



**VERIFICATION OF THE SEECOF-22
WINTER 2019 – 2020 CLIMATE OUTLOOK
AND
SEASONAL BULLETIN
FOR THE TERRITORY OF UKRAINE**

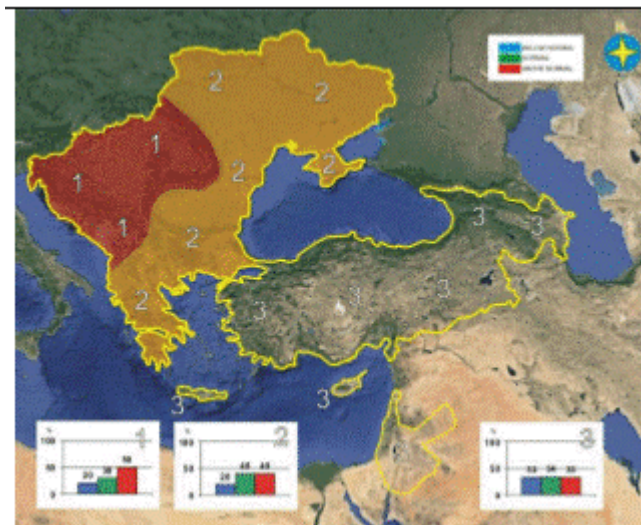
Kyiv, 17 April 2020

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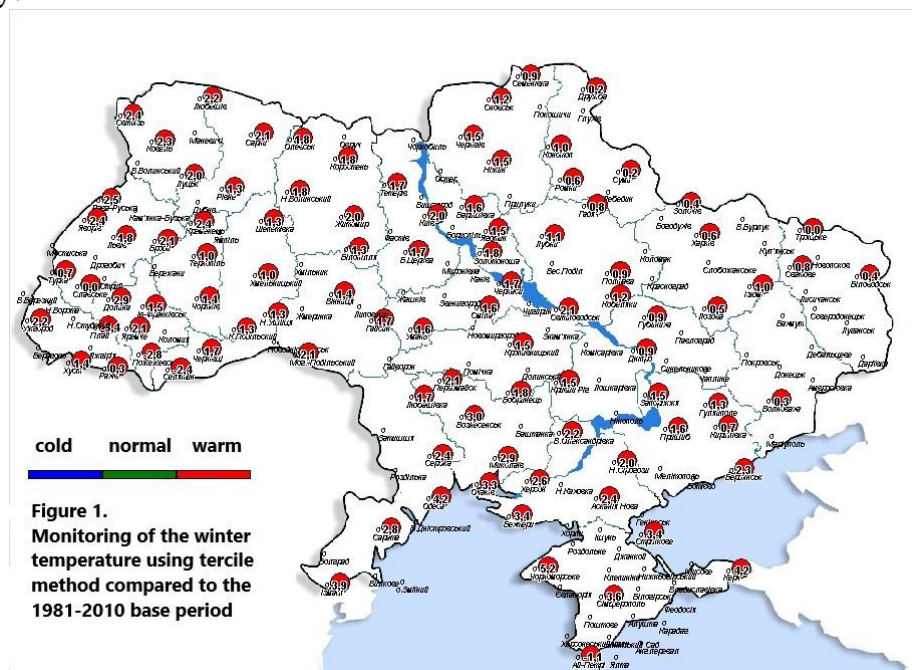
VERIFICATION OF THE SEECOF-20 WINTER 2019-20 CLIMATE OUTLOOK FOR THE TERRITORY OF UKRAINE (1981-2010 BASE PERIOD)

Temperature



According to the SEECOF-22 outlook for the the winter 2019-20 in Ukraine, seasonal temperature was expected warmer (upper tercile) and normal with equal probability (40%) and below (low tercile) with probability (20%) compared to the 1981-2010 climatological base period, in Carpathians and Transcarpathia region was indicated temperature warmer then normal with probability 60%.

Climatological monitoring showed that the the winter 2019-20 was warm in entire Ukraine, with abow-normal temperatyre based on the tercile method (Figure 1.). The outlook for a warm winter with probability 60% would be more correct for the entire country.



Note: Tercile analysis of meteorological elements was performed on the basis of the data from 94 main meteorological stations.

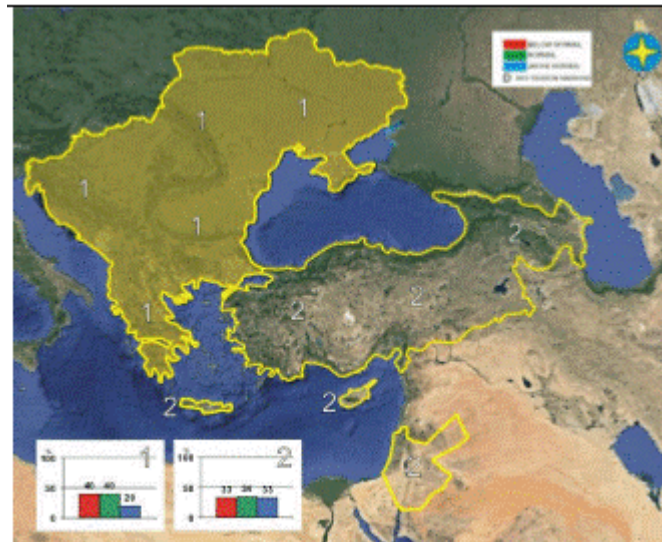
Winter 2019-20			Air Temperature (°C)				
synop		Station	Rank	33	50	66	Observed
1	33526	Ivano-Frankivsk	2	-3,0	-2,2	-1,4	1,5
2	33889	Izmail	1	-0,4	0,4	1,4	3,9
3	34415	Izymb	1	-4,2	-3,6	-2,8	1,0
4	33998	Ai-Petri	9	-3,1	-2,6	-2,2	-1,1
5	99915	Askaniya Nova	2	-1,5	-0,9	0,0	2,4
6	33464	Bila Cerkva	1	-3,5	-2,8	-2,0	1,7
7	34434	Bilovodsk	1	-5,4	-4,3	-3,6	0,4
8	33446	Bilopillya	1	-3,7	-3,1	-2,2	1,3
9	33354	Baryshyvka	1	-3,6	-2,7	-2,3	1,6
10	34717	Berdiyansk	2	-1,8	-1,5	-0,9	2,3
11	33907	Behtery	2	-0,6	-0,2	0,8	3,4
12	33717	Bobryniec	1	-3,1	-2,6	-1,6	1,8
13	33297	Brody	1	-2,2	-1,8	-0,8	2,1
14	33862	V.Oleksandrivka.	1	-2,2	-1,3	-0,6	2,2
15	33562	Vinnyca	1	-3,5	-3,3	-2,3	1,4
16	33777	Voznesensk	1	-1,8	-1,4	-0,2	3,0
17	34615	Volnovaha	1	-4,2	-3,7	-3,0	0,3
18	33376	Hadyach	1	-4,4	-3,7	-3,1	0,8
19	33577	Haisyn	1	-3,2	-2,8	-1,8	1,7
20	34407	Hybinyha	1	-4,1	-3,4	-2,7	0,9
21	34606	Hyliai Pole	2	-3,3	-2,5	-1,9	1,3
22	34504	Dnipro	1	-3,6	-2,8	-2,4	0,9
23	33524	Dolyna	1	-2,5	-1,5	-0,7	2,9
24	33058	Dryzhba	1	-5,4	-4,5	-4,2	0,2
25	33325	Zhitomyr	1	-3,4	-2,7	-1,9	2,0
26	34601	Zaporizzhya	2	-2,5	-2,1	-1,3	1,5
27	33484	Zolotonosha	1	-3,4	-2,5	-2,0	1,8
28	34208	Zolochiv	1	-5,1	-4,4	-3,6	0,4
29	33548	Kamyanec-Podilskiy	1	-3,1	-2,6	-1,1	1,3
30	33983	Kerch	2	0,3	1,3	1,9	4,2
31	33345	Kyiv	1	-3,2	-2,4	-1,9	2,0
32	34609	Kyrylivka	2	-3,9	-3,1	-2,4	0,7
33	33621	Kobelyaky	1	-3,7	-2,8	-2,5	1,2

34	33173	Kovel	1	-2,2	-1,6	-0,8	2,3
35	33261	Konotop	1	-4,6	-3,7	-3,1	1,0
36	33215	Korosten	1	-3,3	-2,4	-1,7	1,8
37	33299	Kremenech	1	-2,4	-1,9	-1,0	2,4
38	33791	Kryviy Rih	1	-3,3	-2,5	-1,8	1,5
39	33711	Kropyvnutsky	1	-3,5	-2,9	-2,0	1,5
40	34409	Lozova	1	-4,2	-3,9	-3,3	0,5
41	33377	Lubnu	1	-4,0	-3,2	-2,9	1,1
42	33187	Luck	1	-2,7	-2,1	-1,2	2,0
43	33393	Lviv	1	-2,8	-2,2	-1,2	1,8
44	33761	Liybashivka	1	-3,0	-2,4	-1,1	1,7
45	33075	Lybeshiv	1	-2,4	-1,6	-0,9	2,2
46	33846	Mykolaiv	1	-1,7	-1,1	-0,3	2,9
47	33663	Mohyliv-Podilskiy	1	-2,1	-1,4	-0,2	2,1
48	33312	Novohrad Volynskiy	1	-2,9	-2,3	-1,3	1,8
49	33877	Nyzhni Sirohozy	2	-2,1	-1,5	-0,5	2,0
50	33557	Nova Ushica	1	-3,4	-2,8	-1,5	1,3
51	33246	Nizhin	1	-4,1	-3,3	-2,8	1,5
52	33837	Odesa	1	-0,4	0,1	1,0	4,2
53	33203	Olevsk	1	-3,1	-2,4	-1,4	1,8
54	33848	Ochakiv	1	-1,2	-0,7	0,1	3,3
55	33699	Pervomaisk	1	-2,8	-2,1	-0,8	2,1
56	33515	*Play	2	-6,5	-5,9	-5,3	-3,4
57	33646	Pozhezhevskaya	2	-6,2	-5,6	-5,2	-2,8
58	33506	Poltava	1	-4,3	-3,4	-3,0	0,9
59	33301	Rivne	1	-2,9	-2,3	-1,6	1,3
60	33287	Rava-Ryska	1	-2,4	-1,6	-0,7	2,5
61	33647	Rahiv	4	-2,8	-2,1	-1,7	0,3
62	33268	Romny	1	-4,8	-3,9	-3,5	0,6
63	33946	Simferopol	3	0,2	1,1	1,7	3,6
64	33896	Sarata	2	-0,9	-0,3	0,8	2,8
65	33088	Sarny	1	-2,8	-2,2	-1,2	2,1
66	33614	Svitlovodsk	1	-3,0	-2,3	-1,7	2,1
67	33067	Svityaz	1	-2,7	-1,5	-0,7	2,4

68	34421	Svatove	1	-5,0	-4,0	-3,3	0,8
69	33657	Selyatyn	5	-5,2	-4,8	-4,0	-2,4
70	33049	Semenivka	1	-4,9	-4,0	-3,6	0,9
71	33833	Serbka	1	-1,9	-1,3	-0,3	2,4
72	33516	Slavske	2	-4,4	-3,9	-2,7	0,0
73	33593	Smila	1	-3,8	-2,7	-2,0	1,6
74	33961	Strilcove	2	-0,6	0,2	1,0	3,4
75	33275	Symy	1	-5,1	-4,5	-3,8	0,2
76	33415	Ternopil	1	-3,5	-2,9	-1,9	1,0
77	33228	Teteriv	1	-3,3	-2,5	-1,7	1,7
78	33511	Tyrka	2	-3,9	-3,4	-1,9	0,7
79	33631	Uzhhorod	3	-1,7	-1,0	0,2	2,2
80	33587	Uman	1	-3,6	-2,8	-1,7	1,6
81	34300	Kharkiv	1	-5,2	-3,9	-3,2	0,6
82	33902	Kherson	2	-1,7	-0,8	0,1	2,6
83	33429	Khmelnitskiy	1	-3,7	-3,2	-1,8	1,0
84	33638	Khyst	3	-2,5	-1,8	-0,3	1,4
85	33487	Chercasy	1	-3,8	-2,7	-2,1	1,7
86	33658	Chernivci	2	-2,8	-2,1	-0,8	1,7
87	33135	Chernihiv	1	-4,3	-3,0	-2,9	1,5
88	33924	Chornomorske	2	1,2	2,0	2,5	5,2
89	33536	Chortkiv	1	-3,3	-2,6	-1,4	1,4
90	33317	Shepetivka	1	-3,3	-2,7	-1,7	1,3
91	33136	Snovsk	1	-4,4	-3,4	-3,1	1,2
92	33392	Yavoriv	1	-2,5	-1,9	-0,7	2,4
93	33356	Yahotyn	1	-3,9	-3,0	-2,6	1,5
94	33645	Yaremche	1	-2,5	-2,0	-0,8	2,1

Rank – 1961-2020 (warmest season), *Play – rank 1981-2020

Precipitation



The SEECOF–22 climate outlook indicated equal probabilities for below and near normal conditions (40%) and above normal conditions (20%) for the territory of Ukraine.

Monitoring of precipitation showed normal and wet conditions in most of the country. (Figure 2). Dry conditions were fixed only in some places in the northern and south-western part of Ukraine (tercile method with 1981–2010 climatological base period).

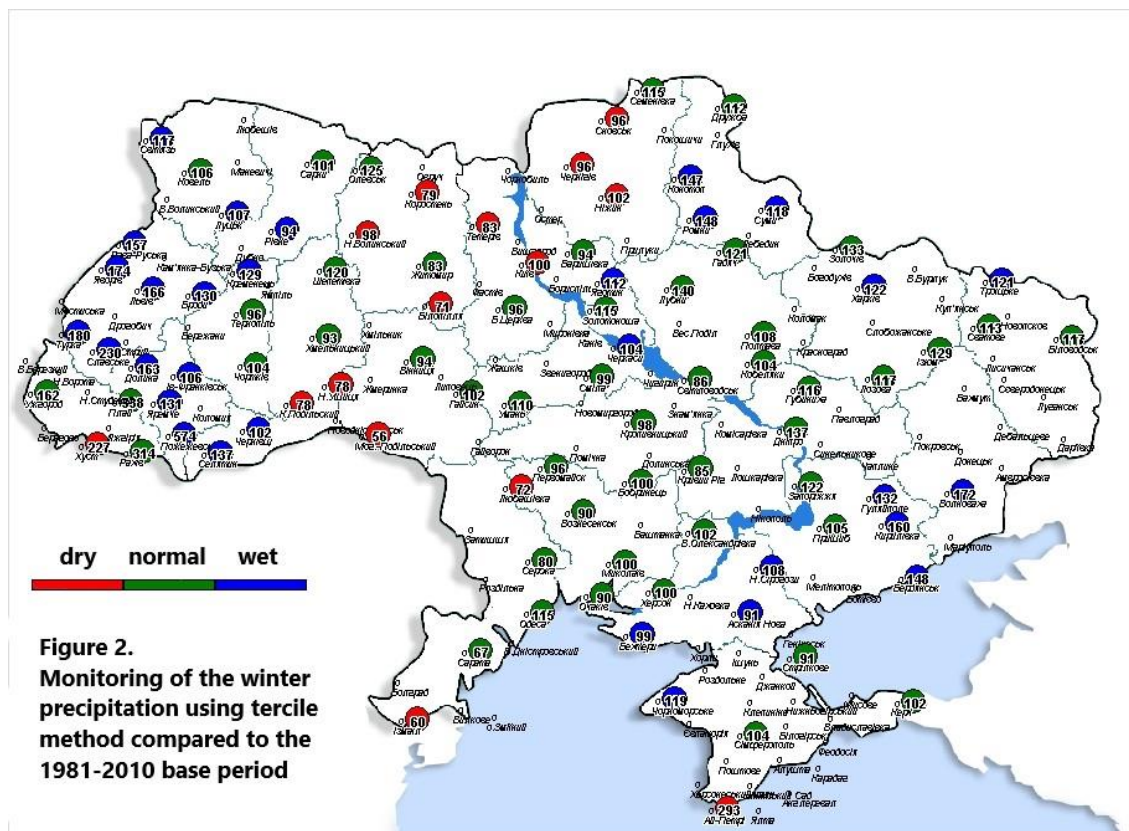


Figure 2.
Monitoring of the winter precipitation using tercile method compared to the 1981-2010 base period

Note: Tercile analysis of meteorological elements was performed on the basis of the data from 94 main meteorological stations.

Winter 2019-20			Precipitation (mm)				
synop		Station	Rank	33	50	66	Observed
1	33526	Ivano-Frankivsk	21	83	91	104	106
2	33889	Izmail	48	73	84	97	60
3	34415	Izymb	35	123	137	150	129
4	33998	Ai-Petri	47	317	358	427	293
5	99915	Askaniya Nova	25	59	84	88	91
6	33464	Bila Cerkva	31	87	95	114	96
7	34434	Bilovodsk	32	104	115	139	117
8	33446	Bilopillya	47	80	99	103	71
9	33354	Baryshyvka	30	79	94	105	94
10	34717	Berdiyansk	22	108	116	135	148
11	33907	Behtery	23	75	84	96	99
12	33717	Bobryniec	33	77	95	115	100
13	33297	Brody	22	100	113	123	130
14	33862	V.Oleksandrivka.	33	72	89	125	102
15	33562	Vinnyca	36	77	88	103	94
16	33777	Voznesensk	34	64	91	109	90
17	34615	Volnovaha	20	121	139	153	172
18	33376	Hadyach	36	110	128	133	121
19	33577	Haisyn	35	88	97	107	102
20	34407	Hybinyha	34	105	118	126	116
21	34606	Hyliai Pole	17	89	116	125	132
22	34504	Dnipro	26	112	120	139	137
23	33524	Dolyna	8	90	102	118	163
24	33058	Dryzhba	39	112	121	148	112
25	33325	Zhitomyr	40	81	103	107	83
26	34601	Zaporizzhya	26	103	115	139	122
27	33484	Zolotonosha	30	94	104	117	115
28	34208	Zolochiv	26	101	116	133	133
29	33548	Kamyanec-Podilskiy	45	83	97	115	78
30	33983	Kerch	33	86	105	120	102
31	33345	Kyiv	48	110	119	127	100
32	34609	Kyrylivka	19	121	136	149	160
33	33621	Kobelyaky	36	88	113	127	104

34	33173	Kovel	31	92	103	120	106
35	33261	Konotop	18	100	115	125	147
36	33215	Korosten	49	85	99	102	79
37	33299	Kremenec	22	101	111	122	129
38	33791	Kryviy Rih	34	68	83	93	85
39	33711	Kropyvnutsky	28	76	82	101	98
40	34409	Lozova	36	108	118	130	117
41	33377	Lubnu	29	115	129	141	140
42	33187	Luck	21	70	83	95	107
43	33393	Lviv	13	113	120	145	166
44	33761	Liybashivka	45	74	87	107	72
45	33075	Lybeshiv	18	105	116	122	97
46	33846	Mykolaiv	30	68	88	109	100
47	33663	Mohyliv-Podilskiy	51	69	85	99	56
48	33312	Novohrad Volynskiy	47	106	119	131	98
49	33877	Nyzhni Sirohozy	22	76	87	107	108
50	33557	Nova Ushica	49	88	100	116	78
51	33246	Nizhin	43	105	118	127	102
52	33837	Odesa	31	81	102	120	115
53	33203	Olevsk	31	102	115	126	125
54	33848	Ochakiv	33	65	85	97	90
55	33699	Pervomaisk	36	81	106	113	96
56	33515	*Play	25	265	299	358	338
57	33646	Pozhezhevsk	2	208	227	251	574
58	33506	Poltava	35	93	118	126	108
59	33301	Rivne	28	73	80	92	94
60	33287	Rava-Ryska	7	95	112	120	157
61	33647	Rahiv	23	229	245	321	314
62	33268	Romny	21	90	122	135	148
63	33946	Simferopol	39	99	125	140	104
64	33896	Sarata	44	66	85	101	67
65	33088	Sarny	33	86	96	108	101
66	33614	Svitlovodsk	37	78	93	102	86
67	33067	Svityaz	19	89	96	108	117

68	34421	Svatove	36	100	119	133	113
69	33657	Selyatyn	7	78	90	102	137
70	33049	Semenivka	31	100	125	131	115
71	33833	Serbka	34	61	79	84	80
72	33516	Slavske	12	149	163	177	230
73	33593	Smila	38	83	105	113	99
74	33961	Strilcove	30	79	90	99	91
75	33275	Symy	28	85	106	116	118
76	33415	Ternopil	27	77	89	96	96
77	33228	Teteriv	51	97	109	118	83
78	33511	Tyrka	22	153	165	179	180
79	33631	Uzhhorod	37	159	187	203	162
80	33587	Uman	34	92	108	123	110
81	34300	Kharkiv	21	90	96	116	122
82	33902	Kherson	28	76	88	104	100
83	33429	Khmelnitskiy	43	86	102	112	93
84	33638	Khyst	43	259	277	325	227
85	33487	Chercasy	24	79	95	101	104
86	33658	Chernivci	23	69	86	91	102
87	33135	Chernihiv	42	97	120	128	96
88	33924	Chornomorske	15	68	76	93	119
89	33536	Chortkiv	33	90	102	117	104
90	33317	Shepetivka	31	107	111	125	120
91	33136	Snovsk	44	102	126	135	96
92	33392	Yavoriv	13	117	136	157	174
93	33356	Yahotyn	19	75	96	108	112
94	33645	Yaremche	16	93	109	110	131

Rank – 1961-2020 (Wettest season), *Play – rank 1981-2020

Assessment of the SEECOF-18 Climate outlook for winter 2019-20

Country	Seasonal Temperature (DJF)		Seasonal Precipitation (DJF)		High impact Events
	Observed	SEECOF-22 climate outlook	Observed	SEECOF-22 climate outlook	
Ukraine	above normal	<p>above and normal (40%)</p> <p>below (20%)</p>	<p>above normal (32% stations)</p> <p>normal (52% stations)</p> <p>below normal (16% stations)</p>	<p>above normal (20%)</p> <p>normal and below (40%)</p>	<p>First warmest winter since 1961 for most stations in Ukraine.</p> <p>Meteorological extraordinary phenomenas were observed in January 29-30th were recorded heavy snowfalls (26-27 mm precipitation per 12 hours) and strong blizzard (for 18 hours with wind gust 18 m/c) in Chernihiv and Symy regions.</p> <p>In February 4-6th heavy snowfalls (20-28 mm precipitation per 6-12 hours) in Zakarpattia, Ivano-Frankivsk, Chernivci, Odesa, Zaporizhzhia, Dnipro, Doneck regions, strong wind (25-28 m/c) in Odesa, Kherson regions, in highland of Carpathians 40 m/c.</p> <p>On 10th of February strong wind (25-34 m/c) in Lviv, Ivano-Frankivsk and in highland of Carpathians 40 m/c.</p> <p>On 24th of February strong wind (25-32 m/c) in Lviv, Ivano-Frankivsk, Odesa, Mykolaiv, Kherson regions.</p> <p>Unfavorable weather conditions caused loss power, telecommunications, utilities and transport.</p>

Analysis of the winter season 2019-2020 for Ukraine compared to the 1981-2010 base period

Winter as a long period (more 10 days) with average day temperature below 0°C was non-available on the plain territory of Ukraine in the winter season 2019-20.

Temperature

The average winter temperature 2019-20 was positive and ranged from 0.0°C in the east to 5.2°C in the south of Ukraine, and only on highlands of the Carpathian and Crimea mountains was negative $-0.7 \dots -3.4^\circ\text{C}$.

Deviations of the mean air winter temperature from average values of the 1981-2010 base period were $+2.5 \dots +5.7^\circ\text{C}$, in the Crimea mountains (highlands) were deviations $+1.5^\circ\text{C}$ (Figure.1).

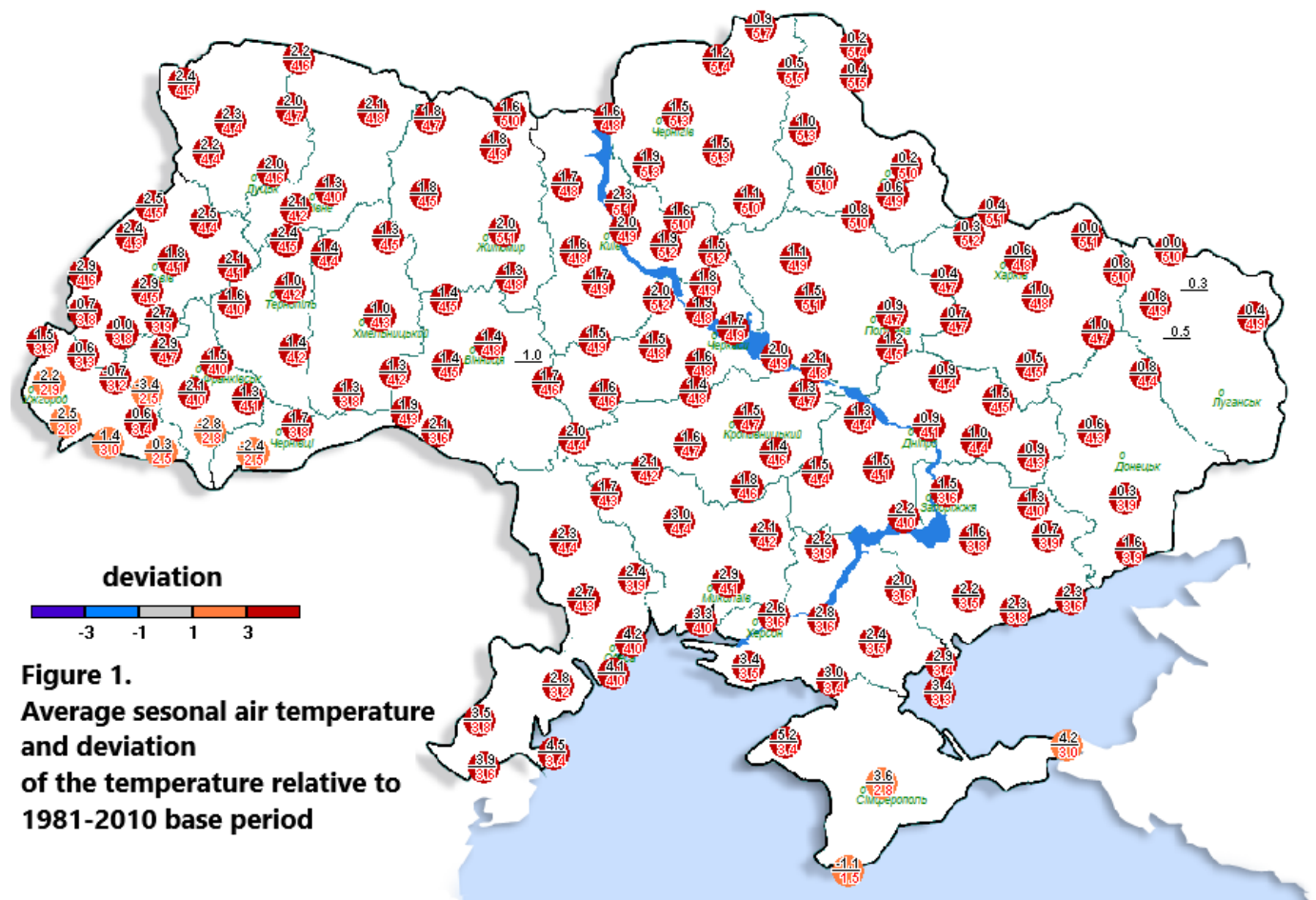
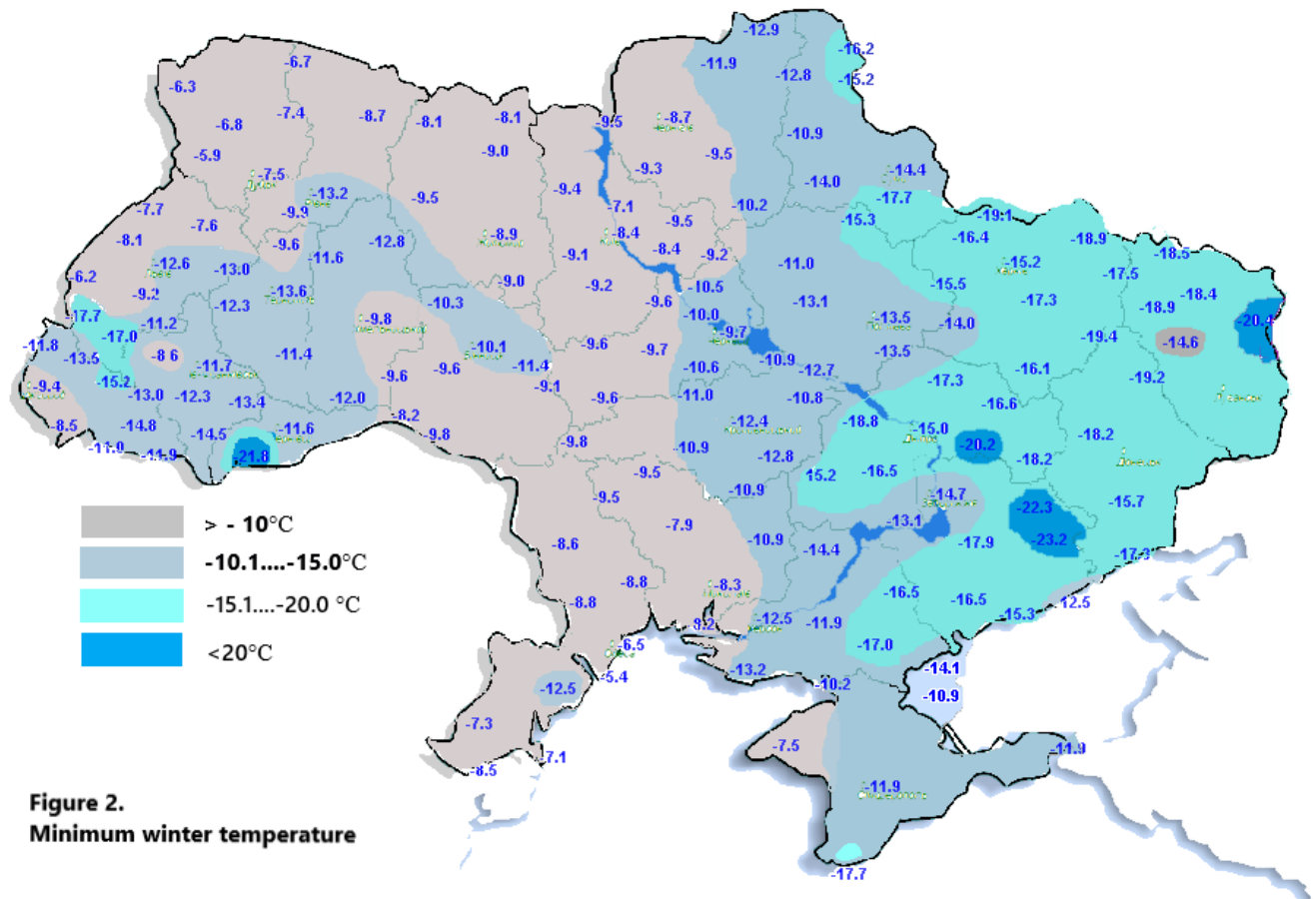


Figure 1.
Average seasonal air temperature and deviation of the temperature relative to 1981-2010 base period

Note: Climatological analysis of meteorological elements was performed on the basis of the data from 163 meteorological stations.

From month to month average temperature deviation was anomaly positive relative to the average values of the 1981-2010 base period and ranged from $+3^\circ\text{C}$ to $+5.7^\circ\text{C}$, only in January deviation was $+2^\circ\text{C}$ in the south of Ukraine.

The minimum temperature ranged from -23.2°C in Zaporizhzhya region (southeast of the country) to -5.4°C in Odesa region (southwest). In the Carpathian mountains minimum temperature was -21.8°C . (Figure 2)



The lowest air temperature during winter 2019-20, measuring -23.2°C was observed on 9th of February in Kyrylivka, also measuring -21.8°C was fixed on 7th of January in Selyatyn in Carpathian mountains.

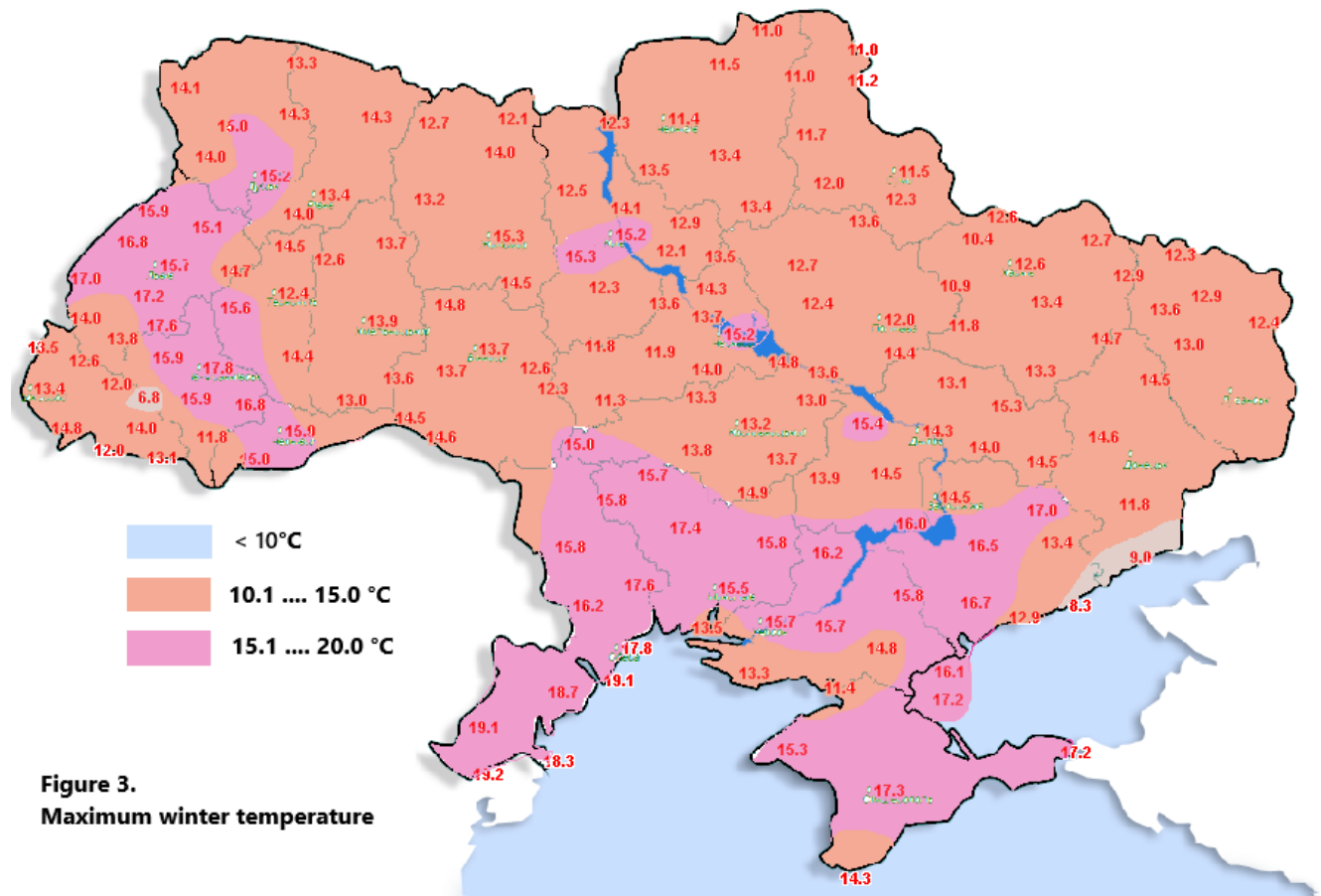
The minimum winter temperatures were mostly in the range $0 \dots -10^{\circ}\text{C}$, only on separate days in Carpathian mountains and in the eastern part of Ukraine it was declined to $-15 \dots -22^{\circ}\text{C}$.

Absolute minimum winter temperatures recorded in the history of observations are $-27 \dots -42^{\circ}\text{C}$, in the south of the country and Transcarpathia region $-23 \dots -34^{\circ}\text{C}$.

The lowest temperatures in winter seasons have been recorded since 2000 are $-23 \dots -35^{\circ}\text{C}$, in the south of the country and Transcarpathia region $-23 \dots -34^{\circ}\text{C}$.

Winter 2019-20 was one of the warmest for the history of observations.

Maximum temperature was in the range from +8.3°C on the coast of Azov Sea (southeast) to +19.2°C in Odessa region (southwest). In Carpathian mountains (highlands) +6,8...11,8°C (Figure 3).

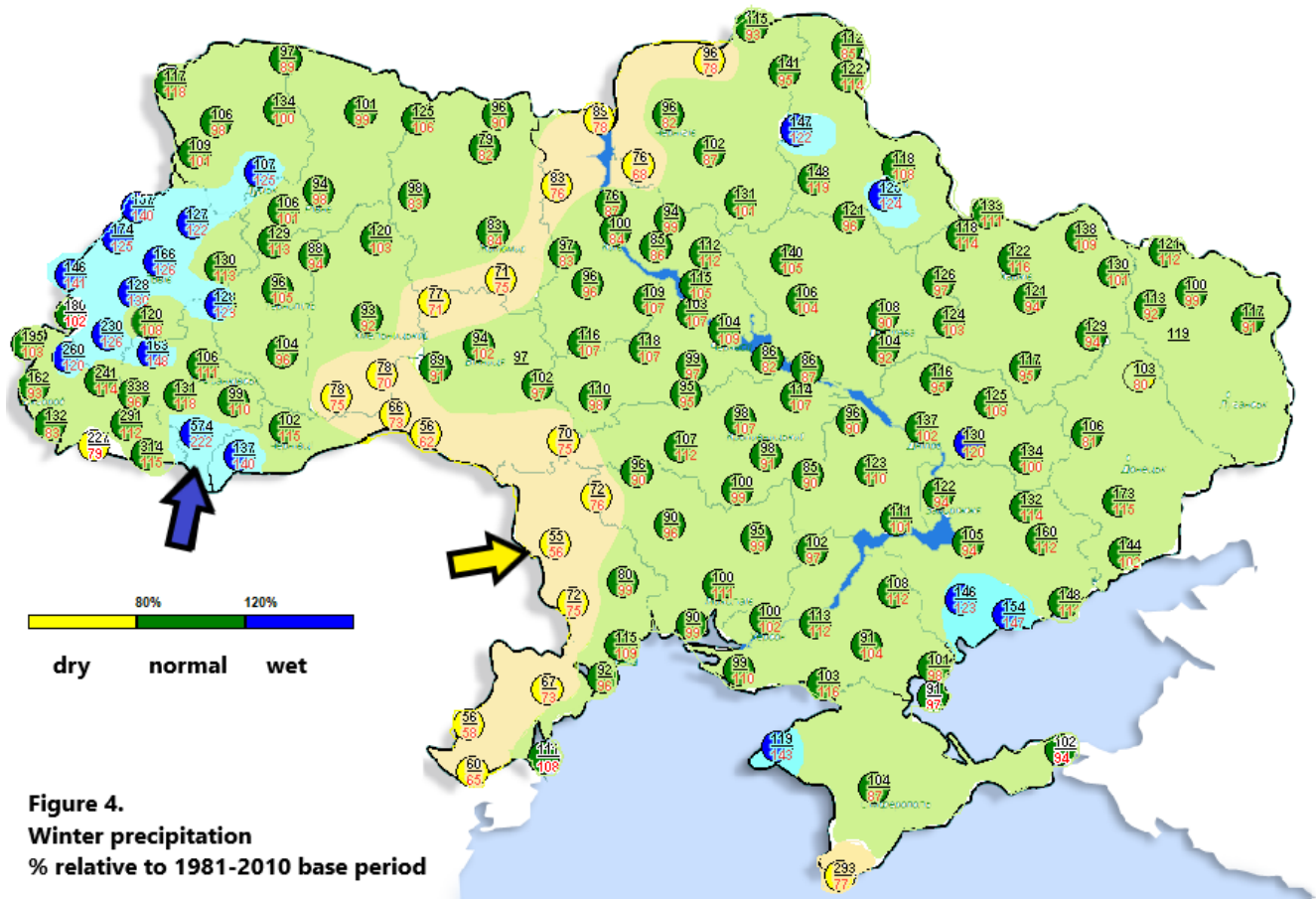


The highest daily air temperature during the winter 2019-20, measuring +19,2°C was observed on 22th of December and 26th of February in Izmail.

Absolute maximum winter temperatures recorded for the history of observations are +10...+18°C, in the south and west part of Ukraine +19..+24°C.

Precipitation

In the winter 2019-20 were dominated normal and wet conditions (80..222% of the norm), but in the northern and southwestern parts was separate stations with some dry conditions (56...79%) compared to the average values of the 1981-2010 base period (Figure.4).



Seasonal precipitation was ranged from 55 mm (56% of the norm) in the Odessa region (Zatyshshia) to 574 mm (222%) in the Carpathian region (Pozhezhevaska) (Figure 4).

The biggest daily precipitation was recorded in Pozhezhevaska (Carpathian) – 44 mm on 11th of February and longest period with snowfall for 9 days (28/01....7/02/2020).

From month to month the winter precipitation was not homogeneous.

In December and **January** were predominated dry conditions with month sum of precipitation 20...80% , only in December the west part of the country were normal and above moistened 100....210% relative to average values of 1981-2010 based period.

February was above normal wetting on most area of the country (100....360%) and only in some places in north were a little dry conditions (65....80%).

Winter 2019-20 was not very snowy in Ukraine, only in Carpathian mountains winter was snowing especially in January and February. Maximum snow depth 36...41 cm was recorded in separate places of Zaporizhzhia and Doneck regions, and in Carpathian and Crimea mountains (highlands) was 30...79 cm (Figure 5.).



Figure 5.
Maximum depth of snow cover

During the winter, snow cover occurred for short periods mostly in certain areas. The number of days with snow cover during the winter 2019-20 was different across the country. Most days with snow cover were 10...31, with maximum duration 36 days in Volnovaha (Doneck region), in Carpathians were 43...84 days with snow cover.

Analysis of the winter season 2019-20 for Ukraine compared to the 1961-1990 base period

Temperature

Deviations of the mean air temperature were +3.0...7.1°C above the climate norm (1961-1990), only in Carpathians and Crimea were places with deviation 1.6...2.9 °C (Figure 1).

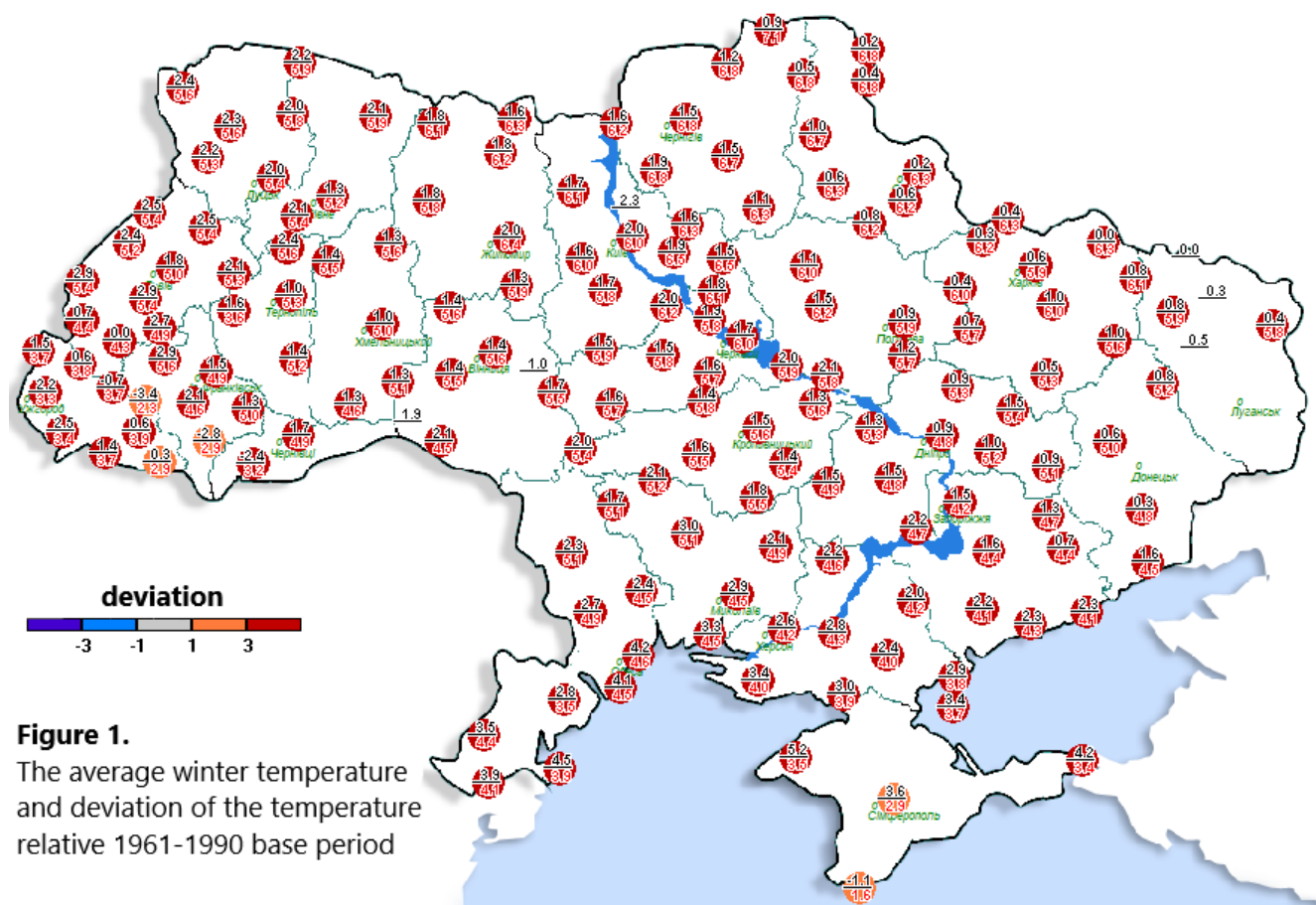
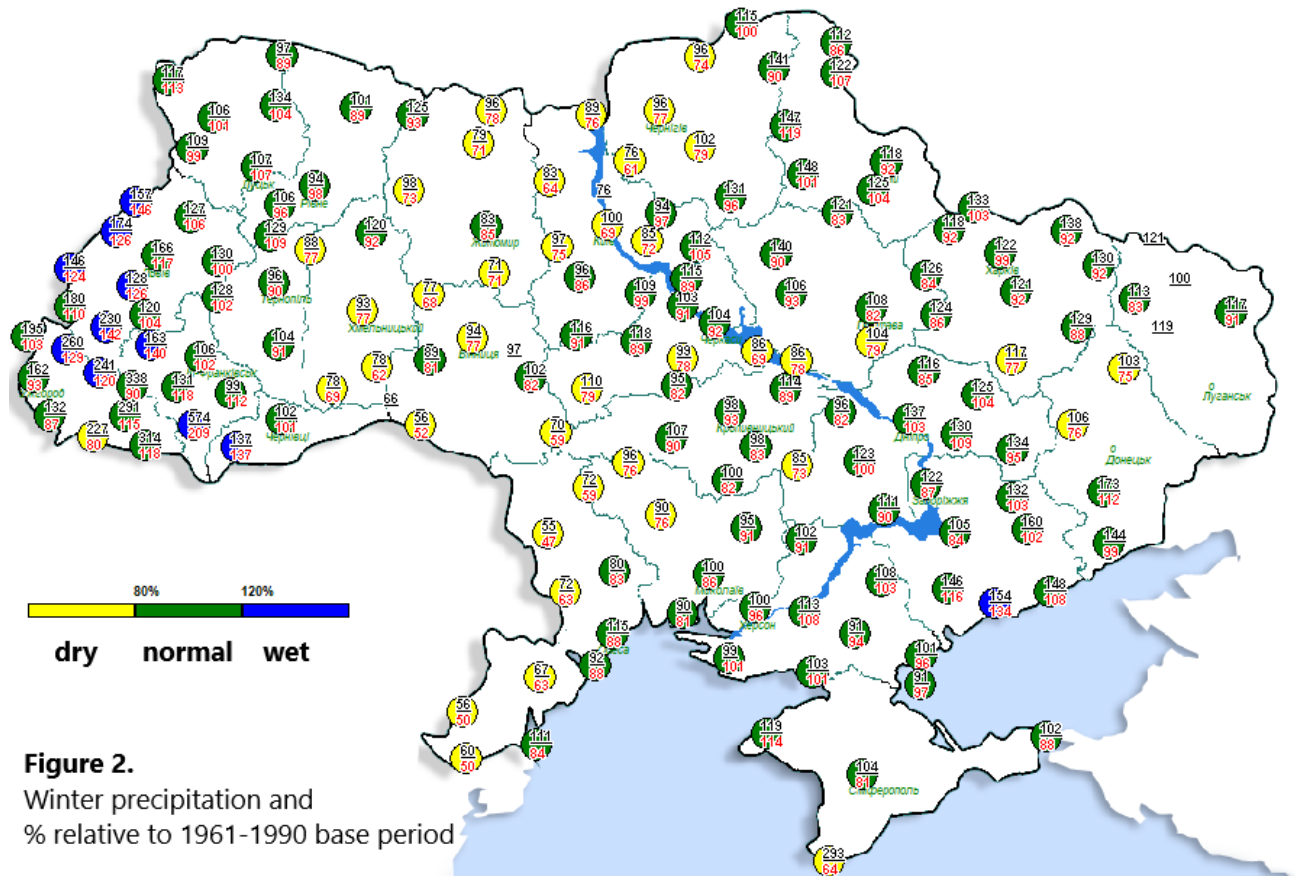


Figure 1.
The average winter temperature and deviation of the temperature relative 1961-1990 base period

According to the tercile method (with 1961–1990 climatological norm), mean air temperature in the winter 2019-20 was in the warm category.

Precipitation

Most stations recorded normal moisture (80...120%) and in the western part were places with wet conditions (125....209%), but along with it were spoty scattered places with dry conditions (50...79%) compared to the 1961-1990 climate norm (Figure 2).



According to the tercile method (with 1961–1990 climatological norm), winter 2019-20 presipitation were in the normal and wet category at most station, but dry conditions were predominate in the northern and south-western part of Ukraine.