VARIABILITY OF AIR TEMPERATURE DURING WINTER BETWEEN 1961-2022 IN SOUTHWEST ROMANIA (OLTENIA)

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ABSTRACT. The periods of heating and cooling of the weather on Earth followed each other with great irregularity and caused significant variations in air temperature but allowed the existence of life and especially of the human species. In the paper I have analysed the variation of the air temperature in Oltenia during the winters for the interval 1961-2022. A number of our other works have analysed climate variability in this part of Romania. After the warm interval 1945-1955 there followed a gradual cooling of the weather, and in the interval 1986-2022 (for 36 years), there was not a single very cold winter (FR) but only two cold winters (R) and two cool (RC). The interval 2000-2022 (23 years) was the warmest of the entire period of meteorological observations in Oltenia. Many annual, monthly and daily temperature climate records have been broken. At the same time, in the analysed interval, in the polar areas the rate of melting of the ice increased a lot and exceptional thermal maxima were recorded in the cold season. The warm periods during the winters were increasingly longer, more frequent and more intense. The work is useful to all those interested in climate variability in Oltenia.

Keywords: warm winters, early springs, drought, winter heat waves, climate warming.

1. INTRODUCTORY REMARKS

The year 2022 also confirmed for Romania the trend of increasing air temperature from the last decades, and in Oltenia, the general annual average of air temperature was 12.26°C and the deviation from normal was 1.96°C, being in second place after 2019 (with an average of 12.41°C and a deviation from normal of 2.55°C). According to the Hellmann criterion the last 11 years (2012-2022) were warm (C) except for 2014 which was less warm being classified as a warmish year (CL) with an overall mean of 11.33 °C and a deviation from normal of 1.03°C.

We make it clear *that climate warming is not climate change, it is climate variability* because the climate system evolves through variability, such values recorded by climate parameters have been and will be recorded again (Marinică 2006; Marinică & Marinică 2016, 2019). It is about the climatic cycles studied by Milankovitch, which have variable durations and intensities. Climate variability is

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a natural way of climate evolution and has deep and powerful cosmic causes (revolutionary movement of the planet Earth, precessional movement, parameters of the Earth's trajectory, intensity of solar radiation, characteristics of extra-atmospheric space, etc.), which cannot be influenced by human actions. For the central latitude of Oltenia (44°19`N – Craiova), we note *that the average length of day calculated for a year* exceeds the average length of night by 27 minutes. This aspect is determined by the precessional movement of the Earth, and for higher latitudes this difference increases and decreases towards the tropics, being a factor that in the long term (thousands of years) contributes to climate warming (A. Berger et. al 1992), in addition to other cosmic factors. Climate warming is a long-term process that started a long time ago, and an important stage was the beginning of industrialization in human civilization, the decade 1990-2000 and the last decade 2011-2022, stages in which the warming was accentuated. Important aspects can be highlighted by analysing air temperature variations in extreme seasons (summer and winter) but also in transitional ones. Thus, *the 10 warmest summers* were recorded after the year 2000. Most of the 10 warmest winters were recorded beginning with 2000, with three exceptions: 1982-1983 with the general seasonal average of 2.05°C and the deviation from normal of 3.0°C being the only very warm winter (FC) recorded before 2000 and the warm winters (C) 1993-1994 with the overall mean of 1.41°C and deviation from normal of 2, 36°C and 1997-1998 with overall mean of 1.35°C and deviation from normal of 2.30°C. The work is a continuation of extensive studies on climate variability in southwestern Romania (Oltenia) (Bogdan et. al. 2019, Marinică 2006, Marinică & A.F. Marinică 2016, 2019, 2022).

We will further analyse the variability of the air temperature in Oltenia during the winter season in the interval 1961-2022 (62 winters).

2. DATA AND METHODS USED

To carry out the work, we used the data from synoptic archives, international databases, existing synoptic maps on the Internet from international weather forecasting centers, the ANM website, satellite information as well as information published in the written press. After data processing and comparisons, the Hellmann Criterion[2] was used, and the multi-year averages for the interval 1901-1990 (the last century) were considered as normal values. The Hellmann criterion is a climatological measure to classify the severity of winters based on the total number of freezing days. A freezing day, in this context, is defined as a day during

[2] Typically, comparisons in most scientific papers are made using multi-year air temperature averages for the past 30 years. But the average for the last 30 years is a moving average that also has an upward trend, like the temperature. So the results of these comparisons are slightly significant, indicating increases compared to what has been recorded in the last 30 years.

which the daily minimum temperature is below 0°C. The criterion is named after the German meteorologist Gustav Hellmann (1854-1939) (Vries et. al. 2013).

3. RESULTS AND ASSESSMENTS

3.1. Analysis of winter seasonal averages of air temperature, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2021

For the 61 winters studied, it is observed that the seasonal average of the winters, calculated for the entire Oltenia region, was between -4.57°C in ***the coldest winter*** recorded after 1960, the winter of `84 - `85 with the deviation from normal of -3.62°C and 3.44°C ***in the warmest winter `06-`07***, with deviation from normal of 4.39°C. ***The amplitude of variation of seasonal averages*** was 8.01°C, and the ***amplitude of deviations from normal*** was also 8.01°C (Tables 1 and 2). ***31 winters were recorded*** in the class of warm winters (CL+C+FC) which means 50.8%, 21 thermally normal winters (N) which means 34.4% and 9 winters in the class of cold ones (RC+R +FR), i.e. 14.8%, The class of near-normal winters (APN) comprising RC+N+CL had 28 winters i.e. 45.9%. Therefore, warm winters recorded the highest frequency, slightly exceeding 50% of the total of winters. The coldest winter in the analysed interval is 1984-1985 and the second in place is 1962-1963 when on January 25, 1963 the absolute minimum temperature occurred in the Romanian Plain at Craiova -35.5°C (*the value was recorded at the weather station Craiova AVIASAN located at Balta Verde in the lower part of the city near the Jiu River meadow, on the road to Podari commune*). ***For the whole of Romania, the record of the coldest recorded winter is the winter of 1941-1942*** (classified as excessively cold (ER) in the Northern Hemisphere) when absolute thermal minimums were recorded throughout the Northern Hemisphere, still unsurpassed until today, while the Winter of 1984-1985 ~~it~~ was the second particularly cold winter. An even colder winter than the one of 1941-1942 was the winter of 1892-1893 when in Slatina on 15.I.1893 ***the absolute minimum value*** of -35.6°C was recorded and in Turnu Magurele, -32.3° C on 25.I.1893.

In the analysed interval, there was no excessively cold winter (ER) according to the Hellmann criterion and ***only two very cold winters (FR):*** 1984-195 and 1962-1963. Extremely cold (ER) or very cold (FR) winters were recorded with a frequency of one in 20 to 40 years (rare but not impossible events).

Table 1. Seasonal temperature averages in winter and the type of winters according to the Hellmann criterion, in the interval 1961-2022

Winter	Aver.	ΔT	Type	Winter	Aver.	ΔT	Type	Winter	Aver.	ΔT	Type
61-62	-0,97	-0,01	N	82-83	2,05	**3,00**	FC	03-04	-0,62	0,33	N
62-63	-4,48	-3,52	FR	83-84	-0,19	0,76	CL	04-05	-0,07	0,88	CL
63-64	-2,98	-2,02	R	84-85	**-4,57**	-3,62	FR	05-06	-1,29	-0,34	N
64-65	-1,12	-0,16	N	85-86	-1,19	-0,24	N	06-07	**3,44**	**4,39**	FC
65-66	1,19	2,15	C	86-87	-1,72	-0,77	RC	07-08	-0,51	0,44	N
66-67	-1,27	-0,31	N	87-88	1,27	2,22	C	08-09	0,89	1,84	C
67-68	-0,08	0,88	CL	88-89	1,31	2,26	C	09-10	-1,10	-0,15	N
68-69	-2,96	-2,00	R	89-90	0,46	1,41	C	10-11	-0,96	-0,01	N
69-70	-0,64	0,32	N	90-91	-0,94	0,01	N	11-12	-1,53	-0,58	RC
70-71	0,68	1,64	C	91-92	-0,62	0,33	N	12-13	0,35	1,30	C
71-72	-0,13	0,83	CL	92-93	-1,42	-0,47	N	13-14	0,69	1,64	C
72-73	-0,40	0,56	CL	93-94	1,41	2,36	C	14-15	1,21	2,16	C
73-74	-0,43	0,53	N	94-95	0,88	1,83	C	15-16	**2,88**	**3,83**	FC
74-75	0,98	1,94	C	95-96	-2,35	-1,40	R	16-17	-1,36	-0,41	N
75-76	-0,80	0,16	N	96-97	0,02	0,97	CL	17-18	1,48	2,43	C
76-77	0,76	1,72	C	97-98	1,35	2,30	C	18-19	0,55	1,50	C
77-78	-2,20	-1,25	R	98-99	-1,18	-0,23	N	19-20	**2,91**	**3,86**	FC
78-79	-0,76	0,19	N	99-00	-0,03	0,92	CL	20-21	**2,56**	**3,51**	FC
79-80	-0,62	0,33	N	00-01	1,69	**2,64**	FC	21-22	2,61	**3,56**	FC
80-81	-0,39	0,52	N	01-02	0,51	1,46	C	31 =(CL+C+FC) (50,8%)			
81-82	-1,21	-0,26	N	02-03	-2,93	-1,98	R	9 = (RC, R, FR) (14.8%)			

N = 21 (34,4%) (APN = close to normal (RC+N+CL) = 28 (45,9%) (Source: *data from ANM Archive*) (average = seasonal average temperature calculated for the entire Oltenia region (°C), ΔT = (°C), deviation of the seasonal average temperature from normal, N=Normal; FR=Very Cold, R=Cold, RC=Cool, CL=Warm, C=Hot, FC=Very Hot; Type=the result of applying the Hellmann Criterion[3] *)*

No very cold winter (FR) has been recorded since 1985 until now (for 38 years), but it is not excluded that it will occur in the future.

Current climate warming cannot guarantee that another very cold or excessively cold winter will not occur.

Warm winters (C) have been recorded the most since 2000 (15 winters i.e. 24.6%), and very warm winters (FC) have been recorded almost all (6 winters) (except for one winter in 1982 -1983) starting in 2000. The very warm winter 1982-1983 occurred 2 years before the winter of 1984-1985 and was followed by the warm winter (CL) 1983-1984. The last three consecutive winters were very warm (FC) (`19-`20, `20-`21, `21-`22). So the average seasonal temperatures in winter have increased faster since 2000 and the increase is related to solar activity. The warmest winter (absolute climate record for the entire period of climate observations) was the winter of 2006-2007 with the overall mean of 3.44°C and the largest deviation from normal of 4.39°C.

[3] ***Hellmann criterion for seasonal and annual air temperature averages***: Δt≤-5.0°C =>excessively cold (ER); -4.9≤Δt≤ -2.6°C =>very cold (FR); -2.5≤Δt≤ -1.1°C =>cold (R); -1.0≤Δt≤ -0.6°C =>cool (RC); -0.5≤Δt≤ +0.5°C =>normal (N); 0.6≤Δt≤ 1.0°C =>warm (CL); 1.1≤Δt≤ 2.5°C =>hot (C); 2.6≤Δt≤ 4.9°C => very hot (FC); Δt≥5.0°C => excessively hot (EC).

Table 2. The warmest 10 winters and the coldest 10 winters and the type of winters according to the Hellmann criterion, in the interval 1961-2022

No. crt.	The coldest 10 winters				The warmest 10 winters			
	Winter	Average	ΔT	CH	Winter	Average	ΔT	CH
1	84-85	**-4,57**	-3,62	**FR**	06-07	3,44	4,39	**FC**
2	62-63	-4,48	-3,52	**FR**	19-20	2,91	3,86	**FC**
3	63-64	-2,98	-2,02	**R**	15-16	2,88	3,83	**FC**
4	68-69	-2,96	-2,00	**R**	21-22	2,61	3,56	**FC**
5	02-03	-2,93	-1,98	**R**	20-21	2,56	3,51	**FC**
6	95-96	-2,35	-1,40	**R**	82-83	2,05	3,00	**FC**
7	77-78	-2,20	-1,25	**R**	00-01	1,69	2,64	**FC**
8	86-87	-1,72	-0,77	**RC**	17-18	1,48	2,43	**C**
9	11-12	-1,53	-0,58	**RC**	93-94	1,41	2,36	**C**
10	92-93	-1,42	-0,47	**N**	97-98	1,35	2,30	**C**

(Average = seasonal average of air temperature (calculated for the entire Oltenia region °C), ΔT = deviation of the seasonal average of the front temperature of normal, N=normal, FR=Very Cold, R=Cold, RC=Cool, C=Hot, FC=Very Hot)

1 normal winters (N); 31 warm class winters (CL, C, FC, none EC); 9 cool and cold winters and RC, R, FR ; 28 APN winters (close to normal – RC+ N+CL) (Source: data from the ANM Archive)

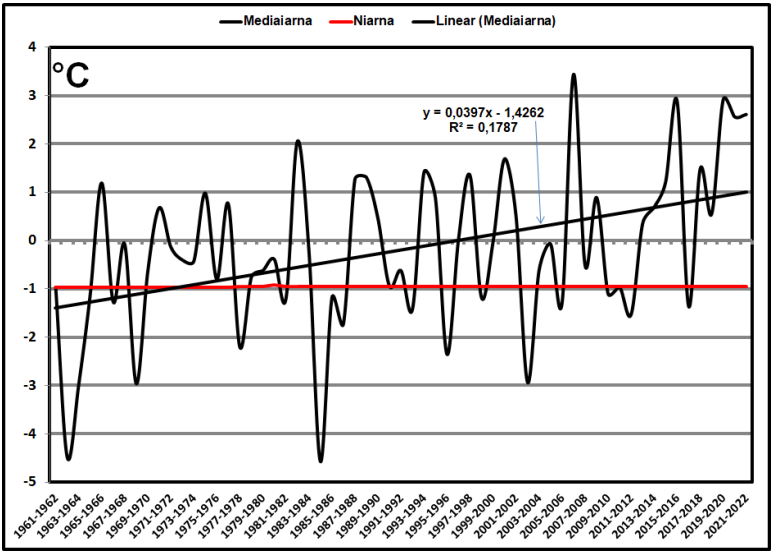

Fig. 1. Variation of the average seasonal winter temperature in Oltenia for the interval 1961-2022.

The variation graph of the average seasonal winter temperature for the interval 1961-2022 has a strong upward trend but also a strong variability (Fig. 1).

The average seasonal temperature in winter for the entire period 1961-2022 and for the entire Oltenia region is -0.19°C and the deviation is 0.76°C from normal, and according to the Hellmann criterion it follows that the entire period was warm (CL) during winters as a whole and many seasonal, monthly and daily temperature records were broken.

3.2. Analysis of the monthly averages of air temperature in December, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2022

In the month of December, the length of the day registers a minimum of 8 hours and 51 minutes starting from the 17th of December to the 25th of December, it remains mostly warmer than the thermal normal in the first half, and the air temperature in the many years register important increases around the date of 25.XII or before it. ***The warming of the weather near Christmas has deep causes related to the occurrence of the winter solstice*** (on 21 or 22.XII and quite rarely 23.XII) so the causes are also related to the precessional movement of the Earth.

As a result, most of the time the monthly maximum temperatures are recorded in the first half of the month.

The highest monthly average air temperature calculated for the entire Oltenia region was 5.19°C, recorded in December 2015, and its deviation from normal was 5.01°C,. a ccording to the Hellmann Criterion it was a very hot month warm (FC), being the only very warm December in the 62 years (Tables 3 and 4).

In December, the distribution of winter temperatures is as follows: warmer months (CL+C+FC) account for 20 winters, making up 32.3% of the time. Colder months (RC+R+FR+ER) occur during 16 winters, representing 25.8%. Winters with temperatures that are considered normal (N) occur in 26 instances, which constitutes 41.9% of the winters.

Table 3. Temperature averages recorded in December and month type according to the Hellmann criterion, in the interval 1961-2022

Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type
1961	-0,17	-0,35	**N**	1983	-0,90	-1,08	**RC**	2005	1,55	1,37	**CL**
1962	**-3,31**	-3,49	**R**	1984	-0,82	-1,00	**RC**	2006	1,80	1,62	**CL**
1963	**-2,16**	-2,33	**R**	1985	**2,17**	1,99	**C**	2007	-1,19	-1,36	**RC**
1964	0,68	0,50	**N**	1986	**-1,48**	-1,66	**RC**	2008	1,90	1,71	**CL**
1965	1,81	1,63	**CL**	1987	1,01	0,83	**N**	2009	1,00	0,82	**N**
1966	0,54	0,36	**N**	1988	0,70	0,52	**N**	2010	-0,72	-1,14	**N**
1967	-0,05	-0,23	**N**	1989	0,28	0,10	**N**	2011	**2,05**	1,87	**CL**
1968	**-1,44**	-1,62	**RC**	1990	0,41	0,23	**N**	2012	-1,23	-1,41	**RC**
1969	-0,03	-0,21	**N**	1991	**-2,39**	-2,57	**R**	2013	-0,42	-0,60	**N**
1970	0,69	0,51	**N**	1992	**-1,61**	-1,79	**RC**	2014	1,61	1,40	**CL**
1971	**2,37**	2,19	**C**	1993	0,75	0,57	**N**	2015	**5,19**	5,01	**FC**
1972	-0,43	-0,61	**N**	1994	0,61	0,43	**N**	2016	-0,40	-0,58	**N**
1973	**-1,26**	-1,43	**RC**	1995	**-1,26**	-1,42	**RC**	2017	**2,73**	2,55	**C**
1974	**2,12**	1,94	**CL**	1996	0,05	-0,13	**N**	2018	-0,04	0,70	**N**
1975	0,34	0,16	**N**	1997	0,47	0,29	**N**	2019	**3,13**	2,95	**C**
1976	-0,01	0,19	**N**	1998	**-4,03**	-4,21	**R**	2020	**3,25**	3,07	**C**
1977	**-3,66**	-3,84	**R**	1999	1,21	1,03	**CL**	2021	**2,38**	2,20	**C**
1978	0,66	0,48	**N**	2000	1,92	1,74	**CL**	2022	**2,75**	2,57	**C**
1979	**3,06**	2,88	**C**	2001	**-3,59**	-3,77	**R**	Warm (CL+C+FC): 20; 32,3%			
1980	0,28	-0,40	**N**	2002	**-3,04**	-3,22	**R**	Cold (RC+R+FR): 16;25,8%			
1981	0,41	0,23	**N**	2003	0,00	-0,18	**N**	Normal (N): 26;41,9%			
1982	3,08	2,90	**C**	2004	1,45	1,27	**CL**	Close to normal: 72,6%			

(Source: ANM Archive)

(Aver. = average monthly temperature calculated for the entire Oltenia region (°C), ΔT = deviation of the seasonal average temperature from normal (°C) , N=normal; R=cold, RC=cool, CL=warm, C=hot, FC=very hot)

Table 4, The warmest 10 December months and the coldest 10 December months and the type of months according to the Hellmann criterion, in the interval 1961-2022

No. crt.	The warmest 10 December months				The coldest 10 December months			
	Year	Average	ΔT	CH	Year	Average	ΔT	CH
1	2015	**5,19**	5,01	**FC**	1998	**-4,03**	-4,21	**R**
2	2020	**3,25**	3,07	**C**	1977	**-3,66**	-3,84	**R**
3	2019	**3,13**	2,95	**C**	2001	**-3,59**	-3,77	**R**
4	1979	**3,06**	2,88	**C**	1962	**-3,31**	-3,49	**R**
5	2022	**2,75**	2,57	**C**	1991	**-2,39**	-2,57	**R**
6	2017	**2,73**	2,55	**C**	1963	**-2,16**	-2,33	**R**
7	2021	**2,38**	2,20	**C**	1992	**-1,61**	-1,79	**RC**
8	1971	**2,37**	2,19	**C**	1986	**-1,48**	-1,66	**RC**
9	1985	**2,17**	1,99	**C**	1968	**-1,44**	-1,62	**RC**
10	1974	**2,12**	1,94	**CL**	1973	**-1,26**	-1,43	**RC**

(Source: ANM Archive)

(mean = average monthly temperature calculated for the entire Oltenia region (°C), ΔT = deviation of the seasonal mean temperature from of normal (°C), N=normal; R=cold, RC=cool, Cl=warm, C=hot, FC=very hot)

The 10 warmest Decembers were mostly recorded since 2017 (6 out of 10), and *most of the coldest December months* were recorded before 2000 (9 out of 10). The lowest monthly mean air temperature in December was -4.03°C recorded in 1998 with a deviation from normal of -4.21°C. *The amplitude of variation of the monthly average air temperature* in December was 9.22°C, 1.21°C higher than the amplitude of the seasonal average air temperature. For the month of December, the average temperature values calculated for the entire Oltenia region in the 1961-2022 period was 0.3°C, and the deviation from normal was 0.12°C, which according to the Hellmann criterion means that December was normal thermal (N) throughout the entire period of 62 years. So for the month of December *we do not find any climatic change, it is only a variability of the air temperature with the characteristics described above.*

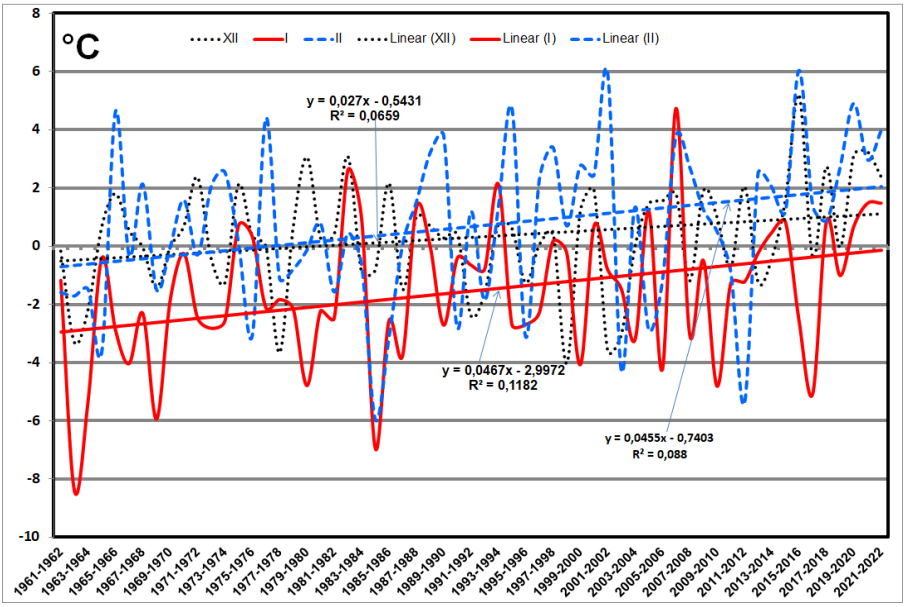

Fig. 2. Variation of the average monthly temperature of December, January and February in Oltenia for the interval 1961-2022.

The graphs of the variation of the average monthly temperature for the winter months, calculated for the entire Oltenia region in the interval 1961-2022 show a strong variability and an increasing trend. *For the month of December*, the growth coefficient is 0.027 ° C/yr. (the lowest of all the months of the winter season) (Fig. 2), *for January* of 0.0467 ° C/yr. being the highest of the winter months, and *for February* of 0.0455 ° C/yr. The fact that January has the highest coefficient of increase in the monthly average temperature is consistent with the increase in the number of warm winters, the warm winter character being given especially by the

air temperature in January, which is normally the coldest month of the year and *the peak of winter* (15.I-15.II) is recorded about a month after the winter solstice.

3.3. Analysis of monthly averages of air temperature in January, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2022

In the 62 years (1961-2022) there was only one very cold January (FR) according to the Hellmann criterion in 1963 with the monthly mean for the entire region of -8.41°C and the deviation from normal of -5.84° C, only 6 months in the cold class (R) in 1985, 1969, 1964, 2017, 2010 and 1980 (Tables 5 and 6). The classes of cold months (RC+R+FR) summarized 11 months (17.8%).

Table 5. Temperature averages recorded in January and month type according to the Hellmann criterion, in the interval 1961-2021

Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type
1961	-1,99	0,58	N	1983	2,62	5,19	FC	2005	1,21	3,77	C
1962	-1,17	1,40	CL	1984	0,96	3,53	C	2006	-4,23	-1,67	RC
1963	-8,41	-5,84	FR	1985	-6,94	-4,37	R	2007	4,73	7,29	FC
1964	-5,29	-2,71	R	1986	-2,57	3,03	C	2008	-3,05	-0,48	N
1965	-0,41	2,16	C	1987	-3,75	-1,19	RC	2009	-0,49	2,08	C
1966	-2,88	-0,31	N	1988	1,31	3,87	C	2010	-4,81	-2,25	R
1967	-4,03	-1,46	RC	1989	0,03	2,81	C	2011	-1,27	1,28	CL
1968	-2,31	0,25	N	1990	-2,71	-0,14	N	2012	-1,23	1,34	CL
1969	-5,94	-3,38	R	1991	-0,41	2,15	C	2013	-0,24	2,33	C
1970	-1,86	0,70	N	1992	-0,65	1,92	CL	2014	0,47	3,03	C
1971	-0,25	2,32	C	1993	-0,79	1,77	CL	2015	0,83	3,17	C
1972	-2,46	0,10	N	1994	2,14	2,14	C	2016	-2,58	-0,01	N
1973	-2,82	-0,25	N	1995	-2,70	-0,13	N	2017	-5,06	-5,06	R
1974	-2,57	0,58	N	1996	-2,69	-0,12	N	2018	0,85	3,37	C
1975	0,71	3,28	C	1997	-2,28	0,29	N	2019	-1,01	1,56	CL
1976	0,34	2,90	C	1998	0,17	2,74	C	2020	0,68	3,21	C
1977	-2,11	0,54	N	1999	-0,22	2,35	C	2021	1,47	4,07	C
1978	-1,83	0,74	N	2000	-4,07	-1,51	RC	2022	1,48	4,05	C
1979	-2,16	0,41	N	2001	0,69	3,26	C	Warm (CL+C+FC): 32;51,6%			
1980	-4,79	-2,23	R	2002	-0,81	1,76	CL	Cold (RC+R+FR): 11;17,8%			
1981	-2,22	0,35	N	2003	-1,47	1,09	CL	Normal (N): 19;30,6%			
1982	-2,47	0,10	N	2004	-3,21	-3,21	N	Close to normal: 31;50,0%			

(Source: ANM Archive)
(ΔT = deviation of the seasonal mean temperature from normal, CH= Hellmann criterion, N=normal; FR =Very Cold, R=cold, RC=cool, CL=warm, C=hot, FC=very hot)

The warmest month of January was recorded in 2007 (during ***the warmest winter***) with the monthly mean air temperature for the whole region of 4.73°C and the deviation from the normal of 7.29°C. In January, only two very warm months (FC) were registered in 2007 and 1983. In the class of warm months (CL+C+FC+EC), 32 January months were registered (51.6%), which shows the

predominance class. This is normal because during January the average length of the day increases by 53 minutes for the latitude of Oltenia and more for higher latitudes, which means a greater input of solar energy to the underlying active surface. ***The maximum amplitude of the monthly mean temperature in January was 13.14°C***, 3.92°C higher than in December. We see a strong asymmetry between the monthly averages of the coldest months and the warmest months. We note that the maximum temperature values have a short duration of persistence, and the minimum ones a much longer persistence, an aspect because the duration of the night in January is longer than 14 hours (on the last night of the month having 14 hours and 12 minutes). In the case of January, the increase in the climate warming process is observed, thus the many warm months out of the 10 were recorded starting from 2005, and the coldest January months out of the 10 were recorded until 1985. January months close to normal (APN) (RC+N+CL) summarized 31 cases (50.0%). The monthly mean, minimum and maximum values show a strong variability, and we cannot find any change. Although the frequency of very cold Januarys (FR) is low 1/62 and climate warming has made warm Januarys predominate in the last 12 years (10 warm months out of 12), a very cold January (FR) can occur at any time or excessively cold (ER), which in current conditions would be a disaster.

Table 6, The warmest 10 months of June and the coldest 10 months of July and the type of months according to the Hellmann criterion, in the interval 1961-2021

No. crt.	The warmest 10 ***January*** months				The coldest 10 ***January*** months			
	Year	Average	ΔT	CH	Year	Average	ΔT	CH
1	2007	**4,73**	**7,29**	**FC**	1963	**-8,41**	-5,84	**FR**
2	1983	**2,62**	5,19	**FC**	1985	**-6,94**	-4,37	**R**
3	1994	**2,14**	2,14	**C**	1969	**-5,94**	-3,38	**R**
4	2022	**1,48**	4,05	**C**	1964	**-5,29**	-2,71	**R**
5	2021	**1,47**	4,07	**C**	2017	**-5,06**	-5,06	**R**
6	1988	1,31	3,87	**C**	2010	**-4,81**	-2,25	**R**
7	2005	1,21	3,77	**C**	1980	**-4,79**	-2,23	**R**
8	1984	0,96	3,53	**C**	2006	**-4,23**	-1,67	**RC**
9	2018	**0,85**	3,37	C	2000	**-4,07**	-1,51	**RC**
10	2015	0,83	3,17	C	1967	**-4,03**	-1,46	**RC**

(Source: ANM Archive)

(ΔT = deviation of the seasonal mean temperature from normal, CH= Hellmann criterion, N=normal; R=cold, RC=cool, CL=warm, C=hot, FC=very hot)

3.4. Analysis of monthly averages of air temperature in February, calculated for the entire Oltenia region (excluding the mountain area) for the interval 1961-2022

February is normally the first month of the year when the air temperature starts to rise, so the normal monthly average registers an increase of 2.11°C.

Table 7. Temperature averages recorded in February and month type according to the Hellmann criterion, in the interval 1961-2021

Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type	Year	Aver.	ΔT	Type
1961	1,83	2,29	C	1983	0,45	0,81	N	2005	**-2,87**	-2,41	R
1962	-1,59	-1,13	RC	1984	-0,63	-0,17	N	2006	-1,20	-0,74	N
1963	-1,71	-1,25	RC	1985	**-5,95**	-5,49	FR	2007	**3,78**	4,24	C
1964	-1,49	-1,03	RC	1986	**-3,16**	-3,16	R	2008	2,71	3,17	C
1965	**-3,63**	-3,18	R	1987	0,06	0,52	N	2009	1,26	1,72	CL
1966	**4,63**	5,09	FC	1988	1,51	1,97	C	2010	0,50	0,81	N
1967	-0,32	0,14	N	1989	**3,19**	3,65	C	2011	-0,88	-0,36	N
1968	2,13	2,59	C	1990	**3,81**	4,27	C	2012	**-5,40**	-4,94	R
1969	-1,49	-1,03	RC	1991	**-2,81**	-2,35	R	2013	2,51	2,97	C
1970	-0,04	0,42	N	1992	1,19	1,65	CL	2014	2,03	2,49	C
1971	1,59	2,05	C	1993	**-1,86**	-1,40	RC	2015	1,20	1,66	CL
1972	-0,30	0,16	N	1994	1,34	1,80	CL	2016	**6,04**	6,50	FC
1973	2,06	2,52	C	1995	**4,73**	5,19	FC	2017	1,39	1,85	C
1974	2,54	3,00	C	1996	**-3,11**	-2,66	R	2018	0,87	1,33	CL
1975	0,11	0,57	N	1997	2,29	2,75	C	2019	2,71	3,16	C
1976	**-3,08**	-2,62	R	1998	**3,40**	3,86	C	2020	**4,91**	5,37	FC
1977	**4,40**	4,86	C	1999	0,70	1,16	CL	2021	2,97	3,46	C
1978	-1,11	-0,65	N	2000	2,77	3,23	C	2022	**3,97**	4,43	C
1979	-0,79	-0,33	N	2001	2,46	2,92	C	Warm (CL+C+FC): 34;54,8%			
1980	-0,14	0,25	N	2002	**5,93**	6,39	FC	Cold (RC+R+FR): 15;24,2%			
1981	0,78	1,24	CL	2003	**-4,27**	-3,81	R	Normal (N): 13;21,0%			
1982	-1,57	-1,11	RC	2004	1,34	1,80	CL	Close to normal: 27;43,5%			

(Source: ANM Archive)

(ΔT = deviation of the seasonal average temperature from normal, N=normal; R=cold, RC=cool, Cl=warm, C= hot, FC=very hot)

The monthly means of air temperature in February calculated for the whole region were between -5.95°C in 1985 and 6.04°C in 2016 (Table no. 7 and 8), so we have ***a variation amplitude*** of 11, 99°C, lower than January by 1.15°C. For the 62 analysed period, there were 34 warm February months (CL+C+FC+EC) i.e. 54.8%, 15 cold Februarys (RC+R+FR+ER) i.e. 24.2 % and 13 thermally normal February months (N) i.e. 21.0%. The number of months close to the thermal normal (APN=RC+N+CL) was 27, i.e. 43.5%. ***The 10 warmest February months*** have been recorded since 1966, and 8 have been recorded since 1989. The highest number of very warm winter months (FC), (4) were recorded in February , and three of them have been registered since 1995. This aspect confirms the acceleration of the warming process of winters by increasing their frequency.

Table. 8. The warmest 10 February and the coldest 10 February and the type of months according to the Hellmann criterion, in the interval 1961-2021

No. crt.	*The warmest 10 February months*				*The coldest 10 February months*			
	Year	Average	ΔT	CH	Year	Average	ΔT	CH
1	2016	**6,04**	6,50	**FC**	1985	**-5,95**	-5,49	**FR**
2	2002	**5,93**	6,39	**FC**	2012	**-5,40**	-4,94	**R**
3	1995	**4,73**	5,19	**FC**	2003	**-4,27**	-3,81	**R**
4	1966	**4,63**	5,09	**FC**	1965	**-3,63**	-3,18	**R**
5	1977	**4,40**	4,86	**C**	1986	**-3,16**	-3,16	**R**
6	2022	**3,97**	4,43	**C**	1996	**-3,11**	-2,66	**R**
7	1990	**3,81**	4,27	**C**	1976	**-3,08**	-2,62	**R**
8	2007	**3,78**	4,24	**C**	2005	-2,87	-2,41	**R**
9	1998	**3,40**	3,86	**C**	1991	**-2,81**	-2,35	**R**
10	1989	**3,19**	3,65	**C**	1993	**-1,86**	-1,40	**RC**

(Source: ANM Archive)

(ΔT = deviation of the seasonal mean temperature from normal, N=normal; R=cold, RC=cool, Cl=warm, C=hot, FC=very hot)

Of the 10 coldest Februarys, 6 have been recorded since 1991, and the very cold winter of 1984-1985 was registered the coldest February (FR) with an overall mean of -5.95°C and deviation from normal of -5.49°C. The average air temperature in February calculated for the entire period of 62 years and for the entire Oltenia region is 0.67°C, a deviation from normal of 1.13°C, which according to the Hellmann criterion, the month of February was in medium warm (CL) (or more accurately it was warm, i.e. slightly cooler than warm (C)).

From the total of 186 winter months analysed in this interval, those from the classes of months warmer than normal (CL+C+FC+EC) were 86, i.e. 46.2%, thermally normal months were 58, i.e. 31.2%, the months in the colder than normal classes (RC+R+FR+ER) were 42 i.e. 22.6%, and the months close to normal (APN=RC+N+CL) were 102 i.e. 54.8%. These results are in perfect agreement with reality and show that the months warmer than normal (CL+C+FC+EC) (46.2%) and those close to normal (APN= RC +N+ CL) (54.8%) are predominant.

3.5. Analysis of the seasonal thermal maximums and minimums of winters, in Oltenia (excluding the mountain area) for the interval 1961-2022

The analysis of unseasonal thermal maxima shows that in the 61 analyzed winters, the seasonal thermal maxima were mostly achieved in ***the last winter month – February*** in 38 cases (62.3%), and 21 of these (34.4%) were recorded in the last decade of February and many of them in the last pentad. This shows that the warm weather comes quickly, an aspect due to the fact that at the end of February the length of the day registers 11 hours and 7 minutes or 11 hours and 10 minutes (the length being variable from one year to another) (Tables 9 and 10).

Table 9. Seasonal maximum temperature recorded during the winters, in the interval 1961-2022

Winter	Tmax	ST	Date	Winter	Tmax	ST	Date	Winter	Tmax	ST	Date
61-62	18,4	450	1.XII.61	82-83	18,6	494 482	10.XII.82 28.II.83	03-04	20,5	482	7.II.04
62-63	**10,6**	369	14.XII.62	83-84	20,4	482	2.I.84	04-05	18,3	482	8.I.05
63-64	**11,0**	482	5.II.64	84-85	**11,4**	482	6.II.85	05-06	16,6	482 369	18.II.06 21.II.06
64-65	16,6	494	1.XII.64	85-86	**21,6**	344	**4.XII.85**	06-07	20,6	494	9.II.07
65-66	19,2	346	23.II.66	86-87	20,0	340	5.XII.86	07-08	**22,2**	465	25.II.08
66-67	20,0	482	28.II.67	87-88	17,3	482	30.XII.87	08-09	19,4	494	5.XII.08
67-68	18,4	482	25.II.68	88-89	**23,5**	494	26.II.89	09-10	**16,1**	346 346	9.I.10 20.II.10
68-69	**13,6**	494	20.XII.68	89-90	**23,0**	494	26.II.90	10-11	17,0	341	6.II.11
69-70	17,6	482	10.II.70	90-91	17,5	482	11.I.91	11-12	20,1	465	5.XII.11
70-71	17,5	482	1.XII.70	91-92	20,4	341	28.II.92	12-13	**14,1**	469 482	1.XII.12 1.II.13
71-72	17,0	482 465	23.XII.71 23.XII.71	92-93	20,5	482	22.I.93	13-14	20,3	494	17.II.14
72-73	18,0	482	8.II.73	93-94	21,0	494	28.II.94	14-15	20,1	482	24.XII.14
73-74	17,6	465	11.II.74	94-95	**23,8**	494	27.II.95	15-16	**24,2**	494	22.II.16
74-75	16,6	482	17.I.75	95-96	**11,8**	341	18.II.96	16-17	20,9	494	24.II.17
75-76	16,5	494	24.I.76	96-97	20,0	482	26.II.97	17-18	21,4	494	3.II.18
76-77	19,7	494	22.II.77	97-98	20,4	410 341	16.II.98 28.II.98	18-19	18,5	482 395	18.II.19 20.II.19
77-78	19,6	465	28.II.78	98-99	**21,7**	410	28.II.99	19-20	**22,7**	494	26.II.20
78-79	19,0	482 494	29.XII.78 30.XII.78	99-00	17,8	482	8.II.00	20-21	**22,4**	340	27.II.21
79-80	19,8	482	1.XII.79	00-01	19,5	346	10.II.01	21-22	18,4	482	11.II.22
80-81	**14,6**	410	3.II.81	01-02	**22,5**	494	13.II.02				
81-82	**16,5**	482	9.XII.81	02-03	**11,4**	482	31.XII.02				

(Source: ANM Archive)

In January, seasonal highs were recorded in only 7 winters (11.5%): `74-`75, `75-`76, `83-`84, `90-`91, `92-`93, `04-`06, `09-`10. In December, the seasonal highs of 18 winters were recorded (29.5%). In a single winter (1.6%), the seasonal maximum was recorded in December and February - the winter of `12-`13 and also in a single winter (1.6%), the seasonal thermal maximum was recorded in January and February – winter `09-`10. We note that the recording of seasonal highs in two months occurred during the range of years in which the frequency of warm winters increased.

The highest seasonal winter temperature was 24.2°C recorded in Bechet on 22.II.2016, ***in the warmest month of February in the entire history of climate observations (February 2016).***

The 10 highest seasonal maximum values were between 21.6°C at Polovragi on 4.XII.1985 and 24.2°C at Bechet on 22.II.2016. ***The value of 24.2°C is the absolute thermal maximum for the winter season in Oltenia (absolute climate record for Oltenia),*** being the highest temperature value recorded in the winter season in the entire history of climate observations and surpassing the old maximum after 117 years. The absolute temperature of 24.0°C was recorded at Dr. Tr. Severin on 16.II.1899. At the level of Romania in February 2016, the absolute

maximum of February was surpassed, registering on 16.II.2016 at Pâtârlagele a maximum of 26.0ºC. Of the 10 highest seasonal temperature maxima, 8 were recorded since 1990, which confirms the increase in climate warming since 1990. The 10 lowest seasonal temperature maxima in winter were between 10.6°C at Tg . Logrești on 14.XII.1962 and 16.5°C in Calafat on 9.XII.1981.

Table 10. The 10 highest winter thermal maxima and the 10 lowest winter thermal maxima, in the interval 1961-2022

No. crt.	The highest 10 maxima				The lowest 10 maxima			
	Winter	Tmax	Station	Date	Winter	Tmax	Station	Date
1	15-16	**24,2**	494	22.II.16	62-63	**10,6**	369	14.XII.62
2	94-95	**23,8**	494	27.II.95	63-64	**11,0**	482	5.II.64
3	88-89	**23,5**	494	26.II.89	84-85	**11,4**	482	6.II.85
4	89-90	**23,0**	494	26.II.90	02-03	**11,4**	482	31.XII.02
5	19-20	**22,7**	494	26.II.20	95-96	**11,8**	341	18.II.96
6	01-02	**22,5**	494	13.II.02	68-69	**13,6**	494	20.XII.68
7	20-21	**22,4**	340	27.II.21	12-13	**14,1**	469 482	1.XII.12 1.II.13
8	07-08	**22,2**	465	25.II.08	80-81	**14,6**	410	3.II.81
9	98-99	**21,7**	410	28.II.99	09-10	**16,1**	346 346	9.I.10 20.II.10
10	85-86	**21,6**	344	4.XII.85	81-82	**16,5**	482	9.XII.81

(Source: ANM Archive)

(°C, Station = weather station: 340 = Tg. Jiu, 341 = Apa Neagră, 344 = Polovragi, 369 = Tg Logrești, 434 = Slatina, 450 = Craiova, 465 = Băilești, 469 = Caracal, 482 = Calafat, 494 = Bechet)

With regard to t***he geographical area where the seasonal temperature maxima*** were recorded, we have the following situation, out of the 61 winters, the seasonal maxima were recorded in one year each (1.6%) at the Drăgășani, Craiova, Polovragi and Caracal weather stations; in 2 years (3.3%) at Tg stations. Tg. Logrești and Tg. Jiu weather stations in 3 years (4.9%) at Dr. Tr. Severin and Rm. Vâlcea; in 4 years (6.6%) in Apa Neagră, in 5 years (8.2%) in Băilești in Oltenia Plain, in 18 years (29.5%) in Bechet in the extreme south of Oltenia and in 27 years (44.3%) in Calafat in the extreme southwest where the sub-tropical influences are most frequently felt and the most very warm winters (FC) according to the Hellmann criterion are recorded.

The analysis of seasonal minimum temperatures shows that the seasonal minimum temperature in the analysed interval was -30.5°C recorded on 25.I.1963 in Bechet. In Oltenia, the absolute minimum temperature for the winter season ***is -35.6°C recorded in Slatina on January 15, 1893. For the Oltenia Plain, the absolute minimum temperature is -35.5°C recorded in Craiova*** in the lower part of the city (towards Jiu River meadow) at the Aviasan weather station on January 25, 1963, while in Romania the absolute minimum temperature is -38 .5°C recorded on the night of January 24/25, 1942 in Bod in Brasov county (the same

value was also recorded here on 11.II.1929). So the interval 15.I-15.II is the peak of winter not only in Romania but on the whole continent of Europe, when the lowest temperature values are often recorded, these are climatic risks. On the continent of Europe, the cooling on the night of 10/11.II.1911, due to a polar cold wave, was so intense that in Warsaw the Poles lit huge fires in the streets and managed to raise the temperature in the city to a bearable level . All this shows that in the first part of February the weather is sometimes as cold as in January, and the cold waves have softened compared to past centuries (on the 10.II the duration of the night is 13 hours and 46 minutes). Out of the analyzed regions , in 14 the seasonal minimum temperature was recorded in December (23.0%), in 30 in winters in January (49.2%), and in February in 17 winters (27.8%) (Tables 11 and 12)

Therefore, climate warming is and has been beneficial, being a bio stimulating factor, 0°C being the temperature of the biological minimum, and values above 25-30°C being those of the biological optimum. A century ago, the Danube frequently froze in winter and could be crossed by sledge or cart.

Table 11. *Minimum temperatures recorded during the winters, in the interval 1961-2022*

Winter	Tmin	ST	Date	Winter	Tmin	ST	Date	Winter	Tmin	ST	Date
61-62	**-17,1**	450 340	20.XII.61 27.XII.61	82-83	**-15,6**	434	1.I.83	03-04	-21,7	369	8.I.04
62-63	**-30,5**	494	25.I.63	83-84	-17,6	319	13.XII.83	04-05	**-26,6**	341	8.II.05
63-64	-19,3	341	13.I.64	84-85	**-30,0**	341	13.I.85	05-06	**-28,2**	341	24.I.06
64-65	-21,0	344	7.II.65	85-86	-20,7	465	***28.II.86***	06-07	**-11,4**	341	28.XII.06
65-66	-23,5	340	22.I.66	86-87	-22,5	341 482	25.I.87 31.I.87	07-08	-25,7	494	5.I.08
66-67	-24,4	341	19.I.67	87-88	**-15,5**	469	2.II.88	08-09	-17,4	482	6.I.09
67-68	**-29,5**	341	10.I.68	88-89	-19,0	341	18.XII.88	09-10	-24,2	341	21.XII.09
68-69	**-27,4**	341	13.I.69	89-90	-23,5	465	8.I.90	10-11	-21,2	369	18.XII.10
69-70	-18,4	369	18.II.70	90-91	-20,0	434	2.II.91	11-12	**-28,9**	465	1.II.12
70-71	**-15,3**	319	18.I.71	91-92	-18,8	465	11.XII.91	12-13	-19,6	341	14.XII.12
71-72	-22,8	341	3.II.72	92-93	-24,5	465	5.I.93	13-14	-18,1	369	5.II.14
72-73	-21,0	341	27.I.73	93-94	-17,9	344	14.II.94	14-15	**-29,8**	341	1.I.15
73-74	-17,5	341	2.XII.73	94-95	-24,0	341	16.I.95	15-16	-23,3	469	24.I.16
74-75	**-13,1**	319	27.II.75	95-96	-23,0	341	2.I.96	16-17	-25,4	369	10.I.17
75-76	-24,2	341	9.II.76	96-97	-21,0	341	29.XII.96	17-18	**-15,1**	341	16.I.18
76-77	**-29,0**	341	1.I.77	97-98	-22,9	469	19.XII.97	18-19	-17,3	341	12.I.19
77-78	-23,2	341	14.XII.77	98-99	-19,4	341	1.II.99	19-20	**-12,1**	369 341	25.I.20 25.I.20
78-79	-20,1	369	4.I.79	99-00	-25,2	369	26.I.00	20-21	**-14,7**	319	18.II.21
79-80	**-27,2**	341	15.II.80	00-01	-17,6	341	24.XII.00	21-22	**-16,3**	319	25.I.22
80-81	-18,3	319	7.I.81	01-02	-22,2	341	18.XII.01				
81-82	-17,9	341	15.I.82	02-03	-23,5	412 341	14.II.03 14.II.03				

(°C, Station = weather station: 340=Tg. Jiu, 341=Apa Neagră, 344=Polovragi, 369= Tg. Logrești, 434=Slatina, 450= Craiova, 465=Băilești, 469=Caracal, 482=Calafat, 494=Bechet)(ST = station)

Among ***the 10 lowest seasonal minimum temperatures***, 8 were < -28°C, only two ≤ -30°C and only two values were recorded since 2005, which confirms the increase in thermal minimums. The 10 lowest seasonal minimum temperature values were between -30.5°C and -26.6°C (within a range of 4.1°C). The 10

highest seasonal minimum temperatures were between -17.1°C recorded in Craiova on 20.XII.1961 and on Tg. Jiu on 27.XII.1961 and -11.4°C recorded at Apa Neagră on 28.XII.2006 (being in a range of 5.7°C). For Oltenia, we signal ***an important orographic obstacle*** that influences the direction of cold air masses on the low landforms influencing the production of temperature minima, foehn and thermal inversions and more.

Table 12. The 10 highest winter thermal minimums and the 10 lowest winter thermal minimums, in the interval 1961-2022

No. crt.	The highest 10 minima				The lowest 10 minima			
	Winter	Tmin	Winter	Tmin	Winter	Tmin	Winter	Tmin
1	06-07	**-11,4**	341	28.XII.06	62-63	**-30,5**	494	25.I.63
2	19-20	**-12,1**	369 341	25.I.20 25.I.20	84-85	**-30,0**	341	13.I.85
3	74-75	**-13,1**	319	27.II.75	14-15	**-29,8**	341	1.I.15
4	20-21	**-14,7**	319	18.II.21	67-68	**-29,5**	341	10.I.68
5	17-18	**-15,1**	341	16.I.18	76-77	**-29,0**	341	1.I.77
6	70-71	**-15,3**	319	18.I.71	11-12	**-28,9**	465	1.II.12
7	87-88	**-15,5**	469	2.II.88	05-06	**-28,2**	341	24.I.06
8	82-83	**-15,6**	434	1.I.83	68-69	**-27,4**	341	13.I.69
9	21-22	**-16,3**	319	25.I.22	79-80	**-27,2**	341	15.II.80
10	61-62	**-17,1**	450 340	20.XII.61 27.XII.61	04-05	**-26,6**	341	8.II.05

(Source: ANM Archive)

(°C, Station = weather station: 340=Tg. Jiu, 341=Apa Neagră, 344=Polovragi, 369= Tg Logreşti, 434=Slatina, 450=Craiova, 465=Băileşti, 469=Caracal, 482=Calafat, 494=Bechet)

This is the ***Muierii Hill***[4] which is the longest hill in Romania (over 120 km long) starting from the Western Carpathians (near the Muierii Cave) and forming the balance of waters between the hydrographic basin of Jiu River and that of Olteț River, it is oriented almost in a straight line on north-south direction and reaches Craiova, stretches towards Pielești commune and Leu commune and then gradually flattens, disappearing to the south in the Oltenia Plain. The seasonal air temperature minimums were recorded as follows: ***one value each*** (1.6% of the years) in Craiova and Bâcleș, ***two values each*** (3.3%) in Slatina, Bechet, Calafat, Tg. Jiu and Polovragi, ***3 values*** (4.9%) at Caracal in Romanați Plain, ***5 values*** at Băilești (8.2%) in Oltenia Plain, ***8 values*** at Tg Logrești (13.1%) and ***31 values*** (50, 8%) in the Apa Neagră Sub-Carpathian Depression (Padeș, west of Muierii Hill).

[4] Since ancient times, the natural road on the crest of ***Muierii Hill*** (which is just as old as the King's Road - Transalpina), has been the shortest access route between the Oltenia Plain, the Danube Meadow and the mountain area, being used for transhumance but also for access invaders in Oltenia. Muierii Hill divides Oltenia into two almost equal parts, being a real axis of Oltenia. The border between Gorj and Vâlcea counties is mostly located on the ridge of Muierii Hill.

4. CONCLUSIONS

In the analyzed period of 62 years, the warming process is also highlighted during winters, by increasing the averages, minimums and seasonal maximums of the air temperature, which determined the increase in the frequency of warm winters. The frequency of early spring events has increased, and the climatic risks of early spring events have become more destructive due to the early establishment of crops, vineyards and orchards. This climate warming is not climate change, it is natural climate variation due to powerful cosmic causes beyond our control (Usoskin & Kovaltsov, 2008). The frequency of warm winters increased, especially after 1990, and intensified in the last decade. Except for the climatic risks of early spring, warm winters are beneficial to social development, causing lower energy consumption and being biostimulatory through the long warm periods that are recorded. As a consequence, the share of liquid precipitation in the winter season increased and 4 very warm Mediterranean winters (FC) were recorded: 2006-2007 with the seasonal average of 3.44°C and the deviation from the normal of 4.39°C; 2019-2020 with the seasonal average of 2.91°C and the deviation from normal 3.86°C; 2021-2022 with seasonal mean of 2.61°C and deviation from normal of 3.56°C and 2020-2021 with seasonal mean of 2.56°C and deviation from normal of 3.51°C. This aspect shows the northward extension of the Mediterranean climate and the increase of its influence in southwest Romania. ***The average seasonal values calculated for Oltenia*** (the normals) over the last century show that the average winter is -0.9°C, spring 10.5°C, summer 20.7°C and autumn 10.4°C. So we observe a difference of about 10°C between the seasonal averages. The variation amplitudes of the seasonal averages as well as the ranges of values show ***that the difference between the seasons will never disappear*** (an aspect also guaranteed by the precessional movement of the Earth), and the 4 seasons will be present every year. The analysed data show that we are in a natural climate warming period of a Milankovitch-type climate cycle (Berger et. al. 2002). In the future, a period of climatic cooling will certainly follow, with its consequences. As a result, climate policies must be oriented towards adapting to new future developments and less towards illusory combat.

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