

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 9101

Global Daily Climatology Network, V1.0

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By

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1. **Data Set ID**

9101

2. **Data Set Name**

Global Daily Climatology Network, Version 1.0

3. **Data Set Aliases**

GDCN

4. **Access Method and Sort for Archived Data**

Access Method for Data Files:

All elements available for a single station are stored in an ASCII format data file. These data files can be accessed using a variety of programming languages (e.g C, Fortran, etc.) and/or software (e.g. spreadsheets). The data format (per one line) is as follows (in Fortran variable notation):

Variable	Type	Width	Start Column	End Column
STNID	Character	11	1	11
YEAR	Integer	4	12	15
MONTH	Integer	2	16	17
ELEMENT	Character	4	18	21
DATA	Integer	5	22	26
FLAG1	Character	1	27	27
FLAG2	Character	1	28	28

NOTE: DATA, FLAG1, and FLAG2 repeat 31 times for a single record (e.g. one line). Therefore one record of data represents one month of daily data.

The following lines of Fortan code can be used to read a single data file line:

```
INTEGER YEAR
INTEGER MONTH
INTEGER VALUE(1:31)
CHARACTER *1, FLAG(1:31,1:2)
```

```

CHARACTER *4, ELEMENT
CHARACTER *11, STNID

READ (unit,10) STNID, YEAR, MONTH, ELEMENT,
+(VALUE(i),FLAG(i,1), FLAG(i,2), i=1,31)
10  FORMAT(A11,I4,I2,A4,31(I5,2A1))

```

Access Method for Inventory Files:

Station information can be found in the ASCII format inventory file. The format of the inventory file is as follows (in Fortran variable notation):

Variable	Type	Width	Start Column	End Column
STNID	Character	11	1	11
LATITUDE	Real	7	12	18
LONGITUDE	Real	8	19	26
ELEVATION	Integer	5	27	31
ELEVATION ESTIMATE				
FLAG	Character	1	32	32
DATA SOURCE				
FLAG	Character	1	34	34
STN_NAME	Character	30	36	65
WMOID	Integer	5	66	70
STNID2	Character	8	71	78
STNID3	Character	8	79	86

The following lines of Fortran code can be used to read a single line from an inventory file:

```

INTEGER ELEVATION
INTEGER WMOID
REAL LATITUDE
REAL LONGITUDE
CHARACTER *1, ELEVATION_ESTIMATE_FLAG
CHARACTER *1, DATA_SOURCE_FLAG
CHARACTER *8, STNID2
CHARACTER *8, STNID3
CHARACTER *11, STNID
CHARACTER *30, STN_NAME

READ (unit,10) STNID, LATITUDE, LONGITUDE, ELEVATION,
+ELEVATION_ESTIMATE_FLAG,DATA_SOURCE_FLAG,STN_NAME,WMOID,

```

+STNID2,STNID3
10 FORMAT(A11,F7.2,F8.2,I5,A1,1x,A1,1X,A30,I5,A8,A8)

5. **Access Method and Sort for Supplied Data**

 Please see #4 above.

6. **Element Names and Definitions**

Element Names and Definitions for Data Files

STATION ID: The 11 character alphanumeric station identification element is comprised of 2 parts ... a 3 digit country code (see Appendix A) and an 8 digit station code. In some cases the last 5 digits of the 8 digit station code are the 5 digit World Meteorological Organization (WMO) number.

Many countries operate weather stations in foreign lands (e.g. possessions, military bases, research stations, etc.) and therefore it is possible for station IDs to have a 3 digit country code that differs from the country where the station is physically located (e.g. Canadian military base located in Europe).

YEAR: 4 digit year

MONTH: 2 digit month

ELEMENT: 4 character weather element that is one of TMAX (maximum temperature), TMIN (minimum temperature), or PRCP (total 24 hour precipitation).

DATA(31): There are 31 daily data values (per record) expressed as a 5 digit integer. The missing value is -9999 and non-missing values are in tenths of a degree Celsius for temperature and tenths of a millimeter for precipitation. Therefore, to obtain the whole measurement unit divide the non-missing integer datum by 10.0 to express value as either whole degree Celsius (to the nearest tenth) or whole millimeters (to the nearest tenth).

Example: (1) TMAX value in 5 digit integer format "00302" would be expressed as 30.2 degrees Celsius. (2) PRCP value in 5 digit integer format "01200" would be expressed as 120.0 millimeters.

DATA MEASUREMENT FLAG(31): There are 31 data measurement flags that are expressed as 1 character. These flags occur immediately following each 5 digit integer datum. Data measurement flags are as follows (Note: flags can apply to Tx = Maximum Temperature, Tn = Minimum Temperature, Pr = Total Precipitation):

- ` - Blank = no data measurement information (Tx,Tn,Pr)
- A - accumulated precipitation value (Pr)
- C - begin or continuing precipitation accumulation (Pr)
- E - estimated value provided by source (Pr)
- H - accumulated precipitation indicated by source, however no accumulated precipitation value was provided (Pr)
- J - source provided accumulated precipitation value, however no information on accumulation period was provided (Pr)
- T - trace accumulation reported by source (Pr)

QUALITY CONTROL FLAG(31): There are 31 quality control flags that are expressed as 1 character. These flags occur immediately following each data measurement flag. The quality control flags are as follows (Note: flags can apply to Tx = Maximum Temperature, Tn = Minimum Temperature, Pr = Total Precipitation):

- ` - Blank = no quality control information (Tx,Tn,Pr)
- F - Failed source quality control (Tx,Tn,Pr)
- S - Suspect value identified by source(Tx,Tn,Pr)
- X - Exceeds known world daily extreme for that particular element (Krause and Flood, 1997). (Tx,Tn,Pr)
- 0 - Temperature value is greater than or equal to 6.0 bi-weight standard deviations from the period bi-weight mean. (Tx,Tn) See Page 11-12 for details.
- 5 - Temperature value is greater than or equal to 5.0 and less than 6.0 bi-weight standard deviations from the period bi-weight mean. (Tx,Tn) See Page 11-12 for details.
- 4 - Temperature value is greater than or equal to 4.0 and less than 5.0 bi-weight standard deviations from the period bi-weight mean. (Tx,Tn) See Page 11-12 for details.
- 3 - Temperature value is greater than or equal to 3.0 and less than 4.0 bi-weight standard deviations from the period bi-weight mean. (Tx,Tn) See Page 11-12 for details.
- K - Streak value (value occurs 10 or more days in a row)

Note: 0.0 mm precipitation values are excluded. (Tx, Tn, Pr))

E - Extreme precipitation value ($\geq 90^{\text{th}}$ percentile of all observations within that month for the period of record). Example: Jan. 13, 1987, data measurement flag = 'E'. Therefore Jan. 13th 1987 is $\geq 90^{\text{th}}$ percentile value for all January observations in the entire station record. (Pr)

I - Internal consistency error, minimum temperature value greater than same day maximum temperature value. (Tx, Tn)

It is possible that one or more quality control flags may apply to a single datum. Therefore, the above listed flags are listed in order of precedence. Thus, if a value is suspect (e.g. 'S') and also an outlier (e.g. 'O') then the 'S' flag will be set for that datum.

Element Names and Definitions for Inventory File

STATION ID: same as for data file (11 character alphanumeric)

LATITUDE: Expressed in decimal degrees to the nearest hundredth of a degree. (7 digits)

LONGITUDE: Expressed in decimal degrees to the nearest hundredth of a degree. (8 digits)

ELEVATION: Expressed in whole meters (5 digits)

ELEVATION ESTIMATE FLAG: If a station had incomplete elevation information, attempts were made to estimate the elevation based on longitude and latitude. The Global Land One-km Base Elevation (GLOBE) data set was used to estimate the elevation (Hastings et. al., 1997). If left blank this field indicates the elevation was provided in the supplied metadata. If the elevation was estimated using GLOBE then this flag is set to 'E'. (1 character)

DATA_SOURCE_FLAG: A one character identifier indicating the source data network from which the data were supplied. In GDCN 1.0 this flag is either blank or set to 'G' to indicate Global Climate Observing System Network stations (GCOS) (Peterson et. al., 1997). (1 character)

STATION_NAME: Name of place or location of station. (30 characters)

WMO_ID: If supplied in the original metadata this 5 digit integer represents the World Meteorological Organization's 5 digit station identifier. (5 digits)

STATION_ID #2: 2nd supplied identifier from original metadata. This often is a cross reference with another station identifier. (8 characters)

STATION_ID #3: 3rd supplied identifier from original metadata. This often is a cross reference with another station identifier. (8 characters)

7. **Start Date**

March 1, 1840

8. **Stop Date**

November 30, 2001

9. Coverage

**The Global Daily Climatology Network (GDCN)
Version 1.0
All Stations**

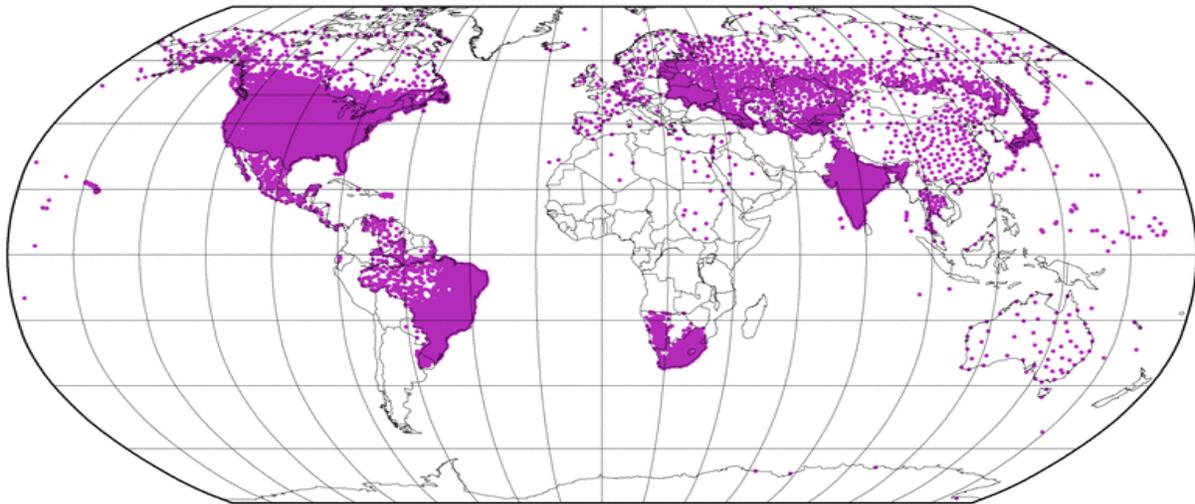


Figure 1. Global map of all stations within the GDCN Version 1.0. Note: Data record length and element availability varies by station. Total number of GDCN 1.0 stations = 32,857.

10. Location

- a. Africa
- b. Asia
- c. Europe
- d. Global
- e. North America
- f. South America
- g. Equatorial
- h. Mid-Latitude
- i. Polar
- j. Surface
- k. Antarctica

11. Keywords

- a. Temperature
- b. Surface Temperature
- c. Precipitation
- d. Daily

12. **How to Order Data**

Ask NCDC's Climate Services about the costs of obtaining this data set.

National Climatic Data Center
Veach-Baley Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
P: (828) 271-4800
F: (828) 271-4876
<http://www.ncdc.noaa.gov/contacts.html>

13. **Archiving Data Center**

National Climatic Data Center
Veach-Baley Federal Building
151 Patton Avenue
Asheville, NC 28801-5001

14. **Technical Contact**

NCDC.GDCN@noaa.gov

15. **Known Uncorrected Problems**

A. An undetermined number of stations within Mexico have recorded some of their temperature observations in Fahrenheit. No pattern has yet been identified so users should pay particular attention to the temperature quality control flags which may or may not be useful in identifying conversion issues.

B. Stations with non-standard practices for recording accumulated precipitation have been identified in Appendix D. Please see page 14 for further explanation.

16. **Quality Statement**

All of the GDCN data (metadata and data) have been processed through an extensive set of quality control procedures. The quality control consisted of two parts:

- (1) Simple datum checks (e.g. correct format, impossible values, out of range values, etc.).
- (2) Statistical analysis of sets of observations to locate and identify potential outliers and/or erroneous data.

The user is referred to Appendix C for a complete list of all quality control procedures used in step 1 (above). More extensive explanation for step 2 is provided below for both temperature (maximum and minimum) and precipitation.

Temperature QC:

The quality control of temperature identifies or removes the numerous problems that can exist with raw temperature data. The most notable problems with temperature data are the presence of outliers. Outliers often provoke controversy because when removed they can affect the final analysis of extreme weather events. However if erroneous outliers are included in the data set they can often adversely affect statistical computations. The general philosophy behind GDCN 1.0 is to provide the user with a minimal set of flags to identify the position of the datum within the overall distribution of observations. The user can then make the decision to include the datum based upon their particular application.

The method employed in the identification of outliers is based on robust and resistant measures of location and scale after Lanzante, 1995. The identification of outlier values within GDCN begins with quality control procedure #5 (Appendix C). This procedure appropriately flags all data values greater than or less than the known world extremes as published in the U.S. Army Corps of Engineers (Krause, 1997). Those values that are flagged are then excluded from future quality control calculations. Next, for both maximum and minimum temperature for each day within the station record, a series (X_i) of daily observations is created. This series is comprised of all non-missing data and for a specified day includes the observation from the day before, day after, and the day after, day of, and day before for all other years in the station record. For example, the calculation of the series (X_i) for June 6th, 1988 for a particular station

with 3 years of data (1987 through 1989) would consist of the following daily observations:

June 5,6,7 of 1987
 June 5,7 of 1988
 June 5,6,7 of 1989

This series is used to calculate the biweight mean and biweight estimate of standard deviation. Both of these estimators are more heavily weighted towards the center of their distributions than the tails. Thus, they are more resistant to outlier values. These estimators provide a more robust calculation of mean and standard deviation than traditional statistical methods which apply equal weight throughout the distribution. All stations for which this type of outlier identification was performed required at least 10 years of data so there was at least a minimum of 29 potential observations. A weight (u_i) is calculated for all n observations within (X_i):

$$u_i = (X_i - M) / (c \times MAD) \quad (1)$$

where M is the median of X_i and MAD is the median of the absolute deviations of the values from the median (Note: for any $*u_i* \leq 1.0$, $u_i=1.0$). The constant c represents a 'censor' value that controls the distance from the center of the distribution at which the weight is equivalent to zero. The censor value used in Lanzante, 1995 of 7.5 was also used throughout all GDCN 1.0 calculations. Therefore the biweight mean from Lanzante, 1995 is:

$$\bar{X}_{bi} = M + \left\{ \left[\sum_{i=1}^n (X_i - M)(1 - u_i^2)^2 \right] / \sum_{i=1}^n (1 - u_i^2)^2 \right\} \quad (2)$$

and the biweight estimate of standard deviation is:

$$s_{bi} = \left[n \sum_{i=1}^n (X_i - M)^2 (1 - u_i^2)^4 \right]^{0.5} / \left| \sum_{i=1}^n (1 - u_i^2)(1 - 5u_i^2) \right| \quad (3)$$

The resulting biweight estimators were used to determine the number of biweight standard deviations a particular value was from the biweight mean of the distribution. Values greater than or equal to 3 biweight standard deviations from the biweight mean were classified using the appropriate quality control flags. A summary of these flags is found on pages 6-7 in this documentation. Figure 2 illustrates the identification of these outlier values for a select GDCN 1.0 station.

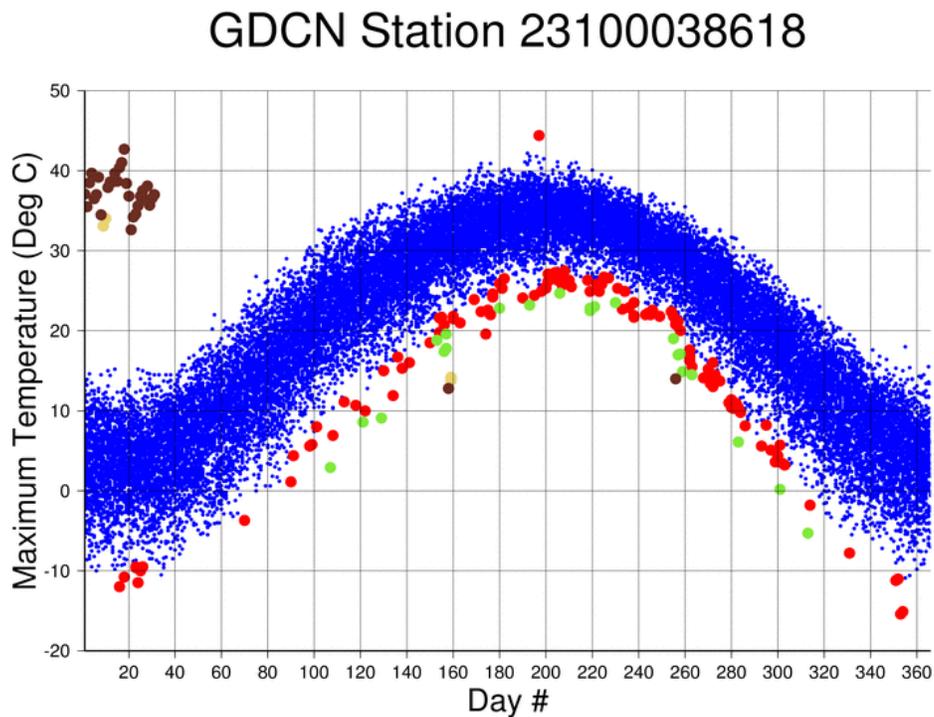


Figure 2. Maximum temperature observations for GDCN station 23100038618. Symbol colors represent quality control flag value - Blue = no flag, Red = '3', Green = '4', Gold = '5', Brown = 'O'.

Spatial quality control was conducted for maximum and minimum temperature by comparing monthly averaged values to an independently created gridded data set (Legates and Wilmott, 1990). Each monthly average was compared to the gridded monthly value and a difference series (for the entire period of record)

was computed. The median value of this difference series was then computed for each station series and these values were used to determine if a station was retained or excluded from the GDCN 1.0. Based upon this analysis no maximum or minimum temperature stations were excluded from GDCN 1.0.

Precipitation QC:

The quality control of precipitation is often problematic due to the spatial variability of precipitation and inadequate metadata (lack of information concerning observing practices and times). The precipitation quality control consisted of the basic checks listed in Appendix C. In addition careful initial format procedures were implemented to ensure that the received raw precipitation metadata information were preserved within the GDCN data measurement flags. However, this often lead to some discrepancies within the data. The data measurement flags 'H' and 'J' both illustrate two problems unique to accumulated precipitation (see pg. 6). Therefore in some cases the preservation of the incomplete or erroneous supplied metadata allows these problems to persist. Thus, users should pay particular attention to the data measurement flag when processing precipitation data.

Unique observing practices can lead to potentially erroneous analysis conclusions. A careful analysis (by day of week) was performed on all precipitation data to examine potential inconsistencies within the data record. In particular, one non-standard precipitation observing practice was identified. If the accumulated precipitation value was 0.0 mm then the observer would correctly record the accumulation but in the previous days included in the accumulation the observer would also record 0.0 mm values. Although not physically incorrect, these observers did not observe the same practice when the accumulation was greater than 0.0 mm. In those instances the previous days in the accumulated period would be set to the missing value. Furthermore this occurrence was almost exclusive to Monday accumulations from the weekend period. Thus, a careful analysis of the record would erroneously show that Saturday and Sunday always had 0.0 mm of precipitation or a missing value of precipitation, if indeed the general practice was to not observe on the weekend throughout the station record. Fortunately the incidence of this occurrence is small within the GDCN (< 100 stations) and thus Appendix D contains a list of stations that were identified with the above mentioned problem.

Spatial quality control was carried out in a similar manner described in the 'Temperature QC'. No precipitation stations were excluded from the GDCN 1.0 based upon the spatial precipitation analysis.

Duplicate Removal:

With over 800 million days of daily data, direct comparison of all data was not feasible due to computational and time limitations. Therefore, duplicate identification was conducted by comparison of metadata (geographic coordinates). Stations with exact or very similar geographic positions were identified and then their full records were compared and the percent of similarity was computed. Stations with exact or very high similarities were then identified and only the station with the longest total period of record was retained for inclusion in GDCN 1.0.

17. **Revision Date**

Version 1.0

18. **Source Data Sets**

National Climatic Data Center scientists collected the majority of daily data contained within this data set through cooperative research exchanges. In addition, many stations were collected through previously established data networks such as the Global Climate Observing System (Peterson, et. al., 1997). Appendix B provides a complete list of personnel who were responsible for collecting and establishing data exchange agreements between each country.

19. **Essential Companion Data Sets**

None

20. **Derived Data Sets**

None

21. References

Hastings, David A., and P. K. Dunbar, 1997. The development of global digital elevation data. Proceedings, 18th Conference on Remote Sensing, Kuala Lumpur. pp. J'S-3-1 to J'S-3-6.

Krause, Paul F. and Kathleen Flood. (1997). Weather and Climate Extremes (TEN-0099). Fort Belvoir, VA: U.S. Army Engineer Topographic Engineering Center).

Lanzante, John R. 1996. Resistant, robust, and nonparametric techniques for the analysis of climate data. Theory and examples, including applications to historical radiosonde station data. Int. J Climatol., 16, 1197-1226.

Legates, David R., and Cort J. Willmott. 1990. "Mean seasonal and spatial variability in gauge-corrected global precipitation." International Journal of Climatology, vol. 10. pp. 111-127.

Legates, David R. and Cort J. Willmott. 1990. "Mean seasonal and spatial variability in global surface air temperature." Theoretical and Applied Climatology, vol. 41, pp. 11-21.

Peterson, Thomas, Harald Daan, Philip Jones, 1997: Initial Selection of a GCOS Surface Network. Bulletin of the American Meteorological Society: Vol. 78, No. 10, pp. 2145-2152.

22. Summary

The Global Daily Climatology Network (GDCN) represents a compilation of global daily timescale data into a single and consistent format. The data set will serve the needs of researchers, weather-sensitive businesses, agriculture, and policy makers whose are dependent upon complete and accurate analysis of daily temperature and precipitation. Data within the GDCN have been extensively checked through a series of quality control procedures to ensure erroneous values have been removed and/or identified. The GDCN currently has over 800 million days of weather data and that number is expected to increase as the GDCN expands in the future.

23. Web Site

www.ncdc.noaa.gov/gdcn.html

GLOSSARY

Access Method and Sort for Archived Data -- How a digital data set can be accessed in its archived condition. If the data are sorted, how.

Access Method and Sort for Supplied Data -- How the user can access data in its most commonly supplied form. If the data are sorted, how.

Archiving Data Center -- Name, organizational acronym and address of institutions that archive and distribute the data.

Coverage -- The smallest latitude-longitude "box" on the earth's surface within which all data measurements occurred. Northernmost and southernmost latitudes, and westernmost and easternmost longitude, are required for coverage.

Data Set Aliases -- Other names or Ids associated with the data set, now or in the past.

Data Set ID -- A unique code number or acronym identifying the data set. Normally, it is the code number used by the data center at the data set is archived.

Data Set Name -- A descriptive name for the data set that provides a thumbnail description.

Elements -- The basic units of data that need to be described. Usually, elements are simply data variables such as "station id", "precipitation", "ocean depth", "daily maximum temperature".

Essential Companion Data Sets -- Other data sets, if any, that must be obtained in order to use this data set.

Derived Data Sets -- Other data sets, if any, that originated, in whole or in part, from this data set.

How to Order Data -- Describes how to find the approximate costs that are associated with obtaining the data set, and how to order the data.

Keyword -- Words or short phrases that suggest the data set.
Actual element names should not be used as keywords.

Known Uncorrected Problems -- Known data difficulties, if any,
for which no corrections have been made.

Location -- A collection of standard phrases that name the major
geographic areas, and the atmospheric layers, to which the
data refer.

Quality Statement -- A brief generalization of how good the data
are.

Reference -- Any important bibliographic references pertaining to
the data set.

Revision Date -- The date that this documentation is created, or
the date of its latest revision.

Start Date -- The date of the earliest data in the data set.

Stop Date -- The date of the latest data in the data set.

Summary -- A concise abstract that is used to capture a few of
the most important facts about the data set, most of which
should have appeared in more detail under individual topic
discussions.

Technical Contact -- The person who can be contacted to obtain
and provide information about the data.

Appendix A

3-digit country codes (used as the first 3 digits of the 11 character station ID) Note: A digital file of the following list is available at the GDCN web site - www.ncdc.noaa.gov/gdcn.html under 'Supplementary Files':

101 - Algeria
115 - Egypt
141 - South Africa
148 - Sudan
205 - China
207 - India
210 - Japan
213 - Kyrgyzstan
215 - Mongolia
221 - Korea
222 - Russia
223 - Saudi Arabia
227 - Tajikistan
228 - Thailand
229 - Turkmenistan
231 - Uzbekistan
301 - Argentina
303 - Brazil
306 - Ecuador
308 - Paraguay
313 - Uruguay
314 - Venezuela
403 - Canada
405 - Costa Rica
408 - El Salvador
410 - Guatemala
412 - Honduras
414 - Mexico
415 - Nicaragua
416 - Panama
425 - United States of America
501 - Australia
505 - Malaysia
514 - French Polynesia
531 - New Caledonia

602 - Armenia
603 - Austria
604 - Azerbaijan
605 - Belarus
606 - Belgium
607 - Bosnia
612 - Denmark
613 - Estonia
614 - Finland
615 - France
616 - Georgia
617 - Germany
618 - Greece
620 - Iceland
621 - Ireland
622 - Israel
623 - Italy
625 - Kazakhstan
626 - Latvia
628 - Lithuania
629 - Luxembourg
631 - Moldova
633 - Netherlands
634 - Norway
635 - Poland
636 - Portugal
641 - Slovakia
642 - Slovenia
643 - Spain
645 - Sweden
646 - Switzerland
647 - Syria
650 - Ukraine
651 - United Kingdom

Appendix B

The National Climatic Data Center staff listed below were responsible for obtaining GDCN data. All data contained within the GDCN are believed to be available for re-distribution through the GDCN in compliance with WMO resolution 40. If you have further questions about the National Climatic Data Center's right to re-distribute data through the GDCN, please email your questions and/or concerns to:

NCDC.GDCN@noaa.gov

Dr. Pavel Ya. Groisman
Visiting UCAR Scientist
National Climatic Data Center
Asheville, NC 28801-5001

Dr. Thomas C. Peterson
Physical Scientist
National Climatic Data Center
Asheville, NC 28801-5001

Dr. David R. Easterling
Principal Scientist
National Climatic Data Center
Asheville, NC 28801-5001

Mr. Russell S. Vose
Chief, Climate Analysis Branch
National Climatic Data Center
Asheville, NC 28801-5001

**Global Daily Climatology Network (GDCN), Version 1.0
Data Collectors**

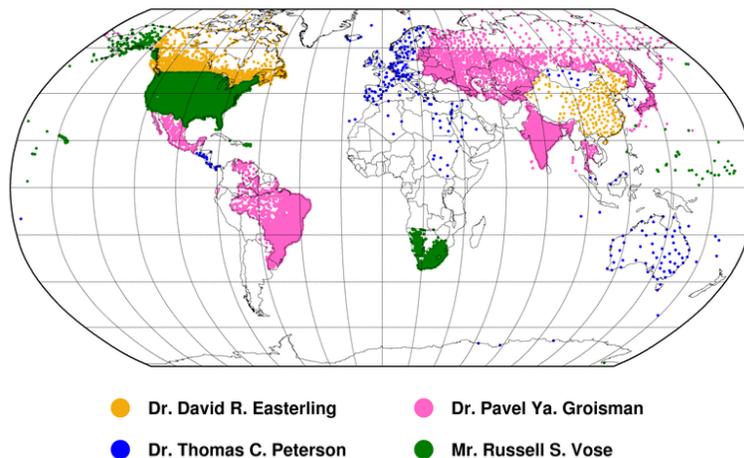


Figure 3. Original GDCN data source collectors

Appendix C

Data and station information format quality control:

1. Check if station identification in station file matches the station identification used in the station file name.
2. Check all non-existent days for missing data. (Example: February, 30th should always equal the missing value)
3. Check for proper sort of station data and inventory file.
4. Trace precipitation (Flag 'T') must equal 0.0.
5. Check that all record elements are one of PRCP (total precipitation), TMAX (maximum temperature), or TMIN (minimum temperature)
6. Check if the 4-digit year element within the station data file is: $1800 \leq \text{YEAR} \leq 2001$.
7. Check that month field is $1 \leq \text{MONTH} \leq 12$.
8. Check both the data measurement and quality control flags to ensure they only contain documented flags.
9. Check each datum to ensure they are integer values.
10. Check for duplicate stations within the entire data set.
11. Check for station $-90.0 \leq \text{Latitude} \leq 90.0$
 $-180.0 \leq \text{Longitude} \leq 180.0$
12. Check that the number of stations within the inventory file matches the number of station data files.
13. Check for precipitation < 0.0 mm.
14. Check for maximum temperature $<$ minimum temperature for the same day.
15. Check for days with the same value repeated 10 or more consecutive times (e.g. quality control flag = 'K'). Note: 0.0 mm

precipitation values were excluded.

16. Check for daily element value exceeding known world extreme according to the U.S. Army Corps of Engineers World Extremes (Krause and Flood, 1997).

World Extremes used for this data set:

highest temperature: El Azizia, Libya 57.8 deg C
September 13, 1922

lowest temperature: Vostok, Antarctica -89.4 deg C
July 21, 1983

greatest 24-hr rainfall: Foc-Foc, Réunion Island 1828.8 mm
January 7th to 8th, 1966

17. If source country supplied quality control information (generally failed or suspect quality control) for a datum then the quality control flag was set as either 'F' for failed quality control or 'S' for suspect datum.

18. Compute monthly sums and/or averages for each station and compare to the global gridded climatology by Legates and Wilmott, 1990.

Appendix D

Stations with potentially inconsistent accumulated precipitation observing practices. See page 14 for further explanation. (Note: A digital file containing a list of the following stations is available at the GDCN web site (www.ncdc.noaa.gov/gdcn.html) under 'Supplementary Files':

14100174520	31300001784	42500455387	42500914000
14100284150	40301191440	42500456909	50100094380
14100315070	40302204000	42500510145	50100094570
14100322090	40304013400	42500510211	50100094693
14101274850	40306044903	42500510470	50100094784
14101516040	40306060773	42500511075	50100094869
14101521900	40307022280	42500511339	50100094910
14101524820	40307063400	42500511665	
14102090390	40307074240	42500511887	
14102400730	40308100500	42500512751	
14102985120	40308202300	42500513734	
14103044460	40308206450	42500513982	
14103688310	42500055507	42500514318	
14103728520	42500058064	42500514634	
14103734850	42500067432	42500514742	
14104002030	42500105708	42500515286	
14104753700	42500113595	42500515710	
14104757610	42500244328	42500515864	
14105116720	42500300870	42500516134	
14105140100	42500301265	42500516588	
14105558780	42500301580	42500518760	
14105945390	42500304207	42500518815	
14105945900	42500304944	42500518941	
14105948060	42500305171	42500519955	
20704171200	42500305679	42500660040	
3030C5-0500	42500318778	42500660152	
3030E3-0530	42500336786	42500661345	
31300001220	42500338366	42500662801	
31300001440	42500340394	42500663904	
31300001558	42500358780	42500665020	
31300001709	42500360785	42500667843	
31300001734	42500361033	42500669466	
31300001751	42500367978	42500669608	

Appendix E

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WMO Resolution 40
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Appendix F

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