

**NATIONAL WEATHER SERVICE INSTRUCTION 10-1004
SEPTEMBER 4, 2008**

**Operations and Services
Climate Services, NWSPD 10-10**

CLIMATE RECORDS

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SUMMARY OF REVISIONS: This instruction supersedes National Weather Service Instruction 10-1004, dated November 9, 2006 and contains these changes:

- a. Defines preliminary data and final data in Section 1 (Introduction).
- b. In Section 4.1.2 and 4.2.2, it now states that WFOs will (vs. should) issue Daily (CLI) and Monthly (CLM) station climate reports using a separate AWIPS ID for each Local Climatological Station (LCD) site.
- c. For Record Event Reports (RER), Section 4.4.2 no longer requires a separate AWIPS ID for each ASOS LCD site.
- d. A new Section and Appendix were added for State climate extremes:
 - Section 6. Surface State Climate Extremes
 - Appendix E – State Climate Extremes Committees

All other information remains unchanged.

(signed)

August 21, 2008

David B. Caldwell
Director, Office of Climate,
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Date

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1. Introduction. This instruction describes surface station climatological data from observing stations and the principles to promote the integrity of the climatological data record. The instruction also discusses station long term normals, means, and extremes; national and state extremes; and station climatological reports.

[The National Climatic Data Center \(NCDC\)](#) determines station long term normals, means, and extremes from observing station sites. The Climate Prediction Center (CPC) provides forecast means and outlook classes as referenced in their climate outlooks.

Preliminary Data are data that have not been subject to all levels of NCDC quality control (QC). **Final Data** are data that has been through all applicable NCDC QC procedures.

2. Surface Station Observation Data. Observational climate data may include the values, totals, or averages of the following (Table 1) for seconds, minute(s), hour, day, month, season, year, and/or other time period, as appropriate.

High temperature (°F)	Low temperature (°F)	Average temperature (°F)
Heating Degree days (°F)	Cooling Degree Days (°F)	Precipitation (0.01 inches or T)
Snowfall (0.1 inches or T)	Snow depth (inches or T)	Relative Humidity (%)
Average 2-min wind speed (mph)	High 2-min wind speed (mph)	Mean wind direction (degrees)
Highest 3-sec wind gust (mph)	Direction of highest gust (degrees)	Average detected cloud cover (oktas or tenths)
Visibility (statute miles)	Sunshine (minutes)	Sunshine (% of possible)

Table 1. Surface Station Observations. (T=trace, mph=miles per hour)

The National Weather Service (NWS) manages its weather/climate monitoring systems through compliance with the "Ten Principles of Climate Monitoring" (see Appendix A). To protect and enhance the integrity of climate records, Weather Forecast Offices (WFO) and Weather Service Offices (WSO) should apply these principles within their capability for surface observing stations in their area of responsibility. Further reference to WFO will mean WFO and WSO. [NWS Instruction 10-1305 \(Observational Quality Control – General\)](#) provides additional information and procedures for WFOs to protect and enhance the integrity of climate records.

3. Surface Station Long Term Normals, Means, and Extremes. NCDC provides these statistics for temperature, precipitation, snowfall, and heating and cooling degree days for use with NWS Automated Surface Observing System (ASOS) data sites and published NWS Cooperative Observing Program (COOP) stations.

3.1 Definitions. The definitions used for these statistics are consistent with World Meteorological Organization (WMO) terminology.

Period of Record (or Record Period): The full length of a station's records from beginning of observations to the most recent observation (the present if the station is active).

Record Mean: The mean for the station's period of record, without regard to changes in a station's location.

Adjusted Record Mean: The mean for the station's period of record, after adjusting the data for inhomogeneties introduced by changes in station location.

Period Mean: A period mean is a mean computed for any period of at least 10 years starting on January 1 of a year ending with the digit 1. One such period is 01/01/1991 through 12/31/2000.

Normal: A normal is a period mean computed by NCDC for an NWS observing station from a period comprising three consecutive 10-year decadal periods (for example, 1971-2000). For cases of sensor instrumentation change and/or relocation, NCDC will make appropriate adjustments to the observational record for the observing station. See Section 3.4.3 for details.

Extreme: An extreme is the maximum or minimum value of an element for a specific calendar day or month, all time, or other specific reference time frame for a station's period of record.

Local Climatological Data (LCD) site. An LCD site is a location for which NCDC publishes a summary of final data that includes a daily account of temperature extremes, degree days, precipitation and winds (as available). LCDs also include the hourly precipitation and abbreviated 3-hourly weather observations. Almost all LCD sites are located at major airports.

3.2 Final Source of Normals. NCDC issues the following publications as part of the Climatology of the United States (CLIM) series as follows:

CLIM No. 81: Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1971-2000.

CLIM No. 84: Daily Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1971-2000.

3.3 Effective Date of Normals. The NWS and NCDC set the effective date for updated final temperature, precipitation, and cooling degree day normals as January 1 following publication of CLIM No. 81 and CLIM No. 84. NWS and NCDC set the effective date for heating degree day and snowfall normals as July 1 of that same year. For the 1971-2000 normals, the effective dates were January 1, 2002 and July 1, 2002, respectively.

3.4 Calculation of Normals.

3.4.1 Monthly Normals. NCDC calculates the monthly normals using observed daily data (according to Section 2) except for degree days at NWS COOP stations, as explained in the following notes:

Notes on deriving monthly degree day normals at NWS COOP stations:

- NCDC computes monthly degree day normals from estimates of monthly degree day values using a modified version of the Rational Conversion Formulae developed by H.C.S. Thom. (Ref: Normal Degree Days above any Base by the Universal Truncation Coefficient, Monthly Weather Review, Volume 94, Number 7, July 1966)
- NCDC uses this modified Thom technique to derive estimated monthly degree day values with a spline fit of the monthly mean temperature and standard deviations to ameliorate the month-to-month step function inherent with only a single monthly input.

3.4.2 Daily Normals. NCDC derives daily normals by interpolating from the respective monthly normals using a cubic spline function. Therefore, the daily normals do not have climatological or meteorological statistical significance. For example, a daily precipitation normal of 0.12 inches on May 1 does not imply that the most likely precipitation amount on May 1 is 0.12 inches. WFOs use these daily normals for the calculation of daily, weekly, monthly, seasonal, yearly, month-to-date, season-to-date, and year-to-date departures from normal.

Note on daily degree day normals: In months with few heating and cooling degree days, NCDC uses an asterisk (*) to indicate values of less than 1 but greater than 0 for a given day. NCDC uses this convention to smooth the daily distribution of daily degree days in such months and to ensure compatibility of daily mean temperature and heating and cooling degree days.

3.4.3 Effect on Normals from Changes in Observing Conditions. If temperature sensors or precipitation gauges are relocated and/or replaced by new equipment, the NWS will collect comparative data to be used as the basis for revising the normals. For details, see NWS Instructions [10-2101 \(General Instructions for Terrestrial-Based In-Situ Instrument and Algorithm Intercomparisons for the Purpose of Climate Data Continuity\)](#) and [10-1302 \(Instrument Requirements and Standards for the NWS Surface Observing Program \[Land\]\)](#). Revised normals for a site become final as soon as they are distributed to the WFO.

Note: NCDC usually adjusts the observational record for the 1971-2000 normals period to be representative of the observing conditions (instrumentation and/or location) on the last day of the normals period (e.g. December 31, 2000). If changes in observing conditions occur, records adjustment to the last day of the normals period requires the changes to be detectable and correctable using established methods of change point detection. For instance, changes in observation conditions that occur near the end of the normals period may not lead to a detectable

change or discontinuity in the observational record. In this case, NCDC would adjust the record to the observing conditions prior to that change. For example, a change in observing practices on October 15, 2000 would probably not yield a detectable discontinuity. Thus, the adjustment would be made to conform with practices on October 14, 2000 instead of December 31, 2000.

3.4.4 Normals and Observations for February 29. WFOs will handle normals and observations related to February 29 in leap years in the following manner:

- February 29 (Daily) Normals: For February 29, WFOs will use the February 28 values for temperature, precipitation, snowfall, and heating/ cooling degree days.
- February Monthly Normals: No change will be made in leap years for normal temperatures, precipitation or snowfall. However, for heating and cooling degree days, WFOs will increase the February normals by the February 29 values.
- Seasonal Normals: After February 29, WFOs will not increase normal seasonal heating and cooling degree day totals, precipitation, or snowfall by the February 29 values.
- Annual Normals: There will be no change in annual temperature, precipitation, or snowfall values by the February 29 values.
- Seasonal and Annual Observed Totals: WFOs will increase the seasonal and annual precipitation and snowfall totals by the February 29 observed values. WFOs will increase seasonal heating and cooling degree days totals by the February 29 values.

Example for heating degree days (cooling degree days would be treated similarly):

For February Computations:

	NORMAL	OBSERVED	DEPARTURE FROM NORMAL
Season through January	2850	2850	0
February 1-28	+800	+700	
February 29	<u>+ 30</u>	<u>+ 20</u>	
Season through February	3680	3570	-110

For March Computations:

Remove Feb 29 Normal	- 30		
Updated through February	3650	3570	- 80
March 1-31	<u>+600</u>	<u>+530</u>	
Season through March	4250	4100	-150

Consider the following example for precipitation (snowfall would be treated similarly):

For February Computations:

	NORMAL	OBSERVED	DEPARTURE FROM NORMAL
January	3.00	3.00	0
February 1-28	2.80	2.75	-0.05
February 29	0.10	0.06	-0.04
February 1-29	<u>2.80 (still)</u>	<u>2.81</u>	<u>+0.01</u>
Year through February	5.80	5.81	+0.01

3.5 Extremes. NCDC provides station extremes for each calendar day, month, and the period of record (i.e. “all time”). To address the challenge of having consistent climate extremes for ASOS LCD stations with numerous relocations during the period of record (especially in large metropolitan areas), NCDC developed a methodology to establish multi-location combined (or threaded) station data sets under the “ThreadEx” project (as described in detail in Appendix B).

4. ASOS Climatological Data Products. WFOs will issue the following products for all ASOS LCD sites (see Appendix C) in their area of responsibility. These reports contain information in accordance with Sections 2 and 3.

- Climatological Report - Daily (CLI)
- Climatological Report - Monthly (CLM)
- Preliminary Local Climatological Data Report (CF6)
- Record Event Report (RER)

WFOs may optionally issue climate reports for the week, season, year, or other period of time under the AWIPS product category of MIS (Miscellaneous Local Product), PNS (Public Information Statement), OPU (Other Public Products), or another specified PIL (e.g. CLA[annual], CLS [seasonal], and CLQ [quarterly]) on a case-by-case basis (by a request through the WFO’s regional office).

The data in these products are preliminary since the products are issued before all levels of NCDC QC makes data final. See climate data disclaimer in [NWS Instruction 10-1003 \(Climate Data Services\)](#). Since the U.S. Naval Observatory is the source for official astronomical records, sunrise, sunset, and sunshine in these reports are not official. See astronomical disclaimer in [NWS Instruction 10-1003 \(Climate Data Services\)](#).

To add or remove LCD designation from ASOS sites in its area of responsibility, a WFO will coordinate with its region and NCDC and reach a consensus, considering such factors as data quality, frequency, reliability, length of record; and historical, cultural, business, public interest, and any other factor(s) of significance.

WFOs may also optionally issue any or all these products for other sites (i.e. NCDC archived non-LCD sites) of major interest in their area, in concurrence with their regional climate services program manager. WFO should consider user interest; length of climate record; and quality,

frequency, and reliability of current observations when considering optional non-LCD site products.

WFOs should compose these products with the Advanced Interactive Weather Processing System (AWIPS) CLIMAT program or a text editor if the program is not available. For service backup procedures, see [NWS Instruction 10-2201 \(Backup Operations\)](#). WFOs will first report operational problems with the AWIPS CLIMAT program to the AWIPS Network Control Facility (NCF) (anytime – “24/7”). NCF will open a trouble ticket and attempt to solve the problem directly. If NCF can not solve the problem, WFOs should report the problem to their regional climate services program manager for referral to the NWS Climate Services Division. This reporting process doesn’t include requests to change output, format, or calculation methods, which are handled through the usual policy coordination process for the directive system.

WFOs will only use backup observation sites when valid ASOS data at the primary site are not available and when all the following four conditions for backup sources are met:

- Sited near the ASOS location in an area of similar exposure (as determined by the WFO).
- The data from the backup site are received, accepted, and archived by NCDC.
- Sensors and methods meet NWS instrument standards ([NWS Instruction 10-1302 – Instrument Requirements and Standards for the NWS Surface Observing Programs \(Land\), Appendix D](#)).
- Completed WS Form B-44 that includes backup site/sensor metadata coordinated with NCDC’s Data Operations Division (E/CC1) (in accordance with [NWS Manual 10-1313 - Cooperative Station Service Accountability](#)).

WFOs will **not** estimate values for missing elements.

WFOs will indicate data as missing (as described in Sections 4.1.3, 4.2.3, and 4.3.3) when the following circumstances apply:

- When there are no data or inaccurate data due to a power outage, sensor malfunction, or other deficiency due to inadequate sensor performance (in the judgment of the WFO).
- There are no established backup sources available nearby.

WFOs will document the use of backup sources in the remarks Section of the Preliminary Local Climatological Data Report (CF6), as described in Section 4.3.3.

4.1 Climatological Report – Daily (CLI).

4.1.1 Mission Connection. The CLI provides climatological data for each day.

4.1.2 Issuance Guidelines.

- a. Issuance Criteria. CLIs will be issued with a separate product for each ASOS LCD site (i.e., unique AWIPS ID for each ASOS LCD site [CLIxxx, xxx for the site] under the WFO's WMO heading [CDaa4i CCCC] for the CLI product category). CLIs for non-LCD sites may be sent as separate products (using the xxx for non-LCD site) or grouped together within an LCD product separated by “&&”.
- b. Issuance Time. The CLI will be issued at least twice daily. The first mandatory issuance will be between 12:30 a.m. and 5:00 a.m. local time to capture the previous calendar day's (midnight-to-midnight Local Standard Time [LST]) data. The second mandatory issuance will be in the late afternoon/early evening (typically between 3:00 p.m. and 5:30 p.m. local time), before local newscast times, to capture data for the current day. Other optional issuances may be made to meet local user requirements (e.g., a late morning report to capture the current day morning low temperature, an early evening report to capture the final high daily temperature, etc.)
- c. Valid Time. The CLI is valid from the time of release until the next issuance.
- d. Product Expiration Time. The CLI does not have a product expiration time.

4.1.3 Technical Description.

- a. MND Product Type Line. The CLI MND is “CLIMATE REPORT.”
- b. Content. The CLI contains the standardized data shown in Section “c.” All data shown in Section “c” are required for both mandatory daily issuances, except as identified in Note 3 at the end of Section “4.1.3.c,” for all CLIs year-round. Data to be included in the optional CLIs may be adapted to meet local needs. “MM” should be used to indicate missing data, as appropriate (as explained in Section 4). To ensure consistency with NCDC routines, one or more missing daily values will result in a “MM” for the preliminary monthly value. WFOs may append specialized data to the end of the standard fixed-fields to meet the needs of local users.
- c. Format. The CLI is a tabular product. However, supplemental narrative information may be included to meet local user needs. When specialized or additional information is appended to the standard format, it will be separated from the standard

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fixed-fields by double ampersands (&&). Double dollar signs (\$\$) will be used to signify the end of the product.

Product Format

CDaa4i cccc ddhhmm
 CLixxx

Description of Entry

(WMO Heading)
 (AWIPS ID)

CLIMATE REPORT

NATIONAL WEATHER SERVICE <WFO> <STATE>
 <HHMM> AM <LT> <DAY MMM DD YYYY>

.....

...THE <CITY1 NAME> CLIMATE SUMMARY FOR <MONTH DD YEAR>...

CLIMATE NORMAL PERIOD YYYY TO YYYY
 CLIMATE RECORD PERIOD YYYY TO YYYY

WEATHER ITEM	OBSERVED VALUE	TIME (LST)	RECORD VALUE	YEAR	NORMAL VALUE	DEPARTURE FROM NORMAL	LAST YEAR
--------------	----------------	------------	--------------	------	--------------	-----------------------	-----------

.....

TEMPERATURE (F)

YESTERDAY							
MAXIMUM	000	0000 PM	000	YYYY	000	000	000
MINIMUM	000	0000 AM	000	YYYY	000	000	000
AVERAGE	000				000	000	000

PRECIPITATION (IN)

YESTERDAY	00.00		00.00	YYYY	00.00	00.00	00.00
MONTH TO DATE	00.00				00.00	00.00	00.00
SINCE <SEASON>	00.00				00.00	00.00	00.00
SINCE JAN 1	000.00				00.00	00.00	00.00

SNOWFALL (IN)

YESTERDAY	00.0		00.0	YYYY	00.0	00.0	00.0
MONTH TO DATE	000.0				00.0	000.0	000.0
SINCE <SEASON>	000.0				000.0	0000.0	0000.0
SINCE JUL 1	0000.0				000.0	0000.0	0000.0
SNOW DEPTH	000						

DEGREE DAYS

HEATING							
YESTERDAY	000				00	000	000
MONTH TO DATE	0000				0000	0000	0000
SINCE <SEASON>	0000				0000	00000	0000
SINCE JUL 1	00000				00000	00000	00000

COOLING

YESTERDAY	00				00	000	00
MONTH TO DATE	0000				000	0000	0000
SINCE <SEASON>	0000				0000	0000	0000
SINCE JAN 1	0000				0000	0000	0000

.....

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WIND (MPH)
HIGHEST WIND SPEED 000 HIGHEST WIND DIRECTION <DIR> (000)
HIGHEST GUST SPEED 000 HIGHEST GUST DIRECTION <DIR> (000)
AVERAGE WIND SPEED 00.0

SKY COVER
POSSIBLE SUNSHINE 000 PERCENT
AVERAGE SKY COVER 0.0

WEATHER CONDITIONS
THE FOLLOWING WEATHER WAS RECORDED YESTERDAY.
<W1>
<W2>
<W3>
<ETC.>

RELATIVE HUMIDITY (PERCENT)
HIGHEST 000 0000 PM
LOWEST 000 0000 AM
AVERAGE 000

THE <CITY1 NAME> CLIMATE NORMALS FOR TODAY

NORMAL RECORD YEAR
MAXIMUM TEMPERATURE (F) 000 000 YYYY
MINIMUM TEMPERATURE (F) 000 000 YYYY
SUNRISE AND SUNSET
<MONTH DD YEAR>.....SUNRISE 0000 AM <LT> SUNSET 0000 PM <LT>(today)
<MONTH DD YEAR>.....SUNRISE 0000 AM <LT> SUNSET 0000 PM <LT>(tomorrow)

- INDICATES NEGATIVE NUMBERS.
R INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T INDICATES TRACE AMOUNT.

&& (Standard Format end indicator entered locally)

<any additional local specialized climate data>

\$\$

Note 1: Note: The "xxx" in this product is the three-letter data site identifier, or WFO site identifier for reports with multiple non-LCD data sites.

Note 2: <Season-to-date> may be locally set to alternate season/year-to-date.

Default <seasons> in northern Hemisphere are defined as:

Winter - December, January, February Summer - June, July, August
Spring - March, April, May Fall - September, October, November

For American Samoa (in the Southern Hemisphere), the default seasons are reversed.

Note 3: WFOs may report only observed values for snowfall. However, if a WFO elects to report any other snowfall field (i.e., record value, year, normal value, departure from normal, or last year), then all snowfall fields will be reported.

4.1.4 Updates, Amendments, and Corrections. These will be done as needed.

4.1.5 Supporting Software. The AWIPS CLIMATE program uses the ASOS Daily Summary Message (DSM) to produce the CLI. The DSM is an automated coded message primarily for use by the NWS National Centers for Environmental Prediction (NCEP), NCDC, and WFOs. The DSM is not subject to WFO quality control. If some data entries are not available from the DSM, other sources, such as the METARs (Transmitted Aviation Weather Reports) or Supplemental Climatic Data (SCD) reports may be used to fill in data resulting from gaps in the DSM. WFOs should correct erroneous data in the CLI. The “PRIMARY DSM XMIT TIME” will be set to 00:15 a.m. LST for each ASOS site. Intermediate DSMs may be generated and transmitted at any time to meet local needs. The ASOS Users Guide provides detailed guidance regarding the DSM.

4.2. Climatological Report - Monthly (CLM).

4.2.1 Mission Connection . The CLM provides climatological data for a monthly basis.

4.2.2 Issuance Guidelines.

- a. Issuance Criteria. CLMs will be issued with a separate product for each ASOS LCD site (i.e., unique AWIPS ID for each ASOS LCD site [CLMxxx; xxx for the site] under the WFO’s WMO heading [CXaa5i CCCC] for the CLM product category). CLMs for non-LCD sites may be sent as separate products (using the xxx for non-LCD site) or grouped together within an LCD product separated by “&&.”
- b. Issuance Time. The CLM will be issued at least monthly, no later than the 5th day of the following month. A monthly product can be generated using the AWIPS CLIMATE program anytime after the last mandatory CLI issuance between 12:30 a.m. and 5:00 a.m. local time for the last day of the past month.
- c. Valid Time. CLMs are valid from the time of release until the next issuance.
- d. Product Expiration Time. The CLM does not have a product expiration time.

4.2.3 Technical Description.

- a. MND Product Type Line. The CLM MND is “CLIMATE REPORT.”
- b. Content. The CLM contains the standardized data shown that follows. These data are required for all CLMs year-round except as noted by “*” in the generic format in Section “4.2.3.c” MM will be used to indicate missing data, as appropriate (i.e. one or more missing daily values result in “MM” for the preliminary monthly value). WFOs may append specialized data to the end of the standard fixed-fields to meet the needs of local users.

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- c. Format. The CLM is a tabular product. However, supplemental narrative information may be included to meet local user needs. When specialized or additional information is appended to the standard format, it will be separated from the standard fixed-fields by double ampersands (&&). Double dollar signs (\$\$) will be used to signify the end of the product.

Product Format

CXaa5i cccc ddhhmm
CLMxxx

Description of Entry

(WMO Heading)
(AWIPS ID)

CLIMATE REPORT
NATIONAL WEATHER SERVICE <WFO> <ST>
<HMM> AM <LT> <DAY MMM DD YYYY>

.....
...THE <CITY_NAME> CLIMATE SUMMARY FOR THE MONTH OF <MONTH> <YEAR>...

CLIMATE NORMAL PERIOD YYYY TO YYYY
CLIMATE RECORD PERIOD YYYY TO YYYY

WEATHER	OBSERVED VALUE	DATE (S)	NORMAL VALUE	DEPART FROM NORMAL	LAST YEAR'S VALUE	DATE (S)
.....						
TEMPERATURE (F)						
RECORD						
HIGH	00	MO/DD/YYYY				
LOW	00	MO/DD/YYYY				
HIGHEST	00	MO/DD	00*	00*	00	00
LOWEST	00	MO/DD	00*	00*	00	00
AVG. MAXIMUM	00.0		00.0	0.0	00	
AVG. MINIMUM	00.0		00.0	0.0	00	
MEAN	00.0		00.0	0.0	00	
DAYS MAX >= 90	00		0.0	0.0	00	
DAYS MAX <= 32	00		0.0	0.0	00	
DAYS MIN <= 32	00		0.0	0.0	00	
DAYS MIN <= 0	00		0.0	0.0	00	
PRECIPITATION (INCHES)						
RECORD						
MAXIMUM	0.00	YYYY				
MINIMUM	0.00	YYYY				
TOTALS	0.00		0.00	0.00	00	
DAILY AVG.	0.00		0.00	0.00	00	
DAYS >= .01	00		0.0	0.0	00	
DAYS >= .10	00		0.0	0.0	00	
DAYS >= .50	00		0.0	0.0	00	
DAYS >= 1.00	00		0.0	0.0	00	
GREATEST						
24 HR. TOTAL	0.00	MO/DD TO MO/DD			00	

* optional – actually these are means and departure from means for the period of record.

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WEATHER	OBSERVED VALUE	DATE (S)	NORMAL VALUE	DEPART FROM NORMAL	LAST YEAR'S VALUE DATE (S)
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-----continued-----

SNOWFALL (INCHES)
RECORDS

TOTAL	0.0	YYYY			
TOTALS	0.0		0.0	0.0	00
SINCE 7/1	0.0		0.0	0.0	00
SNOWDEPTH AVG.	0		0	0	00
DAYS >= 1.0	0		0.0	0.0	00
GREATEST					
SNOW DEPTH	0	MM			00 00
24 HR TOTAL	0.0	MM/DD TO MM/DD			00

DEGREE_DAYS

HEATING TOTAL	000		00	00	00
SINCE 7/1	0000		00	00	00
COOLING TOTAL	00		00	00	00
SINCE 1/1	00		00	00	00

WIND (MPH)

AVERAGE WIND SPEED			0.0		
HIGHEST WIND SPEED/DIRECTION			00/000	DATE	MO/DD
HIGHEST GUST SPEED/DIRECTION			00/000	DATE	MO/DD

SKY COVER

POSSIBLE SUNSHINE (PERCENT)	00
AVERAGE SKY COVER	0.00
NUMBER OF DAYS FAIR	00
NUMBER OF DAYS PC	00
NUMBER OF DAYS CLOUDY	00

AVERAGE RH (PERCENT) 00

WEATHER CONDITIONS. NUMBER OF DAYS WITH

THUNDERSTORM	00	MIXED PRECIP	00
HEAVY RAIN	00	RAIN	00
LIGHT RAIN	00	FREEZING RAIN	00
LT FREEZING RAIN	00	HAIL	00
HEAVY SNOW	00	SNOW	00
LIGHT SNOW	00	SLEET	00
FOG	00	FOG W/VIS <= 1/4 MILE	00
HAZE	00		

- INDICATES NEGATIVE NUMBERS.
R INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T INDICATES TRACE AMOUNT.

&& (Standard Format end indicator entered locally)

<any additional local specialized climate data>

\$\$

4.2.4 Updates, Amendments, and Corrections . These are issued as needed, based upon user needs

4.2.5 Supporting Software. The AWIPS CLIMATE program usually uses the WFO's own database of monthly values (which were mainly derived from the ASOS DSMs) to produce the CLM. The WFOs, however, may optionally use ASOS Monthly Summary Message (MSM) to produce the CLM. The MSM is an automated coded message primarily for use by NCEP, NCDC, and WFOs. The MSM is not subject to WFO quality control. WFOs should correct erroneous or missing data in the CLM. The "MSM XMIT TIME" will be set to a time between 12:30 a.m. and 05:00 a.m. LST for each ASOS site. The ASOS Users Guide provides detailed guidance regarding the MSM.

4.3 Preliminary Local Climatological Data Report (CF6).

4.3.1 Mission Connection. NCDC uses the CF6 (also called the F-6) as a data source to resolve discrepancies with ASOS LCD data reports when preparing the final climate record for each ASOS LCD site. CF6s are also used by the public. WFOs will provide NCDC the name, e-mail address, and telephone number of a point of contact for questions relating to the CF6 data. The WFO CF6 web page will include the disclaimer stating that the data is "preliminary." See [NWS Instruction 10-1003](#) for the disclaimer.

4.3.2 Issuance Guidelines. WFOs will, at a minimum, post on the World Wide Web the CF6 data and any remarks for the entire preceding calendar month no later than the 5th day of the following month. CF6s should be posted to the standardized WFO climate web pages by sending (through AWIPS) a separate product for each ASOS site (i.e., unique CF6 AWIPS ID for each ASOS site [CF6xxx] under the WFO's WMO heading [CXaa5i CCCC] for the CF6 product category).

WFOs should post the CF6 data and any remarks more frequently (i.e. daily data postings for month to date along with the needed remarks, such as backup sensor information.

WFO's should indicate the "final posting" with a note in the CF6 remarks section (i.e. "FINAL MM-YY for month [MM] and year [YY]). This does *not* mean the data are "final," as defined in section 1.

Other remarks (Section 4.3.3) will be posted in the "remarks" section of the CF6.

If the WFO makes corrections to any value(s) in a previously reported "final posting" of an CF6, NCDC will be immediately notified of the change and the updated "final posting" will be sent to NCDC's Data Operations Division for updating of all relevant NCDC data sets and products. Notification and transmittal of the updated CF6 (as attachment) may take place by the submission of a Datzilla report (<http://datzilla.srcc.lsu.datzilla>).

4.3.3 Technical Description.

- a. Content. The CF6 will contain a row of data for each day and summary information of average and cumulative data. Missing data will be indicated with an "M," as appropriate (Section 4). To ensure consistency with NCDC routines, one or more missing daily values will result in an "M" for the corresponding preliminary monthly average or cumulative data value.

WFOs will document the following in the REMARKS section of the CF6.

- Data from backup sensor site and dates
- Location of the backup site in reference to the ASOS site using eight point compass direction and distance in statute miles (in tenths of a mile).

- b. Format. WFOs posting CF6s will use the standard format following the key below. All data are for midnight to midnight LST.

KEY to CF6:

Column 1 - Day of month.

Column 2 - Maximum temperature for the day (nearest whole degree Fahrenheit).

Column 3 - Minimum temperature for the day (nearest whole degree Fahrenheit).

Column 4 - Average daily temperature (nearest whole degree Fahrenheit using columns 2 and 3).

Column 5 - Departure of the average temperature from normal (whole degrees Fahrenheit).

Column 6A - Heating Degree Days (HDD) using 65°F base, in whole degrees Fahrenheit.

Column 6B - Cooling Degree Days (CDD) using 65°F base, in whole degrees Fahrenheit.

Column 7 - Precipitation amount for the day (liquid equivalent, in hundredths of inches or trace).

Column 8 - Snowfall amount (including ice pellets) for the day, in tenths of inches or trace.

Column 9 - Snow depth (including ice pellets, glaze, and hail) to nearest whole inch (or trace) (taken at 1200 Universal Coordinated Time). Hail is noted in remarks section.

Column 10 - Average daily wind speed in miles per hour.

Column 11 - Fastest two-minute sustained (or average) wind speed in miles per hour.

Column 12 - Direction of fastest wind speed; degrees clockwise from true north.

Column 13 - Minutes of sunshine

Column 14 - Percent of possible sunshine.

Column 15 - Cloud cover from sunrise to sunset in tenths.

Column 16 - Weather codes (from weather key on CF6 form).

Column 17 - Peak wind gust in miles per hour.

Column 18 - Direction of peak wind gust in degrees clockwise from true north.

STANDARD FORMAT to CF6:

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION:
MONTH:
YEAR:
LATITUDE:
LONGITUDE:

TEMPERATURE IN F:					:PCPN:		SNOW:		WIND		:SUNSHINE:		SKY		:PK WND			
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
										AVG MX 2MIN								
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
...for each day of month... ..see column key on preceding page...																		
SM ...summations for columns 2, 3, 6A, 6B, 7, 8, 10, 13 and 15...																		
AV (for columns 2, 3)										FASTST		PSBL %		MAX (MPH)				
										MISC ---->		#		(and direction)				

NOTES:
LAST OF SEVERAL OCCURRENCES
COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

STATION:
MONTH:
YEAR:
LATITUDE:
LONGITUDE:

[TEMPERATURE DATA]	[PRECIPITATION DATA]	SYMBOLS USED IN COLUMN 16
AVERAGE MONTHLY:	TOTAL FOR MONTH:	1 = FOG OR MIST
DPTR FM NORMAL:	DPTR FM NORMAL:	2 = FOG REDUCING VISIBILITY TO 1/4 MILE OR LESS
HIGHEST: ON	GRTST 24HR ON	3 = THUNDER
LOWEST: ON	SNOW, ICE PELLETS, HAIL	4 = ICE PELLETS
	TOTAL MONTH:	5 = HAIL
	GRTST 24HR ON	6 = FREEZING RAIN OR DRIZZLE
	GRTST DEPTH: ON	7 = BLOWING DUST OR SAND: VSBY 1/2 MILE OR LESS
		8 = SMOKE OR HAZE
[NO. OF DAYS WITH]	[WEATHER - DAYS WITH]	9 = BLOWING SNOW
MAX 32 OR BELOW:	0.01 INCH OR MORE:	X = TORNADO
MAX 90 OR ABOVE:	0.10 INCH OR MORE:	
MIN 32 OR BELOW:	0.50 INCH OR MORE:	
MIN 0 OR BELOW:	1.00 INCH OR MORE:	
[HDD (BASE 65)]	CLEAR (SCALE 0-3)	
TOTAL THIS MO.	PTCLDY (SCALE 4-7)	
DPTR FM NORMAL	CLOUDY (SCALE 8-10)	
TOTAL FM JUL 1		
DPTR FM NORMAL		
[CDD (BASE 65)]	[PRESSURE DATA]	
TOTAL THIS MO.	HIGHEST SLP ON	
DPTR FM NORMAL	LOWEST SLP ON	
TOTAL FM JAN 1		
DPTR FM NORMAL		
[REMARKS]		

4.3.4. Updates, Amendments, and Corrections. WFOs will perform a quality control check of the CF6 data before final posting for the month.

4.3.5 Supporting Software. At AWIPS sites, the AWIPS CLIMATE program produces the CF6.

4.4 Record Event Report (RER).

4.4.1 Mission Connection. The RER contains meteorological and hydrological events that equal or exceed existing extreme records. The RER will be used to report occurrences relating to both maximum and minimum extreme records.

4.4.2 Issuance Guidelines.

- a. Issuance Criteria. The RER is an event driven product.
- b. Issuance Time. The RER will be issued on an as needed basis whenever an existing record value is met or exceeded.
- c. Valid Time. The RER does not have a valid time.
- d. Product Expiration Time. The RER does not have a product expiration time.

4.4.3 Technical Description.

- a. MND Product Type Line. The RER MND is "RECORD EVENT REPORT."
- b. Content. The RER should be used to report record occurrences of the following meteorological or hydrological events (Table 2, next page), as data availability allows. At AWIPS sites, events identified with an "*" should be automatically identified by the AWIPS CLIMATE program. "All time" in Table 2 means for the station's' period of record.

WFOs producing RERs may optionally add the following statement to RERs for non ASOS LCD sites without the latest 30-year decadal records.

"Record reports for this station may not be as meaningful as those for stations with 30-year decadal normals (1971-2000) as the period of record here is only XX years."

Record Variable	Extreme For:
Temperature	
maximum	day*, month, season, all time
minimum	day*, month, season, all time
highest so early	spring
highest so late	fall
lowest so late	spring
lowest so early	fall
lowest maximum	day, month, season, all time
highest minimum	day, month, season, all time
Sea level pressure	
highest	all time
lowest	all time
Wind	
highest speed	all time
highest gust	all time
Largest hail size	
	all time
Most/least precipitation or snowfall/ snow depth	
within calendar day	day*, month, season, all time
within 24-hour period	month, season, all time
"storm" total	month, season, all time
Greatest snow depth	month, season, all time

Table 2. Station Extremes.

c. Format. The RER is a text product.

Product Format

SXaa7i cccc ddhhmm
RERxxx

RECORD EVENT REPORT
NATIONAL WEATHER SERVICE city st
time am/pm time_zone day mon dd yyyy

[TEXT]

\$\$

Description of Entry

(WMO Heading)
(AWIPS ID)

(MND)
(Issuing Office)
(Issuing time and date)

4.4.4 Updates, Amendments, and Corrections . As needed, based upon user needs.

4.4.5 Supporting Software. The RER is automatically composed whenever the AWIPS CLIMATE program is run and an existing record value (which AWIPS CLIMATE monitors) is met or exceeded. Alternatively, the RER may be composed using the AWIPS text editor or any other text editor.

5. Surface National Climate Extremes. There is a National Climate Extremes Committee (NCEC) to assess the scientific merit of potentially new national extreme climate record events reported from the field. See Appendix D for details on the NCEC. The following list (Table 3) contains parameters that are monitored under the scope of NCEC for the final national climate extremes.

<p><u>Temperature (°F)</u> Maximum Minimum Maximum 24 hour change</p>	<p><u>Snow (inches)</u> Maximum 24 hour Maximum seasonal (July-June) Maximum Depth</p>	<p><u>Rain (inches)</u> Maximum 24 hour Minimum annual Maximum annual <u>Longest Dry Period (days)</u></p>
<p><u>Hail diameter/circumference (inches)</u> Largest Heaviest</p>	<p><u>Pressure (millibars/inches Hg)</u> Lowest Highest</p>	<p><u>Wind (miles per hour)</u> Maximum gust</p>

Table 3. National Extremes

6. Surface State Climate Extremes. State Climate Extremes Committees (SCEC) may be formed to assess the scientific merit of potentially new state extreme climate record events reported from the field. See Appendix E for detailed guidance on SCECs. Should an SCEC be formed for a state, the guidance in Appendix E will be a requirement for a WFO to participate.

7. Base Period Means and Outlook Class Limits for Climate Outlooks. CPC provides this information for surface air temperature, precipitation, sea surface temperature, and 500 millibar heights as reference in their climate outlooks. The information applies to the valid times of the various outlooks. CPC and the Climate Services Division will announce the effective date of the new base period means and class limits at least 30 days in advance.

7.1 Definitions.

Base Period Mean. CPC computes base period means for each of the 102 climate outlook divisional areas in the conterminous U.S. and selected observing stations from a period comprising of three consecutive 10-year periods ending in a decadal year (e.g. 1971-2000).

Outlook Class Limits. CPC provides three climatologically equally likely classes: above, near, and below normal (for temperature) or median (for precipitation). The upper and lower limits of the middle class are defined, thereby defining the lower limits of the above class and upper limits of the below class, respectively.

7.2 Temperature and Precipitation Base Period Means and Outlook Classes. CPC calculates this information for each of 102 areal climate outlook divisions and/or selected cities. CSPM's may request additions or deletions of selected cities to CPC's Operations Branch.

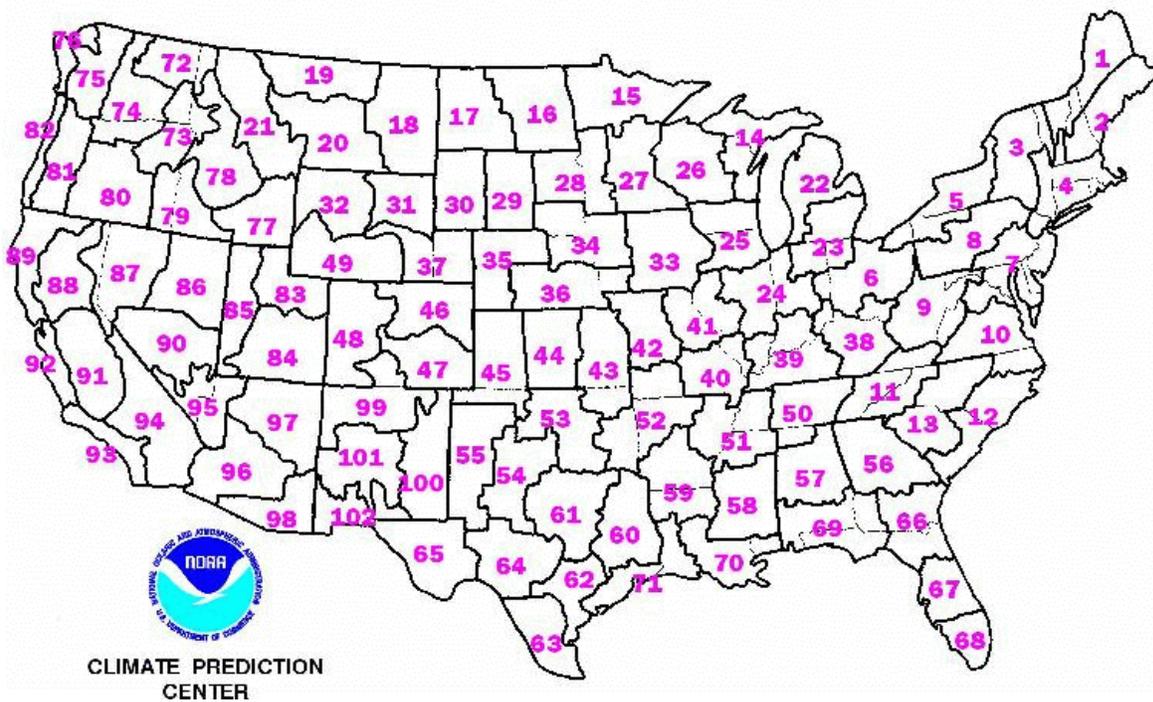


Figure 1. CPC Climate Outlook Divisions for contiguous U.S. (Note: Long Island NY is in division 4).

Base Period Means and Class Limits are calculated for the following valid times (Table 4). This information is available in both graphic and text formats on CPC’s web site. CPC may post just a subset of the valid time calculations for the 6- to 10-day and 8- to 14-day Outlooks (one or two valid times per month).

For Three-Month Outlooks:	For One-Month Outlooks:
January through March	January
February through April	February
March through May	March
April through June	April
May through July	May
June through August	June
July through September	July
August through October	August
September through November	September
October through December	October
November through January	November
December through February	December

For 8- to 14-day Outlooks:	For 6- to 10-Day Outlooks:
January 1 through January 7	January 1 through January 5
January 2 through January 8	January 2 through January 6
etc.	etc.
December 31 through January 6	December 31 through January 4

Table 4. Valid Times for Climate Outlooks

The following are some examples of CPC base period mean maps available on their web site.

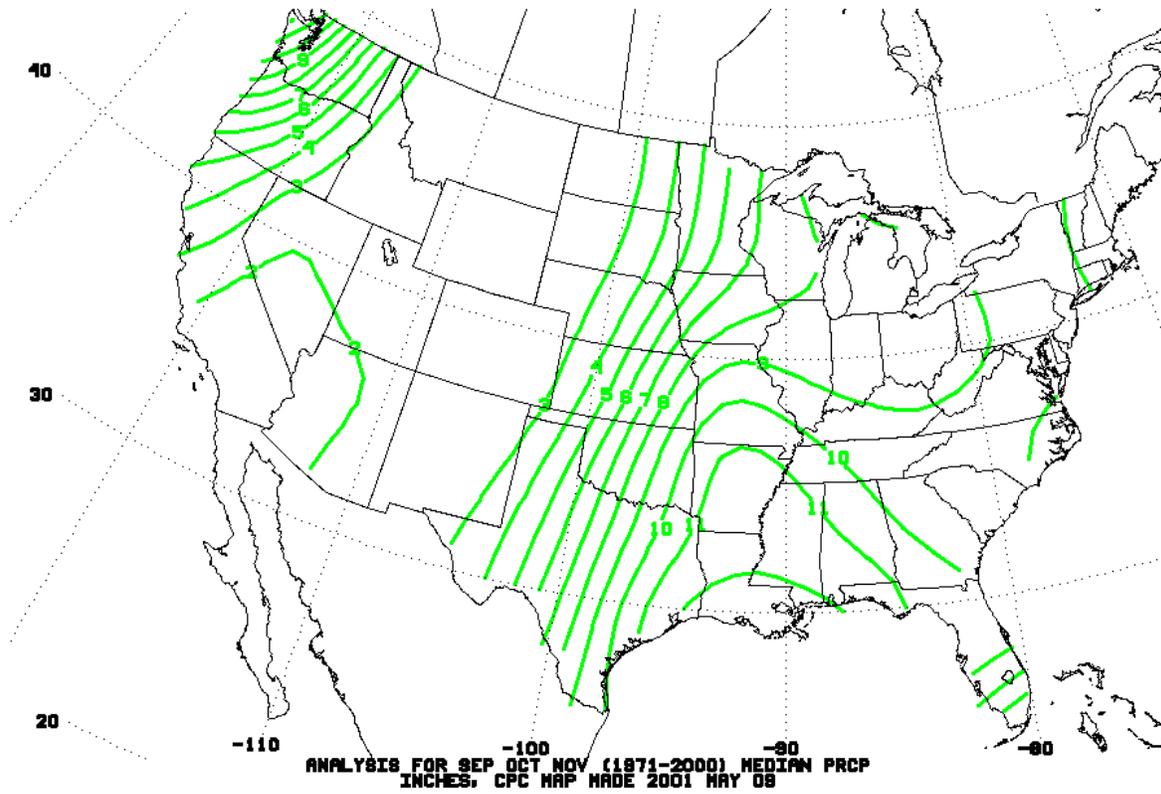


Figure 2. Map of CPC 1971-2000 base period mean total precipitation (inches) for September through November.

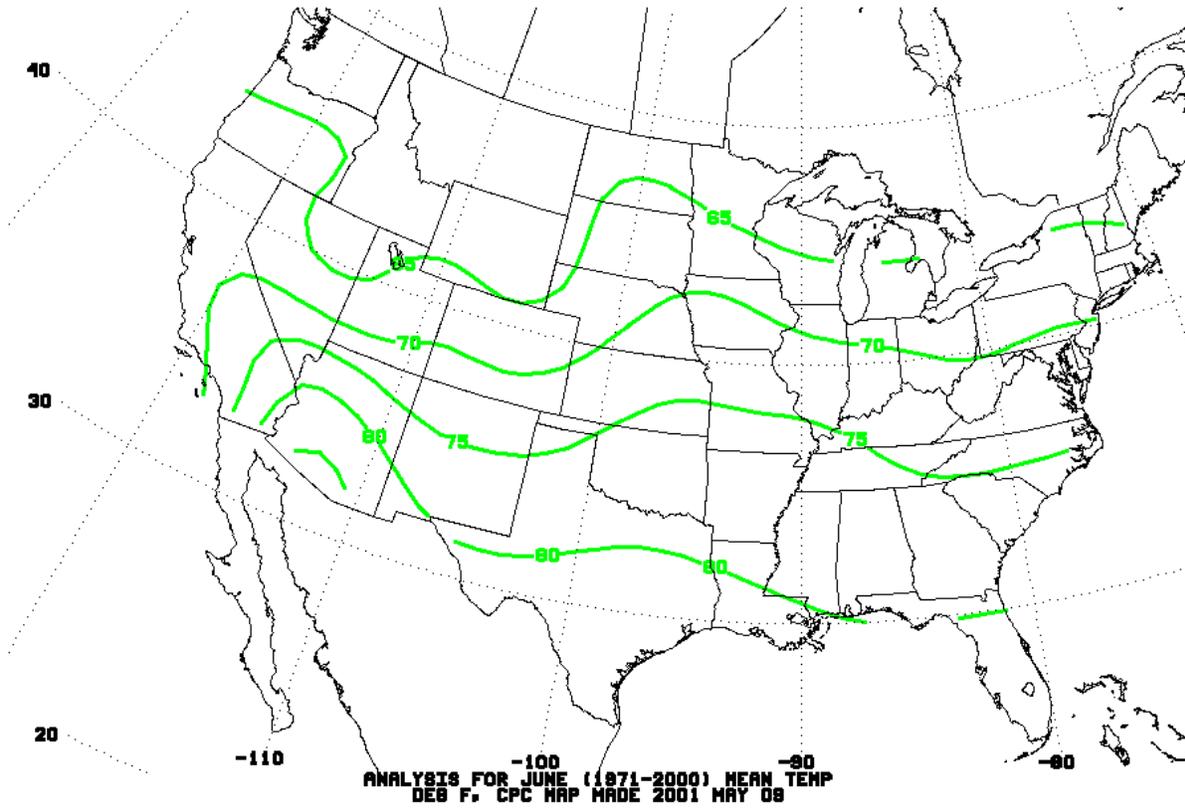


Figure 3. Map of CPC 1971-2000 base period mean temperature for June.

7.3 Base Period Means for Mean 500 millibar heights. CPC has calculated mean Northern Hemisphere 500 millibar heights for the 6-to 10-day and 8- to 14-day valid times listed in Table 4 in Section 7.2. This information is available in graphic format on CPC's web site. The following is an example of base period mean 500 millibar chart.

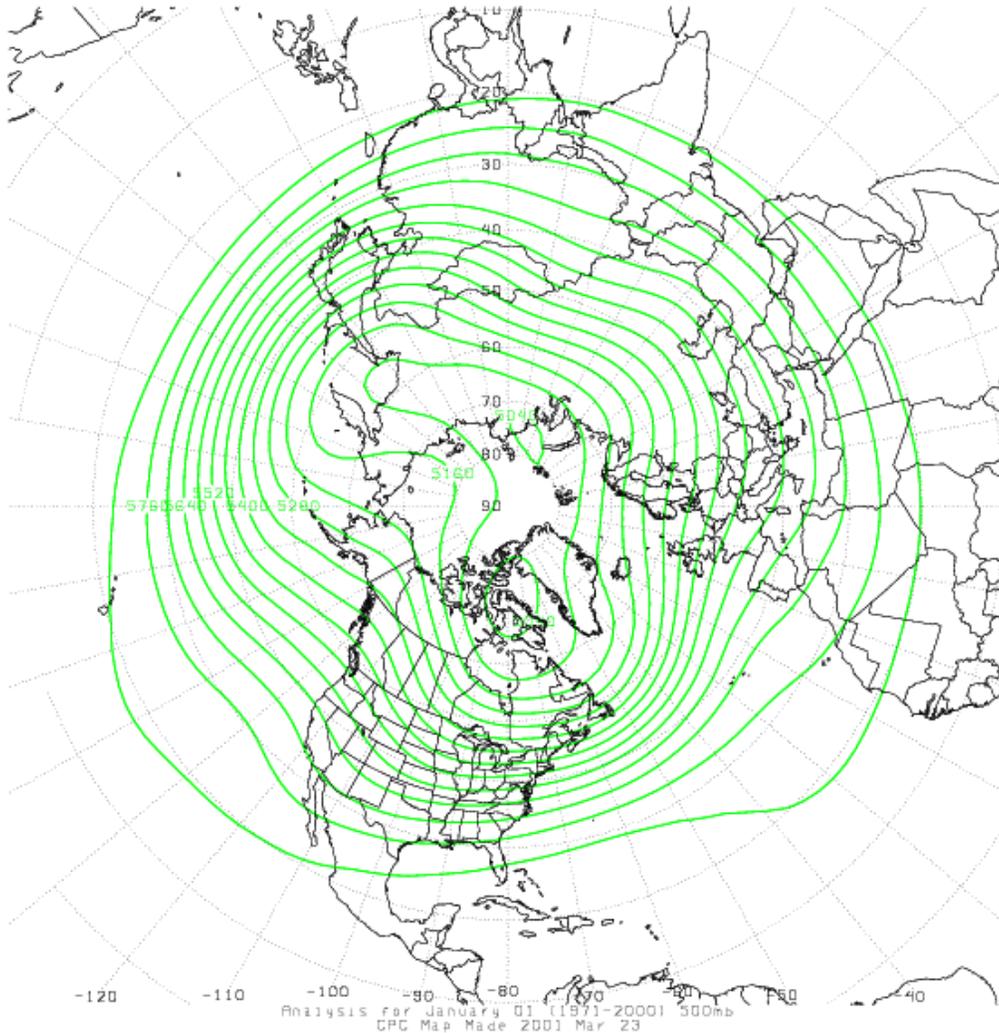


Figure 4. CPC 1971-2000 base period mean Northern Hemisphere 500 millibar height chart (in decameters) for January 1 through 5 (to be used to determine height anomalies in the 6- to 10-day 500 mb height outlook issued December 26).

7.4 Sea Surface Temperature (SST) Base Period Means. CPC has calculated SST means for each month as reference to the official Tropical Pacific SST Outlook (for the Pacific Niño 3.4 area [5°N to 5°S and 120°W to 170°W]). The CPC web site provides global maps of the base period SST means and charts for critical “Niño” subsections of the Tropical Pacific Ocean. Since the SST outlooks are valid for three-month periods, CPC averages the base period SST means of the three months as a reference to calculate the predicted three-month anomaly.

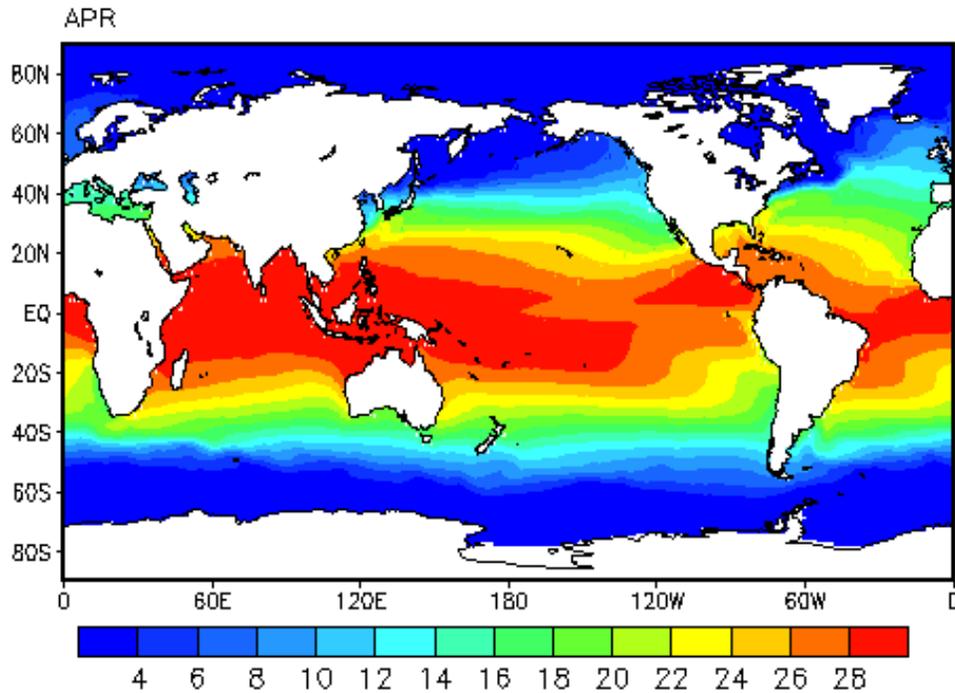


Figure 5. April 1971-2000 base period mean sea surface temperature chart. Temperatures are in Celsius.

Appendix A – Ten Principles of Climate Monitoring

The National Research Council (NRC 1999) recommended that the following ten climate monitoring principles, proposed by Karl *et al.* (1995), should be applied to climate monitoring systems:

1. **Management of Network Change:** Assess how and the extent to which a proposed change could influence the existing and future climatology obtainable from the system, particularly with respect to climate variability and change. Changes in observing times will adversely affect time series. Without adequate transfer functions, spatial changes and spatially dependent changes will adversely affect the mapping of climatic elements.
2. **Parallel Testing:** Operate the old system simultaneously with the replacement system over a sufficiently long time period to observe the behavior of the two systems over the full range of variation of the climate variable observed. This testing should allow the derivation of a transfer function to convert between climatic data taken before and after the change. When the observing system is of sufficient scope and importance, the results of parallel testing should be documented in peer-reviewed literature.
3. **Metadata:** Fully document each observing system and its operating procedures. This is particularly important immediately prior to and following any contemplated change. Relevant information includes: instruments, instrument sampling time, calibration, validation, station location, exposure, local environmental conditions, and other platform specifics that could influence the data history. The recording should be a mandatory part of the observing routine and should be archived with the original data. Algorithms used to process observations need proper documentation. Documentation of changes and improvements in the algorithms should be carried along with the data throughout the data archiving process.
4. **Data Quality and Continuity:** Assess data quality and homogeneity as a part of routine operating procedures. This assessment should focus on the requirements for measuring climate variability and change, including routine evaluation of the long-term, high-resolution data capable of revealing and documenting important extreme weather events.
5. **Integrated Environmental Assessment:** Anticipate the use of data in the development of environmental assessments, particularly those pertaining to climate variability and change, as a part of a climate observing system's strategic plan. National climate assessments and international assessments (e.g., international ozone or IPCC) are critical to evaluating and maintaining overall consistency of climate data sets. A system's participation in an integrated environmental monitoring program can also be quite beneficial for maintaining climate relevancy. Time series of data achieve value only with regular scientific analysis.
6. **Historical Significance:** Maintain operation of observing systems that have provided homogeneous data sets over a period of many decades to a century or more. A list of protected sites within each major observing system should be developed, based on their prioritized contribution to documenting the long-term climate record.

7. **Complementary Data:** Give the highest priority in the design and implementation of new sites or instrumentation within an observing system to data-poor regions, poorly observed variables, regions sensitive to change, and key measurements with inadequate temporal resolution. Data sets archived in non-electronic format should be converted for efficient electronic access.
8. **Climate Requirements:** Give network designers, operators, and instrument engineers climate monitoring requirements at the outset of network design. Instruments must have adequate accuracy with biases sufficiently small to resolve climate variations and changes of primary interest. Modeling and theoretical studies must identify spatial and temporal resolution requirements.
9. **Continuity of Purpose:** Maintain a stable, long-term commitment to these observations, and develop a clear transition plan from serving research needs to serving operational purposes.
10. **Data and Metadata Access:** Develop data management systems that facilitate access, use, and interpretation of data and data products by users. Freedom of access, low cost mechanisms that facilitate use (directories, catalogs, browse capabilities, availability of meta data on station histories, algorithm accessibility and documentation, etc.), and quality control should be an integral part of data management. International cooperation is critical for successful data management.

References:

Karl, T.R., V.E. Derr, D.R. Easterling, C.K. Folland, D.J. Hoffman, S. Levitus, N. Nicholls, D.E. Parker, and G.W. Withee, 1995: Critical issues for long-term climate monitoring. *Climatic Change*, **31**, 185-221.

National Research Council (NRC), 1999: **Adequacy of Climate Observing Systems**, National Academy Press, Washington, D.C.

Appendix B - Accessing NOAA Daily Temperature and Precipitation Extremes Based on Combined/Threaded Station Records

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ABSTRACT

Daily records of both temperature and precipitation are of great interest to the public and many data users and are beneficial in climate perspectives. However, numerous station relocations over the years has resulted in inconsistent approaches to combining multi-location data sets, resulting in disparate reporting of record and extreme values at many prominent large metropolitan observing sites. To address this challenge, the methodology for establishing multi-location combined (or threaded) station data sets under the so-called “*ThreadEx*” project is presented.

1. INTRODUCTION

In the interest of ensuring consistent reporting of climatological data, NOAA's National Climatic Data Center (NCDC), in partnership with the Northeast Regional Climate Center (NRCC), NOAA's National Weather Service/Climate Services Division (NWS/CSD), and numerous data users, has established a data set of combined (or threaded) period of record daily temperature and precipitation values at 255 NOAA published *Local Climatological Data (LCD)* locations that generally correspond to most medium- and large-sized cities in the United States. This new ThreadEx data set provides a consistent basis for the reporting of daily extremes for the longest period of time meaningful. The development of this data set is especially timely given the increasing availability of historic daily values in digital form for the first half of the 20th century (and earlier in some cases) (Kunkel *et al.*, 1998; Guttman, 2002).

Many research applications rely on using a variety of homogenization techniques to account for non-climatic shifts resulting from station relocations, changes in instrument type, and variations in the time of observations (DeGaetano *et al.*, 2002). The ThreadEx project aims to report the *actual* values for a given region mapped to a given published LCD site for the express purpose of conveying general climate perspectives information. Thus, the daily values are preserved in spite of siting changes.

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2. METHODOLOGY

Threads for a given published LCD will be developed as follows. The record of a currently active station will be the starting point for a station thread. This station's current record will be used as far back in time as possible, taking precedence over a closed station's record during any periods of overlap (for Automated Surface Observing System (ASOS) locations, this period of record is generally very short – no more than 12 years). A search will be conducted to identify other weather stations in the region that can be used to extend the thread further back in time. In this process, preference will be given to Weather Service/Bureau stations over volunteer COOP stations. The thread will be extended back in time as far as possible using NOAA daily data available in digital form.

For historic overlaps, all else being equal, the station with a more recent record will take precedence, unless partner input (e.g., NWS field offices, State Climatologists, etc.) with compelling documentation determines otherwise. An attempt will be made to fill any gaps larger than six months in a station record with data from another station. Partner input will be sought during the development of this data set through a survey.

The period of record used for each portion of a thread will be clearly denoted in the station meta-data.

An example of a station thread for the Chicago area would be:

<i>Chicago O'Hare AP</i>	<i>11/1/1958 - present</i>
<i>Chicago Midway AP</i>	<i>1/1/1942 - 10/31/1958</i>
<i>Chicago University</i>	<i>1/1/1926 - 12/31/1941</i>
<i>Chicago (COOP)</i>	<i>1/1/1896-12/31/1925</i>
<i>Chicago (CRB)</i>	<i>10/9/1871-12/31/1895</i>

3. DATA SET ACCESS

The threaded data will be available in two formats:

- On xmACIS (the NWS interface for climate record queries) and other systems using the ACIS database (<http://www.rcc-acis.org/>), the threaded data station daily values will be fully available for query; thus, all data summaries currently available in xmACIS can be applied to this data set. These stations will be clearly identified as threaded stations.

The benefit of an extended record is illustrated using

xmACIS output in Table 1. Presently, the Washington, DC record at National Airport, extends back to 1948. With ThreadEx, daily extremes will be extended back to the 1890s using pre-1948 Weather Bureau station observations, allowing climate perspectives inquiries such as determining the coldest/warmest/wettest Inauguration Day for a substantially longer period of record.

- Another data set containing summary tables for extremes will be produced. This will consist of the top 3 records per calendar day for maximum temperature (highest and lowest), minimum temperature (highest and lowest) and precipitation (highest). Metadata will consist of station information for the station fragments composing the thread. The period of analysis will consist of the earliest data available in digital form through the end of 2004.

Table 1. Sample xmACIS Output

WASHINGTON REAGAN NATIONAL AP (KDCA)		
Extremes		
Lowest Average Minimum Temperature		
Days: 1/20 - 1/20		
Length of period: 1 day		
Years: 1948-2004		
Rank	Value	Ending Date
1	-2.0	1/20/1985
2	8.0	1/20/1994
3	9.0	1/20/1984
4	16.0	1/20/1983

4. FUTURE DEVELOPMENT AND UPDATE

A national oversight committee will be established to oversee future updates to the Threaded Extremes Data Set. This committee will seek to include members representing the Regional Climate Centers, AASC, NCDC, NWS field offices, NWS regional offices and NWS Headquarters. This committee will also be charged with making determinations in situations where a partner requests an exception be made to the methodology outlined above.

Both the xmACIS and table derivatives of the data set will be updated on an annual basis to include calendar year updates and extension of period of record based upon digitized daily data rescued from NOAA archives and offices as they are documented (including metadata such as latitude, longitude, elevation, station/instrument and other siting characteristics, etc.), quality assured, and made available.

5. CONCLUSION

NOAA’s commitment to excellence in climate services is punctuated by its synergies with partners in developing data feedback, quality assurance, and dissemination infrastructure. With the ThreadEx effort, maximized, consistent, updated daily extremes will be available for government, partner, and general public (especially

media) use. The consistent use of such information will make clear regional extremes and lay the foundation for the expansion of this technique to additional locations and parameters.

6. REFERENCES

Guttman, N. B., 2002: Digitization of historical daily cooperative network data. Preprints, *13th Conf. on Applied Climatology*, Portland, OR, Amer. Meteor. Soc., 43–46.

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Trenberth, K.E. and T. W. Owen, 1999: Workshop on indices and indicators for climate extremes, Asheville, NC, USA., 3-6 June 1997: Breakout Group A: Storms. *Climatic Change*, **42**, 9-21.

Appendix C – ASOS Local Climatological Data Stations

ALASKA

ANC ANCHORAGE INTL AP
 ANN ANNETTE ISLAND AP
 BRW BARROW POST-ROGERS AP
 BET BETHEL AIRPORT
 BTT BETTLES FIELD
 CDB COLD BAY AP
 BIG DELTA JUNCTION AAF
 FAI FAIRBANKS INTL AP
 GKN GULKANA INTERMEDIATE
 HOM HOMER AP
 JNU JUNEAU AP
 AKN KING SALMON AP
 ADQ KODIAK STATE CG BASE
 OTZ KOTZEBUE RALPH WEIN
 MCG MCGRATH
 OME NOME MUNICIPAL AP
 SNP ST PAUL ISLAND AP
 TKA TALKEETNA STATE AP
 YAK YAKUTAT STATE AP

ALABAMA

BHM BIRMINGHAM INTL AP
 HSV HUNTSVILLE INTL AP
 MOB MOBILE REGIONAL AP
 MGM MONTGOMERY DANNELLY

ARKANSAS

FSM FT SMITH MUNICIPL AP
 LIT LITTLE ROCK ADAMS FD

AMERICAN SAMOA

NSTU TAFUNA PAGO PAGO INTL AP

ARIZONA

FLG FLAGSTAFF AP
 PHX PHOENIX INTL AP
 TUS TUCSON INTL AP
 INW WINSLOW AP

CALIFORNIA

BFL BAKERSFIELD AP
 BIH BISHOP AP
 EKA EUREKA WSO CITY
 FAT FRESNO AIR TERMINAL
 LGB LONG BEACH AP
 CQT LOS ANGELES DOWNTOWN AP
 LAX LOS ANGELES INTL AP
 RDD REDDING MUNICIPAL AP
 SAC SACRAMENTO EXEC AR
 SAN SAN DIEGO LINDBERGH
 SFO SAN FRANCISCO INTL AP
 SMX SANTA MARIA PBLC AP
 SCK STOCKTON METRO AP

COLORADO

ALS ALAMOSA BERGMAN FLD
 COS COLORADO SPRGS MUNI
 DEN DENVER INTL AP
 GJT GRAND JUNCTION WLKR
 PUB PUEBLO MEMORIAL AP

CONNECTICUT

BDR BRIDGEPORT SIKORSKY
 BDL HARTFORD BRADLEY INTL AP

DELAWARE

ILG WILMINGTN NEW CASTLE

FLORIDA

DAB DAYTONA BEACH INTL AP
 FMY FORT MYERS PAGE FLD AP
 GNV GAINESVILLE MUNI AP
 JAX JACKSONVILLE INTL AP
 EYW KEY WEST INTL AP
 MIA MIAMI INTL AP
 MCO ORLANDO INTL AP
 PNS PENSACOLA REGIONL AP
 TLH TALLAHASSEE MUNI AP
 TPA TAMPA INTL AP
 VRB VERO BEACH MUNI AP
 PBI W PALM BEACH INTL AP

GEORGIA

AHN ATHENS MUNI AP
 ATL ATLANTA HARTSFIELD INTL
 AGS AUGUSTA BUSH FIELD
 CSG COLUMBUS METRO AP
 MCN MACON REGIONAL AP
 SAV SAVANNAH INTL AP

GUAM

PGUM GUAM INTL APRT

HAWAII

ITO HILO INTL AP
 HNL HONOLULU INTL AP
 OGG KAHULUI AP
 LIH LIHUE AP

IOWA

DSM DES MOINES INTL AP
 DBQ DUBUQUE MUNI AP
 SUX SIOUX CITY MUNI AP
 ALO WATERLOO MUNI AP

IDAHO

BOI BOISE AIR TERMINAL
 LWS LEWISTON NEZ PERCE CO. AP
 PIH POCATELLO MUNICIPAL AP

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ILLINOIS

ORD CHICAGO OHARE INTL AP
 MLI MOLINE QUAD CITY AP
 PIA PEORIA GTR PEORIA AP
 RFD GREATER ROCKFORD AP
 SPI SPRINGFIELD CAPTL AP

INDIANA

EVV EVANSVILLE REG AP
 FWA FORT WAYNE INTL AP
 IND INDIANAPOLIS INTL AP
 SBN SOUTH BEND ST JOSEPH AP

KANSAS

CNK CONCORDIA BLOSSER MUNI AP
 DDC DODGE CITY REG AP
 GLD GOODLAND RENNER FLD
 TOP TOPEKA MUNI AP
 ICT WICHITA MID-CNTNT AP

KENTUCKY

JKL JACKSON J CARROLL AP
 LEX LEXINGTON BLUEGRASS FLD
 SDF LOUISVILLE STANDIFRD
 PAH PADUCAH BARKLEY FLD

LOUISIANA

BTR BATON ROUGE RYAN AP
 LCH LAKE CHARLES MUNI AP
 MSY NEW ORLEANS INTL AP
 SHV SHREVEPORT REGIONAL AP

MASSACHUSETTS

BOS BOSTON LOGAN INTL AP
 MQE MILTON - BLUE HILL OBS
 ORH WORCESTER MUNI AP

MARYLAND

BWI BALT-WASHGTN INTL AP

MAINE

CAR CARIBOU MUNI AP
 PWM PORTLAND INTL JETPRT

MICHIGAN

APN ALPENA PHELPS COL AP
 DTW DETROIT METRO AP
 FNT FLINT BISHOP AP
 GRR GRAND RAPIDS INTL AP
 HTL HOUGHTON LAKE ROSCMN AP
 LAN LANSING CAPITAL CITY AP
 MKG MUSKEGON CO AP
 MQT MARQUETTE CTY AP FAA
 ANJ SAULT STE. MARIE AP

MINNESOTA

DLH DULUTH INTL AP
 INL INTERNATL FALLS INTL AP
 MSP MINNEAPOLIS/ST PAUL INTL
 RST ROCHESTER INTL AP
 STC ST CLOUD MUNI AP

MISSOURI

COU COLUMBIA MUNI AP
 MCI KANSAS CITY INTL AP
 SGF SPRINGFIELD REG AP
 STL ST LOUIS LAMBERT INTL

MISSISSIPPI

JAN JACKSON INTL AP
 MEI MERIDIAN KEY FLD
 TUP TUPELO C D LEMONS AP

MONTANA

BIL BILLINGS LOGAN INTL AP
 GGW GLASGOW INTL AP
 GTF GREAT FALLS INTL AP
 HVR HAVRE CITY/COUNTY AP
 HLN HELENA AP
 FCA KALISPELL GLACIER AP
 MSO MISSOULA JOHNSN-BELL

NORTH CAROLINA

AVL ASHEVILLE REGIONL AP
 HSE HATTERAS BILLY MITCHELL
 CLT CHARLOTTE DOUGLAS INTL
 GSO GREENSBORO REG AP
 RDU RALEIGH DURHAM AP
 ILM WILMINGTON NEW HANVR

NORTH DAKOTA

BIS BISMARCK MUNI AP
 FAR FARGO AP
 GFK GRAND FORKS INTL AP
 ISN WILLISTON SLOULIN AP

NEBRASKA

GRI GRAND ISLAND AP
 LNK LINCOLN MUNI AP
 OFK NORFOLK STEFAN AP
 LBF NORTH PLATTE L BRD FLD
 OMA OMAHA EPPLEY AIRFLD
 BFF SCOTTSBLUFF CNTY AP
 VTN VALENTINE MILLER FLD

NEW HAMPSHIRE

CON CONCORD MUNI AP

NEW JERSEY

ACY ATLANTIC CITY INTL AP
 EWR NEWARK INTL AP

NEW MEXICO

ABQ ALBUQUERQUE INTL AP
 CAO CLAYTON MUNI ARPK
 ROW ROSWELL INDSTRL ARPK

NEVADA

EKO ELKO REGIONAL AP
 ELY ELY YELLAND FIELD
 LAS LAS VEGAS MCCRN INTL
 RNO RENO CANNON INTL AP
 WMC WINNEMUCCA MUNI AP

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NEW YORK

ALB ALBANY INTL AP
 BGM BINGHAMTON LINK FLD
 BUF BUFFALO GR BUFFLO INTL
 ISP ISLIP L I MACARTHUR
 NYC NEW YORK CITY R
 JFK NEW YORK J F KENNEDY
 LGA NEW YORK LAGUARDIA
 ROC ROCHESTER INTL AP
 SYR SYRACUSE HANCOCK INTL

OHIO

CAK AKRON-CANTON REG AP
 CLE CLEVELAND HOPKINS INTL
 CMH COLUMBUS INTL AP
 CVG CINCI-NORTHERN KY AP
 DAY DAYTON INTL ARPT
 MFD MANSFIELD LAHM AP
 TOL TOLEDO EXPRESS AP
 YNG YOUNGSTOWN MUNI AP

OKLAHOMA

OKC OKLA. CITY ROGERS INTL
 TUL TULSA INTL AP

OREGON

AST ASTORIA CLATSOP AP
 BNO BURNS MUNICIPAL AP
 EUG EUGENE MAHLON SWEET
 MFR MEDFORD ROUGE VLY INTL
 PDT PENDLETON MUNICPL AP
 PDX PORTLAND INTL AP
 SLE SALEM MCNARY FIELD

PENNSYLVANIA

ABE ALLENTOWN A-B-E INTL
 AVP AVOCA WILKES-BARRE SCRNB
 ERI ERIE INTL AP
 MDT MIDDLETOWN HARRISBRG
 PHL PHILADELPHIA INTL AP
 PIT PITTSBURGH INTL AP
 IPT WILLIAMSPRT-LYCOMING AP

PACIFIC ISLANDS

PTRO PALAU INTL APRT ROP
 PTKR KOROR ROP
 PKWA KWAJALEIN RMI
 PKMJ MAJURO INTL APRT RMI
 PKMR WSO MAJURO, RMI
 PTPN POHNPEI INTL APRT FSM
 PTTP WSO POHNPEI, FSM
 PTKK CHUUK INTL APRT FSM
 PTYA YAP INTL APRT FSM
 PWAK WAKE ISLAND
 PGSN SAIPAN INTL APRT CNMI

PUERTO RICO

SJU ISLA VERDE INTL AP

RHODE ISLAND

PVD PROVIDENCE GREEN ST AP

SOUTH CAROLINA

CHS CHARLESTON INTL ARPT
 CAE COLUMBIA METRO AP
 GSP GREER GREENV'L-SPART

SOUTH DAKOTA

ABR ABERDEEN REGIONAL AP
 HON HURON REGIONAL AP
 RAP RAPID CITY REGINL AP
 FSD SIOUX FALLS FOSS FLD

TENNESSEE

TRI BRISTOL TRI CITY AP
 CHA CHATTANOOGA LOVELL
 TYS KNOXVILLE MCG TYSON
 MEM MEMPHIS INTL AP
 BNA NASHVILLE METRO AP
 OQT OAK RIDGE, TN

TEXAS

ABI ABILENE MUNI AP
 AMA AMARILLO INTL AP
 AUS AUSTIN BERGSTROM INTL
 ATT AUSTIN/CAMP MABRY ANG
 BPT BEAUMONT/P. ARTHUR REG
 BRO BROWNSVILLE INTL AP
 CRP CORPUS CHRISTI INTL
 DAL DALLAS-LOVE FIELD
 DFW DALLAS-FT WORTH AP
 DRT DEL RIO INTL AP
 ELP EL PASO INTL AP
 IAH HOUSTON INT'CNTNL AP
 LBB LUBBOCK REGIONAL AP
 MAF MIDLAND-ODESSA INTL AP
 SJT SAN ANGELO MATHIS FD
 SAT SAN ANTONIO INTL AP
 VCT VICTORIA REGIONAL AP
 ACT WACO MADISN COOPR AP
 SPS WICHITA FALLS MUN AP

UTAH

SLC SALT LK CITY INTL AP

VIRGINIA

LYH LYNCHBURG MUNI AP
 ORF NORFOLK INTL AP
 RIC RICHMOND BYRD AP
 ROA ROANOKE WOODRUM AP
 WAL WALLOPS ISLAND FLGT FAC
 DCA WASHINGTON DC NATL AP
 IAD WASHINGTON DC DULLES

VERMONT

BTV BURLINGTON INTL AP

WASHINGTON

OLM OLYMPIA AP
 UIL QUILLAYUTE AP
 SEA SEATTLE-TACOMA AP
 GEG SPOKANE INTL AP
 YKM YAKIMA AIR TERMINAL

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WISCONSIN

GRB GREEN BAY AUSTIN STR
LSE LA CROSSE MUNI AP
MSN MADISON DANE CNTY AP
MKE MILWAUKEE MTCHLL FLD

WEST VIRGINIA

BKW BECKLEY RALEIGH AP
CRW CHARLESTON KNWA AP
EKN ELKINS RNDLPH CO AP
HTS HNTNGTN TRI-STATE

WYOMING

CPR CASPER NATRONA CO AP
CYS CHEYENNE MUNI AP
LND LANDER HUNT FIELD
SHR SHERIDAN COUNTY AP

Appendix D - Request for National Climatic Extremes Committee (NCEC) Activation for Potential Extreme Events

The NOAA policy source for the following is provided at

<http://www.ncdc.noaa.gov/oa/climate/monitoring/extremes/ncec.html>

When the possibility that a new national climate extreme has occurred, the NCEC will consider requests for activation to evaluate and decide the validity of the event using the following procedures.

i. NCEC chair (NCDC) will accept direct requests for activation only from the following official requesting contacts. Observers (or reporters of automated events) can report to any one of these contacts for forwarding to NCEC except all WFO observations or WFO received reports will be forwarded through one of their NWS Regional Headquarters (c).

a) State climatologists

b) Regional Climate Center directors

c) NWS Regional Headquarters (any one of the following; Regional Climate Services Program Managers, Regional Warning Coordination Meteorologist, or Regional COOP Program Manager).

d) NWS Climate Services Division (W/OS4)

e) NWS Observing Services Division (W/OS7)

f) NCDC Data Operations Division (E/CC1)

ii. Official requesters can make activation requests by email to the NCEC chairman with cc the other NCEC members or by a telephone call to the NCEC chair. If the chair is unavailable via telephone, other NCEC members may be called. Requests should include the following information:

a) Name and affiliation of requester and address, e-mail, telephone, etc.

b) Observer or reporter name and affiliation (COOP, FAA or NWS contractor, WFO, etc.) and address, e-mail, telephone, etc.

c) Station and instrument types; COOP, ASOS, snowboards, stakes, rulers, etc.

d) Type of event being requested for evaluation as per list of existing records

e) Time of event (date, month, year, and time of day)

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f) Place of event (distance and direction from known landmark, city, etc.)
(e.g. 30 miles west of Sioux Falls, 2 miles south of Mt. Rushmore)

iii. Official requesters should screen the observation or report to ensure that the event falls under the charter of the NCEC's authority (i.e., a national climate record is in question as per list of existing records).

iv. Requests for NCEC activation will receive a response from the chair or backup member as soon as possible. NCEC should expedite responses to requests with "perishable" evidence such as hail or snow.

Appendix E - State Climate Extremes Committees

1. Purpose

The formation of a State Climate Extremes Committee (SCEC) addresses the consideration of potentially record-setting extreme meteorological elements observed at the statewide level. The purpose of the SCEC is to mirror the activities of the National Climatic Extremes Committee (NCEC), but for observations challenging state records, rather than national ones. It is proposed that the SCEC serve as an advisory panel that will make recommendations regarding state records to the director of the NCDC. With the agreement of the NCDC Director, such records will become officially sanctioned, and recognized by the meteorological and climatological community.

2. Scope

The SCEC is to provide counsel and a recommendation regarding the status of an observation of a meteorological element (e.g., maximum temperature) that challenges the existing, official record value for that element for a given state. If such observations also may challenge a national record, the involvement of the SCEC will be to render a recommendation regarding the state record only. The case will be forwarded and considered separately by the NCEC

While many aspects of meteorological elements may be tracked, and record extremes determined, it is felt that most of these extremes are anecdotal in nature (e.g., greatest 1-hour rainfall total) and are therefore outside the scope of the SCEC. However, based upon the meteorological elements routinely collected on a daily basis from the extensive network of official observation stations across the United States, there exists a subset of records that may readily be tracked, and for which data validation tools are available. These core records are listed in table 1, and many (marked with asterisks) correspond with the records tracked by the NCEC.

Acronyms for available networks listed in Table 1:

COOP (Cooperative Observers Network)
ASOS (Automated Surface Observing System)
CRN (Climate Reference Network)
SA (Surface Airways, pre ASOS era data)
HPN (High Density Precipitation Network)

Element	Records tracked	Available Network(s)
Surface Air Temperature	All-time max.*	COOP, ASOS, CRN, SA
	All-time min.*	do
	All-time maximum 24-h change*	do
	Monthly max. temperature	do
	Monthly min. temperature	do
	Calendar day all-time max.	do
	Calendar day all-time min.	do
Snowfall	All-time max. 24-h total*	COOP, SA
	All-time max. seasonal (Jul-Jun) total*	do
	Monthly max	do
Snow Depth	All-time max *	do
Precipitation	All-time max. 24-h total*	COOP, ASOS, HPN, SA, CRN
	Min. annual total*	do
	Max. annual total*	do
	Duration of longest dry period*	do
	Duration of longest wet period	do
	Max. monthly total	do
Detected Sky Condition	Monthly max 24-h total	do
	Max. annual number of clear days	ASOS, SA
	Max. annual number of cloudy days	ASOS, SA

* tracked by NCEC
do="ditto"

Table 1. Statewide meteorological elements tracked by SCEC

Table 1 above does not include several elements that are tracked by NCEC. These are maximum wind gust, largest and heaviest hail, highest and lowest pressure. Additional values that are not currently considered by the SCEC may be considered in the future. Extremes of these values are maintained in the NCDC archives, but because they are not significant to many states, such extremes will not be considered by the SCEC unless they are specifically requested by the state's SC. For example, the State Climatologist (SC) for Alaska may wish official SCEC consideration of maximum and minimum barometric pressure for Alaska. New Hampshire might desire SCEC consideration of maximum wind gust (i.e., for Mt. Washington). The SCEC reserves the right to add or remove extreme record elements from consideration, and may do so on a state by state basis or for all states.

For meteorological elements that are not tracked by the SCEC for record status, the NCDC archives remain the official source for querying state meteorological records. The SCEC makes no claim on the veracity of such data, and it should be noted that the NCDC certification given to data held by the NCDC is only a certification that a copy of the data resides in the NCDC archives. It does not certify the correctness of the data that has been obtained from the NCDC; such determinations are left to the user of the data.

3. Composition and convening

The SCEC will be an ad hoc committee comprised of the following five voting members.

- A. A representative from the Weather Forecast Office (WFO) holding jurisdiction over the station recording a potential record. The Meteorologist in charge (MIC), or the climate focal point is preferred.
- B. The SC for the state in which the record is being challenged. If the state does not have an SC, the SC from a neighboring state will be asked to serve.
- C. The NWS Regional Climate Services Program Manager (CSPM) for the relevant Regional Headquarters (RH). If the CSPM is not available, the Regional COOP Program Manager will be asked to serve.
- D. The Regional Climatologist from the supporting Regional Climate Center (RCC)
- E. The Data Quality Administrator (DQA) at the NCDC. If the DQA is not available, the NCDC National Liaison Officer will be asked to serve.

Any voting member, may at their discretion, and if their stated alternate is unavailable, appoint a temporary proxy representative to discuss and vote on their behalf. A quorum of the committee is considered to be three of the five voting members, but a quorum may not exist unless the participation of all five members has been solicited in advance and members have been given the opportunity to announce their recusal or abstention.

The committee may be called by any member, but in general, it will be expected that either the relevant WFO or the SC for the affected state will call for the committee to convene. The committee will dissolve once a recommendation has been reached regarding a challenged record value, or when the challenge has been withdrawn. Recommendations will carry with a simple majority vote. The director of the NCDC renders the final decision regarding any SCEC recommendation, and may override SCEC voting results.

It is expected that most discussion and voting of the committee will take place via either E-mail or teleconference (see Section 4). Occasionally, it may be necessary for the committee to meet in person. If the in-person meeting is to discuss a particular state record, the meeting should occur in the state in question (as a site visit may be necessary). Such a meeting should be arranged by a member based in that state. In-person meetings for reasons other than the consideration of a state record, the meeting may be proposed and arranged by any member of the committee.

4. Record Recognition Process

Upon its inception, the SCEC will compile a list of the extant records listed in Table 1 for each state of the United States. These records will be reviewed to determine their validity and, if found to be acceptable, will be recommended to the NCDC Director for inclusion in the statewide records data set.

Thereafter, the challenge of an SCEC officially recognized statewide record is expected to follow the following guidelines:

- A. If the WFO or the SC thinks a statewide record may have been set, a representative from the WFO or SC office (preferably the WFO) should visit the site of the record within 2 days of notification of the record and take the following action.
 - i. Test equipment to ensure proper working order.
 - ii. Examine and describe exposure and take pictures.
- B. After the site visit, the WFO MIC or SC should send an E-mail to all members of the SCEC (see Section 3) informing them of a challenge to the record. Information/photos from the site visit should be attached to the E-mail.
- C. At this point, the WFO should transmit a preliminary Record Event Report (RER). The RER should clearly indicate that the record is under review, and final determination will be forthcoming.
- D. Once the WFO MIC or SC sends the initial E-mail, the CSPM should set up a teleconference call that includes all members of the SCEC.
 - i. The teleconference should take place no later than 5 business days after the E-mail from the WFO MIC or SC is received.
 - ii. If any member of the SCEC is unavailable during those 5 business days, they should notify the committee of their absence. They may provide input via E-mail, but their vote would either be abstained, or cast by their alternate or other proxy acceptable to the committee.
- E. Each SCEC member will review the validity of the proposed record value, using all tools available to them, prior to the teleconference. They should be prepared to discuss and vote on the validity of the record during the conference call.
- F. The SCEC will vote for or against recommending to the director of the NCDC that the record be updated. A simple majority will carry the vote.
- G. The director of the NCDC will be informed of the challenge to the record, and will be given the recommendation of the SCEC. The director, or their officially designated proxy, will render an official decision on the record. The decision of the NCDC Director will be final

Only meteorological observations from weather stations that are recognized by the National Oceanic and Atmospheric Administration (NOAA) as official stations, and which have been assigned a registration number (e.g., COOP ID, WBAN, NCDC) will be considered for record status. Additionally, upon establishment of a new record value, the data must reside in the official archives of weather data that is maintained by the NCDC.

Due to the more frequent nature of daily temperature records (especially during a period of extreme weather when multiple daily records may be broken), teleconference calls may be difficult to

arrange. In the case of a daily temperature record, the committee may conduct all business, including voting, via E-mail, and may allow the WFO to defer a site visit if not practicable and if the station has been visited within the past year.

5. Erroneous records

If upon future examination, it comes to the attention of a member of the SCEC that an officially recognized statewide record may be in error or otherwise invalid, that member of the SCEC should send an E-mail to the committee, informing them of the questionable record, and including documentation in support of the challenge. The challenging member should then invite all members to a teleconference, where the record will be discussed and a recommendation to the NCDC Director voted upon.

If a challenge to the validity of an existing official statewide record is made by someone outside the committee structure, the challenge should be directed toward the relevant WFO, who will review the challenge and, if the evidence warrants it, forward the challenge to the committee as per the steps outlined in the previous paragraph. If the NCDC Director determines that a record value should be changed, they may order the change without involving the SCEC.

6. Public visibility

NCDC, State Climatologists, and/or the American Association of State Climatologists may wish to publish a table of state records and/or post them on the web. The table may include the officially sanctioned record values, the date on which the records were set, and the stations at which they were set. Web postings may also describe the SCEC mission, the records it tracks, and the steps for reporting potential records or challenging existing records.