THE WARM OF WINTER 2023-2024 IN SOUTHWEST ROMANIA – A CLIMATIC RECORD

MARINICĂ Andreea Floriana, MARINICĂ Ion, CHIMIŞLIU Cornelia, DIACONU Luminița

Abstract. In the year 2023, climate warming continued to remain in the plateau phase. After the warm summer (C) with long and intense tropical heat waves, followed a very warm autumn (FC), which was the warmest in the history of the climate in Oltenia and, as a whole, normal in pluviometric terms (N). The winter of 2023-2024 was very warm (FC) with an overall seasonal average of 3.88°C and a deviation from normal of 4.83°C, being the ***warmest winter in the entire history of climate records for Oltenia***. February was warm on all days with mean daily highs ≥ 10.0°C on 26 days out of 29 (89.7% of days of the month) and ≥ 15.0°C on 14 days (48.3% of days). Throughout the winter, ***six winter heat waves were recorded in the intervals: 1-3.XII (3 days), 11-31.XII (21 days), 1-7.I (7 days), 16-19 .I (4 days), 25-31.I (7 days) and 1-29.II (29 days) totalling 71 days, i.e. 78.0% of winter days and a single cold wave in the interval 9-15.I with a duration of 7 days*.** No monthly temperature and rainfall records were recorded. The seasonal thermal average was 3.88°C and the deviation from normal (calculated for the last century) was 4.83°C, thus ***being the warmest winter in the history of the climate in Oltenia*** and surpassing the winter of 2006-2007 which occupied the first place until this year (2024). Most very warm winters (FC) have been recorded since 2000 (8 winters out of 25, i.e. 32.0%). So, in general, we are currently in a period of climate warming, a process related to the cycles of climate warming and cooling studied by the Serbian physicist Milankovitch, whose causes are of a cosmic nature.

Keywords: warm winter, monthly temperature averages, the Hellmann criterion, warm winter phenomena, vegetative processes.

Rezumat. Iarna caldă 2023-2024 în sud-vestul României – record climatic. În anul 2023 încălzirea climatică a continuat menținându-se în faza de platou. După vara caldă (C) cu valuri de căldură tropicală lungi și intense a urmat toamna foarte caldă (FC), cea mai caldă din istoria climatului în Oltenia și normală pluviometric în ansamblul ei (N), iar iarna 2023-2024 a fost foarte caldă (FC) cu media generală anotimpuală de 3,88°C și abaterea față de normală de 4,83°C, fiind ***cea mai caldă iarnă din toată istoria înregistrărilor climatice pentru Oltenia***. Luna februarie a fost caldă în toate zilele cu media maximelor zilnice ≥ 10,0°C în 26 de zile din 29 (89,7% din zilele lunii) și ≥ 15,0°C în 14 zile (48,3% din zile). În tot cursul iernii s-au înregistrat ***cinci valuri de căldură de iarnă în intervalele: 1-3.XII (3zile), 11-31.XII (21 zile), 1-7.I (7 zile), 16-19.I (4 zile), 25-31.I (7 zile) și 1-29.II (29 zile) însumând 71 de zile, adică 78,0% din zilele iernii și un singur val de frig în intervalul 9-15.I cu durata de 7 zile.*** Nu s-au înregistrat recorduri termice lunare și pluviometrice. Media termică anotimpuală a fost de 3,88°C și abaterea față de normală (calculată pentru secolul trecut) a fost de 4,83°C, fiind astfel ***cea mai caldă iarnă din istoaria climatului în Oltenia*** și surclasând iarna 2006-2007 care până în acest an (2024), era pe primul loc. Cele mai multe ierni foarte calde (FC) s-au înregistrat începând cu anul 2000 (8 ierni din 25 adică 32,0%). Așadar la modul general, actual ne aflăm într-o perioadă de încălzire climatică, proces care ține de ciclurile de încălziri și răciri climatice studiate de fizicianul sârb Milankovitch, ale căror cauze sunt de natură cosmică.

Cuvinte cheie: iarna foarte caldă, medii lunare de temperatură, criteriul Hellmann, fenomene de iarnă caldă, procese vegetative.

INTRODUCTION

Worldwide, the last nine years have been the hottest ever recorded globally. The year 2023 was the warmest on record globally in all global temperature records since 1850 and probably the warmest in the last 100,000 years. On average, the global temperature in 2023 was 14.98°C, 1.48°C warmer than in the pre-industrial period 1850-1900. The year 2023 was 0.17°C warmer than 2016, the previous warmest year - breaking the record by a "remarkable" margin. Of the nearly 30,700 days since 1940, the warmest 46 days were measured in 2023, all in the summer of 2023, in July and August (Courtesy of the EU's Copernicus Climate Change Service (C3S).

At the continental level, the year 2023 in Europe was the second warmest year in history. In Europe, average monthly temperatures were above normal in 11 of the 12 months, and September was the warmest month compared to the multi-year average, making it a true summer month. The winter of 2022-23 was the second warmest on record for Europe, and the summer was the fifth warmest. The autumn of 2023 on the European level was the second warmest, after the autumn of 2020 (the difference was tiny: only 0.03°C).

Temperatures in Europe have risen more than twice the global average over the past three decades. In Europe, the average temperature was 1.02°C higher than the reference period 1991-2020. 2020 was the warmest on record, and last year's average is 0.17°C lower than that peak year.

At the level of Romania, the year 2023 was the warmest since there are weather data with an average temperature of 12.5 degrees and a thermal deviation of 2.3 degrees compared to the normal of the period 1981 - 2010. At the same time, the interval 2012-2023 becomes the most warm period of 12 consecutive years in the history of meteorological measurements, according to the National Meteorological Administration (ANM) (https://www.mmediu.ro/articol/2023-cel-mai-cald-an-din-1900-si-pana- currently/6696).

The five warmest years from 1900-2023 are: 2023, 2019, 2020, 2022 and 2015. The average annual temperature in 2023 was 12.52°C, and the thermal deviation was Δt=2.3°C (the only deviation of over 2°C), in 2019 of 12.14°C with Δt=1.92°C, in 2020 the annual average was 11.88°C with Δt=1.66°C, in 2022 the average annual was 11.77°C with

Δt=1.55°C, in 2015 the annual average was 11.72°C with Δt=1.50°C, compared to the average of the period 1981-2010. The maximum air temperature in Romania for the whole year 2023 is ***42.0° C in Zimnicea on 25.VII.2023 and Cernavodă on 26.VII.2023***. On 4.VIII, the largest expansion of excessively warm tropical air was recorded in Romania this year. There were many dry months, December 2023 was warm (C) above normal, and July and August broke dozens of records. The interval 2012-2023 represents the warmest period of 12 consecutive years, a fact that obviously confirms the trend of increasing air temperature in our country as well. The period 1991-2020, considered the current climatic reference period according to O. M. M. recommendations, registers an increase of 0.5°C in the level of the multi-annual average annual air temperature in Romania, compared to the previous period 1981-2010 (ANM).

In Oltenia, the warmest year in the entire history of meteorological observations was 2023 with the average for the entire region (excluding the mountain area) of 12.74°C and the deviation from normal (calculated for the last century) of 2.44°C. The year 2019 is the second warmest year with an average of 12.41°C and a deviation of 2.11°C, the third is 2022 with an average of 12.26°C and a deviation of 1.96°C, the 4th- 1st is 2015 with mean of 12.22°C and deviation of 1.92°C and 5th is 2020 with mean of 12.18°C and deviation of 1.88°C. Climate warming continued into the winter of 2023-2024.

In order to clarify some ambiguities that have persisted for a long time in climate science, we specify that: ***there are no processes of change, only variability in the Earth's climate.*** The processes of change are characteristic of ephemeral entities: people, beings, plants, etc. Childhood, youth, maturity, old age are stages of change processes. ***The clearest example of change is death***. Any entity that evolves through change disappears. ***Variability*** means an evolution between certain limits which maintains certain conditions within broad limits and is characteristic of eternal entities. For example, the Earth's climate maintains the required conditions for the existence of life on Earth within broad limits, even though not everywhere. If there were processes of change in the Earth's climate, life would have disappeared a long time ago, and we wouldn't have a single virus now. The existence of life on Earth is clear evidence that there are no processes of change. Likewise in the climates of other planets. The universe, the stars, the planets, the climates of the planets, etc. they are eternal entities and they do not evolve through change. So variability characterizes eternity. The earth is created to support life and especially human life. M. Gorbachev also said that ***the Earth is the home of people***. We have made ample demonstrations of these realities in our works. ***Climate change*** is a false theory politically imposed in climate science to justify the action of Global Reset. The World Reset is a Nazi-style action that mainly involves reducing the Earth's population by 2030 by 6 billion out of 8, by any means necessary (That is, to kill 3 out of 4 people by any means). The rest of the measures are shiny wrappers to mask the Nazi action, etc. Although the Reset is disguised as a conspiracy theory, the annual proceedings of the World Economic Forum in Davos (to which all the heads of state on Earth were invited) constantly support and promote it, and the laws of this action are gradually coming into force. The words: variation, variability, change seem synonymous but they are not. Most people use them inappropriately (out of habit) which has led to the ***biggest manipulation in the history of the world***. An organism, entity, etc. cannot evolve through variability and change, these two processes are mutually exclusive. The principle of variability is: ***"what is, has been and will be"*** and was formulated for the first time by Ecclesiastes (Bible), and the principle of change is: ***"what is, has not been and will not be"***. The logical (mathematical) negation of the principle of variability is the principle of change and vice versa, therefore they cannot coexist in the same entity just as the logical principle of non-contradiction says, ***"any proposition cannot be both true and false at the same time"***. In mathematics, there are functions that describe processes of variability: sinx, cosx, circle function, ellipse function, oval function, etc.; functions that describe change processes: functions of the first degree, logarithmic, exponential, etc. The hot season changes to the cold season, the seasons change, night to day or vice versa, but there are no changes, it is a variability, etc. ***Earth's climate variability is particularly random*** depending on the combinations of cosmic and terrestrial factors that generate it, and ***the climate system is one of the most random systems in nature***.

The work is part of a series of extensive studies on climate variability in southwest Romania and the effects of climate warming, being useful to all those interested in climate evolution in this part of Romania (BOGDAN et al., 2007; 2008; BOGDAN & MARINICĂ, 2009; BOGDAN et al., 2010; MARINICĂ & CHIMIŞLIU, 2008; MARINICĂ et al., 2010; 2011; 2012; 2013; BOGDAN et al., 2014. We will further analyse the multiple aspects of climate variability from Oltenia characteristic of the winter 2021-2022, at the regional level in Oltenia and the consequences on agricultural crops, biotopes, the economy and the environment in general.

MATERIALS AND METHODS

To carry out the work, we have used the results of daily processing, with special software from the weather forecasting process, the data archive of ANM[1], the maps currently made in the operational activity, those on the Internet provided by the international analysis and forecasting centers and those from ANM Bucharest, along with international databases and the facilities offered by Office for drawing up tables and graphs. We also used the Hellmann criterion and comparison with normal air temperature averages calculated for the past century (1901-1990). The comparison with the

[1] ANM= National Meteorological Administration

normals of the last 30 years is not conclusive because the normals for the last 30 years are moving averages with a linear upward trend like the averages being compared.

The paper analyses the climatic variability of the warm winter 2023-2024 in the south-west of Romania, based on the thermal and pluviometric regime of the months of December 2023, January and February 2024 and the overall thermal and pluviometric regime of the winter 2023-2024. The effects on the environment and biotopes were also analysed.

RESULTS

1a. The thermal regime of December 2023.

The monthly air temperature averages ranged from 0.2°C in Voineasa to 5.7°C in Calafat, and their deviations from the normal averages calculated for the last century ranged from 2.1°C in Voineasa to 4 .7°C in Calafat and Bâcles (Table 1). According to the Hellmann criterion, December 2023 was warm (C) at all weather stations. ***The overall monthly average air temperature for the whole Oltenia region*** was 3.71°C, and its deviation from normal was 3.53°C, which confirms, according to the Hellmann Criterion[2], that December 2023 was warm (C) on average for the entire Oltenia region. According to the general average for the entire Oltenia region, December 2023 was the 2nd warmest December in the entire history of climate observations, after the very warm December 2015 (FC – the only very cold December) with the overall average of 5.19° C. On all days of the month, the average daily temperature for the entire Oltenia region was positive, that is, no winter day was recorded.

The maximum monthly temperatures in the air were most recorded in the dates of 25-26.XII and ranged from 14.0°C in Voineasa on 25.XII.2023 to 20.9°C in Calafat on 25.XII.2022, and their average for the entire Oltenia region was 17.79°C. ***The minimum monthly temperatures in the air*** were most recorded on various dates and ranged from -7.8°C in Apa Neagră on 4.XII.2023 to -1.8°C inat Dr. Tr. Severin in on 17.XII.2023, and their average for the entire region was -4.22°C. In most of December, daily minimum temperatures were positive. ***Heat units***[3] in December ranged from 30.1 in the Voineasa intermountain depression to 177.8 in Calafat in the southwest of the region, and their average for the entire region was 117.25, which confirms that December was warm. ***Cold units***[4] were recorded on an isolated basis during 4-6.XII, 8-11.XII, 16-20.XII and 28-31.XII and ranged from 0 in Dr. Tr. Severin, Calafat and Craiova to 24.9 in Voineasa, and their average for the entire region was 3.01. So, the cold was insignificant. No frost was registered. ***At the surface of the soil, the maximum temperatures*** were recorded on 25 and 26.XII.2023 and ranged frm13.3°C in Slatina on 26.XII.2023 to 23.1° C in Băilești on 26.XII.2023, and their average for the entire Oltenia region was 18.1°C. ***The minimum monthly temperatures on the soil surface*** were recorded on various dates, but most on 1.XII and ranged from -7.8°C in Polovragi on 1.XII.2023 to -2.4°C in Băilești on 5.XII.2023, and their average for the entire region was -5.22°C. For most of the day, the ground remained thawed and crop plants and spontaneous vegetation continued their vegetative stage. Throughout the month of December 2023, the biotopes and biocenoses[5] remained active. ***Vernalization***[6] occurred during the cold spans of December 2023, January and February 2024.

---

[2] ***Hellmann's criterion for monthly air temperature averages***: Δt≤-10.0°C = >excessively cold (ER); -9.9≤Δt≤ -5.0°C =>very cold (FR); -4.9≤Δt≤ -2.0°C =>cold (R); -1.9≤Δt≤-1.0°C =>cool (RC); -0.9≤Δt≤+0.9°C =>normal (N); 1.0≤Δt≤ 1.9°C =>warm (CL); 2.0≤Δt≤ 4.9°C =>warm (C); 5.0≤Δt≤ 9.9°C => very warm (FC); Δt≥10.0°C => excessively warm (EC).

[3] ***Heat units***= ΣTmeans daily > 0°C ; ***Cold units*** = ΣTmeans daily < 0°C.

[4] ***The degree of harshness of winter*** in agrometeorology (winter type) is classified according to the sum of agrometeorological frost units (Σ the differences between the minimum daily temperature values <-15°C and the critical agroclimatic threshold of -15.0°C, in the XII-II interval). Therefore, *an agrometeorological* ***frost unit*** is the difference of 1°C that is obtained between the critical threshold of -15.0°C and a thermal minimum in the air ≤ -15°C (for example for T min = -16.0°C then the difference -15.0° C - (-16.0°C) = 1, i.e. one frost unit, (Sandu et al., 2010); ***Cold units for the entire cold season*** are calculated as Σ average daily temperatures ≤ 0°C, in the period November-March. A cold day is the day when the average temperature is ≤ 0°C; ***Active temperatures*** are those ≥0°C, and the temperature of the biological minimum is 0°C. It is called a winter day, the day when the maximum air temperature is < 0°C. ***Heat units*** (Σ average daily temps ≥ 0°C). For weather diagnoses and forecasts intended for the public, frost means a temperature ≤ -10.0°C. Frost defined by weather forecast terms (which are adapted for living organisms) differs from agrometeorological frost (temperatures ≤ -15°C), plants being better adapted to climatic conditions (due to their cellular structure and specific biotic processes). Starting from 21.II.2022, ANM redefined the agrometeorological frost for temperatures ≤ -10°C, an aspect due to a long series of warm winters in which the agrometeorological frost after the old thermal limit of -15°C disappeared. Similarly, frost units are calculated based on the new limit.

[5] The term ***biocenosis*** (from the Greek *koinosis* - to divide) represents a supra-individual level of organization of living matter and describes the totality of living organisms, plant (phytocenosis) and animals (zoocenosis), which interact with each other and coexist in a certain environment or sector of biosphere (biotope), forming a unitary entity with it and which is in a dynamic balance dependent on that environment. It is characterized by a certain structure and function given by the pattern of circulation of matter, energy and information. The term biocenosis was proposed by Karl Möbius in 1877 (http://ro.wikipedia.org/wiki/Biocenoz%C4%83).

[6] ***Vernalization*** represents the acquisition or acceleration of the flowering capacity under the influence of exposure to low temperatures.

Table 1. The air temperature regime in Oltenia and the minimum and maximum temperature values at the soil surface **in December 2023** (N XII = December normals calculated for the interval 1901-1990, M XII = monthly averages of December 2023; Δ = M-N = deviation temperature, CH = Hellmann criterion). (Source: processed data from the ANM archive).

Meteorological Station	Hm	NXII	MXII	Δ=M-N	CH	Tmax air		Tmin air		Tmax soil		Tmin soil	
						(°C)	Date	(°C)	Date	(°C)	Date	(°C)	Date
Dr.Tr .Severin	77	1.4	5.6	4.2	C	18.5	25	**-1.8**	**17**	21.2	25	-5.3	1
Calafat	66	1.0	**5.7**	**4.7**	C	**20.9**	**25**	-2.3	8	22.5	25	-5.0	4
Bechet	65	0.4	4.4	4.0	C	20.4	25	-5.0	5	21.3	25	-5.1	29
Băilești	56	0.4	4.3	3.9	C	19.3	26	-2.3	29	**23.1**	**26**	**-2.4**	**5**
Caracal	112	-0.1	4.1	4.2	C	18.4	26	-2.8	5	18.1	26	-4.6	1
Craiova	190	0.1	4.4	4.3	C	17.9	26	-2.4	17	19.8	26	-5.0	1
Slatina	165	0.3	3.7	3.4	C	17.9	26	-3.1	18	***13.3***	***26***	-2.6	1
Bâcleș	309	-0.4	4.3	**4.7**	C	16.9	26	-4.5	4	-	-	-	-
Tg. Logrești	262	0.1	2.3	2.2	C	17.6	25	-5.3	29	14.4	25	-8.0	1
Dragasani	280	0.6	4.4	3.8	C	17.7	25	-3.7	1829	15.5	27	-3.3	1
Apa Neagră	*250*	*0.1*	2.8	2.7	C	18.7	25	***-7.8***	***4***	13.7	25	-5.4	1
Tg. Jiu	210	0.1	2.8	2.7	C	18.6	25	-4.0	29	20.7	25	-7.1	1
Polovragi	546	0.1	3.1	3.0	C	17.7	26	-4.0	17	16.0	26	***-7.8***	***1***
Rm. Vâlcea	243	0.5	3.4	2.9	C	18.0	25	-2.3	29	16.3	3	-6.3	1
Voineasa	587	-1.9	***0.2***	***2.1***	C	***14.0***	***25***	-6.2	17	-	-	-	-
Parâng	1585	-	-	-	-	12.2	26	-10.0	4	-	-	-	-
Media Oltenia	-	0.18	3.71	3.53	C	17.79	-	-4.22	-	18.1		-5.22	
Ob. Lotrului	1404	-4.9	-1.4	3.5	C	11.0	1	-11.7	9	-	-	-	-

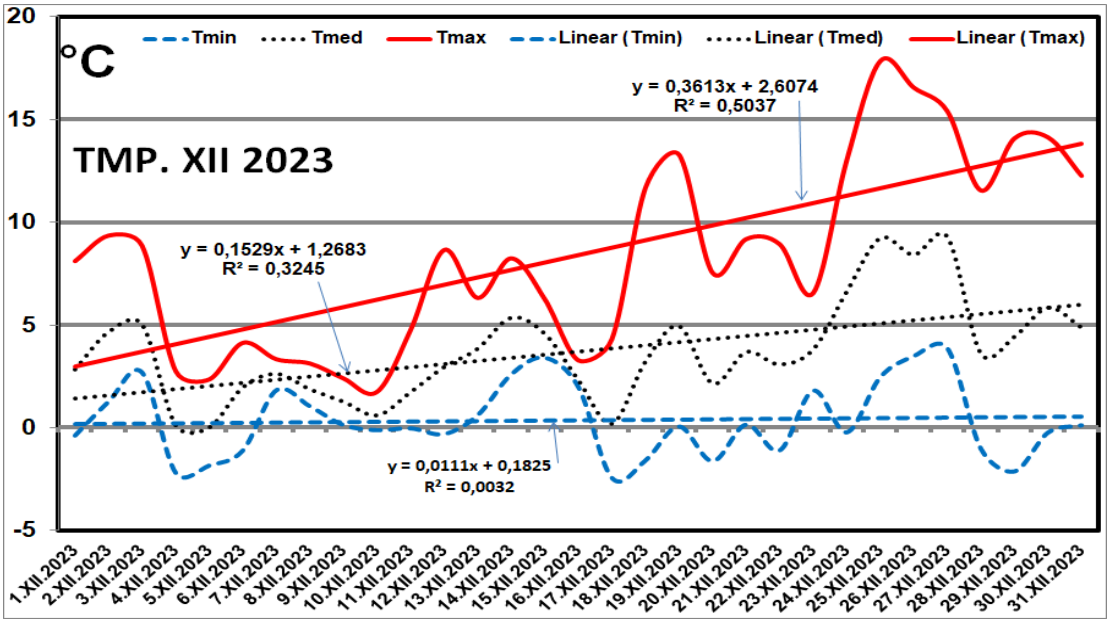

Figure 1. The variation of the parameters characterizing the air temperature (average of daily maximums, daily average and average of daily maximums, calculated for the entire region) in December 2023. (Source: processed data from the ANM archive).

The graphs of variation of the parameters characterizing air temperature (daily averages of minimum temperatures, averages of temperatures and daily averages of thermal maxima) had increasing trends, and the fastest increasing was the maximum temperature (Fig. 1). We note that the warming of the weather that occurs regularly near Christmas (25.XII) occurred in the interval 11-31.XII with a maximum during 25-26.XII. This warming has deep causes related to the precession movement of the Earth, which after the 21.XII, causes the beginning of the gradual orientation towards the Sun of the Northern Hemisphere of the Earth and therefore begins the reorientation of the hot and cold advection flows**.**

In December 2023, two heat waves were recorded in the intervals: 1-3.XII (3 days), 11-31.XII (21 days) totalling 24 days. No cold waves were recorded.

1.b. Rainfall regime of December 2023

The monthly amounts of precipitation ranged from 8.4 l/m^2 in Bâcleș to 32.4 l/m^2 in Apa Neagra, and their percentage deviations from normal ranged from -84.6% at Bâcleș to -31.8% in Dragășani (Table 2). According to the Hellmann criterion, the month of December 2023 was excessively dry (ES) in most of Oltenia, slightly rainy (PP) in the mountain area at Parâng and excessively rainy (EP) in Ob. Lotrului. The average monthly amount of precipitation for the entire region was 20.2 l/m^2, and its percentage deviation from normal was -60.3%. According to the Hellmann criterion, December 2023 was on average excessively dry (ES) for the entire region. The precipitations were liquid throughout

Oltenia, and it snowed in the mountains. The snow layer was insignificant and was recorded only in the mountains (43 cm in Parâng on 24.XII) and in the sub-Carpathian area with a maximum thickness of 3 cm in Polovragi on 24.XII.2023.

2a. The thermal regime of January 2024.

The monthly air temperature averages ranged from -1.3°C in Voineasa to 2.2°C in Dr. Tr. Severin and Calafat, and their deviations from normal ranged from 1.7°C in Tg. Logresti to 4.9°C in Calafat. According to the Hellmann criterion, the month of January was warm (C) throughout Oltenia (Table 3), with the exception of some restricted areas where it was slightly warm (CL – warmish) (Tg Logrești and Ob. Lotrului). The average air temperature calculated for the entire Oltenia region was 0.58°C, and its deviation from normal was 3.1°C. According to the Hellmann criterion, January 2024 was warm (C) on average for the entire Oltenia region. The maximum monthly air temperatures were recorded on different dates and ranged from 9.8°C in Voineasa on 3.I.2024 to 16.6°C in Bechet on 5.I.2024. The beginning and end of January were marked by two waves of moderate heat: 1-7.I.2024 and 25-31.I.2024 with a duration of 14 days. In Oltenia, in January 2024, there were no ***thermal records***. The heat wave triggered on 25.I. extended throughout the month of February and until 6.III.2024, thus lasting ***41 consecutive days and being the longest moderate heat wave in the history of the climate in Oltenia***.

Table 2. Amounts of precipitation recorded in the winter of 2023-2024 (Σ), compared to normal values[7] (N).

Δ% = percentage deviation from normal, CH = Hellmann's Criterion. No. crt	Meteorological Station	Hm	December 2023				January 2024				February 2024			
			ΣXII	N	Δ%	CH	Σ I	N	Δ%	CH	ΣII	N	Δ%	CH
1	Dr. Tr. Severin	77	14.5	61.2	-76.3	ES	23.2	51.4	-54.9	ES	***4.8***	47.9	***-90.0***	ES
2	Calafat	66	16.6	45.5	-63.5	ES	20.7	40.4	-48.8	FS	9.6	38.0	-74.7	ES
3	Bechet	65	12.9	***36.3***	-64.5	ES	32.3	33.5	**-3.6**	N	9.7	34.8	-72.1	ES
4	Băileşti	56	18.7	46.8	-60.0	ES	21.7	38.5	-43.6	FS	8.8	36.1	-75.6	ES
5	Caracal	112	9.9	39.5	-74.9	ES	29.3	34.7	-15.6	PS	10.8	34.5	-68.7	ES
6	Craiova	190	11.8	41.8	-71.8	ES	19.4	37.5	-48.3	FS	12.0	30.4	-60.5	ES
7	Slatina	165	21.5	42.8	-49.8	FS	29.5	36.0	-18.1	PS	15.0	38.4	-60.9	ES
8	Bâcleș	309	***8.4***	54.7	***-84.6***	ES	13.7	50.5	***-72.9***	ES	6.6	44.1	-85.0	ES
9	Tg. Logrești	262	16.1	44.8	-64.1	ES	26.7	35.9	-25.6	S	18.7	41.0	-54.4	ES
10	Drăgășani	280	30.4	44.6	**-31.8**	FS	31.6	34.1	-7.3	N	14.9	35.4	-57.9	ES
11	Apa Neagră	250	27.1	**82.3**	-67.1	ES	32.3	70.9	-54.4	ES	9.0	66.4	-86.4	ES
12	Tg. Jiu	210	16.2	64.0	-74.7	ES	30.4	53.9	-43.6	FS	6.7	52.0	-87.1	ES
13	Polovragi	546	**32.4**	56.1	-42.2	FS	**36.8**	48.9	-24.7	S	**47.0**	48.4	**-2.9**	N
14	Rm. Vâlcea	243	20.9	46.2	-54.8	ES	29.7	35.5	-16.3	PS	36.8	38.4	-4.2	N
15	Voineasa	587	***2.0***	55.1	***-96.4***	ES	***12.9***	42.7	-69.8	ES	35.2	44.0	-20.0	PS
16	Parâng	1585	64.4	54.6	17.9	PP	54.4	57.7	-5.7	N	63.0	47.7	32.1	FS
	Media Oltenia	-	20.2	51.0	-60.3	ES	27.8	43.9	-36.7	FS	19.3	42.3	-54.5	ES
17	Ob. Lotrului	1404	89.5	54.6	63.9	EP	90.0				99.0			
	Petrosani		52.9	47.8	10.7	PP	46.2	45.3	2.0	N	64.3	46.4	38.6	FS

(Source: processed data from the ANM archive)

In January 2024, a certain wave of moderate cold was registered (the only one of the whole winter) in the interval 9-17.I.2024 during which the minimum monthly temperatures were recorded. The average monthly maximum temperature for the entire Oltenia region was 13.6°C. ***The minimum monthly air temperatures for the month of January*** were recorded on different dates, but most on 11.I.2024 (Table 3) and ranged from -13.4°C in Tg. Logrești on 11.I.2024 to -8.2°C in Dr. Tr. Severin and Drăgășani on the same date. The average monthly minimum air temperature calculated

[7] ***Voineasa and Bâcleș weather stations***, because in the cold season, they have incomplete rainfall data (the precipitation sensor being covered), cannot be taken into account.

for the entire Oltenia region was -11.0°C. In the month of January 2024, the rain waves totalled 18 days (58.1% of the days of the month) and were recorded in the intervals: 1-7.I, 16-19.I and 25-31.I.2024.

Heat units ranged from 25.3 in Voineasa to 93.7 in Calafat, and their average for the entire region was 61.4, being the third average of all winter months. ***The cold units*** ranged from 17.1 in Dr. Tr. Severin to 68.4 at Voineasa, with an average for the entire region of 45.64, being the highest of all winter months. ***Frost*** was not recorded in January 2024.

At the soil surface, the maximum temperature values were recorded on the dates of 2, 4, 5, 27, 30 and 31.I and ranged from 10.3°C in Apa Neagră on 2.I.2024 to 22 .3°C in Băilești on 5.I.2024, and their average for the entire Oltenia region was 16.7°C. ***The minimum monthly temperatures*** on the soil surface were most recorded during 10-14.I and ranged from -15.8°C in Calafat to -5.7°C in Drăgășani, and their average for the whole region was -9.4°C. The ground remained thawed for most of the day. As a result of the warm weather, the plants continued their state of slow vegetation, and the trees, vines and others continued their state of vegetative rest. In January, snowdrops, hyacinths, myositis, hazel and others bloomed, and the bees went out to collect pollen and propolis on many days. ***The graphs of the variation of the parameters*** characterizing the air temperature in January (daily averages, daily minimums and daily maximums) had linear decreasing trends (Fig. 2) and the fastest decreasing was the average temperature.

Table 3. The air temperature regime in Oltenia and the minimum and maximum temperature values at the soil surface in ***January 2024*** (N I = January normals calculated for the interval 1901-1990, M I = monthly averages of January 2023; Δ=M-N = temperature deviation, CH = Hellmann Criterion).

Meteorological Station	Hm	NI	MI	Δ=M-N	CH	Tmax air		Tmin air		Tmax soil		Tmin soil	
						(°C)	Date	(°C)	Date	(°C)	Data	(°C)	Date
Dr. Tr. Severin	77	-1.1	**2.2**	3.3	C	13.3	25	**-8.2**	**11**	20.0	27	-11.9	10
Calafat	66	-1.8	**2.2**	**4.0**	C	13.7	3	-12.6	11	21.1	30	***-15.8***	***10***
Bechet	65	-2.2	0.6	2.8	C	**16.6**	**5**	-12.1	11	17.8	5	-14.9	11
Bailești	56	-2.3	1.0	3.3	C	14.0	5	-12.6	11	**22.3**	**5**	-8.5	14
Caracal	112	-2.9	0.9	3.8	C	15.3	5	-9.6	11	17.7	4	-10.5	10
Craiova	190	-2.6	1.0	3.6	C	14.1	5	-10.8	11	15.3	5	-12.3	11
Slatina	165	-2.4	0.8	3.2	C	14.9	5	-9.8	11	10.8	5	-8.4	12
Bacleș	309	-3.0	0.8	3.8	C	13.0	19	-10.7	11	-	-	-	-
Tg. Logrești	262	-2.7	-1.0	***1.7***	CL	13.7	6	***-13.4***	***11***	-	-	-	-
Dragasani	280	-2.2	1.3	3.5	C	14.9	5	**-8.2**	**11**	16.9	31	**-5.7**	**14**
Apa Neagră	250	-2.6	-0.5	2.1	C	13.2	2	-13.1	11	***10.3***	***2***	-6.9	14
Tg. Jiu	210	-2.6	0.0	2.6	C	12.8	2	-11.5	11	14.8	2	-12.2	11
Polovragi	546	-3.2	0.0	3.2	C	14.0	6	-10.4	10	-	-	-	-
Rm. Vâlcea	243	-2.2	0.7	2.9	C	14.5	5	-9.1	11	16.8	4	-10.5	17
Voineasa	587	-4.7	***-1.3***	3.4	C	***9.8***	***3***	-11.0	17	-	-	-	-
Parâng	1585	-	-	-	-	10.3	31	-13.4	13	-	-	-	-
Media Oltenia	-	-2.57	0.58	3.1	C	13.6	-	-11.0	-	16.7	-	-9.4	-
Ob. Lotrului	1404	-6.2	-4.9	1.3	CL	7.6	31	-18.9	30	-	-	-	-
Petroșani	-	-3.2	-	-	-	13.3	6	-13.1	17	8.5	6	-10.1	14

(Source: processed data from the ANM archive)

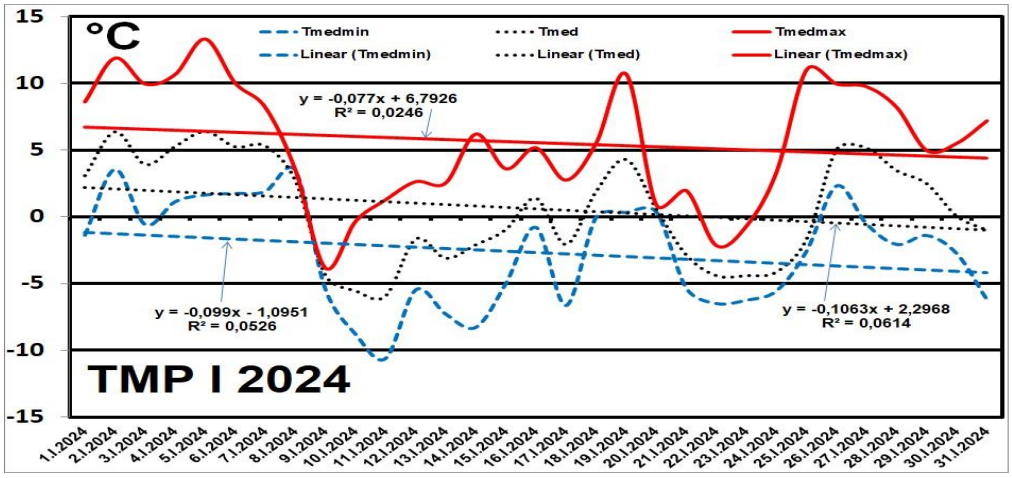

Figure 2. The variation of the parameters that characterize the air temperature (average of daily maximums, daily average and average of daily maximums, calculated for the entire region) in January 2024. (Source: processed data from the ANM archive).

2.b. The rainfall regime of January 2024

The monthly amounts of precipitations ranged from 13.7 l/m^2 in Tg. Logresti in the Oltenia Hills at the foot of the Muierii Hill on the western side to 36.8 l/m^2 in Rm. Vâlcea, with ***the maximum rainfall in the mountain area at Parâng*** of 54.4 l/m^2. The percentage deviations of the monthly amounts of precipitation compared to normal ranged from

-54.9% in Dr. Tr. Severin to -3.6% at Bechet. According to the Hellmann criterion, January was excessively dry (ES) in Dr. Tr. Severin, Bâcleș, Apa Neagră and Voineasa, very dry (FS) in Calafat, Băilești, Craiova and Tg. Jiu, drought (S) at Tg. Logrești and Polovragi, slightly dry (PS) in Caracal, Slatina and Rm. Vâlcea and normally pluviometric (N) in Bechet, Drăgășani and Parâng (Table 2). The average monthly amount of precipitations in January 2024, for the entire Oltenia region, was 27.8 l/m^2, and its deviation from normal was -36.7%, which, according to the Hellmann Criterion[8], confirms that January was on average very dry (FS) for the entire region. Most of the precipitations were in the form of rain. On some nights, the drops in air temperature caused the rain to turn into sleet and snow, and to form of an insignificant layer of snow. Thus, 2 days with an insignificant layer of snow were recorded in the interval 9-10.I and 5 days with an insignificant layer in the southeast of Oltenia 20-25.I which melted quickly, and the maximum thickness of 6 cm was recorded at Tg. Logrești on 9.I.2024 at 08:00 (Fig. 3).

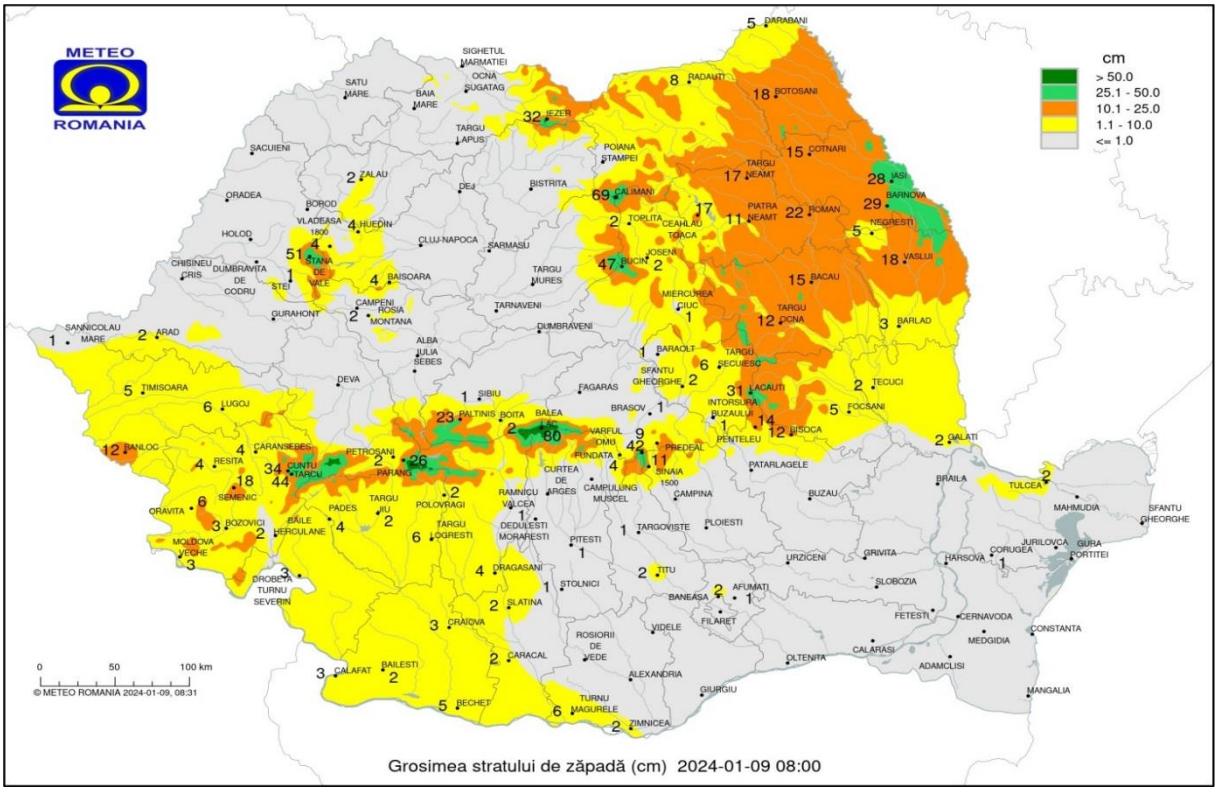

Figure 3. The maximum thickness and extent of the snow cover in the winter of 2023-2024 ((9.I.2024 at 08:00) (according to ANM Bucharest).

3a. The thermal regime of February 2024.

The monthly air temperature averages ranged from 4.6°C in the Voineasa intramountain depression to 9.0°C in the extreme southwest in Calafat (Table 4). Their deviations from normal values ranged from 6.4°C in Tg. Logrești to 8.7°C in Bâcleș. According to the Hellmann criterion, ***the month of February 2024 was very warm (FC) throughout Oltenia***. The general average of the air temperature calculated for the entire Oltenia region was 7.37°C, and its deviation from normal was 7.83°C, which, according to the Hellmann criterion, shows that February was on average very warm (FC) for the whole Oltenia region. It is the first time in Oltenia's climate history that a month is very warm (FC) in all meteorological stations (Such a situation has never been encountered before for any month of any season, so it is ***an absolute climate record***). The maximum air temperatures were recorded in the first decade of the month, the highest on 6.II and ranged from 17.4°C in Voineasa (on 9.II) to 22.3°C in Calafat on 6.II, and their average for the entire region was 20.2°C. The value of 22.3°C in Calafat is the 4th lowest value in the entire data series of this station. The minimum monthly temperatures in the air were recorded on 1.II and ranged from -8.5°C in Apa Neagră to -3.1°C in Drăgășani, with an average for the entire Oltenia region of -5.8°C. In February 2024***, no cold wave was recorded. In February, the weather was warm and there was a continuation of the heat wave triggered on 25.I.2024 with peaks of warming on the dates of 6-9.II and 24-25.II and the maximum intensity of heating of 22.3 °C in Calafat in the extreme southwest in 6.II.***

On the surface of the soil, the highest thermal maximums were recorded in the last pentad of the month and ranged from 19.4°C in Apa Neagră on 28.II to 33.2°C in Bechet on 23.II . ***The average maximum temperature at the***

[8] ***Hellmann Criterion*** for monthly precipitation amounts: Δp%<-50% →excessively dry (ES); -50.0≤ Δp% ≤-30.1→very dry (FS); -30.0≤ Δp% ≤-20.1→dry (S); -20.0≤ Δp% ≤-10.1→slightly dry (PS); -10.0≤ Δp% ≤-10→normal pluviometric (N); 10.1≤ Δp% ≤20.0→slightly rainy (PP); 20.1≤ Δp% ≤30.0→rainy (P); 30.1≤ Δp% ≤50.0→very rainy (FP); Δp% 50.0→excessively rainy (EP).

ground surface for the whole of Oltenia was 27.6°C. ***The minimum monthly temperatures on the soil surface*** were recorded on 1.II and ranged from -9.3°C in Dr. Tr. Severin to -3.0°C in Apa Neagră. ***The average monthly minimum temperature*** for the entire Oltenia region was -6.4°C.

Table. 4. The air temperature regime in Oltenia and the minimum and maximum temperature values at the soil surface in February 2024 (N II = February normals calculated for the interval 1901-1990, M II = monthly averages of February 2024; Δ = M-N = temperature deviation, CH = Hellmann criterion).

Meteorological Station	Hm	NII	MII	Δ=M-N	CH	Tmax air (°C)	Tmax air Date	Tmin air (°C)	Tmin air Date	Tmax soil (°C)	Tmax soil Data	Tmin soil (°C)	Tmin soil Date
Dr. Tr .Severin	77	0.9	8.6	7.7	FC	20.6	6	-5.1	1	29.3	28	***-9.3***	***1***
Calafat	66	0.4	**9.0**	8.6	FC	**22.3**	**6**	-4.1	1	32.2	24	-8.4	1
Bechet	65	-0.1	8.5	8.6	FC	22.1	6	-6.0	1	**33.2**	**23**	-7.6	1
Băileşti	56	-0.1	8.3	8.4	FC	21.8	6	-6.5	1	29.0	25	-5.6	1
Caracal	112	-0.7	7.9	8.6	FC	21.5	6	-4.7	1	29.4	24	-6.0	1
Craiova	190	-0.4	8.2	8.6	FC	20.6	6	-4.9	1	22.2	6	-6.9	2
Slatina	165	-0.2	7.7	7.9	FC	21.8	6	-5.7	1	26.0	28	-3.6	1
Bâcleș	309	-0.9	7.8	**8.7**	FC	19.2	6	-3.9	1	-	-	-	-
Tg. Logrești	262	-0.7	5.7	***6.4***	FC	21.3	6	-8.7	1	-	-	-	-
Drăgășani	280	-0.2	8.4	8.6	FC	22.6	6	**-3.1**	**1**	31.2	28	-3.6	1
Apa Neagră	250	-0.6	5.7	6.3	FC	20.7	6	***-8.5***	***1***	***19.4***	***28***	**-3.0**	**1**
Tg. Jiu	210	-0.4	6.8	7.2	FC	21.7	6	-6.9	1	23.1	5	-7.8	1
Polovragi	546	-1.4	6.2	7.6	FC	18.6	6	-4.8	1	-	-	-	-
Rm. Vâlcea	243	0.0	7.2	7.2	FC	21.2	6	-5.1	1	28.6	10	-8.3	1
Voineasa	587	-2.5	***4.6***	7.1	FC	***17.4***	***9***	-7.8	1	-	-	-	-
Parâng	1585	-	-	-	-	10.5	17	-6.3	3	-	-	-	-
Media Oltenia	-	-0.46	7.37	7.83	FC	20.2	-	-5.8	-	27.6	-	-6.4	-
Ob. Lotrului	1404	-5.5	0.5	6.0	FC	11.7	9	-11.6	1	-	-	-	-
Petroșani	-	-1.3	-	-	-	16.9	6	-8.5	1	14.0	28	-6.1	1

(Source: processed data from the ANM archive)

The graphs of the variation of the parameters that characterize the air temperature in February (daily averages, daily minimums and daily maximums) had linear increasing trends for daily temperature averages and daily minimums and slightly decreasing for daily maximums (Fig. 4), and the fastest increasing was the minimum temperature, meaning that in February the main climatic process is the increase of minimum temperatures and the initiation of the springing process. ***The heat units*** ranged from 135.3 in Voineasa to 260.9 in Calafat, and their average for the entire region was 213.03, being the highest in the history of the climate in Oltenia, in each meteorological station, thus registering an absolute climate record. ***The cold units*** were insignificant and in most meteorological stations equal to 0. Agrometeorological frost was not recorded. ***All these agrometeorological conditions mean a warm winter from an agrometeorological point of view.***

3.b. The rainfall regime of February 2024

The monthly amounts of precipitation ranged from 4.8 l/m^2 in Dr. Tr. Severin to 47.0 l/m^2 in Polovragi, and their percentage deviations from normal ranged from -90.0% in Dr. Tr. Severin to -2.9% in Polovragi. According to the Hellmann criterion, the month of February was excessively dry (ES) in most of Oltenia and normal pluviometrically (N) in limited areas in Polovragi and Rm. Vâlcea (Table 2). The average monthly amount for the entire region was 19.3 l/m^2, and its percentage deviation from normal was -54.5% which confirms that, on average, February 2024 was exceptionally dry on average for the entire region. ***The snow layer*** was recorded only in the mountain and Subcarpathian area.

4. Seasonal climatic characteristics of the winter 2023-2024

The seasonal air temperature averages ranged from 1.2°C in Voineasa to 5.6°C in Dr. Tr. Severin, and their deviations from normal ranged from 3.4°C in Tg. Logresti to 5.7°C in Calafat. According to the Hellmann criterion, the winter of 2023-2024 was very warm (FC) throughout the Oltenia region (Table 5). Except for seasonal averages from Tg. Logrești, Apa Neagră, and Ob. Lotrului, the others in the table have absolute climate records. ***The seasonal average of the air temperature*** calculated for the entire Oltenia region was 3.88°C, and its deviation from normal was 4.85°C. According to the Hellmann criterion, on average the winter 2023-2024 was very warm (FC) as a whole. ***The overall seasonal mean of 3.88°C and its deviation from normal of 4.85°C are absolute climate records.***

In descending order, the seasonal average of 3.88°C is the highest in the entire series of climate data for Oltenia, so the winter of 2023-2024 was the warmest winter in the entire history of climate observations, surpassing the Mediterranean winter of 2006-2007 with the average seasonal average of 3.44°C and deviation from normal of 4.39°C. ***The winters of 2006–2007, 2022–2023, and 2023–2024 are the only winters with a seasonal mean ≥ 3.0°C in the entire data set***, showing that climate warming has continued.

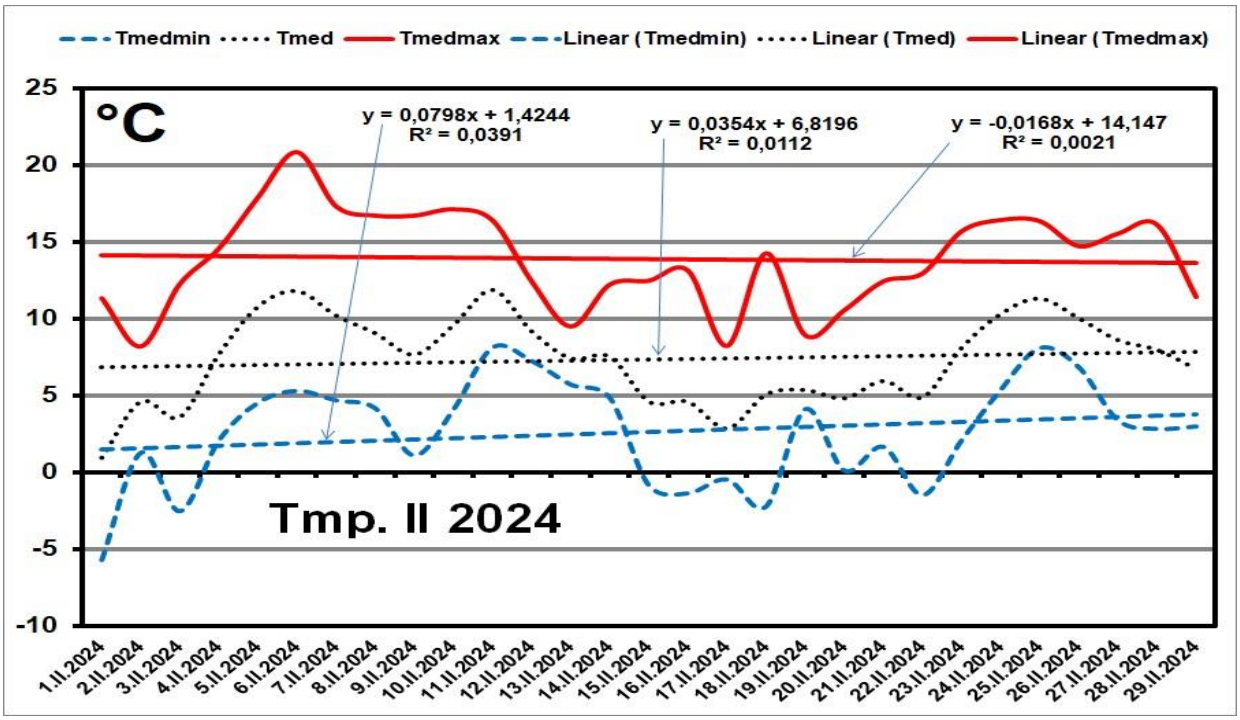

Figure 4. The variation of the parameters characterizing the air temperature (average daily minimums, daily average and average daily maximums, calculated for the entire region) in February 2024 (Source: processed data from the ANM archive).

The seasonal amounts of precipitation ranged from 28.7 l/m^2 in Bâcleș to 116.2 l/m^2 in Polovragi, and their percentage deviations from normal ranged from -80.8% in Bâcleș to -24.3% in Polovragi. According to the Hellmann criterion, the winter of 2023-2024 was from dry (S) on restricted areas in Polovragi and Rm. Vâlcea to very dry (FS) and excessively dry (ES) in most of Oltenia, and slightly rainy in the mountain area (Parâng) (PP) (Table 5).

Table 5. The overall thermal and rainfall regime of the winter 2023-2024. (Hm = altitude of the weather station, W`22-`24=average temperature values in winter 2023-2024 (°C), NW = normal values of seasonal averages of temperature in winter (°C), Δ = W-N = deviations of average temperatures compared to normal (°C) CrH = Hellmann Criterion, SW = sum of precipitation in winter 2023-2024 (l/m^2), NW = normal values of precipitation in winter (l/m^2), Δ = S-N= deviations from normal (l/m^2), Δ% = percentage deviations from normal).

No. crt.	Meteorological Station	Hm	Thermal regime (°C)				Pluviometric regime (l/m^2)				
			W`23-`24	NW	Δ=W-N	CrH	SW	NW	Δ=S-N	Δ%	CrH
1	Dr. Tr. Severin	77	5.5	0.4	5.1	EC	42.5	160.5	-118.0	-73.5	ES
2	Calafat	66	5.6	-0.1	5.7	EC	46.9	123.9	-77.0	-62.1	ES
3	Bechet	65	4.5	-0.6	5.1	EC	54.9	104.6	-49.7	-47.5	FS
4	Băileşti	56	4.5	-0.7	5.2	EC	49.2	121.4	-72.2	-59.5	ES
5	Caracal	112	4.3	-1.2	5.5	EC	50.0	108.7	-58.7	-54.0	ES
6	Craiova	190	4.5	-1.0	5.5	EC	43.2	109.7	-66.5	-60.6	ES
7	Slatina	165	4.1	-0.8	4.9	FC	66.0	117.2	-51.2	-43.7	FS
8	Bâcleş	309	4.3	-1.4	5.7	EC	***28.7***	149.3	-120.6	***-80.8***	ES
9	Tg. Logreşti	262	2.3	-1.1	***3.4***	FC	61.5	121.7	-60.2	-49.5	FS
10	Drăgăşani	280	4.7	-0.6	5.3	EC	76.9	114.1	-37.2	-32.6	FS
11	Apa Neagră	250	2.7	-1.0	3.7	FC	68.4	219.6	-151.2	-68.9	ES
12	Tg. Jiu	210	3.2	-1.0	4.2	FC	53.3	169.9	-116.6	-68.6	ES
13	Polovragi	546	3.1	-1.5	4.6	FC	116.2	153.4	-37.2	-24.3	S
14	Rm. Vâlcea	243	3.8	-0.6	4.4	FC	87.4	120.1	-32.7	-27.2	S
15	Voineasa	573	1.2	-3.0	4.2	FC	50.1	141.8	-91.7	-64.7	ES
16	Parâng	1585					181.8	160.0	21.8	13.6	PP
	Media Oltenia	-	3.88	-0.95	4.85	FC	67.3	137.2	-69.9	-50.9	ES
17	Ob. Lotrului	1348	-1.9	-5.5	3.6	FC	278.5				
18	Petroşani	607		-1.7			163.4	139.5	23.9	17.1	PP

(Source: processed data from the ANM archive)

DISCUSSIONS

Depending on the air masses that prevail during the winter, winters can be classified into:

- ***Mediterranean winters*** in which the Mediterranean air masses brought by the Mediterranean Cyclones predominate. This type of winters occur in warm years and especially in periods of climate warming, and they include

the following winters: 2023-2024 with a seasonal average of 3.88°C and a deviation from the normal of 4.83°C, 2006-2007 with a seasonal average of 3.44°C and a deviation of 4.39°C, 2022-2023 with an average of 3.25°C and a deviation of 4.20°C; 2019-2020 with an average of 2.91°C and a deviation of 3.86°C, 2015-2016 with an average of 2.88°C and a deviation of 3.83°C; 2021-2022 with an average of 2.61°C and a deviation of 3.56°C and winter 2020-2021 with an average of 2.56°C and a deviation of 3.51°C. Therefore, ***the winter of 2023-2024 was a Mediterranean winter, the warmest of the whole series of climate data, being an absolute climate record.*** This is due to the northward extension of the influence of the Mediterranean climate, which is produced by the extension of the thermal equator[9] of the planet Earth determined by cosmic factors.

- ***Scandinavian winters***, dominated by cold air masses brought by air circulations determined by the Scandinavian Anticyclone, the region of Scandinavia being an important reservoir of cold polar and arctic air and having a direct connection with the polar zone. This type of winters is the most common due to the proximity of the Scandinavian area, the presence of Atlantic Ocean and other geographical factors that determine these types of atmospheric circulations.

- ***the Siberian winters*** in which cold polar and arctic air masses prevail, brought by air circulations determined by the Russo-Siberian Anticyclone[10] which sometimes extends over all of Asia and Europe (or the Asian Anticyclone as it is also called in some treatises on Geography and Meteorology) and has a direct supply of particularly cold arctic air (A). As a rule, it takes about 3 days for this anticyclonic formation to extend over all of Europe, being favoured by the circulation of air in the Northern Hemisphere. They are the coldest winters with intense and long waves of cold and frost that have produced immense damage, human casualties and more. This type of winters is frequently encountered during periods of climatic cooling. We exemplify the winter of 1941-1942, whose thermal minimums have not been surpassed before and turned the tide of World War II in Favour of Russia and its allies, and many other winters.

Apart from these three large distinct classes, there are a number of intermediate types of winters in which, in different periods of time, certain types of atmospheric circulation prevail, whose occurrence is random according to cosmic and terrestrial factors. In the winter of 2023-2024, solar activity was at its maximum and a series of solar flares occurred, and the El Nino[11] climate process was in its maximum phase from the beginning of the summer of 2023.

Throughout the winter, ***six winter heat waves were recorded in the intervals***: 1-3.XII (3 days); 11-31.XII.2023 (21 days), 1-7.I.2024 (7 days), 16-19.I.2024 (4 days), 25-31.I.2024 (7 days); the whole month of February: 29 days that lasted until 6.III.2024. So, a total of 71 warm winter days (3+21+7+4+7+29+6=71 from winter +6 from March (spring) = 77 consecutive warm days)

The persistent waves of heat and moderate cold and the presence of thin snow in Oltenia allow us to classify the winter of 2023-2024 as a Mediterranean winter. On most days the ground remained thawed, and the biotopes and vegetation maintained their slow activity.

We will further analyse the synoptic causes of the most intense heating from January-February produced in the interval 25.I. – 6.III.2024 (January being the month that generally defines the type of warm, cold winter, etc.) and of the most intense cooling of the weather this winter recorded in the interval 9-17.I.2024.

The synoptic causes that determined the warming of the weather in the interval 25.I. – 6.III.2024

The initiation of the tropical continental warm air mass (cT) advection over Europe occurred on 21.I.2024 starting from Western Europe, and the situation evolved slowly at first, then gradually accelerated. The peak of warm air advection over Oltenia occurred on 6.II.2024. ***At the level of the land surface***, on 6.II. at 18 UTC, the distribution of baric centres over Europe was as follows: northern Europe was dominated by a cyclonic field of Icelandic origin with three centres, of which two were positioned in the south and north of the Scandinavian Peninsula and one in the east in the southern Barents Sea with atmospheric pressure values < 990 hPa, and the one from east < 900 hPa. Most of Europe was dominated by a vast anticyclonic field, of Azorean origin extended over Eastern Europe with atmospheric pressure values ≥ 1025 hPa over large areas***. In the middle troposphere at the level of non-divergence*** (500 hPa, about 5000 m altitude), the geopotential field distribution evidenced the high geopotential field in the southern half of Europe, the highest values ≥584 damgp over the Atlantic Ocean and North Africa and with the characteristic isohypse of 552 damgp positioned north of Romania. North of this isohypse the lowest geopotential values ≤ 496 damgp in northern Scandinavia and the Barents Sea (Fig. 5). ***At the level of 850 hPa*** (about 1500 m altitude) (Fig. 6), we can notice the extension of warm air over Europe (limited by the 0°C isotherm), to the coast of the Baltic Sea and the southern half of the British Isles, and in the East to north of Romania and the Black Sea. Extremely warm air with values ≥10°C occupied an extensive area over the Mediterranean Sea and a very warm core with temperature values ≥12°C was located over southern Greece, southeastern Bulgaria and over the Bosphorus and Dardanelles Straits.

In these conditions, a westerly air circulation persisted over Europe with a mass of mPw +cP (warm polar maritime + polar continental). Such a synoptic situation is characterized by a good persistence in time under certain conditions. In these synoptic conditions, in addition to warm air advection, the effect of insolation was added, and the

[9] ***The Earth's thermal Equator*** is the area with the highest air temperatures, usually intertropical, but in some years or periods of time it extends far north or south of the intertropical zone, depending on cosmic and terrestrial factors.

[10] ***The Russian-Siberian Anticyclone*** was called by journalists the ***"Beast of the East"*** or the ***"Moscow-Paris"*** train.

[11] ***El Nino*** = This forms when temperatures in the Central and Eastern Tropical Pacific are at least 1.5°C above normal for several months. This happens when the wind in the Western Pacific sets in motion a large, slow wave of water that rapidly warms the ocean just below the surface.

thermal maxima exceeded 20.0°C at 12 weather stations out of 16 (75.0%) as well as their average for the entire Oltenia region (Table. 4). As a result of the warm weather this winter, the swelling of the buds on the fruit trees and the initiation of flowering on the early species were seen since 21.II.2024, the stage with the flower buds developed so much that one could see the colour of the petals on the apricot, mulberry, almond trees and other species, which lasted until March 3-4, and the full opening of the flowers was achieved on 8-9.III. Also, on 21.II the willow and roses leafed out, and the autumn crops started to develop. The prolonged flowering stage due to cold nights (even if there is no frost or 0°C) leads to the degradation of the flower elements: stamens, pistil, ovaries, petals, etc. and compromises fertilization leading to its abortion. Such situations due to warm winters totally compromise the production of apricot fruits, corkscrew peach, etc. Therefore, warm winters constitute a special climatic risk.

The synoptic causes that determined the cooling of the weather from 6-11.II.2023

The only wave of moderate cold in the winter of 2023-2024 occurred in the interval 9-17.I.2024 (9 days), and the peak of cooling at the lower levels in the atmosphere occurred on the night of 10/11.I.2024.

For January, the 2024 cooling is the most intense cooling on record this winter, demonstrating that ***climate warming[12] is not a process of change but climate variability***, with cold snaps and cold winters likely to return at any time (If climate warming were a change, cold winters and cold waves would never return). For example, living organisms and many other systems evolve through change because the evolutionary phases they go through do not come back. Climate evolves through variability because such states have occurred before and will occur again). If the evolution of the climate was done through changes, life on Earth would have disappeared long ago. So, there is no climate emergency, the current climate warming is part of the climate cycles (warmings and coolings) studied by Milankovitch throughout his life. This cooling of the weather had ***five peaks on the dates of 10-14.I***, and on the date of 11.I.2024 with the lowest thermal minima of -13.4°C in Tg. Logreşti (the lowest in the lowlands for the entire cooling range), up to -8.2°C in Drăgăşani and Dr. Tr. Severin. The initiation of advection of the cold continental polar + arctic air mass (cP+A) over Europe occurred on 6.I.2024 starting from Western Europe, and the situation evolved slowly at first then gradually accelerated, reaching the peak of cooling in the mass of air from the lower troposphere on 13.I.2024 at 00 UTC. On 13.I.2024 at 00 UTC, the synoptic situation over Europe was as follows: ***at land surface level*** (Fig. 7).

Western Europe was dominated by a vast anticyclonic field determined by the union of the Azorean Anticyclone with the North African and Greenland Anticyclone with pressure field values ≥1025 hPa in North Africa, ≥1035 hPa north of the British Isles and ≥1040 hPa in Greenland, Eastern Europe was dominated by cyclonic fields of ex-Icelandic origin with atmospheric pressure values ≤990 hPa in the north of the Scandinavian Peninsula, ≤1005 hPa north of the Black Sea and ≤995 hPa in the Russian Plain. ***In the middle troposphere at the level of the isobaric surface of 500 hPa*** (about 5000 m altitude) the geopotential field showed an extended ridge from North Africa over Western Europe and Atlantic Ocean to Greenland with geopotential field values ≥584 damgp in North Africa. The characteristic isohypse of 552 damgp was shaped like the Greek letter Ω, which means that atmospheric circulation was blocked. In these conditions, the warm air was advected to the north above Oc. Atlantic, and the cold one to the south over Eastern Europe. ***At the level of the isobaric surface of 850 hPa*** (about 1500 m altitude), the air temperature values were ≤ -10°C over Romania, and slightly higher values were seen over the south of our country (Fig. 8). In these conditions, although the minimum temperatures increased slightly compared to 11.1, they remained close to -10.0°C.

The advection of extremely cold air from the polar zone and the cooling of the air during the clear nights of 9-17.I.2024 with a duration of over 14 hours and 53 minutes determined the intensification of the cooling and the realization of the particularly low minimums on the morning of 11.I.2024 and the other mornings of this interval. This cooling interval was beneficial for achieving vernalization and sanitation was accomplished by killing some agricultural pests, especially since it occurred quickly after a warm period.

[12] Climate warming and cooling have always been on Earth, being a natural way of climate evolution, for example, 6000 years ago, the Sumerians wrote on their clay tablets: ***it was hot both day and night, it was hot all over the Earth*** (Zecharia Sitchin, ***Twelfth Planet***).

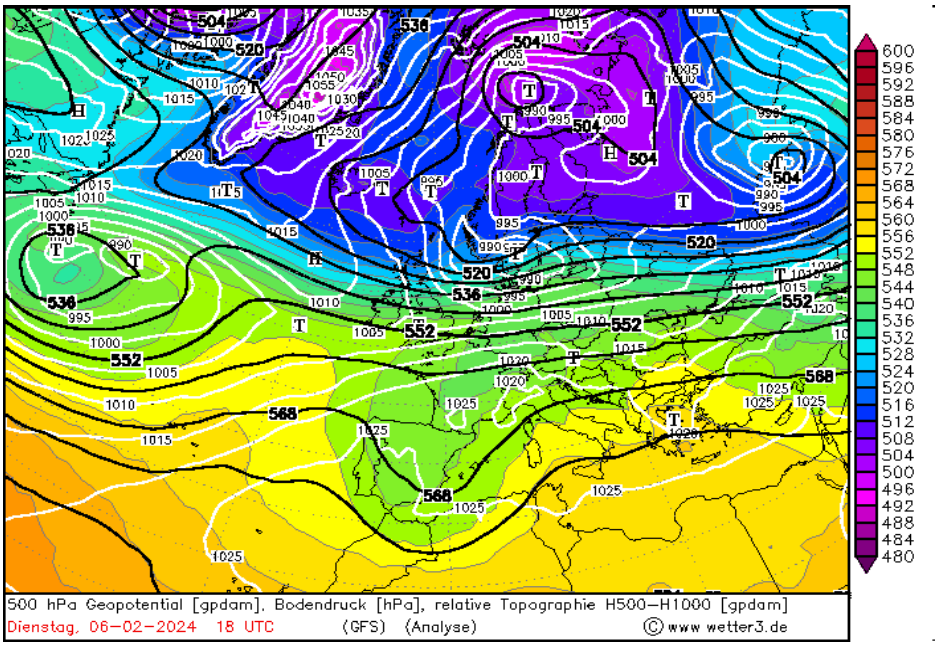

Figure 5. The synoptic situation at the level of the land surface (atmospheric pressure field) superimposed with the synoptic situation at altitude (the geopotential field at the level of 500 hPa - about 5000 m altitude) and the relative baric topography field (TR 500/1000) from the 6.II.2024 at 18 UTC. (www.wetterr3.de).

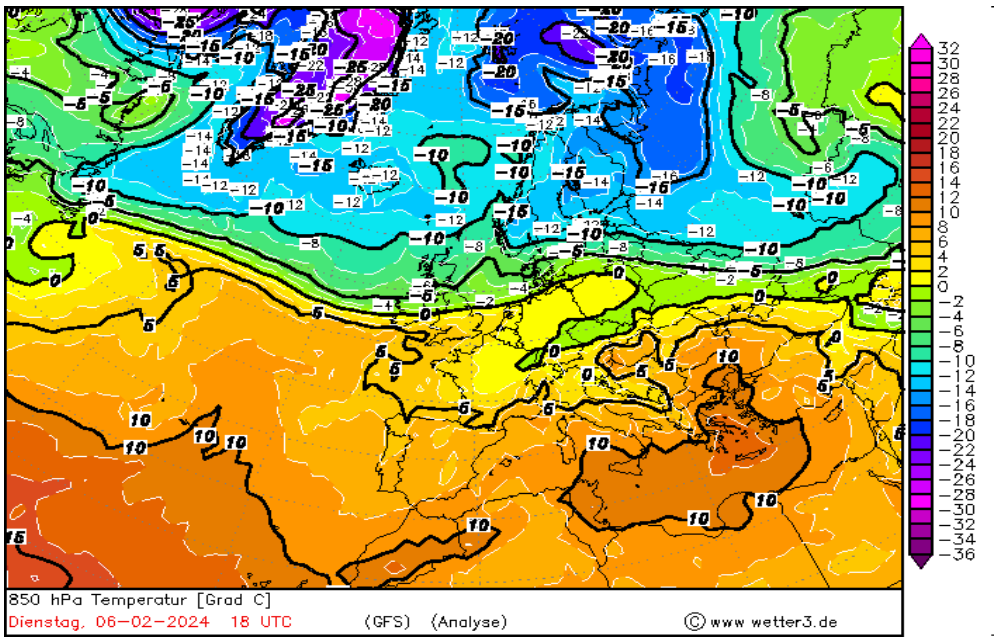

Figure 6. The temperature field at the geopotential surface level at the level of 850 hPa – about 1500 m altitude) from 06.II.2024 at 00 UTC. (www.wetterr3.de).

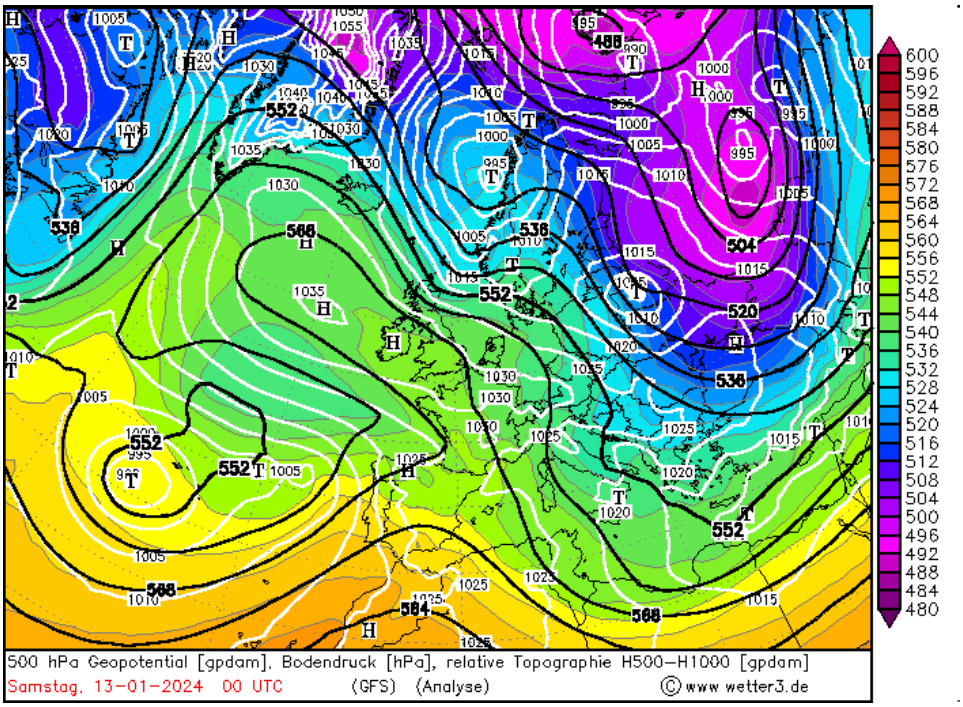

Figure 7. The synoptic situation at the level of the land surface (atmospheric pressure field) superimposed with the synoptic situation at the altitude (the geopotential field at the level of 500 hPa - about 5000 m altitude) and the relative baric topography field (TR 500/1000) from the 13.I.2024 at 00 UTC. (www.wetterr3.de).

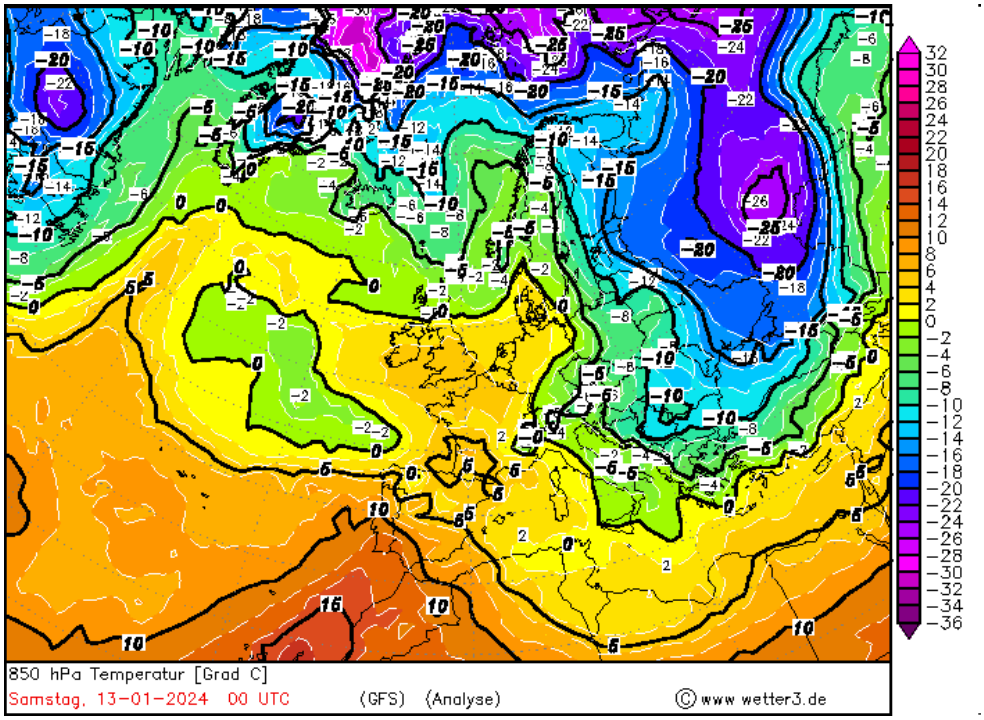

Figure 8. The temperature field at the level of the geopotential surface at the level of 850 hPa – about 1500 m altitude) from 13.II.2024 at 00 UTC. (www.wetterr3.de).

CONCLUSIONS

The winter of 2023-2024 was a very warm winter (FC) ***with an overall seasonal average of 3.88°C and a deviation from normal of 4.83°C, being the warmest winter in the entire history of climate records for Oltenia.*** In the entire history of climate data, there have been only three winters with a seasonal mean ≥3.0°C, the winter of 2023–2024 with a mean of 3.88°C and a deviation from normal of 4.83°C, 2006–2007 with a mean of 3.44°C and a deviation from normal of 4.39°C and winter 2022-2023 with a mean of 3.25°C and a deviation from normal of 4.20°C.

Climate warming has continued and it cannot be labelled as climate change[13] because it is not a stable process, as cold waves and intense cooling of the weather can occur at any time. The evolution of the climate takes place due to variability, not changes. Changes are those developments that do not allow the return to system states recorded in previous phases. For example, living organisms evolve through change and not through variability. For the interval 1961-2024 (63 years) the overall mean of winters is -0.08°C and the deviation from normal is 0.87°C, which according to the Hellmann criterion the winters of the whole period, on average, were warm (CL) (i.e. only slightly warmer than normal) and in the near-normal class. So, in the medium run, we cannot talk about climate change. ***No absolute thermal records were recorded for monthly temperature values, but absolute thermal records were recorded for February monthly averages and winter seasonal averages in almost all of Oltenia.*** For the whole winter, ***the heat units*** were between 190.7 in Voineasa and 532.4 in Calafat with the average for the entire Oltenia region of 394.3, all of which are absolute climate records and characterize the warmest winter. We note that no exceptionally warm winter (EC) has been recorded so far.

Most cold units were recorded in the interval 9-17.I and were between 17.1 at Dr. Tr. Severin and 95.4 at Voineasa, and their average for the entire region was 49,1.

Agrometeorological frost was not recorded, which means a mild winter from an agrometeorological point of view. In the intervals 1961-1981, for 20 years, and 1983-1999, for 16 years, no very warm winter (FC) was recorded. Most very warm winters (FC) have been recorded since 2000 (7 winters out of 8, i.e. 87.5%). So, in general, we are currently in a period of climate warming, a process related to the cycles of climate warming and cooling studied by the Serbian physicist Milankovitch, whose causes are of a cosmic nature. Human activity as well as increasing the amount of CO_2 cannot have significant influences on these processes because the weight of CO_2 in the entire mass of the atmosphere is 0.03% (i.e. three parts out of 10000, and physical and chemical reasoning shows that the proportion is one molecule of CO_2 to 10000 other molecules in the atmosphere.). Global warming and warm climate are bio-stimulant, and the large number of Earth's population and demographic explosion is due to this process.

REFERENCES

BOGDAN OCTAVIA, MARINICĂ I., RUSAN N., RUSU SIMONA. 2007. Riscul iernilor calde în România (cu aplicaţii la iarna 2006-2007). In *Riscuri şi Catastrofe, Editor Victor Sorocovschi*. Edit. Casa Cărţii de Ştiinţă Cluj Napoca. **6**(4): 97-110.

BOGDAN OCTAVIA, MARINICĂ I., MIC LOREDANA-ELENA. 2008. Consideraţii asupra „fenomenului de iarnă caldă" din România. *Comunicări de Geografie. Universitatea din Bucureşti. Facultatea de Geografie*. Edit. Universităţii din Bucureşti. **12**: 139-144.

BOGDAN OCTAVIA & MARINICĂ I. 2009. Caracteristici climatice ale iernii 2007-2008 în Oltenia. *Revista Geografică Serie Nouă.* Edit. Ars Docendi. Bucureşti. **16**: 73-81.

BOGDAN OCTAVIA, MARINICĂ I., MARINICĂ ANDREEA FLORIANA. 2010. Frequency of warm winters within Oltenia in 1999-2008 decade. *Aerul şi Apa, Componente ale Mediului dedicat Conferinţei Ştiinţifice cu acelaşi titlu, 19-20.III.2010 Cluj-Napoca. Universitatea „Babeş-Bolyai" Facultatea de Geografie. Catedra de Geografie fizică şi tehnică în colaborare cu Direcţia Apelor Someş. Eds. Gavril Pandi şi Florin Moldovan*. Edit. Presa Universitară Clujană. Cluj-Napoca: 45-54.

BOGDAN OCTAVIA, MARINICĂ I., MARINICĂ ANDREEA FLORIANA. 2014. Caracteristici climatice ale iernii 2010-2011 în Oltenia. *Revista Geografică T. XIX – XXI 2012-2014. Serie nouă. Academia Română, Institutul de Geografie, Bucureşti 2014*. Edit. Ars Docendi. Bucureşti: 37-48 www.geoinst.ro. (Accessed February 2018).

SANDU I., MATEESCU ELENA, VĂTĂMANU V. V. 2010. *Schimbări climatice în România şi efectele asupra agriculturii*. Edit. Sitech. Craiova. 406 pp.

MARINICĂ I. & CHIMIȘLIU CORNELIA. 2008. Climatic Changes on regional plan in Oltenia and their effects on the biosphere. *Oltenia. Studii şi comunicări. Ştiinţele Naturii*. Muzeul Olteniei Craiova. **24**: 221-229.

MARINICĂ I., CHIMIȘLIU CORNELIA, MARINICĂ ANDREEA FLORIANA. 2010. The cooling bioclimatic index in Oltenia and the thermal risk at low temperatures during the cold season. *Oltenia. Studii şi comunicări. Ştiinţele Naturii*. Muzeul Olteniei Craiova. **26**: 235-246.

MARINICĂ I., CHIMIȘLIU CORNELIA, MARINICĂ ANDREEA FLORIANA. 2011. Consideration upon climatic conditions characteristic to the winter 2010-2011, in Oltenia. *Oltenia. Studii şi comunicări. Ştiinţele Naturii*. Muzeul Olteniei Craiova. **27**(1): 148-154.

[13] ***If climate had evolved through changes, there would have been no life on Earth long ago.***

MARINICĂ I. & MARINICĂ ANDREEA FLORIANA. 2012. Excessively droughty autumn in the south-west of Romania during 2011. *Aerul şi apa componente ale mediului / Air and water components of the environment, Conferinţa 23-24 martie 2012 Cluj Napoca*. Edit. Presa Universitară Clujană. Cluj Napoca: 351-358

MARINICĂ ANDREEA FLORIANA, CHIMIŞLIU CORNELIA, MARINICĂ I. 2012. Considerations on the climatic conditions in Oltenia during the winter of 2011-2012. *Oltenia Studii şi Comunicări. Ştiinţele Naturii.* Muzeul Olteniei Craiova. **28**(1): 149-160.

MARINICĂ ANDREEA FLORIANA, CHIMIŞLIU CORNELIA, MARINICĂ I. 2013. Considerations on the climatic conditions in Oltenia during the warm winter of 2012-2013. *Oltenia Studii şi Comunicări. Ştiinţele Naturii.* Muzeul Olteniei Craiova. **29**(1): 233-244.

MARINICĂ I. & MARINICĂ ANDREEA FLORIANA 2016. *Variabilitate climatică în Oltenia şi schimbări climatice*. Edit. Universitaria. Craiova. 306 pp.

***. https://www.scribd.com/doc/311451614/Zecharia-Sitchin-A-Douasprezecea-Planeta (accessed February 2024).

***. http://stiri.tvr.ro/anul-2021-a-fost-unul-dintre-cei-mai-caldurosi-ani-din-istoria-masuratorilor-meteorologice__898194.html#view (accessed February 2024).

***. http://www.wetterr3.de (accessed February 2024).

***. http://ro.wikipedia.org/wiki/Biocenoz%C4%83 (accessed February 2024).

Marinică Andreea Floriana
Bachelor of Sciences, Klimacampus, Hamburg, gGmbH., Germany.
E-mail: marinica.andreea@gmail.com

Marinică Ion
Associate Professor, University of Craiova, Faculty of Sciences, Bibescu Street no. 84, Craiova, Romania.
E-mail: ionmarinica@yahoo.com

Chimişliu Cornelia
The Oltenia Museum of Craiova, Str. Popa Șapcă, No. 8, Craiova, Romania.
E-mail: chimisliu_cornelia@yahoo.com

Diaconu Luminița
"C-tin Brâncoveanu" Theoretical High School, Dăbuleni, Dolj, Romania.
E-mail: diaconu_luminita_vip@yahoo.com

Received: March 14, 2024
Accepted: July 07, 2024