WARM WINTER 2024-2025 IN SOUTHWEST ROMANIA – A CLIMATE SIGNAL

MARINICĂ Andreea Floriana, MARINICĂ Ion, CHIMIŞLIU Cornelia

Abstract. In 2024, climate warming continued, being the warmest year according to the annual average in the entire data series since 1960. After the very warm summer (FC) with long and intense tropical heat waves, the warm autumn (C) followed, which was the sixth warmest in the history of the climate in Oltenia and very dry in terms of rainfall as a whole (FS). The winter 2024-2025 was warm (C) with an overall seasonal average of 0.91°C and a deviation from normal of 1.86°C, being the 29th value in descending order for warm winters, signifying a significant decrease in the values of the series of seasonal averages recorded in the last 29 years, especially for the last five years, starting with the winter 2019-2020. This is an important climatic signal that shows that in the near future global warming will decrease. February was warm in the first six days and the last four days, and cold in the period 7-24.II, with some frosty nights, with the average daily maximum ≥ 10.0°C only on 1.II.2025. Throughout the winter, eight winter heat waves were recorded in the periods: 1-2.XII (two days); 7-13.XII.2024 (seven days), 15-22.XII.2024 (eight days), 30.XII.2024-3.I.2025 (five days), 8-10.I.2025 (three days); 18.I-6.II.2025 (eight days), 25-28.II (four days). In total, there were 49 warm winter days, i.e. 54.4% of winter days. Two moderate cold waves were recorded in the intervals: 12-17.I (six days), 18-24.II (17 days) totaling 23 days, i.e. 25.6% of winter days. No monthly thermal and pluviometric records were recorded. Most very warm winters (FC) were recorded since 2000 (eight 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: monthly temperature averages, Hellmann criterion, warm winter phenomena, winter heat waves, vegetative processes.

Rezumat. Iarna caldă 2024-2025 în sud-vestul României – un semnal climatic. În anul 2024 încălzirea climatică a continuat, acesta fiind cel mai cald an după media anuală din tot șirul de date începând cu anul 1960. După vara foarte caldă (FC) cu valuri de căldură tropicală lungi și intense, a urmat toamna caldă (C), care a fost a șasea cea mai caldă din istoria climatului în Oltenia și foarte secetoasă pluviometric în ansamblul ei (FS). Iarna 2024-2025 a fost caldă (C) cu media generală anotimpuală de 0,91°C și o abatere față de normală de 1,86°C, fiind a 29 valoare în ordine descrescătoare pentru iernile calde, semnificând o scădere importantă a valorilor șirului mediilor anotimpuale înregistrate în ultimii 29 de ani, în special pentru ultimii cinci ani, începând cu iarna 2019-2020. Acest fapt constituie un semnal climatic important care arată că în viitorul apropiat încălzirea climatică va diminua. Luna februarie a fost caldă în primele șase zile și ultimele patru zile, și în intervalul 7-24.II friguroasă, cu unele nopți geroase, cu media maximelor zilnice ≥ 10,0°C doar în data de 1.II.2025. În tot cursul iernii s-au înregistrat opt valuri de căldură de iarnă în intervalele: 1-2.XII (două zile); 7-13.XII.2024 (șapte zile), 15-22.XII.2024 (opt zile), 30.XII.2024-3.I.2025 (cinci zile), 8-10.I.2025 (trei zile); 18.I-6.II.2025 (opt zile), 25-28.II (patru zile). În total au fost 49 de zile calde de iarnă, adică 54,4% din zilele iernii. S-au înregistrat două valuri de frig moderat în intervalele: 12-17.I (șase zile), 18-24.II (17 zile) însumând 23 de zile, adică 25,6% din zilele iernii. Nu s-au înregistrat recorduri termice lunare și pluviometrice. Cele mai multe ierni foarte calde (FC) s-au înregistrat începând cu anul 2000 (opt 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: medii lunare de temperatură, criteriul Hellmann, fenomene de iarnă caldă, valuri de căldură de iarnă, procese vegetative.

INTRODUCTION

Globally, the last ten years have been the hottest ever recorded globally. ***The year 2024 was the warmest year on record and the first to exceed the 1.5°C threshold*** (Copernicus 9.1.2025). *According to the ERA5 dataset provided by the Copernicus Climate Change Service, in 2024 the global average temperature was **15.1°C**, which is **1.6°C** above the 1850–1900 reference period. Thus, 2024 is the first year in the history of meteorological observations when the global average temperature exceeds the 1.5°C threshold set by the 2015 Paris Agreement. Compared to the previous record set in 2023, 2024 was **0.12°C** warmer. Starting in June, every month of 2023 was warmer than the corresponding month in any previous year (1940–2022), with July and August being the warmest ever recorded.* The largest deviation of ***1.6°C*** (relative to the 1850–1900 reference period) occurs in the Berkeley Earth dataset, and the smallest deviation of ***1.34°C*** in the NOAA dataset. Thus, deviations from certain periods depend on the datasets considered, but regardless of which datasets we consider, it is clear that there has been and is ongoing global warming in the Earth's climate.

In Romania, the year 2024 was the warmest year in the history of meteorological measurements in Romania, with an average annual temperature of 12.9916 °C and a thermal deviation of 2.7163 °C compared to the average for the period 1991 - 2020 (the only deviation ≥ 2.0°C), (communication of the Ministry of Environment, Waters and Forests - MMAP). The period 2000 - 2024 represents the warmest period of 25 consecutive years in which annual thermal deviations are positive (from 0.4338 °C in 2000 to 2.7163°C in 2024), the first five warmest years in the period 1900 - 2024 being 2024, 2023, 2019, 2020 and 2022 (cf. with ANM).

At the level of Oltenia, the year 2024 was the warmest in the data set since 1961, with an annual average of 13.44°C (the only annual average ≥ 13.0°C and with the largest deviation from the average of the last century, of 3.14°C (the only annual deviation ≥2.5°C) being the only very warm year (FC) according to the Hellmann criterion. The warmest five years in Oltenia were: 2024; 2023 with an annual average of 12.74°C and a deviation of 2.44°C; 2019 with an average of 12.41°C and a deviation of 2.11°C; 2022 with an annual average of 12.26°C and a deviation of 1.96°C and 2015 with an annual average of 12.22°C and a deviation of 1.92°C.

We will make some important clarifications regarding climate variability. It has been demonstrated that the terms climate variability and climate change are the negation of each other and cannot coexist (MARINICĂ et al., 2024). From the variability of the Earth-Sun geometry that is directly correlated with climate variability, it is known that the ***precession of the equinoxes***, which represents the retrograde movement of the equinoctial points along the ecliptic[1], permanently occurs. This phenomenon is a direct effect of the precession movement of the Earth's rotation axis relative to the fixed stars. This astronomical process was observed and described by the greatest astronomer of antiquity, Hipparchus. The precession of the equinoxes remained unexplained for tens of centuries. Currently, ***the equinoxes move by 50.3 arc seconds per year, which is why the phenomenon is very slow and, if it maintained this speed, would repeat itself once every 25,765 years***. ***In our opinion, this process is due to the Earth's revolution*** (the annual movement of the Earth around the Sun). A complete rotation takes 365 days 6 h 9 min. 9 s. mean solar time, a value that is the basis for defining the sidereal year (in reality the value is slightly variable from one year to another). A complete rotation takes 365 days 6 h 9 min. 9 s. mean solar time, a value that is the basis for defining the sidereal year (in reality the value is slightly variable from one year to another). Therefore, the annual trajectory of the Earth, each year lasts a little more than 365 days and therefore the new trajectory begins from a point further ahead than the previous year. The movement is from West to East and therefore, the next equinox will occur a little earlier, and on the ecliptic this point appears retrograde compared to the previous year, etc. As a result of this retrograde of the equinoxes, the same thing happens with the precession of perihelion and aphelion[2]. The annual trajectory of the Earth around the Sun is an ellipse with the Sun at one of the foci. So over a long period of time, the Earth's trajectory is like a flower with 25,765 elliptical petals (for a period of 25,765 years). The Earth receives the greatest amount of heat from the Sun at perihelion, that is, during the winter in the Northern Hemisphere, and during this interval, the Southern Hemisphere is oriented towards the Sun. The distance from the Sun is on average 5 million km less than at Aphelion (a value that varies slightly from one year to another). So this immense amount of heat that the Earth receives from the Sun at Perihelion (during the winter in the Northern Hemisphere) is absorbed by the immense expanse of water in the Southern Hemisphere and is then redistributed through the water currents of the Planetary Ocean throughout the Earth, contributing essentially to the moderation of the Global Climate and maintaining the existence of life on Earth[3]. (If the Northern Hemisphere summer occurred while the Earth was at Perihelion, the summer heat would be unbearable with average temperatures 5°C higher than those that typically occur.) Due to the large amount of water in the Southern Hemisphere, the average difference over long periods of time between the average air temperature in the Northern Hemisphere summer and the Southern Hemisphere summer is 5.0°C. So the idea that the polar ice caps will melt is an illusion in the current cosmic construction of the Earth. The Antarctic continent, the only permanently uninhabited continent, is considered the "refrigerator" of planet Earth and contains ice accumulated over many millennia. Astronomical cycles longer than 25,765 years are possible. The precession movement is not simple on a circle but is accompanied by a nutation movement of the Earth's axis (of swinging relative to a certain position). ***The nutation period of 18.6 years correlates very well with periods of short-term climatic cooling and warming*** (MARINICĂ et al., 2024)[4]. Information from old sources speaks of periods in the past when Greenland was a large green island with rich vegetation, and some ancient populations descended from the north of the Earth to Eurasia. Such a process would be possible if the summer of the Northern Hemisphere occurred at Perihelion, a situation possible after several cycles with an average duration of 25,765 years because these do not have an exact duration either. The Earth's orbits around the Sun vary in shape and size (in long-term cycles) and some become circular (shaped like a circle) so the Sun is at the center of the circle, the ellipse becomes a circle, the two foci overlap at the center of the circle. In other situations the Sun is placed at the other focus, in which case Northern Hemisphere summer would be when the Sun is at Perihelion, etc. So nothing is fixed but variability occurs within certain finite limits so that the conditions for the existence of life on Earth are maintained. Some old sources of information show us a map of the Antarctic continent without ice (of the land surface under the ice[5]). Such a situation would occur after a long time in which the inclination of the Earth's axis would be greater, which would make the sun's rays fall almost perpendicularly on the surface of the Antarctic continent at Perihelion. The nutation of the Earth's axis, whose period of 18.6 years coincides with the precession period of the Moon's orbit, leads to the idea that the precession of the Earth's rotation axis is also determined by the action of the Moon, which is why the general movement of the axis bears the inappropriate name of ***lunisolar precession***. We thus have an idea of how great the climatic variations on Earth can be over long periods of time but which have maintained life on Earth and especially the existence of man. Polar ice caps play a major role in the functioning of the huge thermodynamic machine of the

[1] ***Ecliptic*** = Imaginary circle resulting from the intersection of the plane of the Earth's orbit with the celestial sphere and which constitutes the trajectory described by the Sun in its apparent movement.

[2] ***Perihelion*** = the closest point of a planet to its central star. Aphelion = the farthest point of a planet from its central star.

[3] ***Genesis*** 8:22 VDC: As long as the earth remains, seedtime and harvest, and cold and heat, and summer and winter, and day and night, shall not cease!" The only being who sows and reaps is man. So we have the guarantee that man will exist as long as the Earth remains.

[4] There is no nutation without precession.

[5] ***The Piri Reis map*** shows the land edges of Antarctica, not the ice edges, which has led to the conclusion that it was made by aliens. Our opinion is that they would have had ancient information, from earlier populations who lived on Earth in distant times when Antarctica may have been ice-free. The Antarctic ice sheet is today about a mile thick.

atmosphere, and the variability of cosmic factors as well as solar activity are essential in the variability of global climate. It is no coincidence that the current climate warming has coincided with a period of exceptional maximum solar activity. The optimal functioning of the thermodynamic machine of the atmosphere that generates weather and climate is done in the presence of polar ice caps, which constitute its cold poles. The Earth is thus a perfect geoengineering construction. ***All these large climatic variations, over long periods of time, are not changes but variability and are due to the variability of cosmic factors that generate climate***.

The Earth's climate variability is extremely 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 paper is part of a series of extensive studies on climate variability in southwestern Romania and the effects of global warming, being useful to all those interested in climate evolution in this part of Romania (BOGDAN et al., 2007, 2008. 2010, 2014; BOGDAN & MARINICĂ, 2009; MARINICĂ & CHIMIŞLIU, 2008; MARINICĂ et al., 2010, 2011, 2012, 2013, 2016; MARINICĂ & MARINICĂ, 2016; MARINICĂ et al., 2024. Next, we will analyze multiple aspects of climate variability in Oltenia characteristic of the winter 2024-2025, at the regional level in Oltenia and the consequences on agricultural crops, biotopes, the economy and the environment in general.

MATERIAL AND METHOD

To carry out the work, we used the results of daily processing, with special software from the weather forecasting process, the The National Administration of Meteorology (ANM) data archive, the maps currently produced in operational activity, those on the internet provided by international analysis and forecasting centers and those from the NAM Bucharest. International databases and the facilities offered by Office for drawing up tables and graphs. The Hellmann criterion and the comparison with the normal air temperature averages calculated for the last century (1901-1990). The comparison with the normals of the last 30 years is not conclusive because the normals for the last 30 years are moving averages with a linear increasing or decreasing trend like the averages being compared. The paper analyzes the climate variability of the warm winter 2024-2025 in southwestern Romania, based on the thermal and pluviometric regime of December 2024, January and February 2025 and the overall thermal and pluviometric regime of the winter 2024-2025. The effects on the environment and biotopes were also analyzed.

RESULT

1a. Thermal regime of December 2024. ***The monthly averages of air temperature*** calculated for the entire Oltenia region (excluding the mountain area) were between 0.92°C at Voineasa and 5.27°C at Drobeta Turnu Severin, and their deviations from the multiannual averages of the last century were between 2.82°C at Voineasa and 4.46°C at Caracal. According to the Hellmann criterion, December 2024 was warm (C) throughout Oltenia (Table 1). The monthly average of air temperature calculated for the entire Oltenia region was 3.79°C with a deviation from normal of 3.61°C, and according to the Hellmann[6] criterion, December 2024 was warm on average for the entire Oltenia region (Table 1).

According to the general average for the entire Oltenia region, December 2024 was the second warmest December in the entire history of climate observations, after the very warm December 2015 (FC - the only very warm December month (FC)) with the general average of 5.19°C, surpassing December 2023. On all days of the month, the average daily temperature for the entire Oltenia region was positive, meaning that no winter day was recorded.

The maximum monthly air temperatures were recorded on 17 and 19.XII and ranged between 12.0°C at Târgu Jiu on 19.XII.2023 and 19.8°C at Calafat on 17.XII.2022, and their average for the entire Oltenia region was 15.3°C. In December 2024, no thermal records were recorded. The minimum monthly air temperatures were recorded on 13, 14, 23 and 31.XII and ranged between -6.8°C at Apa Neagră on 13.XII.2024 and -1.6°C at Drobeta Turnu Severin on 31.XII.2024, and their average for the entire region was -4.3°C. During most of December, the daily minimum temperatures were positive. ***The heat units[7] in December*** ranged from 39.5 in the Voineasa intramontane depression and 167.5 at Drobeta Turnu Severin in the west of the region, and their average for the entire region was 112.9, which confirms that December was warm. ***The cold units[8]*** were recorded isolatedly, in the intervals of 13-14.XII, 23 and 29-31.XII and

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[6] Hellmann 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 =>warmish (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).

[7] Heat units = åTdaily averages > 0°C ; Cold units = åTdaily averages < 0°C.

[8] The severity of winter in agrometeorology (winter type) is classified by the sum of agrometeorological frost units (□ differences between the values of daily minimum temperatures <-15□C and the critical agroclimatic threshold of -15.0°C, in the interval XII-II). Therefore, an agrometeorological frost unit is the difference of 1°C 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); The frost units for the entire cold season are calculated as **Σ** average daily temperatures ≤ 0°C, in the period November-March; A frost 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. The day when the maximum air temperature is < 0°C is called a winter day. Heat units (**Σ** average daily temp ≥ 0°C). For diagnoses and weather forecasts intended for the public, frost is understood as a temperature ≤ -10.0°C. Frost defined by the forecast terms weather (which are adapted for living organisms) differs from agrometeorological frost (temperatures ≤ -15°C),

were between 0 at Drobeta Turnu Severin, Calafat, Craiova, Târgu Logrești, Târgu Jiu and Rîmnicu Vâlcea and 13.1 at Voineasa, and their average for the entire region except the mountain area was 1.1. (In the mountain area the cold units recorded were 63.2 at Obârșia Lotrului and 67.5 at Parâng.) ***So the cold was insignificant. Frost was not recorded***. ***In the soil at a depth of 5 cm[9], the minimum temperatures*** were recorded on 1, 4, 5, 8-11, 21, 25 and 26.XII.2024 and were between -6°C at Târgu Logrești on 13.XII.2024 and -1°C at Slatina on 13, 14 and 16.XII.2024, and their average for the entire Oltenia region was -3.8°C. The highest monthly minimum temperatures in the soil at a depth of 5 cm were recorded in various areas on 1, 5, 8-11, 18, 21, 25 and 26.XII and were 4 - 5°C throughout Oltenia, and their average for the entire region was 4.8°C. On most days the soil remained thawed, and the plants in agricultural crops and spontaneous vegetation continued their vegetative stage slowly on some days, being very reactive to temperature variations.

Table 1. Air and soil temperature regime at a depth of 5 cm in Oltenia in December 2024. (Hm=altitude of the meteorological station, N-XII=air temperature normals in December calculated for the 20th century (1900-1990) (°C); Tmd*XII.2024 = average monthly air temperature in December 2024 (calculated as the average of daily extremes) (°C); Δ = Tmd*-N air temperature deviation from normal (°C); CH = Hellmann criterion; Tm = minimum monthly air temperature (°C); DTm = date of recording the minimum monthly air temperature (°C); TM = maximum air temperature in Oltenia (°C);DTM = date of recording the maximum air temperature; TmS5 = minimum monthly soil temperature at a depth of 5 cm (°C); DTmS5 = Date of recording the minimum monthly soil temperature at depth of 5 cm; CMS5 = highest minimum soil temperature at a depth of 5 cm (°C); DcmMmS = Date of recording of the highest minimum soil temperature at a depth of 5 cm Average Oltenia = Average for the entire Oltenia region).

Meteorological Station	Hm	N-XI I	Tmd* XII2024	Δ	CH	Tm	DTm	TM	DTM	Tm S5	DTmS5	CMS 5	Dcm MmS	MedS H5cm
Drobeta Turnu Severin	77	1,4	**5,27**	3,87	C	**-1,6**	**31**	17,7	17	-5	13;23;31	5	5;21;25	0,0
Calafat	66	1,0	4,68	3,68	C	-3,0	31	**19,8**	**17**	-3	8;14;22;30; 31	5	5;10	0,7
Bechet	65	0,4	4,62	4,22	C	-3,4	23	18,4	17	-4	16;20;30	5	4;10;21	0,5
Băilești	56	0,4	4,56	4,16	C	-2,4	31	17,2	17	-3	8;20	5	1;5;10; 18; 21	**1,8**
Caracal	112	-0,1	4,36	**4,46**	C	-3,3	23	16,3	17	-3	13;16;19; 30	5	10;11	0,8
Craiova	190	0,1	3,95	3,85	C	-3,4	23	16,7	17	-4	13;	5	11;21	1,3
Slatina	165	0,3	3,92	3,62	C	-3,8	23	16,1	17	***-1***	***13;14;16***	5	9;11;25	**1,8**
Bâcleș	309	-0,4	3,48	3,88	C	-2,7	14	15,7	17	-5	13;	4	21;25	-0,2
Târgu Logrești	262	0,1	3,59	3,49	C	-6,2	13	13,8	17	**-6**	**13;**	4	5;8;9;2 6	***-0,4***
Drăgășani	280	0,6	3,64	3,04	C	-5,2	30	15,5	17	-5	16;	5	9;	0,4
Apa Neagră	250	0,1	3,34	3,24	C	***-6,8***	***13***	16,3	17	-2	13;19;31	4	5;9;25	1,1
Târgu Jiu	210	0,1	3,52	3,42	C	-4,5	13	***12,0***	***19***	-5	13;	5	9;	0,6
Polovragi	546	0,1	2,95	2,85	C	-4,5	23	14,1	17	-	-			-
RîmnicuVâlcea	243	0,5	4,03	3,53	C	-3,8	13	13,3	19	-4	13;16;31	5	25;	0,7
Voineasa	587	-1,9	***0,92***	***2,82***	C	-5,8	13	12,1	17	-	-			-
Parâng	1585					-9,1	13	9,7	19	-	-			-
Media Oltenia	-	0,18	3,79	3,61	C	-4,3		15,3		-3,8		4,8		0,7
Obârșia Lotrului	1404	-4,9	-2,9	2	C	-12,2	13	5,6	18	-	-			-

(Source: processed data from the ANM archive)

Throughout December 2024, the biotopes and biocenoses[10] generally remained active. Vernalization[11] occurred during the cold intervals of December 2024, January and especially February 2025.

plants being better adapted to climatic conditions (due to their cellular structure and specific biotic processes). Starting from 21.II.2022, ANM redefined agrometeorological frost for temperatures ≤ -10°C, an aspect due to a long string of warm winters in which agrometeorological frost after the old thermal limit of -15°C disappeared. Frost units are calculated analogously after the new limit.

[9] ***The 5 cm depth in the soil*** is the area where most of the root system of autumn crops is usually located.

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

[11] ***Vernalization*** represents the acquisition or acceleration of the ability to bloom under the influence of exposure to low temperatures.

The graphs of the variation of the parameters characterizing the air temperature (daily averages of minimum temperatures, average temperatures and daily averages of maximum temperatures) had trends: insignificantly increasing for the maximum temperature and decreasing for the daily minimums and averages, signifying the gradual installation of the winter season, and of these, the fastest decreasing was the minimum temperature (Fig. 1).

We note that the warming of the weather that occurs regularly near Christmas (December 25) occurred earlier in the interval December 15-22 with a maximum on December 17-19. This warming has deep causes related to the precession movement of the Earth, which after December 21[12], determines the beginning of the gradual orientation of the Northern Hemisphere of the Earth towards the Sun and therefore the reorientation of the flows of warm and cold advections begins. ***In December 2024, the warming of the weather was recorded in the intervals (waves of heat): 1-2.XII (two days), 7-13.XII (seven days), 15-22.XII (eight days) and 30-31.XII (two days) totaling 19 days. Cold waves were not recorded, and cooling of the weather occurred on 8 and 13-14.XII.2024, being insignificant.***

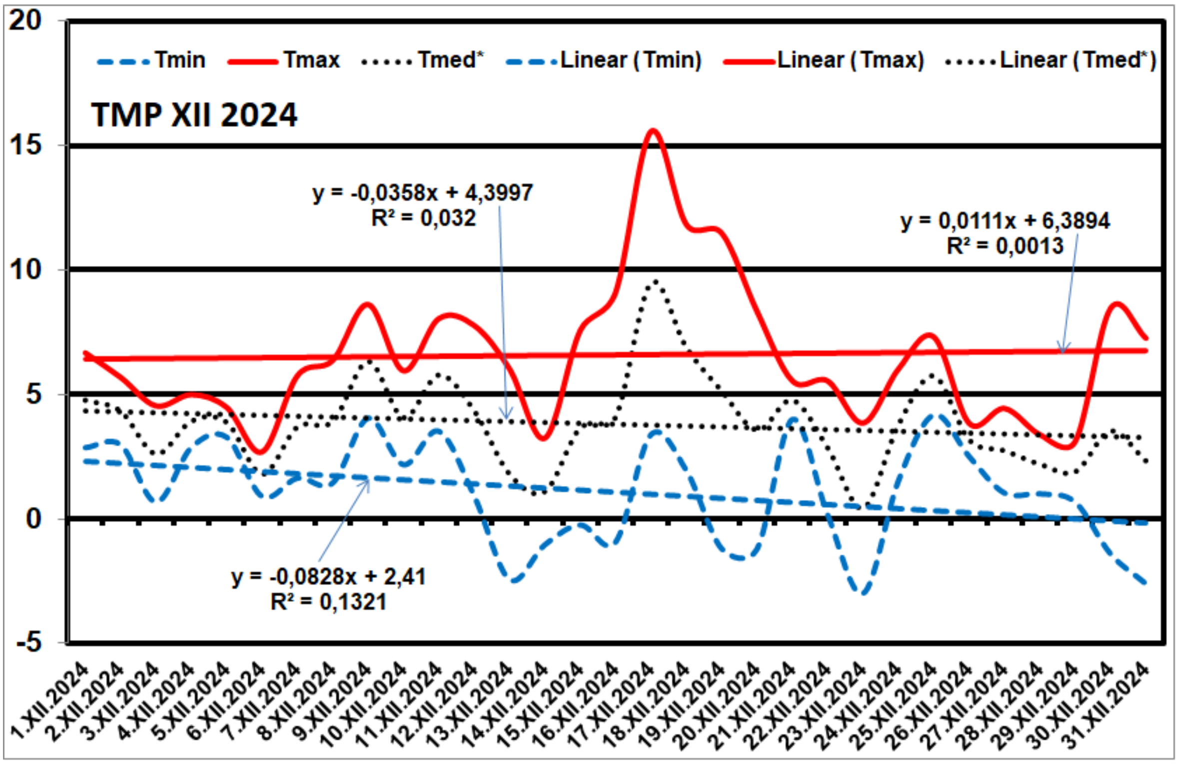

Figure 1. Variation of parameters characterizing air temperature (average daily minimum, daily average and average daily maximum, calculated for the entire region) in December 2024. (Source: data processed from the ANM archive).

1.b. Rainfall regime of December 2024

The monthly precipitation amounts ranged between 53.5 l/m^2 at Voineasa and 99.0 l/m^2 at Bechet, and their percentage deviations from normal were between -2.9% at Voineasa and 172.7% at Bechet (Table 2). According to the Hellmann criterion, December 2024 was excessively rainy (EP) in most of Oltenia, slightly rainy (PP) in the Apa Neagră area, rainy (P) Târgu Jiu, Voineasa and Bâcleș and very dry (FS) in the mountain area at Parâng. The average monthly precipitation amounts for the entire region were 74.4 l/m^2, and its percentage deviation from normal was 45.8%. According to the Hellmann criterion, December 2024 was on average very rainy (FP) for the entire region. Precipitation was liquid throughout Oltenia, and it snowed in the mountains. The snow cover was insignificant and was recorded only in the mountains (39 cm in Parâng on 25.XII) and 52 cm in Obârșia Lotrului on the same date. December was the richest in precipitation from 1.XII.2023 to the end of 2024 (all the other previous 12 months being pluviometrically deficient from dry (S) to excessively dry (ES) and from the entire winter 2024-2025 and restored the soil water reserve to optimal values throughout Oltenia.

2a. Thermal regime of January 2025

The monthly averages of air temperature ranged between -0.8°C at Voineasa (the only negative average) and 5.0°C at Drăgășani, and their deviations from normal ranged between 3.9°C at Voineasa and 7.3°C at Drăgășani. According to the Hellmann criterion, January was very warm (FC) in most of Oltenia and warm (C) in the Apa Neagră and Voineasa areas (Table 3). The average air temperature calculated for the entire Oltenia region was 3.38°C, and its deviation from normal was 5.95°C. According to the Hellmann criterion, January 2025 was very warm (FC) on average

[12] The winter solstice in 2024 occurred on December 21, 2024 at 11:21 AM.

for the entire Oltenia region. According to the monthly average temperature, January 2025 was the second warmest January in the history of climate in Oltenia after January 2007 with a monthly average of 4.73°C and a deviation from normal of 7.29°C.

Table 2. Precipitation amounts (l/m^2) recorded in the winter of 2024-2025 (Σ), compared to normal values[13] (N); (EP=exceptionally rainy; FP=very rainy; PP=little rainy; N=normal rainfall; ES=exceptionally dry), Δ%=percentage deviation from normal; CH=Hellmann's criterion.

No. crt.	Meteorological Station	Hm	December 2024				January 2025				February 2025			
			ΣXII	N	Δ%	CH	Σ I	N	Δ%	CH	ΣII	N	Δ%	CH
1	Drobeta Turnu Severin	77	78,4	61,2	28,1	**P**	2,8	51,4	-94,6	**ES**	13,5	47,9	-71,8	**ES**
2	Calafat	66	68,5	45,5	50,5	**EP**	3,6	40,4	-91,1	**ES**	8,3	38,0	-78,2	**ES**
3	Bechet	65	**99,0**	***36,3***	**172,7**	**EP**	2,0	33,5	-94,0	**ES**	**19,0**	34,8	**-45,4**	**FS**
4	Băileşti	56	92,4	46,8	97,4	**EP**	3,2	38,5	-91,7	**ES**	9,1	36,1	-74,8	**ES**
5	Caracal	112	83,2	39,5	110,6	**EP**	2,3	34,7	-93,4	**ES**	7,8	34,5	-77,4	**ES**
6	Craiova	190	92,9	41,8	122,2	**EP**	2,4	37,5	-93,6	**ES**	5,7	30,4	-81,3	**ES**
7	Slatina	165	83,3	42,8	94,6	**EP**	1,6	36,0	-95,6	**ES**	9,6	38,4	-75,0	**ES**
8	Bâcleş	309	59,0	54,7	7,9	**N**	4,3	50,5	-91,5	**ES**	7,5	44,1	-83,0	**ES**
9	Târgu Logreşti	262	93,5	44,8	108,7	**EP**	2,0	35,9	-94,4	**ES**	7,8	41,0	-81,0	**ES**
10	Drăgăşani	280	73,9	44,6	65,7	**EP**	3,4	34,1	-90,0	**ES**	13,4	35,4	-62,1	**ES**
11	Apa Neagră	250	96,5	**82,3**	17,3	**PP**	3,5	70,9	-95,1	**ES**	14,1	66,4	-78,8	**ES**
12	Târgu Jiu	210	68,7	64,0	7,3	**N**	2,0	53,9	***-96,3***	**ES**	11,6	52,0	-77,7	**ES**
13	Polovragi	546	55,8	56,1	-0,5	**N**	**5,2**	48,9	-89,4	**ES**	9,9	48,4	-79,5	**ES**
14	Rîmnicu Vâlcea	243	59,9	46,2	29,7	**P**	1,6	35,5	-95,5	**ES**	8,7	38,4	-77,3	**ES**
15	Voineasa	587	***53,5***	55,1	-2,9	**N**	***0,1***	42,7	-99,8	**ES**	***3,8***	44,0	***-91,4***	**ES**
16	Parâng	1585	***31,7***	54,6	***-41,9***	FS	11,6	57,7	-79,9	**ES**	8,1	47,7	-83,0	**ES**
	Media Oltenia	-	74,4	51,0	45,8	**FP**	3,2	43,9	-92,7	**ES**	9,9	42,3	-76,7	**ES**
17	Obârșia Lotrului	1404	0,1	54,6	-99,8		0,9							

(Source: processed data from the ANM Archive)

The maximum monthly air temperatures were recorded on 9, 10, 19, 28-31.I and ranged between 12.4°C in Voineasa on 29.I.2025 and 19.9°C in Drăgăşani on 29.I.2025. The beginning and end of January were marked by ***three moderate heat waves: 1-3.I.2025*** (three days - continuation of the one that started on 30.XII.2024), ***8-10.I.2025*** (three days) and ***18-31.I.2025*** (14 days) totaling 20 warm days (64.5% of the days of the month). No thermal records were recorded in January 2025. The heat wave triggered on 18.I. was extended until 6.II.2025. In January 2025, ***a single moderate cold wave*** was recorded between 12-17.I.2024 (six days) during which the monthly minimum temperatures were recorded. The average monthly maximum temperatures for the entire Oltenia region were 16.4°C. ***The monthly minimum air temperatures for January*** were recorded on 15-17.I.2025 (Table 3) and ranged between -12.6°C at Apa Neagră and Voineasa on 16.I.2024 and -6.2°C at Caracal on the same date. The average monthly minimum air temperature (excluding the mountain area) calculated for the entire Oltenia region was -9.1°C.

The heat units ranged from 26.5 at Voineasa to 157.6 at Drăgășani, and their average for the entire region was 111.0, being the second average of all winter months. ***The cold units*** ranged from 20.8 at Drobeta Turnu Severin and 147.8 at Voineasa, with the average for the entire region of 58.4, being the second of all winter months. Frost in January 2025 was recorded in four areas at Polovragi, Apa Neagră, Târgu Logrești and Voineasa, and the frost units ranged from 0.4 at Polovragi and 7.1 at Voineasa, with a monthly average of 2.9. In the mountain area, the frost units were 5.1 at Parâng located on the southern slope and 49.4 at Ob Lotrului located on the northwestern slope of the mountain. So in January, the frost was insignificant.

At a depth of 5 cm in the soil, the minimum temperature values were recorded between 15-17.I and were between -13°C at Târgu Logrești on 16.I.2025 and -6°C at Slatina on 16-17.I.2025, and their average for the entire Oltenia region was -9.9°C. ***The highest monthly minimum soil temperature at a depth of 5 cm*** (CMS5) were recorded on 10, 22, 30 and 31.I and were between 0°C at Drobeta Turnu Severin on 30.I and 7°C at Craiova on the same date, and their average for the entire region was 2.7°C. The soil remained thawed for most of the days. As a result of the warm weather, the plants continued their slow vegetation, and the trees, vines and others continued their vegetative dormancy. In January, snowdrops, hyacinths, forget-me-nots, hazel and others bloomed, and the bees went out to collect pollen and propolis for 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 increasing trends (Fig. 2) and the fastest increasing was the maximum temperature.

[13] The Voineasa and Bâcleș meteorological stations, because they have incomplete rainfall data in the cold season (the precipitation sensor remains covered), cannot be taken into account.

Table 3. Air and soil temperature regime at a depth of 5 cm in Oltenia in January 2025. (Hm=altitude of the meteorological station, N-Jan = normal air temperature in January calculated for the 20th century (1900-1990) (°C); Tmed*I.2025 = average monthly air temperature in January 2025 (calculated as the average of daily extremes) (°C); Δ = Tmed*-N deviation of air temperature from normal (°C); CH = Hellmann criterion; Tm = minimum monthly air (°C); DTm = date of recording the minimum air temperature (°C); TM = maximum air temperature in Oltenia (°C); DTM = date of recording the maximum air temperature; TmS5 = minimum monthly soil temperature at a depth of 5 cm (°C); DTmS5 = Date of recording the minimum monthly soil temperature at depth of 5 cm; CMS5 = highest minimum soil temperature at a depth of 5 cm (°C); DCMS = Date of recording of the highest minimum soil temperature at a depth of 5 cm; Average Ol = Average for the entire Oltenia region.

Meteorological Station	Hm	N-Ian	Tmed* I 2025	Δ	CH	Tm	DTm	TM	DTM	TmS5	DTmS5	CMS5	DCMS	MedS H5cm
Drobeta Turnu Severin	77	-1,1	4,3	5,4	FC	-7,8	16	17,3	29	-12	16	0	*30*	-5,5
Calafat	66	-1,8	3,6	5,4	FC	-7,5	15	15,3	29	-11	15	2	22	-4,2
Bechet	65	-2,2	3,4	5,6	FC	-7,9	16	17,4	9;10	-10	16	1	22;30	-4,3
Bailești	56	-2,3	3,3	5,6	FC	-8,3	15	16,0	29	-8	16	3	30	-2,4
Caracal	112	-2,9	4,2	7,1	FC	-6,2	16	18,2	29	-9	16	2	30	-3,5
Craiova	190	-2,6	3,8	6,4	FC	-8,4	16	18,1	29	-9	16	7	30	-1,9
Slatina	165	-2,4	3,9	6,3	FC	-9,0	15	18,5	29	-6	16;17	3	30	-1,4
Bâcleș	309	-3	4,2	7,2	FC	-7,2	16	16,9	29	-11	15;16	2	30	-4,6
TârguLogrești	262	-2,7	2,7	5,4	FC	-12,5	16	18,0	29	*-13*	*16;*	1	10	-6,4
Drăgășani	280	-2,2	5,0	7,2	FC	-6,9	15	19,9	29	-10	15;16	3	30	-3,5
Apa Neagră	250	-2,6	2,1	4,7	C	*-12,6*	*16*	18,1	31	-9	16	1	31	-3,1
Târgu Jiu	210	-2,6	2,8	5,4	FC	-10	16	17,0	30	-11	16	4	30	-4,1
Polovragi	546	-3,2	4,1	7,3	FC	-7,8	17	16,0	28	-	-			-
Rîmnicu Vâlcea	243	-2,2	4,2	6,4	FC	-8,7	15	18,5	29	-10	15;16;17	6	30	-2,5
Voineasa	587	-4,7	*-0,8*	3,9	C	*-12,6*	*16*	*12,4*	*29*	-	-			-
Parâng	1585					-11,8	5	10,0	19	-	-			-
Media Oltenia	-	-2,57	3,38	5,95	FC	-9,1		16,4		-9,92		2,7		-3,6
Obârșia Lotrului	1404	-6,2	-2	4,2	C	-20,6	16	10,6	28	-	-			-
Petroșani	607	-3,2	1,4	4,6	C	-13,4	16	15,3	29	-9	16;17	1	10;	-3,2

(Source: processed data from the ANM Archive)

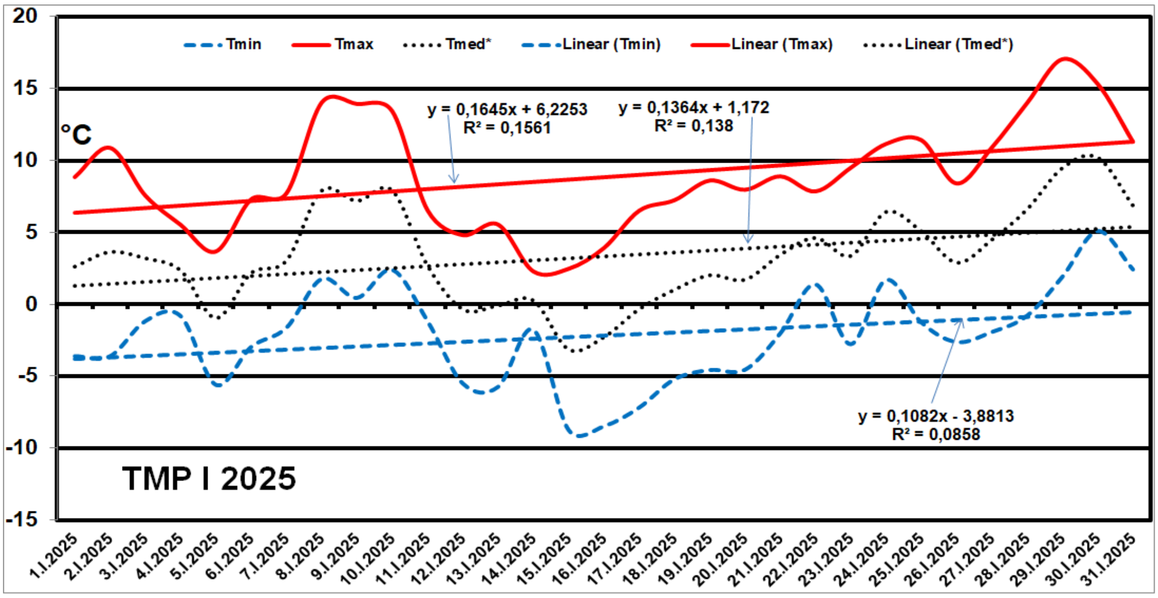

Figure 2. Variation of parameters characterizing air temperature (average daily minimum, daily average and average daily maximum, calculated for the entire region) in January 2025. (Source: data processed from the ANM archive).

2.b. Rainfall regime of January 2025. Monthly precipitation amounts ranged between 0.1 l/m^2 in the Voineasa intramontane depression and 5.2 l/m^2 in the Polovragi Subcarpathian depression, with the maximum rainfall in the mountain area at Parâng of 11.6 l/m^2. The percentage deviations of monthly precipitation amounts from normal were between -99.8% at Voineasa and -89.4% at Polovragi. According to the Hellmann[14] criterion, January was excessively dry (ES) throughout Oltenia, (Table 2). The average monthly precipitation amounts in January 2025, for the entire Oltenia region was 3.2 l/m^2, and its deviation from normal was -92.7%, which according to the Hellmann criterion confirms that January was on average excessively dry (ES) for the entire region. Most precipitation was in the form of rain. On some nights, the decrease in air temperature determined the transformation of rain into sleet and snow and the formation of an insignificant layer of snow. In the mountain area, the maximum thickness of the snow layer was 46 cm in Obârșia Lotrului on 11.I.2025.

3a. Thermal regime of February 2025. ***The monthly averages of air temperature*** were between -7.1°C in the Voineasa intramontane depression and -2.2°C in the extreme west at Drobeta Turnu Severin (Table 4). Their deviations from normal values were between -5.8°C at Apa Neagră and -3.1°C at Drobeta Turnu Severin and Bâcleș. According to the Hellmann criterion, February 2025 was cold (R) in most of Oltenia and very cold FR at Târgu Logrești and Apa Neagră and in the mountain area at Obârșia Lotrului. The general average of air temperature calculated for the entire Oltenia region, except for the mountain area, was -4.43°C, and its deviation from normal was -4.0°C, which according to the Hellmann criterion shows that ***February was on average cold (R) for the entire Oltenia region***. It is the first cold (R) winter month recorded after 2010. This is a climate signal that may indicate that ***climate warming will decrease in the coming years. The maximum air temperatures*** were recorded, except for the mountain area, on the first day of the month and ranged between 10.7°C at Slatina in the Getic Piedmont and 17.6°C at Apa Neagră, and their average for the entire region was 14.7°C. ***The minimum monthly air temperatures*** were recorded on 10, 11 and 19-23.II, and the maximum intensity of air cooling of -15.3°C at Apa Neagră on 19.II. 2025. In February, ***two heat waves were recorded in the intervals 1-6.II (six days) and 25-28.II (four days), totaling 10 days. The most intense cold wave of the entire winter was recorded between 8-24.II.2025 with a duration of 17 days***.

In the soil at a depth of 5 cm, the thermal minimums were recorded on the dates of 10-12, 19-22 and 24.II and were between -16°C at Bâcleș on the date of 19.II and -9°C at Apa Neagră on the dates of 11 and 12.II. ***The average of the thermal minimums in the soil*** at a depth of 5 cm for the entire Oltenia was -12.9°C. The highest daily minimums of temperature in the soil at a depth of 5 cm were recorded on the dates of 2, 3 and 28.II and were between 1°C at Bâcleș and 6°C at T. Jiu with ***the average for the entire Oltenia region*** of 3.7°C.

Table 4. Air and soil temperature regime at a depth of 5 cm in Oltenia in February 2025. (Hm=altitude of the meteorological station, N-Feb=air temperature normals in February calculated for the 20th century (1900-1990) (°C); Tmed*II.2025 = monthly average air temperature in February 2025 (calculated as the average of daily extremes) (°C); Δ = Tmed*-N air temperature deviation from normal (°C); CH = Hellmann criterion; Tm = minimum monthly air temperature (°C) in February; DTm = date of recording the minimum air temperature (°C); TM = maximum air temperature in February (°C); DTM = date of recording the maximum air temperature; TmS5 = minimum monthly soil temperature at a depth of 5 cm (°C); DTmS5 = Date of recording the minimum temperature monthly soil temperature at a depth of 5 cm; CMS5 = highest minimum soil temperature at a depth of 5 cm (°C); DCMS = Date of recording of the highest minimum soil temperature at a depth of 5 cm; Average Ol = Average for the entire Oltenia region).

Meteo Station	Hm	N-Feb	Tmed*II 2025	Δ	CH	Tm	DTm	TM	DTM	TmS5	DTmS5	CMS5	DCMS	MedSH5cm
Drobeta Turnu Severin	77	0,9	***-2,2***	**-3,1**	**R**	***-7,4***	**11**	17,3	1	-12	11;12	4	28	-5,7
Calafat	66	0,4	-3,5	-3,9	**R**	-9,8	10	16,9	1	-13	10;11;12	3	28	-6,0
Bechet	65	-0,1	-4,9	-4,8	**R**	-12,5	10	15,9	1	-14	10;12	2	28	-6,6
Băilești	56	-0,1	-3,7	-3,6	**R**	-10,1	10	16,8	1	-10	10;	3	28	-3,7
Caracal	112	-0,7	-4,3	-3,6	**R**	-10,6	21	12,3	1	-16	20;22	5	3	-7,1
Craiova	190	-0,4	-4,0	-3,6	**R**	-10,7	19	13,9	1	-11	19;	4	2	-4,3
Slatina	165	-0,2	-4,8	-4,6	**R**	-11,5	23	***10,7***	***1***	-15	21;	4	2	-4,2
Bâcleș	309	-0,9	-4,0	**-3,1**	**R**	-9,8	20	15,8	1	***-16***	***19;***	***1***	***2***	-6,6
Târgu Logrești	262	-0,7	-5,9	-5,2	**FR**	-13,2	11	16,8	1	-15	11;	3	2	***-7,4***
Drăgășani	280	-0,2	-3,1	-2,9	**R**	-8,7	23	11,6	1	-15	19;	4	2	-5,8
Apa Neagră	250	-0,6	-6,4	***-5,8***	**FR**	***-15,3***	***19***	**17,6**	**1**	**-9**	**11;12**	4	2	**-3,0**
Târgu Jiu	210	-0,4	-3,7	-3,3	**R**	-10,0	10	16,9	1	-11	10,11	**6**	**2**	-4,3
Polovragi	546	-1,4	-5,1	-3,7	**R**	-10,5	19	15,5	1					
Rîmnicu Vâlcea	243	0,0	-3,8	-3,8	**R**	-9,5	11	16,3	1	-11	11;24	5	2	-4,5
Voineasa	587	-2,5	***-7,1***	-4,6	**R**	-13,4	21	11,7	1					

[14] ***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 rainfall (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);

Parâng	1585	-5,1	-3,6	1,5	CL	-15,0	22	8,6	18					
Media Oltenia	-	-0,46	-4,43	-4	R	-11,13		14,66		-12,9		3,7		-5,3
Obârșia Lotrului	1404	-5,5	-11,5	-6	FR	-21,7	21	9,0	27					
Petroșani	607	-1,3	-6,4	-5,1	FR	-14,2	21	12	1	-11	4;	3	1	-3,8

(Source: data processed from the ANM archive).

The graphs of the variation of the parameters characterizing the air temperature in February (daily averages, daily minimums and daily maximums) had linear decreasing trends for the daily averages of temperature, daily minimums and daily maximums (Fig. 3), and the fastest decreasing was the minimum temperature. ***The heat units*** ranged between 19.0 at Voineasa and 67.3 at Drobeta Turnu Severin, and their average for the entire region, except for the mountain area, was 43.2. In the mountain area, the heat units were 3.9 at Parâng and 6.2 at Obârșia Lotrului. ***The cold units*** were recorded especially during the cold wave and ranged between 18.4 at Drobeta Turnu Severin and 76.0 at Voineasa with the average for the entire region (except for the mountain area) of 46.6 being the highest throughout the winter. Agrometeorological frost was also recorded during this cold wave, and the units ranged from 0 in Drobeta Turnu Severin, Calafat, Bâcleș, Târgu Jiu and Rîmnicu Vâlcea and 15.5 in Voineasa with an average for the entire Oltenia region of 4.1. In the mountain area, frost units were 23.0 in Parâng and 85.6 in Obârșia Lotrului. All these agrometeorological conditions signifying ***a cold winter month from an agrometeorological point of view***.

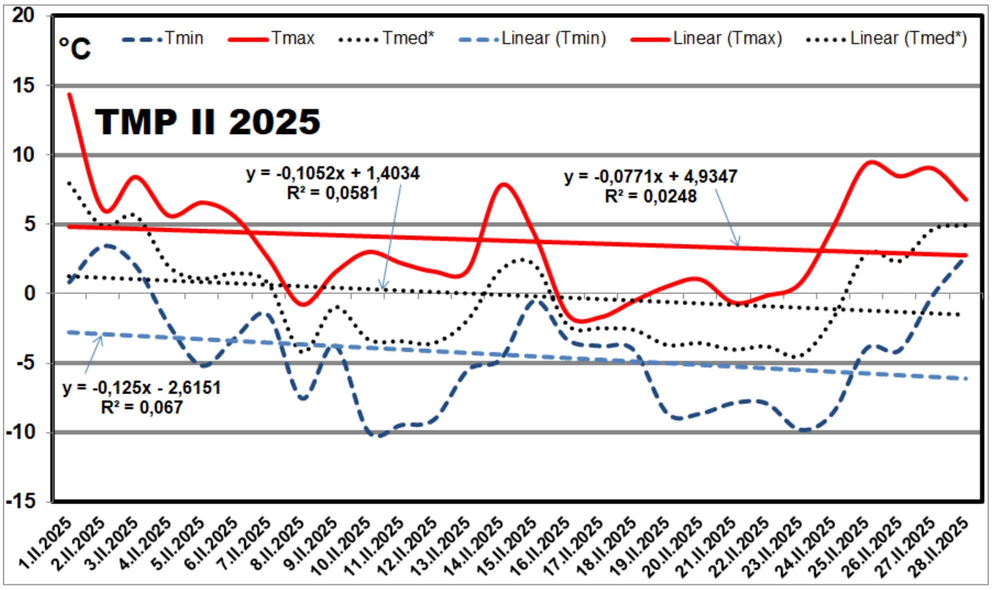

Figure 3. Variation of parameters characterizing air temperature (average daily minimum, daily average and average daily maximum, calculated for the entire region) in February 2025. (Source: data processed from the ANM archive).

3.b. Rainfall regime of February 2025. ***Monthly precipitation amounts*** ranged between 3.8 l/m^2 at Voineasa and 19.0 l/m^2 at Bechet, and their percentage deviations from normal were between -91.4% at Voineasa and -45.4% at Bechet. According to the Hellmann criterion, February was excessively dry (ES) in most of Oltenia and very dry (FS) in limited areas at Bechet (Table 2). The average monthly amounts for the entire region were 9.9 l/m2, and its percentage deviation from normal was -76.7%, which confirms that on average February 2025 was exceptionally dry on average for the entire region. ***The snow layer*** was recorded between 16-24.II with thicknesses between 0 and 15 cm (maximum thickness in Oltenia of 15 cm at Drăgășani and 0 cm in the extreme west). At the level of Romania, the maximum thickness of the snow layer was 48 cm, recorded at Bucharest Filaret on 19.II.2025 at 08:00 and lasted until 28.II, accompanied by frost that determined thermal minimums of -20.1°C at Oltenița and -20.3°C at Întorsura Buzăului on 24.II.2025, being the minimums of the 2024-2025 winter, and in the mountain area of Oltenia -21.7°C at Obârșia Lotrului on 21.II. The maximum extension of the snow layer was recorded on 18.II.2025 (Fig. 4).

4. Seasonal climate characteristics of the winter 2024-2025. ***The seasonal averages of the air temperature*** were between -2.3°C at Voineasa and 2.5°C at Drobeta Turnu Severin. There is only one negative seasonal average of -0.3°C at Apa Neagră, all the others being positive. The deviations of the seasonal averages from normal were between 0.7°C at Voineasa and 2.6°C at Caracal and Bâcleș. According to the Hellmann criterion, the winter 2024-2025 was warm (C) in most of Oltenia, very warm (FC) at Caracal and Bâcleș and lukewarm at Apa Neagră and Voineasa (Table 5). ***The seasonal average of the air temperature calculated for the entire Oltenia region*** was 0.91°C, and its deviation from the normal was 1.86°C. According to the Hellmann criterion, on average the winter of 2024-2025 was warm (C) as a whole. ***The general seasonal average of 0.91°C is the 29th value in descending order for warm winters, signifying a significant decrease in the values of the series of seasonal averages recorded in the last five years starting with the winter of 2019-2020.***

The winters of 2006-2007, 2022-2023 and 2023-2024 are the only winters with a seasonal average ≥3.0°C in the entire data series, which shows that climate warming has decreased.

The seasonal precipitation amounts ranged between 57.4 l/m^2 at Voineasa and 120.0 l/m^2 at Bechet, and their percentage deviations from normal were between -59.5% at Voineasa and 14.7% at Bechet. According to the Hellmann criterion, the winter of 2024-2025 was excessively dry (ES) at Bâcleş, Apa Neagră, Târgu Jiu, Polovragi and Voineasa, very dry (FS) at Drobeta Turnu Severin, Calafat and Rîmnicu Vâlcea, dry (S) at Slatina and Drăgăşani, slightly dry (PS) at Băileşti, Caracal and Târgu Logreşti, normal pluviometrically (N) at Craiova and slightly rainy (PP) at Bechet, and in the mountain area (Parâng) excessively dry (ES) (Table 5).

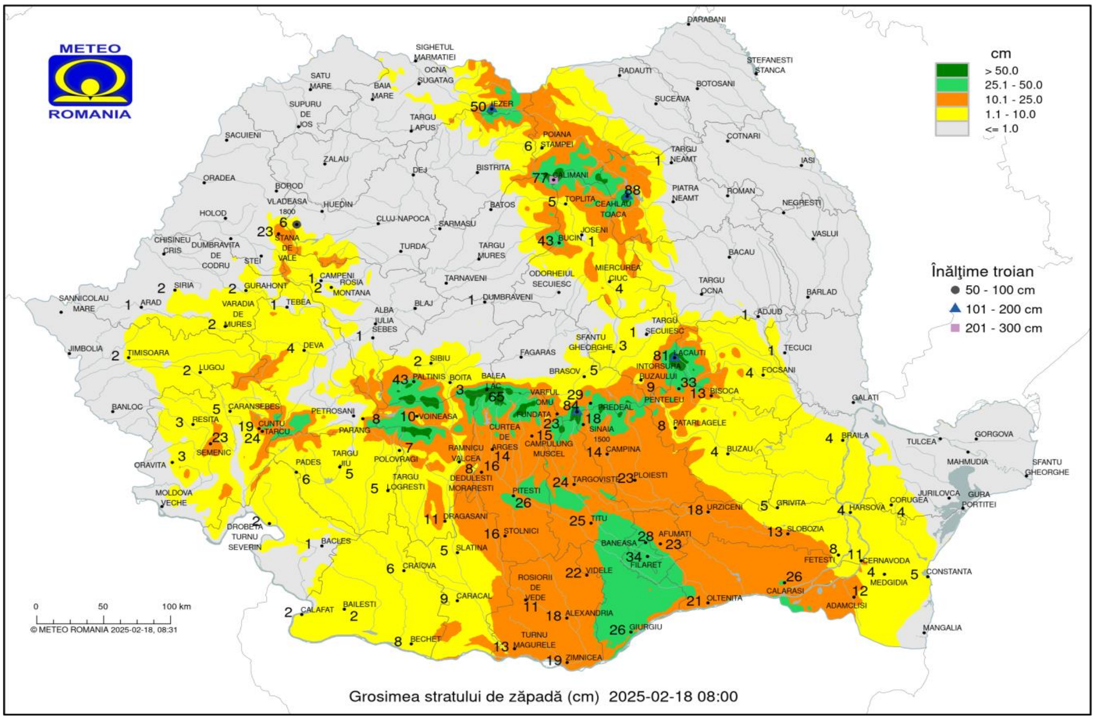

Figure 4. Maximum snow cover in winter 2024-2025 (18.II.2025 08:00). (according to ANM Bucharest).

Table 5. Overall thermal and pluviometric regime of winter 2024-2025. (Hm = altitude of the meteorological station, W`24-`25 = average temperature values in winter 2024-2025 (°C), NW = normal values of seasonal averages of winter temperature (°C), Δ = W-N = deviations of average temperatures from normal (°C) CrH = Hellmann criterion; SW = sum of precipitation in winter 2024-2025 (l/m^2), NW = normal values of winter precipitation (l/m^2), Δ = S-N = deviations from normal (l/m^2), Δ% = percentage deviations from normal).

No. crt.	Meteorological Station	Hm	Termic regim (°C)				Pluviometric regim (l/m^2)				
			W`24-`25	NW	Δ=W-N	CrH	SW	NW	Δ=S-N	Δ%	CrH
1	Drobeta Turnu Severin	77	**2,5**	0,4	2,1	**C**	94,7	160,5	-65,8	-41,0	**FS**
2	Calafat	66	1,6	-0,1	1,7	**C**	80,4	123,9	-43,5	-35,1	**FS**
3	Bechet	65	1,0	-0,6	1,6	**C**	**120,0**	104,6	15,4	**14,7**	**PP**
4	Băileşti	56	1,4	-0,7	2,1	**C**	104,7	121,4	-16,7	-13,8	**PS**
5	Caracal	112	1,4	-1,2	**2,6**	**FC**	93,3	108,7	-15,4	-14,2	**PS**
6	Craiova	190	1,3	-1,0	2,3	**C**	101,0	109,7	-8,7	-7,9	**N**
7	Slatina	165	1,0	-0,8	1,8	**C**	94,5	117,2	-22,7	-19,4	**S**
8	Bâcleş	309	1,2	-1,4	**2,6**	**FC**	70,8	149,3	-78,5	*-52,6*	**ES**
9	Târgu Logreşti	262	0,1	-1,1	1,2	**C**	103,3	121,7	-18,4	-15,1	**PS**
10	Drăgăşani	280	1,8	-0,6	2,4	**C**	90,7	114,1	-23,4	-20,5	**S**
11	Apa Neagră	250	-0,3	-1,0	0,7	**CL**	114,1	219,6	-105,5	-48,0	**ES**
12	Târgu Jiu	210	0,9	-1,0	1,9	**C**	82,3	169,9	-87,6	-51,6	**ES**
13	Polovragi	546	0,6	-1,5	2,1	**C**	70,9	153,4	-82,5	-53,8	**ES**
14	Rîmnicu Vâlcea	243	1,5	-0,6	2,1	**C**	70,2	120,1	-49,9	-41,5	**FS**
15	Voineasa	573	***-2,3***	-3,0	0,7	**CL**	***57,4***	141,8	-84,4	***-59,5***	**ES**
16	Parâng	1585					51,4	160,0	-108,6	-67,9	**ES**
	Media Oltenia	-	0,91	-0,95	1,86	**C**	87,5	137,2	-49,7	-36,2	**FS**
17	Obârşia Lotrului	1348	-5,5	-5,5	0,0	**N**	1,0				

(Source: data processed from the ANM archive)

DISCUSSIONS

Depending on the air masses that predominate during the winter, winters can be classified into: ***Mediterranean winters, Scandinavian winters, Siberian winters and ordinary winters for the latitude of 45°N and the relief conditions and geographical location of Romania***. In addition to these distinct classes, there are a number of types of intermediate winters in which, in different periods of time, certain types of atmospheric circulations predominate, the realization of which is random depending on cosmic and terrestrial factors. The 2024-2025 winter, for Oltenia, in the first two months was of the Mediterranean type, and in February of the Scandinavian type with cold air masses advected by the air circulation from the Scandinavian area.

In the winter of 2024-2025, solar activity was at its maximum and a series of solar flares occurred, and the El Nino[15] climate process has been at its maximum since early summer 2023. While El Niño conditions continued in 2024, the forecast suggests that 2025 could introduce a new dynamic, possibly transitioning back to La Niña or neutral ENSO conditions (https://hydrorain.com/what-to-expect-from-el-nino-and-la-nina-in-2025-a-look-into-the-future-of-weather-patterns/?srsltid=AfmBOoqmRsrKItfpYNrV6eDX8UYwn_JyWWQ5h7cnY5N5--i-vhWKl0cP), which confirms our estimate that global warming will diminish.

Throughout the winter, eight winter heat waves were recorded in the intervals: 1-2.XII (two days); 7-13.XII.2024 (seven days), 15-22.XII.2024 (eight days), 30.XII.2024-3.I.2025 (five days), 8-10.I.2025 (three days); 18.I-6.II.2025 (eight days), 25-28.II (four days). So a total of 49 warm winter days, i.e. 54.4% of winter days. ***Two moderate cold waves*** were recorded in the intervals: 12-17.I (six days), 18-24.II (17 days) totaling 23 days, i.e. 25.6% of winter days.

The persistent heat waves and moderate cold waves and the presence of thin and ephemeral snow cover in Oltenia allow us to classify the 2024-2025 winter as a Mediterranean winter. On most days, the soil remained thawed, and the biotopes and the vegetation maintained their slow activity. We will continue to analyze the synoptic causes of the most intense warming in January-February (the peak month of winter) produced in the interval 18.I. – 6.II.2025 (January being the month that generally defines the type of warm, cold winter, etc.) and of the most intense cooling of the weather in this winter recorded in the interval 18-24.I.2024.

Synoptic causes that determined the warming of the weather from 18.I. to 6.II. 2025 (19 days)

The initiation of the advection of the tropical continental warm air mass (cT) over Europe occurred on 3.I. 2025 starting from Western Europe, and the situation evolved slowly and oscillatingly at first then gradually accelerated. The peak of the warm air advection over Oltenia occurred on 29.I. 2025 at 00 UTC when at the level of 850 hPa (about 1500 m altitude), a core of warm air with values of 10°C was positioned over Romania.

At the land surface level on 29.I.2025 the distribution of the atmospheric pressure field highlights a vast cyclonic field over part of Europe (Central and Northern part) (Fig 5) delimited by the 1015 hPa isobar, formed by Icelandic and Atlantic Cyclones with several low pressure cores with pressure values at the center ≤ 990 hPa on the North Sea and ≤970 hPa on the coasts of Canada. The Greenland Anticyclone had values at the center ≥1040 hPa. The anticyclone belt specific to winter that usually extends from the Atlantic Ocean to the far East of Asia (the Euro-Asian or Asian Anticyclone according to some treaties or the Russian-Siberian Anticyclone according to others) that values in the high pressure centers ≥ 1030 hPa over the Atlantic Ocean and ≥1045 hPa over the Asia Minor peninsula (Fig. 5). At this level the air circulation was westerly and southwesterly for a large part of Europe. ***At the level of the middle troposphere*** (500 hPa – about 5000 m altitude) the air circulation was westerly southwesterly (of the cT type – tropical continental) advecting over Europe warm air masses from the Atlantic Ocean and from northern Africa (characteristic isohypse of 552 damgp). The isohypse of the relative altitude topography (H500 H1000) highlight a warm air ridge with massive extension towards the north over Eastern Europe.

At the level of 850 hPa (about 1500 m altitude (Fig. 6) the temperature field distribution highlights a strong warm air advection over Eastern Europe where the warm air mass reached over Poland and the Baltic States. Over Southeast Romania the warm air had temperatures ≥10°C.

In these synoptic conditions, in addition to the warm air advection, the effect of insolation was added, and the thermal maxima in Romania exceeded 20.0°C in Ploiești (20.7°C) and Pătârlagele (20.9°C) being the thermal maxima for the entire country in January 2025. As a result of the warm weather this winter, the buds of fruit trees swelled and the flowering of early species began as early as January, the stage with floral buds developed in apricot, sycamore, almond and other species was interrupted by the cold of February and resumed starting with 25.II, and the full opening of the flowers was achieved on 13-16.III. On 28.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 completely compromise fruit production in apricot, dodder peach, etc. Therefore, warm winters constitute a particular climatic risk. Spring was fast and early. Due to the advection of warm air on 15.III.2025, the maximum temperature of 28.8°C was recorded in Călărași in the county of the same name.

Synoptic causes that determined the cooling of the weather from 8 to 24.II.2025 (17 days)

[15] ***El Nino*** = This occurs when temperatures in the Central and Eastern Tropical Pacific are at least 1.5°C warmer than normal for several months. This occurs when winds in the Western Pacific set in motion a large, slow-moving wave of water that rapidly warms the ocean just below the surface.

The most intense moderate cold wave of the winter 2024-2025 occurred from 18 to 24.II.2025 (17 days), and the peak of the cooling at the lower levels of the atmosphere occurred on the night of 18/19.II.2025. The advection of cold air over the middle latitudes of Europe began on 26.I when at the 850hPa level the 0°C isotherm reached southern Austria approaching northern Italy, and the situation evolved slowly. In the maximum phase of cold air advection on 19.II.2025 at 00 UTC the distribution of pressure centers over Europe was as follows: At the land surface level over the Atlantic Ocean the Icelandic Cyclone was present with atmospheric pressure values at the center ≤ 960 hPa (Fig. 7). In the area of Novaya Zemlya Island centered south of it there was a vast cyclonic field, originally Icelandic, with atmospheric pressure field values at the center ≤ 990 hPa.

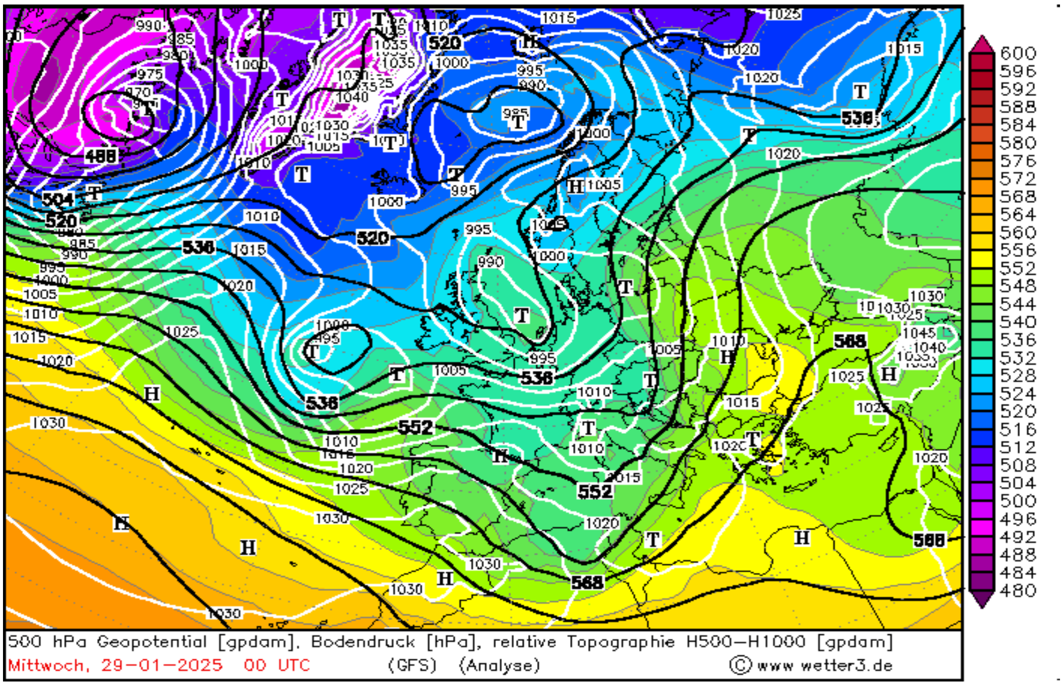

Figure 5. The synoptic situation at the land surface level (atmospheric pressure field) superimposed with the synoptic situation at altitude (geopotential field at 500 hPa level – about 5000 m altitude) and the relative baric topography field (TR 500/1000) as of 29.I.2025 at 00 UTC. (www.wetterr3.de).

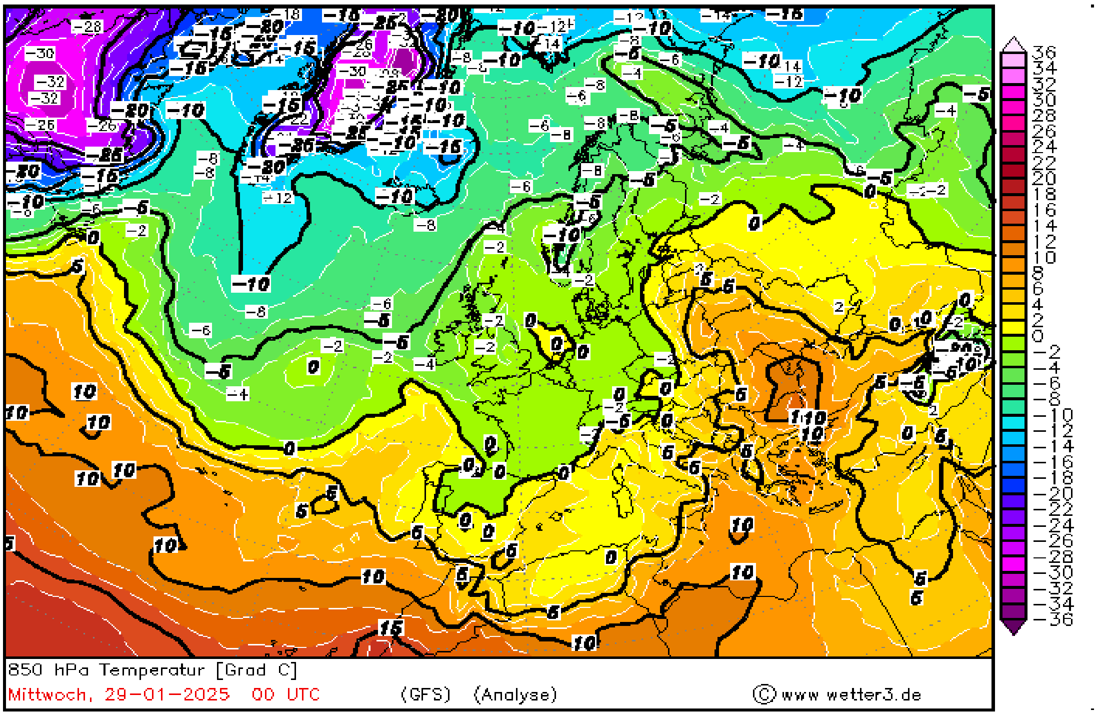

Figure 6. The temperature field at the geopotential surface at the 850 hPa level – about 1500 m altitude) as of 29.I.2025 00 UTC. (www.wetterr3.de).

Between these two vast cyclonic fields an anticyclonic belt connected the Greenland Anticyclone with the Euro-Asian anticyclone belt extended from the Atlantic Ocean over the Russian Plain and Asia. The Greenland Anticyclone had pressure field values at the center ≥1040 hPa, the anticyclonic field over the Atlantic Ocean had pressure values ≥1020 hPa, and over the Russian Plain ≥1035 hPa. At this level, for Oltenia and southern Romania the air circulation was slow northeasterly with a cold mass (cPk+A) brought from the Russian Plain. At the 500hPa level (about 5000 m altitude), the distribution of the geopotential field was as follows: above the Atlantic Ocean a low geopotential core with values at the center ≤ 500 damgp, above the Russian Plain another low geopotential core with values at the center ≤ 500 damgp, and most of Europe was dominated by a vast high geopotential field (corresponding to the anticyclonic belt at the level of the land surface), with values at the center ≥ 584 damgp. The air circulation at this level was blocked (the characteristic contour line 552 damgp had the shape of the letter "Ω". At the level of 850 hPa (about 1500 m altitude), on 19.II.2026 at 06 UTC, the distribution of air temperature values was as follows: the particularly cold air brought by the northeastern circulation from the front part of the atmospheric blockage had the isotherm of -10.0°C positioned above southern Bulgaria and northern Greece, above Oltenia values of -14.0°C, and above the Republic of Moldova and Crimea values of -15°C (Fig. 8). Under these conditions, during the clear night lasting 13 hours and 18 minutes, the air temperature in Oltenia dropped to -15.3°C. The cooling continued and on 24.II in Muntenia the minimum of -20.1°C was recorded at Oltenița and -20.3°C at The Buzău twist, values that are the thermal minimums of the 2024-2025 winter in Romania, which signifies a return to normality in the evolution of air temperature at a global level if we consider that periods with cold winters, blizzards and heavy snowfall were also recorded on the American continent and in Asia.

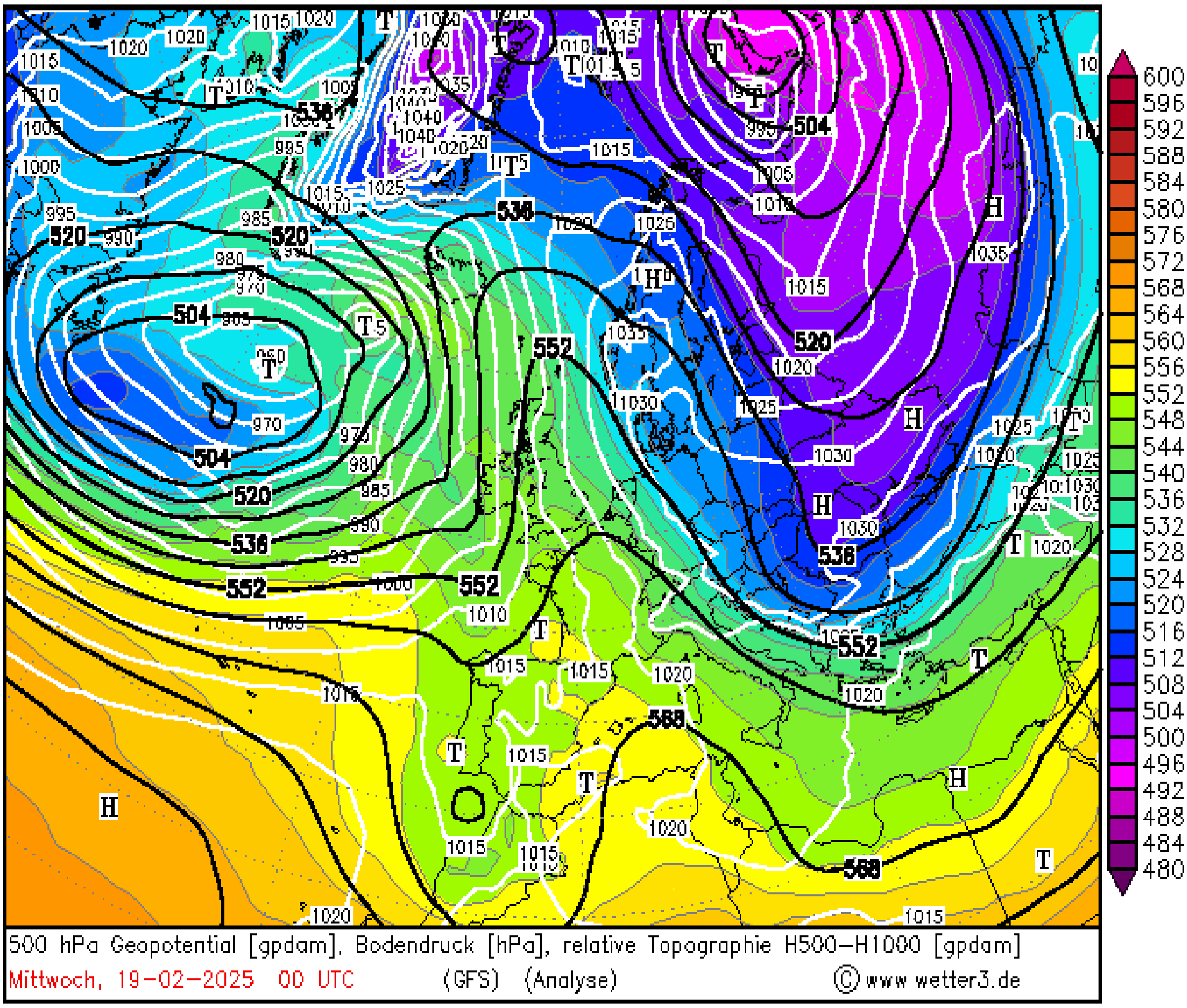

Figure 7. The synoptic situation at the land surface level (atmospheric pressure field) superimposed with the synoptic situation at altitude (geopotential field at 500 hPa level – about 5000 m altitude) and the relative baric topography field (TR 500/1000) as of 19.II.2025 at 00 UTC. (www.wetterr3.de).

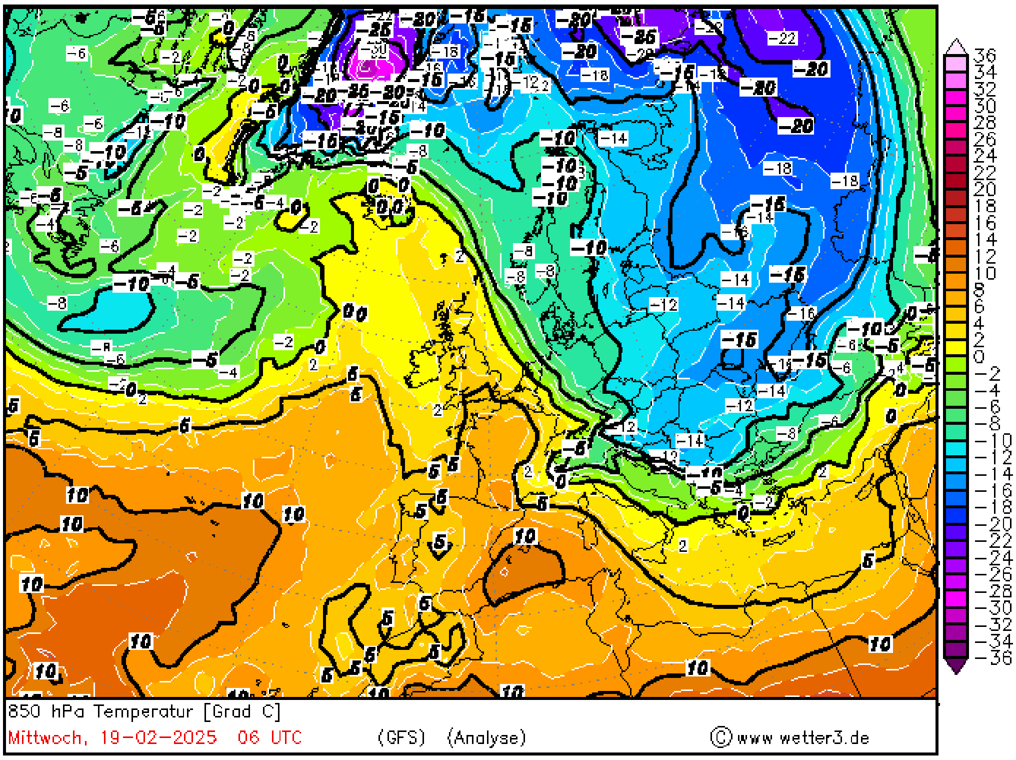

Figure 8. The temperature field at the geopotential surface at the 850 hPa level – about 1500 m altitude) as of 19.II.2025 at 06 UTC. (www.wetterr3.de).

So only 17 days of cold and frost were enough for a winter that could have been very warm (FC) if the warm weather had continued, to become warm (C) on average. The combination of monthly weather types (C, FC, R) resulted in the warm type (C) for the winter season on average. For the month of February, the cooling in February 2025 is the most intense cooling recorded this winter and even in the last 6 winters, ***demonstrating that climate warming[16] is not a process of change but a climate variability***, with cold waves and cold winters being able 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 changes because the phases of evolution they go through do not return. The climate evolves through variability because such states have occurred before and will occur again). If climate evolution were 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.

The advection of particularly cold air from the polar zone and the cooling of the air during the clear nights from 8-24.II.2025 lasting over 13 hours and 18 minutes determined the intensification of cooling and the achievement of particularly low minimums on the morning of 19.II.2025 and the other mornings of this interval. This cooling interval was beneficial for the achievement of vernalization and made a sanitation by destroying some agricultural pests, especially since it occurred quickly after a warm period.

CONCLUSIONS

Winter 2024 -2025 was a warm winter (C) with an overall seasonal average of 0.91°C and a deviation from normal of 1.86°C. The overall seasonal average of 0.91°C is the 29th value in descending order for warm winters, signifying a significant decrease in the values of the series of seasonal averages recorded in the last 29 years and especially for the last five years starting with the winter of 2019-2020.

In the entire history of climate data, only three winters with a seasonal average ≥3.0°C have been recorded, winter 2023-2024 with an average of 3.88°C and a deviation from normal of 4.83°C, 2006-2007 with an average of 3.44°C and a deviation from normal of 4.39°C and winter 2022-2023 with an average of 3.25°C and a deviation from normal of 4.20°C.

Climate warming has continued and is not climate change[17] because it is not a stable process, cold waves and intense weather cooling can occur at any time. Climate evolution is done through variability and not through changes.

[16] ***Global 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, The Twelfth Planet).

[17] ***If climate evolution had been through changes, life on Earth would have ceased to exist long ago***.

Changes are those developments that do not allow the system to return to states recorded in previous phases. For example, living organisms evolve through changes and not through variability. For the period 1961-2024 (63 years) the general average of winters is -0.06°C and the deviation from normal is 0.89°C, which according to the Hellmann criterion the winters in the entire period, on average, were warm (CL) (i.e. only slightly warmer than normal) and in the class of those close to normal. Therefore, in the medium term we cannot speak of climate change. ***No absolute thermal records were recorded for monthly temperature values***. For the entire winter, ***the heat units*** were between 85.0 at Voineasa and 367.6 at Drobeta Turnu Severin with the average for the entire Oltenia region of 276.8. We mention that to date (2025) no exceptionally warm winter (EC) has been recorded.

The most ***cold units*** were recorded in the interval 8 - 24.II.2025 and were between 20.8 at Drobeta Turnu Severin and 147.2 at Voineasa, and their average for the entire region was 57.7.

The agrometeorological frost (6.8 units) was insignificant and was recorded in January (1.4 units) and February (4.1 units), signifying 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) were recorded starting with 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 cosmic in nature. Human activity and the increase in the amount of CO2 cannot have a noticeable influence on these processes because the share of CO2 in the entire mass of the atmosphere is 0.03% (i.e. three parts in 10,000, and physico-chemical reasoning shows that the proportion is one molecule of CO2 per 10,000 other molecules in the atmosphere.). Climate warming and the warm climate are biostimulants, and the large number of the Earth's population and the demographic explosion are due to this process. We owe all of our technological and scientific development, as well as the level of our civilization, to the large number of people.

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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 Craiova, Str. Popa Şapcă, No. 8, Craiova, Romania.
E-mail: chimisliu_cornelia@yahoo.com

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