P1.4 DEVELOPMENT OF THE 1971-2000 MONTHLY STATION CLIMATE SUMMARIES (CLIMATOGRAPHY OF THE UNITED STATES NO.20 OR CLIM 20)

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1. INTRODUCTION

The climatography of the United States No. 20, Monthly Station Climate Summaries for 1971-2000 are station summaries of particular interest to agriculture, industry, and engineering applications and include a variety of statistics for temperature, precipitation, snow, and degree day elements for 4,263 stations. The new CLIM20's were developed after reviewing suggestions from customers and soliciting comments from climate service providers such as state and regional climatologist and the National Climatic Data Center's (NCDC) Climate Services Branch. This product updates and expands on the previous version by adding statistics and thresholds to the Temperature, Precipitation, and Snow climatologies and including 32° F as a base to the Degree Days table.

2. PRODUCT DESCRIPTION

The stations summaries are grouped into five tables:

(1) Monthly and annual temperature climatologies (Figure 1).

A. Means of daily maximum, daily minimum, average temperature, and extremes of monthly average temperature and year of occurrence derived from the 1971-2000 monthly normals.

B. Highest and lowest daily temperature extremes and data of occurrence from the station's available digital record.

C. Heating and cooling degree days computed with base temperature 65° F derived from the 1971-2000 monthly normals.

D. Mean number of days maximum temperature equals or exceeds 100, 90, 50° F or maximum temperature is less than or equal to 32° F. Mean number of days daily minimum temperature is less than or equal to 32 and 0° F. The mean number of days statistics are computed from a 1971-2000 serially complete daily data set.

(2) Monthly and annual precipitation climatologies (Figure 2).

A. Means and medians (50th percentile) of monthly precipitation totals and extremes of highest and lowest precipitation totals and year of occurrence derived from the 1971-2000 monthly normals.

B. Highest and lowest precipitation extremes and date of occurrence from the station's available digital record.

C. Mean number of days precipitation totals equal or exceed 0.01, 0.1, 0.5, 1.0 inches. The mean number of days statistics were computed from a 1971-2000 serially complete daily data set.

D. Precipitation probabilities are monthly values of precipitation amounts which correspond to selected levels of probable occurrence. The values represent the probability that the monthly precipitation will be equal to or less than the indicated amount. These values were determined from the incomplete gamma distribution.

(3) Monthly and annual snow climatologies (Figure 3).

A. Means and medians (50th percentile) of monthly snowfall and snow depth and extremes of highest and lowest monthly snowfall and snow depth and year of occurrence derived from the Snow Climatology and 1971-2000 daily data.

B. Highest and lowest daily snowfall and snow depth extremes and data of occurrence from the 1971-2000 daily data.

C. Mean number of days snowfall equals or exceeds 0.1, 1.0, 3.0, 5.0, 10.0 inches and snow depth equals or exceeds 1.0, 3.0, 5.0, 10.0 inches. The means number of days statistics were computed from the Snow Climatology and 1971-2000 daily data.

(4) Freeze data (Figure 4).

Freeze data are computed from a 1971-2000 serially complete daily data set. All freeze dates are based upon the season August 1 through July 31 for each threshold temperature.

A. Spring freeze dates - The probability of later date of occurrence in spring for 36, 32, 28, 24, 20, and 16° F.

B. Fall freeze dates - The probability of earlier date of occurrence in fall for 36, 32, 28, 24, 20, and 16° F.

C. Freeze free period - The probability of longer than indicated freeze free period.

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(5) Degree days (Figure 5).

Heating and cooling degree days are computed from 1971-2000 monthly normal temperature and standard deviation of the temperature. Growing degree units are computed from the 1971-2000 serially complete daily data set.

A. Heating Degree Days are computed for 65, 60, 57, 55, 50, and 32° F bases.

B. Cooling Degree Days are computed for 32, 55, 57, 60, 65, and 70° F bases.

C. Growing Degree Units are computed for 40, 45, 50, 55, 60, and 50/86° F bases. The 50/86° F truncated base is computed by resetting minimum temperatures below 50° F to 50° F and maximum temperatures above 86° F to 86° F.

3. APPLICATIONS

This product has a variety of uses and applications.

(1) A climatological summary giving means, median (precipitation, snow), daily and monthly extremes, degree days and mean number of days exceeding specified thresholds.

(2) Precipitation probabilities can be used to determine the chance of receiving a specified monthly precipitation amount.

(3) Freeze data can determine the chance by a certain date of the first frost or the chance of having a span of days exceeding a specified temperature.

(4) Degree days to selected bases offers alternatives to the standard base 65° F to calculate energy requirements.

(5) Growing degree days to selected bases have many agricultural uses such as phenological cycles and crop growth patterns.

4. SUMMARY

The new CLIM20s update and expand on the previous version by adding stations and expanding summaries for additional parameters.

CLIM20s can be ordered for individual stations or State collections. For complete order information, contact NCDC at 828-271-4800 or e-mail: ncdc.info@noaa.gov. Complete documentation is available at the following url: www.ncdc.noaa.gov/oa/climate/normals/usnormals.html.

Temperature (°F)																						
Mean (1)				Extremes										Degree Days (1) Base Temp 65		Mean Number of Days (3)						
Month	Daily Max	Daily Min	Mean	Highest Daily(2)	Year	Day	Highest Month(1) Mean	Year	Lowest Daily(2)	Year	Day	Lowest Month(1) Mean	Year	Heating	Cooling	Max >= 100	Max >= 90	Max >= 50	Max <= 32	Min <= 32	Min <= 0
Jan	54.4	31.6	43.0	80	1975	30	542	1974	-6	1985	21	320	1977	686	0	.0	.0	22.0	.8	18.2	.1
Feb	59.3	33.8	46.6	81+	1996	27	52.9	1990	5	1996	5	39.0	1978	516	0	.0	.0	22.3	.3	13.5	.0
Mar	67.6	40.9	54.3	89	1995	24	60.6	1997	12	1980	3	47.5	1971	344	11	.0	.0	29.5	.1	5.6	.0
Apr	74.9	47.3	61.1	92+	1987	23	65.8	1999	27	1987	1	55.7	1983	150	33	.0	.3	29.9	.0	1.1	.0
May	81.3	56.5	68.9	96	1996	25	73.6	1998	35	1971	4	63.3	1976	42	162	.0	2.5	31.0	.0	.0	.0
Jun	87.5	64.5	76.0	102+	1985	7	80.5	1998	42	1984	1	71.9	1983	1	331	.2	13.3	30.0	.0	.0	.0
Jul	90.6	68.4	79.5	104+	1980	14	82.9	1993	55	1970	6	76.5	1975	0	450	.8	20.4	31.0	.0	.0	.0
Aug	89.7	67.4	78.6	102+	2000	19	81.9	1995	54	1992	29	75.7	1992	0	419	.7	18.0	31.0	.0	.0	.0
Sep	85.0	61.8	73.4	99	1980	17	77.1	1980	38	1983	22	69.8	1975	7	258	.0	8.3	30.0	.0	.0	.0
Oct	76.0	49.5	62.8	93	1983	4	69.2	1984	26	1976	29	57.1	1976	136	65	.0	.5	31.0	.0	.5	.0
Nov	66.2	41.1	53.7	86	2000	1	61.6	1985	14	1970	25	45.6	1976	353	11	.0	.0	28.7	.0	7.2	.0
Dec	57.2	34.1	45.7	81	1971	17	54.0	1971	-1	1983	25	38.0	2000	600	1	.0	.0	24.6	.3	15.1	@
Ann	74.1	49.7	62.0	104+	Jul 1980	14	82.9	Jul 1993	-6	Jan 1985	21	32.0	Jan 1977	2835	1741	1.7	63.3	341.0	1.5	61.2	.1

Figure 1. Monthly and annual temperature climatologies.

Precipitation (inches)																							
	Precipitation Totals									Mean Number of Days (3)				Precipitation Probabilities (1) Probability that the monthly/annual precipitation will be equal to or less than the indicated amount									
	Means/ Median(1)		Extremes							Daily Precipitation				Monthly/Annual Precipitation vs Probability Levels These values were determined from the incomplete gamma distribution									
Month	Mean	Median	Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year	>= 0.01	>= 0.10	>= 0.50	>= 1.00	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
Jan	6.01	6.59	3.57	1972	10	12.13	1972	1.01	1986	11.1	8.8	4.1	1.9	2.29	2.85	3.65	4.31	4.94	5.59	6.28	7.09	8.12	9.71	11.15
Feb	5.23	4.63	3.50	1981	11	9.12	1975	1.70	1976	8.8	6.7	3.9	1.8	2.11	2.59	3.27	3.83	4.36	4.90	5.48	6.15	6.99	8.29	9.47
Mar	6.56	5.63	4.16	1970	20	15.00	1980	1.97	1982	10.0	8.3	4.5	2.4	2.03	2.65	3.58	4.38	5.15	5.95	6.83	7.86	9.19	11.27	13.19
Apr	4.60	3.90	4.50	1975	3	11.65	1979	.37	1986	8.0	6.1	3.1	1.7	1.07	1.50	2.17	2.77	3.37	4.01	4.72	5.57	6.69	8.46	10.12
May	4.31	3.82	3.36	1973	28	12.29	1973	1.24	1992	8.9	6.7	3.4	1.3	1.49	1.90	2.49	2.99	3.47	3.96	4.50	5.12	5.93	7.17	8.31
Jun	4.48	3.94	3.55	1989	19	14.67	1989	.49	1988	8.9	6.8	3.4	1.5	.84	1.24	1.90	2.50	3.12	3.79	4.54	5.45	6.66	8.61	10.46
Jul	5.37	5.43	2.90	1994	28	9.87	1975	1.25	1993	11.2	9.0	3.8	1.5	1.82	2.33	3.08	3.71	4.31	4.93	5.61	6.40	7.42	8.99	10.44
Aug	4.05	3.66	3.40	1984	2	7.83	1984	1.20	1988	9.7	7.1	3.1	1.1	1.60	1.98	2.51	2.95	3.36	3.78	4.24	4.77	5.44	6.46	7.39
Sep	4.05	3.51	3.62	1980	18	9.61	1988	.80	1981	7.9	5.7	2.6	1.3	.76	1.12	1.72	2.27	2.83	3.43	4.11	4.94	6.04	7.80	9.48
Oct	2.84	2.80	3.20	1970	14	6.67	1995	.23	1991	5.5	3.8	1.8	.8	.52	.77	1.19	1.57	1.97	2.39	2.87	3.46	4.24	5.49	6.68
Nov	4.56	4.13	3.02	1983	24	11.70	1992	.69	1981	8.5	6.8	3.3	1.6	1.52	1.95	2.58	3.12	3.64	4.17	4.76	5.44	6.32	7.68	8.93
Dec	5.07	5.02	4.17	1983	3	12.50	1983	1.04	1980	9.5	6.9	3.3	1.5	1.80	2.28	2.97	3.55	4.10	4.67	5.29	6.01	6.94	8.36	9.67
Ann	57.13	55.46	4.50	Apr 1975	3	15.00	Mar 1980	.23	Oct 1991	108.0	82.7	40.3	18.4	42.03	44.99	48.76	51.61	54.13	56.55	59.05	61.81	65.14	69.95	74.09

Figure 2. Monthly and annual precipitation climatologies.

Snow (inches)																						
Snow Totals															Mean Number of Days (1)								
Means/Medians (1)					Extremes (2)										Snow Fall >= Thresholds					Snow Depth >= Thresholds			
Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year	0.1	1.0	3.0	5.0	10.0	1	3	5	10
Jan	.2	.0	#	0	5.0	1992	19	5.0	1992	#+	2000	28	#	2000	.1	@	@	@	.0	.0	.0	.0	.0
Feb	#	.0	#	0	#	1981	12	#+	1981	#	1971	13	#	1971	.0	.0	.0	.0	.0	.0	.0	.0	.0
Mar	.3	.0	#	0	6.5	1993	13	6.5	1993	7	1993	13	#+	1993	@	@	@	@	.0	@	@	@	.0
Apr	.0	.0	0	0	.7	1987	3	.7	1987	0	0	0	0	0	@	.0	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Jun	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Jul	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Aug	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sep	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Oct	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Nov	.0	.0	0	0	.0	0	0	.0	0	0	0	0	0	0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Dec	.2	.0	#	0	2.0	1996	19	2.0	1996	#+	2000	20	#+	2000	.1	.1	.0	.0	.0	.0	.0	.0	.0
Ann	.7	.0	#	0	6.5	Mar 1993	13	6.5	Mar 1993	7	Mar 1993	13	#+	Dec 2000	.2	.1	@	@	.0	@	@	@	.0

Figure 3. Monthly and annual snow climatologies.

Spring Freeze Dates (Month/Day)									
Temp (F)	Probability of later date in spring (thru Jul 31) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	4/22	4/18	4/15	4/12	4/10	4/07	4/05	4/01	3/28
32	4/17	4/11	4/06	4/03	3/30	3/27	3/23	3/19	3/13
28	3/24	3/19	3/15	3/11	3/08	3/05	3/01	2/25	2/20
24	3/18	3/09	3/03	2/26	2/21	2/16	2/10	2/04	1/27
20	3/11	3/02	2/24	2/18	2/13	2/08	2/03	1/27	1/18
16	3/07	2/25	2/17	2/10	2/03	1/27	1/18	1/02	0/00
Fall Freeze Dates (Month/Day)									
Temp (F)	Probability of earlier date in fall (beginning Aug 1) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	10/07	10/13	10/16	10/19	10/22	10/25	10/29	11/01	11/07
32	10/24	10/29	11/02	11/05	11/08	11/11	11/14	11/17	11/22
28	11/04	11/09	11/13	11/16	11/19	11/22	11/26	11/29	12/05
24	11/20	11/28	12/03	12/08	12/12	12/16	12/21	12/27	1/03
20	12/03	12/12	12/19	12/24	12/30	1/04	1/09	1/16	1/25
16	12/07	12/20	12/30	1/08	1/17	1/27	2/08	3/02	0/00
Freeze Free Period									
Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	211	205	201	198	195	192	188	185	179
32	245	237	231	226	222	217	212	206	199
28	280	271	265	260	255	250	245	239	231
24	323	313	306	300	294	288	282	274	264
20	>365	345	334	325	317	310	302	293	280
16	>365	>365	>365	>365	>365	335	319	306	290

Figure 4. Freeze data.

Degree Days to Selected Base Temperatures (°F)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	686	516	344	150	42	1	0	0	7	136	353	600	2835
60	542	379	216	64	11	0	0	0	1	62	227	458	1960
57	457	301	154	32	4	0	0	0	0	34	165	375	1522
55	404	251	119	18	1	0	0	0	0	21	131	323	1268
50	285	146	52	3	0	0	0	0	0	5	62	213	766
32	37	3	0	0	0	0	0	0	0	0	0	16	56

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	377	410	690	873	1143	1320	1473	1442	1241	953	648	439	11009
55	31	15	96	201	432	630	760	729	551	260	89	33	3827
57	22	9	69	155	372	570	698	667	491	211	64	23	3351
60	14	2	38	97	286	480	605	574	402	146	35	13	2692
65	0	0	11	33	162	331	450	419	258	65	11	1	1741
70	0	0	2	7	74	191	295	265	135	21	1	0	991

Growing Degree Units (2)

Base	Growing Degree Units (Monthly)												Growing Degree Units (Accumulated Monthly)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	186	240	471	655	918	1101	1244	1213	1017	717	430	237	186	426	897	1552	2470	3571	4815	6028	7045	7762	8192	8429
45	103	144	331	506	763	951	1089	1058	867	562	295	133	103	247	578	1084	1847	2798	3887	4945	5812	6374	6669	6802
50	49	77	209	359	608	801	934	903	717	408	179	73	49	126	335	694	1302	2103	3037	3940	4657	5065	5244	5317
55	23	34	112	232	454	651	779	748	568	269	94	32	23	57	169	401	855	1506	2285	3033	3601	3870	3964	3996
60	1	8	46	124	306	501	624	593	419	151	42	8	1	9	55	179	485	986	1610	2203	2622	2773	2815	2823
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	122	164	308	424	610	754	854	835	689	471	283	160	122	286	594	1018	1628	2382	3236	4071	4760	5231	5514	5674

Figure 5. Degree days.