

VERIFICATION OF THE SEECOF – 16 WINTER 2016-2017 CLIMATE OUTLOOK AND SEASONAL BULLETIN FOR THE TERRITORY OF UKRAINE

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VERIFICATION OF THE SEECOF–16 WINTER 2016-2017 CLIMATE OUTLOOK FOR THE TERRITORY OF UKRAINE

Temperature



According to the SEECOF-16 outlook for the winter 2016-17 in Ukraine, seasonal temperature in Ukraine was expected normal with 40% probability, warmer (upper tercile) and below (low tercile) with 30% probability, compared to the 1981–2010 climatological base period.

Climatological monitoring showed that the winter 2016-17 was cold and nomal in Ukraine based on the tercile method (*Figure* 1).

Verification showed that the temperature reached below and normal tercile which was indicated in the outlook with the 30% and 40% probability. The outlook for a normal winter (40%) was good, but outlook for a cold winter could be better.



Precipitation



The SEECOF–16 climate outlook indicated the equel probabilities for below (33%), near (34%) and above normal (33%) conditions in entire Ukraine.

Monitoring of precipitation showed normal winter conditions in most stations of the country, only in the west and souht parts were places which dry conditions and in the north and north-east parts were places with wet conditions based on the tercile method with 1981–2010 climatological base period (*Figure 2*).



	Winte	r 2016-2017	Air Temperature (°C)					
S	ynop	station	Rank	33	50	66	Observed	
1	33526	Ivano-Frankivsk	32	-3.0	-2.2	-1.4	-2.2	
2	33889	Izmail	16	-0.4	0.4	1.4	-0.8	
3	34415	Izym	24	-4.2	-3.6	-2.8	-4.3	
4	33998	Ai-Petri	7	-3.1	-2.6	-2.2	-4.3	
5	99915	Askaniya Nova	15	-1.5	-0.9	0.0	-2.1	
6	33464	Bila Cerkva	26	-3.5	-2.8	-2.0	-3.5	
7	34434	Bilovodsk	27	-5.4	-4.3	-3.6	-5.0	
8	33446	Bilopillya	23	-3.7	-3.1	-2.2	-3.9	
9	33354	Baryshyvka	24	-3.6	-2.7	-2.3	-3.7	
10	34717	Berdiyansk	22	-1.8	-1.5	-0.9	-1.9	
11	33907	Behtery	12	-0.6	-0.2	0.8	-1.3	
12	33717	Bobrynec	21	-3.1	-2.6	-1.6	-3.6	
13	33297	Brody	27	-2.2	-1.8	-0.8	-2.5	
14	33862	V.Oleksandrivka.	16	-2.2	-1.3	-0.6	-2.8	
15	33562	Vinnyca	24	-3.5	-3.3	-2.3	-3.8	
16	33777	Voznesensk	21	-1.8	-1.4	-0.2	-2.0	
17	34615	Volnovaha	23	-4.2	-3.7	-3.0	-4.3	
18	33376	Hadyach	25	-4.4	-3.7	-3.1	-4.5	
19	33577	Haisyn	25	-3.2	-2.8	-1.8	-3.2	
20	34407	Hybinyha	21	-4.1	-3.4	-2.7	-4.5	
21	34606	Hylyai Pole	23	-3.3	-2.5	-1.9	-3.4	
22	34504	Dnipro	19	-3.6	-2.8	-2.4	-4.2	
23	33524	Dolyna	30	-2.5	-1.5	-0.7	-2.1	
24	33058	Dryzhba	33	-5.4	-4.5	-4.2	-4.7	
25	33325	Zhitomyr	32	-3.4	-2.7	-1.9	-3.1	
26	34601	Zaporizzhya	15	-2.5	-2.1	-1.3	-3.7	
27	33484	Zolotonosha	24	-3.4	-2.5	-2.0	-3.6	
28	34208	Zolochiv	23	-5.1	-4.4	-3.6	-5.4	
29	33548	Kamyanec-Podilskiy	26	-3.1	-2.6	-1.1	-2.9	
30	33983	Kerch	15	0.3	1.3	1.9	0.1	
31	33345	Куіv	28	-3.2	-2.4	-1.9	-3.1	
32	34609	Kyrylivka	22	-3.9	-3.1	-2.4	-3.9	
33	33621	Kobelyaky	22	-3.7	-2.8	-2.5	-4.0	

34	33173	Kovel	27	-2.2	-1.6	-0.8	-2.4
35	33261	Konotop	30	-4.6	-3.7	-3.1	-4.2
36	33215	Korosten	30	-3.3	-2.4	-1.7	-3.1
37	33299	Kremenec	27	-2.4	-1.9	-1.0	-2.7
38	33791	Kryviy Rih	18	-3.3	-2.5	-1.8	-3.9
39	33711	Kropyvnutsky	23	-3.5	-2.9	-2.0	-3.9
40	34409	Lozova	22	-4.2	-3.9	-3.3	-4.8
41	33377	Lubnu	24	-4.0	-3.2	-2.9	-4.1
42	33187	Luck	27	-2.7	-2.1	-1.2	-2.8
43	33393	Lviv	25	-2.8	-2.2	-1.2	-3.0
44	33761	Liybashivka	26	-3.0	-2.4	-1.1	-2.9
45	33075	Lybeshiv	30	-2.4	-1.6	-0.9	-2.3
46	33846	Mykolaiv	18	-1.7	-1.1	-0.3	-2.0
47	33663	Mohyliv-Podilskiy	25	-2.1	-1.4	-0.2	-2.0
48	33312	Novohrad Volynskiy	27	-2.9	-2.3	-1.3	-3.1
49	33877	Nyzhni Sirohozy	15	-2.1	-1.5	-0.5	-2.6
50	33557	Nova Ushica	26	-3.4	-2.8	-1.5	-3.3
51	33246	Nizhin	29	-4.1	-3.3	-2.8	-3.9
52	33837	Odesa	16	-0.4	0.1	1.0	-0.9
53	33203	Olevsk	30	-3.1	-2.4	-1.4	-3.0
54	33848	Ochakiv	16	-1.2	-0.7	0.1	-1.6
55	33699	Pervomaisk	25	-2.8	-2.1	-0.8	-2.6
56	33515	Play *	17	-6.5	-5.9	-5.3	-5.9
57	33646	Pozhezhevska	31	-6.2	-5.6	-5.2	-5.5
58	33506	Poltava	23	-4.3	-3.4	-3.0	-4.4
59	33301	Rivne	24	-2.9	-2.3	-1.6	-3.7
60	33287	Rava-Ryska	28	-2.4	-1.6	-0.7	-2.4
61	33647	Rahiv	11	-2.8	-2.1	-1.7	-3.3
62	33268	Romny	27	-4.8	-3.9	-3.5	-4.6
63	33946	Simferopol	12	0.2	1.1	1.7	-0.6
64	33896	Sarata	16	-0.9	-0.3	0.8	-1.2
65	33088	Sarny	32	-2.8	-2.2	-1.2	-2.6
66	33614	Svitlovodsk	23	-3.0	-2.3	-1.7	-3.3
67	33067	Svityaz	28	-2.7	-1.5	-0.7	-2.2
68	34421	Svatove	25	-5.0	-4.0	-3.3	-4.8

69	33657	Selyatyn	22	-5.2	-4.8	-4.0	-5.3
70	33049	Semenivka	34	-4.9	-4.0	-3.6	-4.2
71	33833	Serbka	21	-1.9	-1.3	-0.3	-2.1
72	33516	Slavske	14	-4.4	-3.9	-2.7	-5.0
73	33593	Smila	24	-3.8	-2.7	-2.0	-3.7
74	33136	Snovsk	33	-4,4	-3,4	-3,1	-3,9
75	33961	Strilcove	12	-0.6	0.2	1.0	-1.2
76	33275	Symy	26	-5.1	-4.5	-3.8	-5.1
77	33415	Ternopil	27	-3.5	-2.9	-1.9	-3.5
78	33228	Teteriv	27	-3.3	-2.5	-1.7	-3.2
79	33511	Tyrka	18	-3.9	-3.4	-1.9	-4.3
80	33631	Uzhhorod	7	-1.7	-1.0	0.2	-2.6
81	33587	Uman	27	-3.6	-2.8	-1.7	-3.3
82	34300	Kharkiv	24	-5.2	-3.9	-3.2	-4.8
83	33902	Kherson	14	-1.7	-0.8	0.1	-2.2
84	33429	Khmelnitskiy	26	-3.7	-3.2	-1.8	-3.7
85	33638	Khyst	15	-2.5	-1.8	-0.3	-2.8
86	33487	Chercasy	26	-3.8	-2.7	-2.1	-3.8
87	33658	Chernivci	32	-2.8	-2.1	-0.8	-2.1
88	33135	Chernihiv	33	-4.3	-3.0	-2.9	-3.7
89	33924	Chornomorske	12	1.2	2.0	2.5	0.6
90	33536	Chortkiv	30	-3.3	-2.6	-1.4	-2.9
91	33317	Shepetivka	27	-3.3	-2.7	-1.7	-3.6
92	33392	Yavoriv	25	-2.5	-1.9	-0.7	-2.5
93	33356	Yahotyn	25	-3.9	-3.0	-2.6	-3.9
94	33645	Yaremche	26	-2.5	-2.0	-0.8	-2.2

Rank – 1961–2017 (coldest season), * Play – rank 1981-2017

	Winte	r 2016-2017	Precipitation sums (mm)					
S	ynop	station	Rank	33	50	66	Observed	
1	33526	Ivano-Frankivsk	7	83	91	104	57	
2	33889	Izmail	6	73	84	97	51	
3	34415	Izym	28	123	137	150	139	
4	33998	Ai-Petri	23	317	358	427	349	
5	99915	Askaniya Nova	15	59	84	88	61	
6	33464	Bila Cerkva	32	87	95	114	104	
7	34434	Bilovodsk	27	104	115	139	116	
8	33446	Bilopillya	41	80	99	103	111	
9	33354	Baryshyvka	26	79	94	105	93	
10	34717	Berdiyansk	28	108	116	135	126	
11	33907	Behtery	18	75	84	96	74	
12	33717	Bobrynec	16	77	95	115	78	
13	33297	Brody	23	100	113	123	109	
14	33862	V.Oleksandrivka.	24	72	89	125	91	
15	33562	Vinnyca	27	77	88	103	100	
16	33777	Voznesensk	16	64	91	109	70	
17	34615	Volnovaha	24	121	139	153	136	
18	33376	Hadyach	37	110	128	133	141	
19	33577	Haisyn	24	88	97	107	100	
20	34407	Hybinyha	39	105	118	126	140	
21	34606	Hylyai Pole	23	89	116	125	97	
22	34504	Dnipro	32	112	120	139	127	
23	33524	Dolyna	8	90	102	118	66	
24	33058	Dryzhba	24	112	121	148	116	
25	33325	Zhitomyr	50	81	103	107	140	
26	34601	Zaporizzhya	15	103	115	139	96	
27	33484	Zolotonosha	28	94	104	117	115	
28	34208	Zolochiv	44	101	116	133	148	
29	33548	Kamyanec-Podilskiy	8	83	97	115	69	
30	33983	Kerch	17	86	105	120	86	
31	33345	Куіv	25	110	119	127	120	
32	34609	Kyrylivka	16	121	136	149	120	

33	33621	Kobelyaky	33	88	113	127	128	
34	33173	Kovel	27	92	103	120	103	
35	33261	Konotop	41	100	115	125	145	
36	33215	Korosten	42	85	99	102	118	
37	33299	Kremenec	26	101	111	122	112	
38	33791	Kryviy Rih	14	68	83	93	69	
39	33711	Kropyvnutsky	21	76	82	101	81	
40	34409	Lozova	26	108	118	130	120	
41	33377	Lubnu	33	115	129	141	145	
42	33187	Luck	32	70	83	95	100	
43	33393	Lviv	35	113	120	145	151	
44	33761	Liybashivka	6	74	87	107	50	
45	33075	Lybeshiv	14	105	116	122	141	
46	33846	Mykolaiv	10	68	88	109	55	
47	33663	Mohyliv-Podilskiy	10	69	85	99	59	
48	33312	Novohrad Volynskiy	29	106	119	131	127	
49	33877	Nyzhni Sirohozy	8	76	87	107	62	
50	33557	Nova Ushica	11	88	100	116	81	
51	33246	Nizhin	34	105	118	127	128	
52	33837	Odesa	11	81	102	120	63	
53	33203	Olevsk	42	102	115	126	148	
54	33848	Ochakiv	14	65	85	97	61	
55	33699	Pervomaisk	19	81	106	113	85	
56	33515	Play*	19	265	299	358	282	
57	33646	Pozhezhevska	44	208	227	251	373	
58	33506	Poltava	40	93	118	126	138	
59	33301	Rivne	28	73	80	92	88	
60	33287	Rava-Ryska	39	95	112	120	130	
61	33647	Rahiv	35	229	245	321	317	
62	33268	Romny	46	90	122	135	170	
63	33946	Simferopol	50	99	125	140	169	
64	33896	Sarata	12	66	85	101	61	
65	33088	Sarny	38	86	96	108	121	
66	33614	Svitlovodsk	26	78	93	102	98	
67	33067	Svityaz	43	89	96	108	121	

68	34421	Svatove	27	100	119	133	124
69	33657	Selyatyn	9	78	90	102	67
70	33049	Semenivka	21	100	125	131	108
71	33833	Serbka	12	61	79	84	57
72	33516	Slavske	40	149	163	177	193
73	33593	Smila	14	83	105	113	78
74	33136	Snovsk	20	102	126	135	110
75	33961	Strilcove	14	79	90	99	73
76	33275	Symy	29	85	106	116	114
77	33415	Ternopil	9	77	89	96	68
78	33228	Teteriv	26	97	109	118	112
79	33511	Tyrka	20	153	165	179	147
80	33631	Uzhhorod	15	159	187	203	132
81	33587	Uman	18	92	108	123	93
82	34300	Kharkiv	28	90	96	116	108
83	33902	Kherson	18	76	88	104	76
84	33429	Khmelnitskiy	20	86	102	112	97
85	33638	Khyst	16	259	277	325	225
86	33487	Chercasy	26	79	95	101	94
87	33658	Chernivci	1	69	86	91	45
88	33135	Chernihiv	32	97	120	128	126
89	33924	Chornomorske	29	68	76	93	94
90	33536	Chortkiv	19	90	102	117	93
91	33317	Shepetivka	44	107	111	125	141
92	33392	Yavoriv	38	117	136	157	165
93	33356	Yahotyn	25	75	96	108	96
94	33645	Yaremche	7	93	109	110	78

Rank - 1961 - 2016 (driest season), * Play - rank 1981-2016

	Sesonal T	emprtature	Sesonal I	Precipitation	
	(D	JF)	(DJF)		
Countru		SEECOF 16		SEECOF 16	Hight impact Events
	Observed	climate	Observed	climate	
		outlook		outlook	
Ukraine	normal (46%) and cold (54%)	near-normal (30, 40, 30) in entire Ukraine	normal (46%) below normal (27%) above normal (27%)	No predictive signal (33, 34, 33) in entire Ukraine	In December meteorological extraordinary phenomena in the form of <i>very heavy snow</i> (21-24 mm of precipitation fell in 12 hours; snow cover 10-40 sm) were observed on 2-3 th of December in north-east of the country (Kharkiv, Symy, Poltava regions). In January meteorological extraordinary phenomena in the form of <i>very heavy snow</i> (22-45 mm of precipitation fell in 8-12 hours) were observed on 6-7 th of January in the south and the north-east parts of country (Odesa, Mykolayiv, Kherson, Kharkiv regions). Snowfalls was accompanied by <i>strong blizzards</i> (wind speed 15-24 m/s during 14-24 hours, in Ust-Danaysk (Odessa region) wind speed was 25 m/s), were formed snowdrifts. Unfavorable weather conditions caused loss power, telecommunications, utilities and a stop of transport. In February was recorded <i>strong wind</i> in west of the contry (wind speed 25 m/s in Lviv, Ivano-Frankivsk regions on 24 th of Februaru and on 28 th wind speed 40 m/c in the Carpathian highlands)

% from stations whith calculated tercile (94 stations on the territory of Ukraine)

Analysis of the 2016-2017 winter season for Ukraine compared to the 1961-1990 base period

Temperature

The average seasonal temperature ranged from -5.7° C in the north-east of the country (Kharkiv region) to -0.2° C in the south-west (Odessa region), in the Carpathians mountains $-2.0 \dots -5.9^{\circ}$ C.

Deviations of the mean air temperature from the normal were $-1,0...+1,0^{\circ}C$ on the most of the territory, only in north part were $+1,1...1,9^{\circ}C$ and some where in the Transcarpathia, Crimea and sity Zaporizhzhia were $-1,1...-1,6^{\circ}C$ in relation to the climate norm (1961-1990) (Figure 1).



According to the tercile method (with 1961–1990 base period), mean air temperature during winter was in the **normal category** on the most of stations, only in north part were plases with warm category and in Transcarpathia and in the south of country were stations with cold category.

The minimum temperature ranged from -14.0° C in Odessa to -29.0° C (Slavske 08.01.2017) in the Carpathian region, in Carpathian highlands $-22,6...-26,1^{\circ}$ C. (Figure 2).



Throughout the winter has not been reached criteria for severe frost $(-30^{\circ} \text{ and } -35^{\circ}\text{C})$ in Ukraine, but most of observation points recorded frost in the range $-20...-25^{\circ}\text{C}$.

Maximum temperature was in the range from $+5,0^{\circ}$ C in Luhansk region (east) to $+18,5^{\circ}$ C (Hust 28.02.2017) in the Transcarpathia (west), in Carpathian mountains (highlands) 5,6..9,6°C (Figure 3).



Duration of winter (when the average daily temperature was below 0° C) in Ukraine was about 80-83 days. This period started on 28-29th of November and ended on 18-19th of February, in the Transcarpathia – from 29th of November to 21th of February.

Precipitation

Winter precipitation ranged from 37mm in Zatysha (Odessa region) to 170mm in Romny (Symy region) for plain territory of Ukraine and in some places of Carpathian were 210..317mm with maximum number 373 mm in Pozhezhevska (highland).

Precipitation sums were close to normal (81-120%) in the north part of the country and in the southern half of the country dominated dry conditions (31-80%), only five observation points recorded wet conditions (121...142%) (Figure 4).

The biggest daily presipitation 56 mm was recorded on 3^{th} of February at Pozhezhevska (Carpathian highland) and there was also recorded continuously (from 2^{th} to 8^{th} February) precipitation (snow) with the amount 123mm as a result.

According to the tercile method (with 1961–1990 climatological norm), winter presipitation prevailed in the nomal category in the north part of the country and in the southern half of the country were dominated dry category.

Analysis of the 2016-2017 winter season for Ukraine compared to the 1981-2010 base period

Temperature

Deviation of the average winter temperature from the normal (1981-2010 base period) ranged mainly from $+0.6^{\circ}$ C in the far north and some places in the west of the country to -1.0° C in most areas of the rest of the territory. In Transcarpathia and some places in south it were in the cold range $-1.1 \dots -1.9^{\circ}$ C (Figure 1).

From month to month temperature deviations were not homogeneous.

In December most stations provide deviation close to the average monthly values, but in Transcarpathia and the east, south-east parts of the country had negative anomalies $-1,1...-3^{\circ}$ C, only in some places of the western vere positiv anomalies $1,1..2^{\circ}$ C (Figure.2 (A)).

In January were *negative deviations* $-1,1...-3,3^{\circ}$ C in most of Ukraine, in the west of the country (especially in Transcarpathia) were anomaly negative deviations $-3...-5,3^{\circ}$ C (Figure.2 (B)).

In February fixed small positive and negative deviations in entire country $-1,0...1,0^{\circ}$ C, only in Carpathian and Transcarpathia regions were positive anomalies $1.5...3.3^{\circ}$ C (Figure.2 (C)).

A)

B)

C)

Figure.2 Average monthly temperature in December (A), January (B), February (C)

Precipitation

In the northen and the easten of Ukraine were dominated normal, in some pleaces excessive wet conditions (81...145%). Insufficient precipitation (37...80%) recorded, by most observation points in the southern and the southwestern, compared with avarage base values 1981-2010 (Figure 3).

From month to month precipitations were not homogeneous.

December was wet and excessive humid (81..195%) in the northern part of the country and with a deficit of presipitation (14...79%) in the southern part and the aroud Carpathians (Figure 4 (A)).

In **January**, the situation with precipitation improved in the south (Kherson, Zaporizhzhia, Krimea regions) where were fixed norm and above norm (81...178%), but it became dry in most western points (17...79%) (Figure.4 (B)).

In **February** was droughty (29...80%) in most areas of southern, central and northeastern parts of the country and in some pleaces in front of the Carpathians; the rest of the country received norm and above norm of precipitation (100...150%), in Transcarpathia and Carpathians (128...265%) (Figure.4 (C)).

A)

B)

Figure 4. Month sums of presipitation in December (A), January (B), February (C)

The maximum and minimum daily temperatures at most stations of Ukraine remained within the range of daily absolute temperatures (min...max) during the winter 2016-17, only in January in most areas of western (Lviv, Lycsk, Rivne, Khmelnitskiy, Uzhorod) minimum temperatures approached and decreased below historical lows for some days. Graphs with minimum and maximum temperatures for selected cities listed below (Figure. 5, 6, 7, 8).

