56	R	2017	9,20	4,57	C
1976	2,79	-1,82	RC	1997	4,75	0,12	N	2018	3,63	-1,00	RC
1977	7,33	2,70	C	1998	4,22	-0,41	N	2019	8,61	3,98	C
1978	6,08	1,33	CL	1999	6,33	1,70	CL	2020	7,24	2,61	C
1979	6,67	1,92	CL	2000	5,81	1,18	CL	2021	4,74	0,11	N
1980	3,78	-0,97	N	2001	8,16	3,53	C	2022	3,96	-0,67	N
1981	7,17	2,42	C	2002	8,47	3,84	C	2023	7,29	2,66	C

(ΔT = deviation of the seasonal average temperature from normal (n=4.64°C), N=normal; R=cold, RC =cool, CL=warmish, C=warm, FC=very warm)

Table 4. Warmest 10 March and coldest 10 March and month type according to the Hellmann criterion, in the interval 1961-2021

No. crt.	The warmest 10 months of March				The coldest 10 months of March			
	Year	md	Δt	CH	Year	md	Δt	CH
1	1990	**9,35**	4,72	**C**	1987	***-0,10***	-4,73	**R**
2	2017	9,20	4,57	**C**	1996	0,07	-4,57	**R**
3	2014	8,79	4,16	**C**	1969	0,42	-4,19	**R**
4	2019	8,61	3,98	**C**	1962	1,82	-2,79	**R**
5	2002	8,47	3,83	**C**	1985	2,07	-2,56	**R**
6	1989	8,28	3,65	**C**	1963	2,19	-2,41	**R**
7	2001	8,16	3,53	**C**	1964	2,36	-2,25	**R**
8	1961	8,07	3,45	**C**	1976	2,79	-1,81	**RC**
9	1994	7,85	3,21	**C**	1984	3,15	-1,49	**RC**
10	2008	***7,81***	3,18	**C**	1986	3,24	-1,39	**RC**

(ΔT = seasonal mean temperature deviation from normal, N=normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

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 (our planet's main source of energy).

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

The monthly averages of the air temperature in April were between 7.13°C in 1997 and 15.79°C in 2018, this maximum average value being greater than twice the minimum average value of the monthly average temperature (Table 5).

The deviations of these values from normal (n=10.89°C) were between -3.76°C in 1997 and 4.89°C in 2018, a range of values almost symmetrical to the 0°C deviation, which shows that the negative deviations are almost offset by the positive ones.

This aspect is confirmed by the overall average for the 63 years of April which is 11.18°C and with the deviation from the normal of 0.29°C, which according to the Hellmann criterion shows that on average in these 63 years the month of April was thermally normal (N).

Table 5. Temperature averages recorded in April and month type according to the Hellmann criterion, in the interval 1961-2023

Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type
1961	13,18	2,27	C	1982	8,91	-1,98	R	2003	9,67	-1,22	RC
1962	11,36	0,50	N	1983	12,98	2,09	C	2004	11,54	0,65	N
1963	10,45	-0,41	N	1984	9,43	-1,46	RC	2005	10,87	-0,02	N
1964	11,45	0,59	N	1985	12,15	1,26	CL	2006	11,96	1,07	CL
1965	7,76	-3,10	R	1986	13,33	2,44	C	2007	12,48	1,59	CL
1966	12,94	2,08	C	1987	9,75	-1,14	RC	2008	12,01	1,12	CL
1967	10,59	-0,27	N	1988	9,55	-1,34	RC	2009	12,29	1,40	CL
1968	13,63	2,77	C	1989	13,43	2,54	C	2010	11,70	0,58	CL
1969	9,60	-1,26	RC	1990	10,91	0,02	N	2011	11,28	0,39	N
1970	11,76	0,90	N	1991	9,76	-1,13	RC	2012	13,31	2,42	C
1971	10,46	-0,40	N	1992	11,41	0,52	N	2013	12,95	2,06	C
1972	13,33	2,47	C	1993	10,36	-0,53	N	2014	11,48	0,59	N
1973	10,41	-0,45	N	1994	11,85	0,96	N	2015	11,09	0,20	N
1974	8,59	-2,27	R	1995	10,79	-0,10	N	2016	13,60	2,71	C
1975	11,57	0,71	N	1996	10,38	-0,51	N	2017	10,71	-0,18	N
1976	11,16	0,30	N	1997	**7,13**	-3,76	R	2018	**15,79**	4,90	C
1977	10,37	-0,52	N	1998	12,58	1,69	CL	2019	11,50	0,61	N
1978	9,96	-0,97	RC	1999	11,65	0,76	N	2020	11,40	0,51	N
1979	9,89	-1,04	RC	2000	13,76	2,87	C	2021	8,86	-2,03	R
1980	9,66	-1,27	RC	2001	10,82	-0,07	N	2022	10,70	-0,19	N
1981	9,68	-1,25	RC	2002	10,21	-0,68	N	2023	10,10	-0,79	N

(md = average, n=10.89°C, ΔT = deviation of the seasonal average temperature from normal, N=normal; R= cold, RC=cool, CL=warmish, C=warm, FC=very warm)

Table 6. The warmest 10 months of June and the coldest 10 months of April and the type of months according to the Hellmann criterion, in the interval 1961-2023

No. crt.	The warmest 10 months of April				The coldest 10 months of April			
	Year	md	Δt	CH	Year	md	Δt	CH
1	2018	**15,79**	4,89	C	1997	**7,13**	-3,76	R
2	2000	13,76	2,87	C	1965	7,76	-3,09	R
3	1968	13,63	2,77	C	1974	8,59	-2,27	R
4	2016	13,60	2,71	C	2021	8,86	-2,03	R
5	1989	13,43	2,53	C	1982	8,91	-1,99	R
6	1972	13,33	2,47	C	1984	9,43	-1,46	RC
7	1986	13,33	2,44	C	1988	9,55	-1,34	RC
8	2012	13,31	2,42	C	1969	9,6	-1,26	RC
9	1961	13,18	2,27	C	1980	9,66	-1,27	RC
10	1983	***12,98***	2,09	C	2003	***9,67***	-1,22	RC

(md= average, n=10.89°C, ΔT = deviation of the seasonal average temperature from normal, N=normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

The 10 warmest Aprils have mostly been recorded since 1986 with the exception of two months in 1961 and 1968 (ranked 3rd in descending order). The distance between the average values is small on the order of hundredths or tenths of a degree (Table 6) with the exception of the value of the 1st place (April 2018

which is separated from the one of the 2nd place by 2.03°C, which shows that the variability of the average monthly temperature can be high, with an average frequency of 1.59%, that is, once or at most 2 times in 100 years. ***The month of April 2018 was the warmest in the entire history of climate observations*** (according to monthly averages and deviations). ***The monthly average for the whole of Oltenia*** in 2018 of ***15.8°C is an absolute climate record*** for the entire observation period (1894-2018), for this parameter.

The 10 coldest April months were recorded in different years located throughout the studied range at variable time intervals. We note the 2006-2018 interval with the higher frequency of months warmer than normal but mostly close to normal (CL) (Table 5). So ***in April, the climate warming was not spectacular and there is no reason to declare a climate emergency***.

The graph of the monthly temperature averages in April has a slightly increasing linear trend, and the growth coefficient is 0.014, which is higher than that of March by 0.0018.

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

The monthly air temperature averages in May, in the analyzed interval, fell between 13.35°C (the lowest monthly average) recorded in 1991 and 19.87°C (the highest average) recorded in 2003. Therefore, all 63 average monthly values were distributed over an interval with the length of 6.52°C (Table 7*). 21 warmer-than-normal May months* (Cl and C) were recorded (33.3%), No very warm (FC) or excessively warm (EC) months were recorded. We note the random distribution of thermal weather types in May. Of the 21 months warmer than normal, 16 (76.2%) were recorded in the period 1982-2023, i.e. over 42 years, an aspect that can be considered related to climate warming. The 10 warmest Mays were randomly distributed over the entire 63-year interval. The same can be said about the *11 colder-than-normal months of May* that were randomly distributed over the 63-year interval, and of these only 2 Mays were cold and the others cool, that is, close to normal.

The largest deviation from normal was 3.89°C in 2003 and the smallest - 2.63°C in 1991, both after 1990. The range of deviations [-2.63°C, 3.89° C] is asymmetric with respect to 0°C, i.e. 1.23°C longer on the side of positive deviations than on the side of negative deviations, an aspect directly related to the rapid warming of the weather in May and the early spring heat waves in May intense and longer, which shows that this is how the climate will always evolve in May. The months closer to normal (APN=N+CL+RC) were 52, i.e. 82.5% of the total.

Table 7. Temperature averages recorded in May and month type according to the Hellmann criterion, in the interval 1961-2023

Year	Average	ΔT	Type	Year	Average	ΔT	Type	Year	Average	ΔT	Type
1961	14,27	-1,68	RC	1982	17,04	1,06	CL	2003	**19,87**	**3,89**	C
1962	17,05	1,14	CL	1983	17,69	1,71	CL	2004	14,86	-1,12	RC
1963	16,72	0,81	N	1984	16,42	0,44	N	2005	16,75	0,77	N
1964	14,49	-1,42	RC	1985	18,14	2,16	C	2006	16,29	0,31	N
1965	15,08	-0,83	N	1986	17,69	1,71	CL	2007	18,39	2,41	C
1966	15,89	-0,02	N	1987	14,38	-1,60	RC	2008	16,70	0,72	N
1967	16,46	0,55	N	1988	15,79	-0,19	N	2009	17,31	1,33	CL
1968	18,79	2,88	C	1989	15,05	-0,93	N	2010	16,69	0,43	N
1969	18,88	2,97	C	1990	15,87	-0,11	N	2011	16,13	0,15	N
1970	14,31	-1,60	RC	1991	***13,35***	***-2,63***	R	2012	16,91	0,93	N
1971	17,23	1,32	CL	1992	15,31	-0,67	N	2013	18,29	2,31	C
1972	16,08	0,17	N	1993	17,24	1,26	CL	2014	15,57	-0,41	N
1973	16,60	0,69	N	1994	16,81	0,83	N	2015	17,73	1,75	CL
1974	14,44	-1,47	RC	1995	15,19	-0,79	N	2016	15,32	-0,66	N
1975	16,88	0,97	CL	1996	18,55	2,57	C	2017	16,33	0,35	N
1976	15,49	-0,42	N	1997	17,20	1,22	CL	2018	18,47	2,49	C
1977	16,17	0,19	N	1998	15,57	-0,41	N	2019	15,80	-0,18	N
1978	14,25	-1,85	RC	1999	15,56	-0,42	N	2020	15,70	-0,28	N
1979	16,46	0,36	N	2000	17,79	1,81	CL	2021	14,05	-1,93	RC
1980	13,89	-2,21	R	2001	16,67	0,69	N	2022	17,40	1,42	CL
1981	14,74	-1,36	RC	2002	18,35	2,37	C	2023	15,57	-0,41	N

(normal n=15.97°C ΔT = deviation of the seasonal average temperature from normal (°C), N=normal; R= cold, RC=cool, CL=warmish, C=warm, FC=very warm)

Table 8. The warmest 10 months of May and the coldest 10 months of May and the type of months according to the Hellmann criterion, in the interval 1961-2023

No. crt.	The warmest 10 months of May				The coldest 10 months of May			
	Year	md	Δt	CH	Year	md	Δt	CH
1	2003	**19,87**	3,89	C	1991	**13,35**	-2,63	R
2	1969	18,88	2,96	C	1980	13,89	-2,21	R
3	1968	18,79	2,87	C	2021	14,05	-1,93	RC
4	1996	18,55	2,57	C	1978	14,25	-1,85	RC
5	2018	18,47	2,49	C	1961	14,27	-1,68	RC
6	2007	18,39	2,41	C	1970	14,31	-1,60	RC
7	2002	18,35	2,37	C	1987	14,38	-1,60	RC
8	2013	18,29	2,31	C	1974	14,44	-1,47	RC
9	1985	18,14	2,16	C	1964	14,49	-1,42	RC
10	2000	***17,79***	1,81	CL	1981	14,74	-1,36	RC

(ΔT = deviation of the seasonal average temperature from normal (normal n=15.97°C), N= normal; R=cold, RC=cool, CL=warmish, C=warm, FC=very warm)

They show that May thermal types follow ***a normal statistical distribution*** with skewness towards warmer-than-normal May months. *The average air temperature in May* for the entire studied interval is 16.35°C, and the deviation

from normal is 0.37°C, which shows that on average, in the 63 years, May was thermally normal. So again we note that there is no reason for a "climate emergency". *The graph of the average monthly temperature variation* in May has a linear growth trend with the growth coefficient of 0.0387 (fig. 2) being the highest among the spring months.

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

Due to the astronomical processes discussed above, seasonal thermal minima are always recorded in March, 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 March.

Table 9. Minimum temperatures recorded during the springs, in the interval 1961-2023

Year	Tmin	Date	Station	Year	Tmin	Date	Station	Year	Tmin	Date	Station
1961	-7,2	1.III	450	1982	-8,3	22.III	344	2003	-12,4	23.III	319
1962	-12,6	19.III	319	1983	-10,6	4.III	344	2004	-12,0	7.III	319
1963	-20,8	1.III	319	1984	-10,2	21.III	319	2005	-19,4	2.III	319
1964	-15,3	10.III	341	1985	-12,0	13.III	341	2006	-16,1	9.III	319
1965	-19,4	1.III	319	1986	-19,4	29.III	319	2007	-3,8	14.III	319
1966	-7,5	16.III	319	1987	***-27.0***	***5.III***	341	2008	-6,2	20.III	369;319
1967	-6,5	6.III	319	1988	-11,6	4.III	319	2009	-7,7	20.III	369
1968	-13,5	4.III	341	1989	-5,0	3.III	319	2010	-10,1	7.III	344
1969	-13,5	8.III	341	1990	-8,4	17.III	369	2011	-15,2	5.III	341
1970	-13,5	8.III	319	1991	-12,4	5.III	341	2012	-10,9	7.III	319
1971	-16,6	13.III	319	1992	-8,4	18.III	341	2013	-6,9	5.III	319
1972	-15,0	13.III	341	1993	-12,8	6.III	319	2014	**-3,5**	**1.III**	319
1973	-9,0	1.III	369	1994	-5,4	19.III	319	2015	-5,9	20.III	344
1974	-7,3	2.III	319	1995	-10,2	14.III	344	2016	-5,0	17.III	341
1975	-7,6	1.III	369	1996	-14,3	5.III	319	2017	-5,0	27.III	319
1976	-13,2	6.III	319	1997	-10,7	19.III	319	2018	-24,8	1.III	369;341
1977	-8,8	1.III	341	1998	-10,1	13.III	319	2019	-7,8	13.III	341
1978	-5,7	13.III	319	1999	-6,8	18.III	344	2020	-7,5	17.III	369
1979	-6,8	1.III	369	2000	-9,0	20.III	344	2021	-8,4	8.III	369
1980	-13,1	1.III	369	2001	-5,5	8.III	319	2022	-11,5	12.III	319
1981	-9,7	2.III	319	2002	-6,8	18.III	341	2023	-7,1	30.III	369

(°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) (Source: ANM Archive)

In March, the minimum temperature is recorded most frequently in the first two decades and less often in the last decade, and the area in which it is recorded is the one in the north of Oltenia, the Voineasa Intramontane Depression (32 cases, i.e. 50.8%), in the Subcarpathian Depressions Apa Neagră (7 cases, i.e. 11.1%) and Polovragi (located at the foot of Muierii Hill[8] to the East of it) (14 cases, i.e.

[8] ***The Muierii hill*** is the longest hill in Romania (over 120 km long and is the Cumpăna Apelor between the hydrographic basin of Jiului and that of Olteţu, 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.

22.2%), with lower frequency at Tg. Logrești located at the foot of Muierii Hill to the west of it in the area of Foehn descent (11 cases i.e. 17.5%; Table no. 9) 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 (1 case, i.e. 1.6%). In the 63 years analysed, ***the absolute minimum temperature was -27.0°C recorded at Apa Neagră on 5.III.1987, which is also the absolute minimum temperature for the entire period of climate observations, and at the level of Romania*** *the minimum temperature absolute temperature of March of -31.4°C at Intorsura Buzăului on 9.III.1952*.

We note that in March, around the 20th of March, intense cooling of the weather occurs frequently. So in March the monthly minimum temperatures have never been positive and never will be. The 10 lowest seasonal minimum temperatures were mostly ≤ -15°C (9 out of 10, i.e. 90.0%) (Table no. 10). The 10 highest seasonal minimum temperatures were all ≥−3.5°C, which confirms the above statement.

Table 10. The 10 highest spring thermal minimums and the 10 lowest spring thermal minimums, in the interval 1961-2023

No. crt.	The highest 10 minima				The lowest 10 minima			
	Year	Tmin	Date	Station	Year	Tmin	Date	Station
1	2014	**-3,5**	**1.III**	319	1987	**-27,0**	***5.III***	341
2	2007	-3,8	14.III	319	2018	-24,8	1.III	369;341
3	1989 2016 2017	-5,0	3.III 17.III 27.III	319	1963	-20,8	1.III	319 341 319
4	1994	-5,4	19.III	319	1965 1986 2005	-19,4	1.III 29.III 2.III	319
5	2001	-5,5	8.III	319	1971	-16,6	13.III	319
6	1978	-5,7	13.III	319	2006	-16,1	9.III	319
7	2015	-5,9	20.III	344	1964	-15,3	10.III	341
8	2008	-6,2	20.III	369;319	2011	-15,2	5.III	341
9	1967	-6,5	6.III	319	1972	-15,0	13.III	341
10	1979 1999 2002	***-6,8***	***1.III*** ***18.III*** ***18.III***	369 344 341	1996	***-14,3***	***5.III***	319

(°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) (Source: ANM Archive)

In March, the maximum temperatures are usually recorded in the last decade or even in the last pentad. For the analyzed interval (1961-2023), the 10 highest maximum temperatures in March were between 26.1°C recorded in Calafat on 21.III.2004 and in Bechet on 31.III.2018 and 29.0° C registered on 31.III.1975 in Bechet. *In Oltenia, the absolute maximum temperature of March is 29.5°C recorded at Dr. Tr. Severin on 23.III.1927, a value not surpassed until now for 97 years, which disproves climate warming and confirms the variability of air temperature.*

At the level of Romania, ***the absolute maximum value of the air temperature is 32.8°C recorded on 30.III.1952 in Odobeşti, a value not surpassed until now for 72 years*****,** i.e. in the last century it was even warmer in March in certain periods of time. The 10 lowest monthly maximum temperatures were between 14.0°C recorded on 30.III.1996 at Dr. Tr. Severin and 21.8°C at Calafat on 31.III.1976, distributed on an interval with the length of 7.8°C. The time distribution of these values is random and disproves the existence of climate warming in March.

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

Due to the astronomical processes that I spoke about above, seasonal thermal maxima are always recorded in May, 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 maximums of May. The presence of the relief of Oltenia in steps 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 meteorological stations: Bechet 22 years (34.9% of the years), Calafat 20 years (31 ,7.0%), Băilești 18 years (28.6%), Caracal 6 years (9.5%); Dr. Tr. Severin 3 years (4.8%), Drăgășani 1 year (1.6%). We note that in the period 2002-2023 for 22 years, in Băilești the seasonal spring thermal maximum has never been achieved, which shows that the Mediterranean influence, spring in May 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 at Bechet (12 years, i.e. 19.0%), so in the last 22 years the Mediterranean influence in the spring in May was more intense in the bordering part of Oltenia, to Bechet, Calafat and Dr. Tr. Severin (Table no. 11) normal appearance for several reasons, including the distance from the Mediterranean region but also the frequency of southern and southwest circulations. Another aspect is that starting from 1987, for 37 years, the seasonal thermal maximum has never been achieved in the Romanațiului Plain at Caracal, the causes are the same as those cited above.

The highest spring temperature for this interval in Oltenia was 39.4°C recorded on 20.V.2004 in Calafat (Dolj county). The 10 highest seasonal maximum temperatures were between 33.6°C recorded on 22.V.1983 and 17.V.2022 in Calafat and 14.V.2007 in Bechet and 39.4°C recorded on 20.V .2004 in Calafat. So they were recorded at Calafat and Bechet meteorological stations in the south-west and south of Otenia. The distribution over time, by years, is random. ***The absolute thermal maximum of May in Oltenia is 39.6°C*** *recorded in Corabia on 27.V.1950*. ***We therefore note that for 74 years (1950-2023) this value was not exceeded, disproving climate warming in May and confirming the variability of temperature values.*** We note the very small difference of only 0.2°C between the two values, possibly due to different locations having different local conditions. *In*

Romania, the absolute maximum monthly temperature of May is 40.8°C ***recorded in Mărculeşti in Bărăgan on 27.05.1950,*** May being thus *the first month of the year in Romania when the air temperature can reach and exceed 40°C . The same can be said about the absolute maximum value of May in Romania.*

The 10 lowest maximum temperatures in May were between 27.6°C, recorded on 25.V.1980 in Băilești and 29.7°C on 23.V.1975 at the same meteorological station, all these values were recorded within a temperature range of 2°C.

The minimum monthly temperatures in the warmest month of spring – May, during the analyzed period, calculated for the entire Oltenia region, were between -3.2°C recorded at Apa Neagră on 6.V.2011 and 5.8°C registered on 17.V.2003 in Bâcleș. We mention that the weather station Bîcleș is located in the Medințiului Hills and has an altitude of 309.0 m, which means that this value was achieved under the influence of the thermal inversion that is present almost permanently in Oltenia.

In 17 years out of the 63 monthly thermal minimums in May were negative (27.0%).

Table 11. Maximum temperatures recorded during the springs, in the interval 1961-2023

Year	Tmax	Date	Station	Year	Tmax	Date	Station	Year	Tmax	Date	Station
1961	29,6	30.V	494	1982	32,0	11.V	494; 469	2003	34,5	10.V	494
1962	32,8	30.V	482; 465	1983	33,6	22.V	482	2004	**39,4**	**20.V**	482
1963	29,5	27.V	469	1984	32,0	23.V	482	2005	31,4	31.V	482
1964	28,6	14.V; 15.V	465; 395	1985	31,1	22.V	465	2006	34,6	24.V	494
1965	33,7	19.V	482	1986	31,0	30.V	469	2007	33,6	14.V	494
1966	32,1	7.V	494	1987	28,8	18.V	465	2008	35,5	28.V	482
1967	30,5	17.V	494	1988	30,5	6.V	465	2009	32,4	22.V	494
1968	34,4	6.V	494	1989	32,7	13.V	465	2010	31,8	26.V	482
1969	37,0	16.V	494	1990	34,6	25.V	482	2011	30,2	30.V	482
1970	31,7	11.V	465	1991	28,0	4.V	465	2012	33,0	12.V	482
1971	31,2	21.V	482	1992	30,6	11.V	410	2013	33,1	19.V	482
1972	32,3	7.V;27.V	494;465	1993	35,0	28.V	494	2014	29,7	26.V	494
1973	32,7	22.V	469	1994	31,8	31.V	465	2015	31,8	6.V	494
1974	29,3	31.V	465	1995	31,8	31.V	465	2016	31,6	30.V	482
1975	29,7	23.V	465	1996	36,0	19.V	482	2017	32,2	31.V	410
1976	29,0	20.V	465;469	1997	33,5	8.V	465	2018	32,6	5.V	494
1977	33,7	21.V	494	1998	30,4	13.V	410; 340	2019	31,0	28.V	494
1978	29,9	1.V	494	1999	31,6	31.V	482; 494	2020	33,0	11.V	494
1979	30,4	28.V	469	2000	31,3	27.V	482	2021	31,8	2.V	482;494
1980	***27,6***	***29.V***	465	2001	32,6	31.V	465	2022	33,6	17.V	482
1981	29,2	27.V	465	2002	33,2	18.V	494	2023	29,4	24.V	482;494

(°C, Station = weather station, 482=Calafat, 494=Bechet, 465=Băilești, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg. Jiu)

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, late spring frosts are quite frequent in May (27.0%), that is, in almost one year out of three, late spring frosts can be recorded, especially in the north of the region. The meteorological stations where these thermal minimums of May were recorded are: Voineasa located in the intramontane Depression of the same name, in 40 years (64.5%), Polovragi (at the foot of Muierii Hill in the East) and Apa Neagră (located in Subcarpathian depressions) 8 years each (12.7%), Tg. Logrești (located at the foot of Muierii Hill in the West) with 6 years (9.5%), Tg. Jiu and Bâcles one year each (1.6%).

In the 63 years the monthly minimum temperatures in May for the entire region were distributed along an interval of length 9.0°C ([-3.2°C, 5.8°C]). ***The absolute minimum temperature of May in Oltenia*** for the entire period of climate observations is -3.2°C recorded on 6.V.2011 at Apa Neagră, and at the level of Romania ***-9.6°C recorded on the night of 14 /15.05.1940 at Câmpulung Moldovenesc, May, being the last month of the year when the thermal minimums can be negative in Romania.*** 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.

Table 12. The 10 highest thermal maxima of springs and the 10 lowest thermal maxima of springs, in the interval 1961-2023

No. crt.	The highest 10 maxima				The lowest 10 maxima			
	Year	Tmax	Date	Station	Year	Tmax	Date	Station
1	2004	**39,4**	20.V	482	1980	**27,6**	**29.V**	465
2	1969	37,0	16.V	494	1991	28,0	4.V	465
3	1996	36,0	19.V	482	1964	28,6	14.V; 15.V	465; 395
4	2008	35,5	28.V	482	1987	28,8	18.V	465
5	1993	35,0	28.V	494	1976	29,0	20.V	465;469
6	1990 2006	34,6	25.V 25.V	482 494	1981	29,2	27.V	465
7	2003	34,5	10.V	494	1974	29,3	31.V	465
8	1968	34,4	6.V	494	2023	29,4	24.V	482;494
9	1965 1977	33,7	19.V 21.V	482 494	1961	29,6	30.V	494
10	1983 2007 2022	***33,6***	22.V 14.V 17.V	482 494 482	1975	***29,7***	23.V	465

(°C, Station = weather station, 482=Calafat, 494=Bechet, 465=Băilești, 469=Caracal, 450=Craiova, 434=Slatina, 340=Tg. Jiu)
(Source: ANM Archive)

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

The monthly minimums for the entire Oltenia region in April were all negative and fell between -8.6°C recorded on 7.IV.2003 at Tg. Logrești and -0.4°C recorded on 25.IV.1989 at the weather stations Apa Neagră and Polovragi. For the analyzed interval, the monthly minimum temperatures fell within an interval of 8.2°C. This means that there has never been a year in which at least in the north of the region we did not have late spring frosts in April. Over time, at the level of the entire Northern Hemisphere, the month of April has been very capricious marked by a great variability of the air temperature with heat and cold waves and every year, with late spring snows in some areas and especially in mountain areas. So everything that happens in April is climate variability and not climate change. ***The absolute minimum temperature of April, in Oltenia, is -8.6°C recorded on 7.IV.2003 at Tg. Logrești, and in Romania the absolute minimum temperature in April is -9.4°C recorded in Iași on 4.IV.1963.*** The 10 lowest thermal minima were between -8.6°C at Tg. Logrești on 7.IV.2003 and between -5.1°C in Voineasa in 1996. The 10 highest thermal minimums of April fell between -2.2°C recorded in Voineasa on 19.IV .1978 and 8.IV.1994 at Polovragi and -0.4°C recorded in 1989 at Apa Neagră and Polovragi.

Table 13. The matrix of weather types in the spring months and the spring season as a whole in the interval 1961-2023

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

(III, IV, V= the type of thermal weather in the spring months; P= the type of thermal weather in the whole of the spring season)

The monthly maximums for the entire Oltenia region in April were between 22.4°C recorded at Dr. Tr. Severin on 15.IV.1984 and 35.5°C recorded on 10.IV.1985 at Bechet. ***The value of 35.5°C from 10.IV.1985 from Bechet is the absolute thermal maximum of April not only for Oltenia but also for Romania***, which shows that the warming of the weather starts early in the South-West of Romania and spreads quite quickly throughout the country. April 10th is only 20 days from the Vernal Equinox, and 35.0°C is the first heat wave, but in spring these temperature values do not last long and are particularly beneficial for the development of plants that react quickly to increases in temperature. We also note that values of 35°C and slightly higher in Romania in April were recorded only once (10.IV.1985), in the entire history of climate observations, and the second highest monthly thermal maximum in April for the whole of Oltenia, it was 33.5°C recorded in Bechet on 6.IV.1998, the year 1998, a year considered for a long time to be the warmest year after the global average for the entire planet Earth. All this actually shows a large variability of temperature values in April between certain limits favorable to biotic processes and does not support the idea of a continuous and unlimited climate warming.

4. CONCLUSIONS

During the spring season, there is the largest increase in the angle of maximum elevation of the Sun at noon, of 28.9°. Corresponding to this increase, the length of the day increases from 10 hours and 07' on 28.II to 15 hours and 17' on 1.VI, recording an increase of 5 hours and 10' and as a result the monthly temperature averages, calculated for the whole Oltenia normally increase, registering increases of 4.9°C in March over February, 6.1°C in April over March and 5.0°C in May over April. Of the 63 years studied, in only 5 springs (7.9%) (1983, 2000, 2007, 2009, 2013) all spring months were CL (warmish) or C (warm). Most warmer-than-normal springs occurred in the 1999-2020 range. Warmish springs (CL, 7 in total – 11.1%) (with deviations from normal between 0.6-1.0°C) are part of the class of those close to normal (APN). Warm springs (C, whose deviations from normal were between 1.1-2.5°C) were 22 (34.9%) which shows a climate warming trend compared to the last century, but in a certain sense is a normal aspect because the warming of the weather, the spring is particularly fast, and the percentage of 34.9% is close to 1/3, the ideal distribution would be 1/3 colder than normal springs, 1/3 thermally normal springs and 1/3 warmer than normal springs but air temperature variability is random in all months and seasons not just spring.

Over the period under review, increases were 4.68°C in March over February, 5.40°C in April over March and 5.63°C in May over April, all within normal deviation ranges.

Starting from the year 2021, an interruption of the string of warmer than normal springs is observed, which can be a signal that a period of climatic cooling will follow, just as the frosty interval 5-11.II.2023 can be interpreted as a precursory signal a future climate cooling. Future developments will confirm or deny this aspect. The old absolute thermal records for Oltenia and for the whole country were not surpassed, which shows that everything is within normal limits. In April, the climate warming is not detected. The systematic climate data are over a short interval, recorded since 1960, and are non-homogeneous 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 warmer than normal or normal months were followed by colder than normal months, and thermal alternations occur at the level of seasons and years, are a natural and normal way of climate evolution over longer or longer periods short of time. Therefore, the conclusions of some studies that state that there is a climate emergency are false alarms. Climate warming and cooling are produced by the combinations of cosmic factors that determine Earth's climate and cannot be combated or regulated by human action. We cannot make the absurd claim that on Earth the climate has no variation and should be constant as in a sealed laboratory. The claim that human activities have caused climate warming is not the result of climate studies, nor can it be the result of such studies, but is of a political nature and has a Nazi character, being intended to justify the reduction of the Earth's population from 8 billion to 2 billion (i.e. killing by any means 3 out of 4 people, until 2030), action packaged in the name of "World Reset".

REFERENCES

1. Marinică, I. (2006), *Fenomene climatice de risc în Oltenia,* Editura Autograf MJM, Craiova, 386 p. (Risk of Climatic Phenomena in Oltenia)
2. Marinică I., Marinică Andreea Floriana (2016), *Variabilitatea climatică în Oltenia şi schimbările climatice*, Editura Universitaria, Craiova, 306 p. (The Climate Variability in Oltenia and the Climatic Changes)
3. Marinică I, Andreea Marinică (2019), *Considerations Regarding the Variability of Earth-Sun Geometry and the Climate Variability in South-Western Romania*, Riscuri şi Catastrofe, Nr. XIX, Vol. 25, Nr. 2/2019; pp. 33-55.
4. Ion Marinică, Andreea Floriana Marinică, (2022) *Variability of Air Temperature During the Summer From the Period 1961-2022 In The Southwest Of Romania, In Context Of Climate Change* (2021); Riscuri și Catastrofe, An XXII, Vol. 30, Nr. 1/2022, pp: 35-53.