ClimoBase: Rouse Canadian Surface Observations of Weather, Climate, and Hydrological Variables, 1984-1998, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

National Snow and Ice Data Center. 2014. *ClimoBase: Rouse Canadian Surface Observations of Weather, Climate, and Hydrological Variables, 1984-1998, Version 1.* Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center. https://doi.org/10.7265/N5FX77CH. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/G10008

National Snow and Ice Data Center

TABLE OF CONTENTS

1 OVERVIEW 2
2 DETAILED DATA DESCRIPTION 2
2.1 Summary 3
2.1.1 Data Files 3
2.1.2 Readme Files 3
2.2 Format 4
2.2.1 Data Files 4
2.2.2 Readme Files 4
3 FILE NAMING CONVENTION 5
3.1.1 Data Files 5
3.1.2 Readme Files 7
3.2 File and Directory Structure 8
3.3 File Size 10
3.4 Spatial Coverage and Resolution 10
3.5 Temporal Coverage and Resolution 17
3.6 Parameters 17
3.6.1 Parameter Description 17
4 DATA ACQUISITION AND PROCESSING 25
4.1 Sensor or Instrument Description 26
4.2 Quality Assessment 26
5 REFERENCES AND RELATED PUBLICATIONS 26
5.1 Related Publications 27
6 CONTACTS AND ACKNOWLEDGMENTS 27
7 DOCUMENT INFORMATION 27
7.1 Document Authors 27
7.2 Document Creation Date 27
7.3 Date Last Updated 27

1 OVERVIEW

ClimoBase is a collection of surface climate measurements taken in Northern Canada by Dr. Wayne Rouse between 1984 and 1998 in three locations: Churchill, Manitoba; Marantz Lake, Manitoba; and Inuvik, Northwest Territories. ClimoBase was created to provide a central repository for Dr. Wayne Rouse's raw field data. Dr. Rouse is now Professor Emeritus at McMaster University, Hamilton, Ontario. Dr. Rouse was considered by the Canadian Association of Geographers (CAG) to have "pioneered field research on the evaporation of high latitude sites, including woodlands, tundra, wetland and lake surfaces" (1998). He received the 1998 CAG Award for Scholarly Distinction in Geography. In 2001, Dr. Roger Barry, the Director of NSIDC at the time, received a copy of ClimoBase for NSIDC. We are publishing these data now as part of an effort to help assure the preservation of small data collections that are not part of a larger funded program, and that may receive wider use through documentation and distribution on line.

2 DETAILED DATA DESCRIPTION

These data are surface-climate measurements from 1984-1998, including solar time, wind speed, wind direction, dry-bulb, wet-bulb, and vapor pressure in 24 sites focused on three Northern Canada locations: Churchill, Manitoba, Marantz Lake, Manitoba, and Inuvik, Northwest Territories. The sites were chosen to include a variety of terrains in the study and were categorized into the following groups:

- Sedge fen wetland
- Willow-birch wetland
- Lichen-heath
- Bedrock boulders/Heath
- Spruce- tamarack forest
- Tundra lake
- Creek
- Various (for example, a basin with different terrains: sedge, willow, lichen-heath, forest, etc.)
- Sparse vegetation (short grass/sedge, heath spp.)
- Coastal marsh (tall grass, sandy soils)

The measurements were taken in increments ranging from seasonally to every 15 minutes. In all, 177 different variables were measured and recorded. The data are valuable due to their unique and consistent nature.

ClimoBase was created to provide a central repository for Dr. Wayne Rouse's raw field data. Dr. Rouse is now Professor Emeritus at McMaster University, Hamilton, Ontario. Dr. Rouse was considered by the Canadian Association of Geographers (CAG) to have "pioneered field research on the evaporation of high latitude sites, including woodlands, tundra, wetland and lake surfaces"

(1998). He received the 1998 CAG Award for Scholarly Distinction in Geography. In 2001, Dr. Roger Barry, the Director of NSIDC at the time, received a copy of ClimoBase for NSIDC. We are publishing these data now as part of an effort to help assure the preservation of small data collections that are not part of a larger funded program, and that may receive wider use through documentation and distribution on line.

2.1 Summary

ClimoBase was compiled to serve as a central repository for the data collected through the research of Dr. Wayne Rouse in Northern Canada from 1984 through 1998. The collection includes 7007 data files that list surface climate measurements collected at regular intervals, along with a user manual and README files that detail data attributes and measurement techniques.

Note: The ClimoBase Users Manual (Boudreau, 1999) contains some outdated information. It describes these data as they were in 1999 as well as how to install the original database from the data files. This newer version of the data have been reformatted into comma separated value (.csv) files for NSIDC so that they are easy to read in Excel or any text editor, so sections 2, 4, 6, and 7 of the user manual do not pertain to this data set. However, those sections do still contain valuable information about the provenance of the data. Sections 3 and 5 of the ClimoBase Users Manual do contain pertinent information and are referenced often throughout this document as a place to find specifics about site location, temporal resolution, and measurements taken.

2.1.1 Data Files

There are two types of data files: daily and seasonal. Daily data files mostly contain half-hourly data, however, hourly and 15-minute data also exist for certain data sets. The seasonal data files contain discrete daily values, usually manually measured once a day (for example: water table elevation, rain gauge amounts, frost table depth, etc.).

2.1.2 Readme Files

There are two different types of readme files: study site overviews and data parameter descriptions. The study site overview Readme files describe the geographical location of the sites, the measurements taken, the instruments used, and the time frame that the measurements took place; there is one of these files for each site. The data parameter description Readme files describe the attributes and list the headings of each column of the data files. There is one data parameter description Readme file for each year that measurements were taken at a site. This means that all data files from a particular year and site share one common description file. Note: the data parameter description Readme files are called "control" files in the ClimoBase Users Manual (Boudreau, 1999).

2.2 Format

2.2.1 Data Files

The data files are in comma separated value (.csv) format. Both the daily and seasonal data files contain columns of data by parameter separated by a comma with no headers. A data parameter descriptions Readme file describes the contents of the columns. A data file can have up to 110 different parameters. A null value means that the original value was deemed erroneous or could not be determined. See the 4 below of this document for further information on the processing of the data.

2.2.2 Readme Files

The study site overviews and data parameter descriptions Readme files are in text format (.txt). The study site overviews are provided in paragraph format providing a written description of the sites. The data parameter description files contain headers describing the data like year and number of parameters as well as columns of a variety of parameter codes which correspond to the parameters in the related data files. The top portion of the description Readme files describe the daily data files and the lower portion of the files, after the "DAY File Parameters" line, describe the seasonal files. A parameter code has three parts:

VVVLLUU

Where:

Table 1. Data Parameter Description Readme File Parameter Code Description

Variable	Description
VVV	3-digit variable code that identifies the parameter in the specified column of the data files. See Table 5 for the codes and variables.
LL	2-digit level code. When value is greater than zero, a multi-level variable is assumed.
UU	2-digit unit code identifying the units of the parameter identified with the variable code. See Table 6 for the units and codes.

Example: In the parameter code 1370501, 137 corresponds to dry-bulb temperature, 05 is the Level, and 01 is the Unit Code, which corresponds to units of °C.

For complete details on how to interpret the data parameter description files with examples, see section 3.3.2 and 3.3.3 of the ClimoBase Users Manual (Boudreau, 1999).

3 FILE NAMING CONVENTION

3.1.1 Data Files

The data files are named according to the following convention:

GGSSTTYY.ddd.csv

Where:

Table 2. File Naming Convention Description

<table>
<tr><th>Variable</th><th>Description</th></tr>
<tr><td>GG</td><td>2-digit Geographic Location Code
<table>
<tr><th>GG Code</th><th>Location</th></tr>
<tr><td>01</td><td>Churchill, MB</td></tr>
<tr><td>02</td><td>Marantz Lake, MB (including Waterhole Lake)</td></tr>
<tr><td>03</td><td>Inuvik, NWT</td></tr>
</table></td></tr>
<tr><td>SS</td><td>2-digit Site Name Code
<table>
<tr><th>SS Code</th><th>Site Name (unofficial)</th><th>SS Code</th><th>Site Name (unofficial)</th></tr>
<tr><td>01</td><td>Sedge, Site4 (1987)</td><td>13</td><td>Site2 (1987)</td></tr>
<tr><td>02</td><td>Willow</td><td>14</td><td>Site3 (1987)</td></tr>
<tr><td>03</td><td>Beach, Ridge</td><td>15</td><td>Eastern Creek Basin</td></tr>
<tr><td>04</td><td>Rocky</td><td>16</td><td>Pfrost</td></tr>
<tr><td>05</td><td>Twin Lakes (note: no files exist with this code)</td><td>17</td><td>Eddy</td></tr>
<tr><td>06</td><td>Golf Lake</td><td>18</td><td>LowTVC (lowland)</td></tr>
<tr><td>07</td><td>reserved (note: no files exist with this code)</td><td>19</td><td>Mobile Qg</td></tr>
<tr><td>08</td><td>RCT-1</td><td>20</td><td>Main (1984,1985)</td></tr>
<tr><td>09</td><td>RCT-2</td><td>21</td><td>Marantz</td></tr>
<tr><td>10</td><td>Airport (AES) (note: no files exist with this code)</td><td>22</td><td>UpTVC (upland)</td></tr>
<tr><td>11</td><td>Eastern Creek</td><td>23</td><td>Rodney</td></tr>
<tr><td>12</td><td>Site1 (1987)</td><td>24</td><td>Waterhole Lake</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Variable</th><th>Description</th></tr>
<tr><td>TT</td><td>2-digit Terrain Type Code
<table>
<tr><th>TT Code</th><th>Terrain Type</th></tr>
<tr><td>01</td><td>Sedge fen wetland</td></tr>
<tr><td>02</td><td>Willow-birch wetland</td></tr>
<tr><td>03</td><td>Lichen-heath</td></tr>
<tr><td>04</td><td>Bedrock boulders/Heath</td></tr>
<tr><td>05</td><td>Spruce-tamarack forest</td></tr>
<tr><td>06</td><td>Tundra lake</td></tr>
<tr><td>07</td><td>Creek</td></tr>
<tr><td>08</td><td>Various (i.e. a mosaic, e.g. a basin: sedge, willow, lichen-heath, forest, etc.)</td></tr>
<tr><td>09</td><td>Sparse vegetation (short grass/sedge, heath spp.)</td></tr>
<tr><td>10</td><td>Coastal marsh (tall grass, sandy soils)</td></tr>
</table></td></tr>
<tr><td>YY</td><td>2-digit year</td></tr>
<tr><td>ddd</td><td>3-digit day of year for daily files and "DAY" for seasonal files</td></tr>
<tr><td>.csv</td><td>Indicates that this file is in comma separated value format</td></tr>
<tr><td>.txt</td><td>Indicates that this file is in text format</td></tr>
</table>

Example

01080494.145.csv which translates to Churchill, MB; site RCT-1; terrain type bedrock boulders/heath; in 1994 on day 145.

3.1.2 Readme Files

Study Site Overview Readme Files

The overview readme files are named according to the following convention:

GGSSTT.README.txt

See Table 2 for file naming convention code descriptions.

Data Parameter Description Readme Files

The parameter description readme files are named according to the following convention:

GGSSTTYY.INI.README.txt

See Table 2 for file naming convention code descriptions.

3.2 File and Directory Structure

Data are available on the FTP site in the ftp://sidads.colorado.edu/pub/DATASETS/NOAA/G10008/ directory. Within this top level directory is a directory for each research site, named with a site code, and within the research-site directories is a Data directory and a ReadMe directory that contain the data and the Readme files, respectively. See Table 3 and Figure 1 for further details.

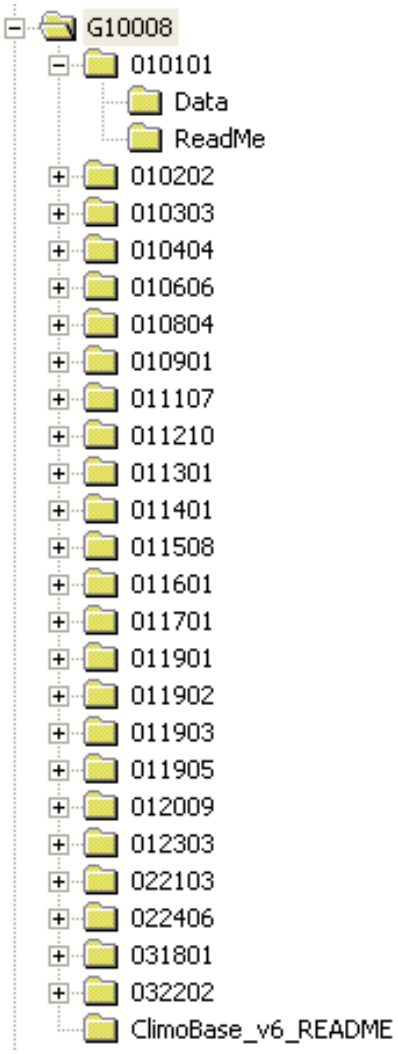

Figure 1. FTP Directory Structure

Table 3. Directory Structure Description and Contents

Directory	Description
GGSSTT	6-digit research site code directory name. See Table 2 for the code values.
GGSSTT/Data	Contains the data files for each year that data was taken at that research site.
GGSSTT/ReadMe	Contains the Readme files that describe the data files.
ClimoBase_v6_README	Contains 2 Readme files. One that decodes the headers of the data files (HEADERS.prn.README.txt) and the other describes the units of the headers (UNITS.prn.README.txt). This information is also consolidated for easy reference in Table 5 and Table 6 of this document.

3.3 File Size

The data files range in size from .5 KB to 32 KB and the Readme files range in size from 1 KB to 19 KB. The total volume of the data files and Readme files together is approximately 31 MB.

3.4 Spatial Coverage and Resolution

These data were gathered from 24 research sites in 3 locations in Northern Canada: Churchill, Manitoba; Marantz Lake, Manitoba; and Inuvik, Northwest Territories.

The 24 locations lie within this approximate bounding box:

Southernmost Latitude: 58.13° N
Northernmost Latitude: 68.74° N
Westernmost Longitude: 133.51° W
Easternmost Longitude: 93.82° W

Specific latitude and longitude of each site, if known, is given in Table 4.

Table 4. Site Descriptions and Dates

Site Name (unofficial)	Location	Lat/Lon	Description	Data Collection Dates	Type of Data Collected
Sedge, Site4 (1987)	Churchill, MB	58° 40' N, 93° 49' W	A sedge-dominated fen wetland located approximately 30 km ESE of Churchill, MB, and 12 km due south of the coast of Hudson Bay. The Sedge and Site4 sites are at the same location. Prior to 1989, the site was referred to as Site4 after that it was referred to as the Sedge site.	1 June to 13 August 1987 19 June to 1 September 1989 19 June to 22 August 1990 16 June to 24 August 1991 8 June to 3 September 1992 14 June to 24 August 1993 6 June to 26 August 1994 12 June to 25 August 1995 4 June to 25 August 1996 4 June to 6 September 1997	soil temperature, temperature and humidity profiles, soil heat flux, net wave radiation
Willow	Churchill, MB	58° 46' N, 93° 53' W	Dwarf willow-birch forest located along a portion of the coast of Hudson Bay, 20 km east of Churchill, MB.	19 June to 24 August 1990 15 June to 23 August 1991	soil temperature, temperature and humidity profiles, soil heat flux, soil moisture

Site Name (unofficial)	Location	Lat/Lon	Description	Data Collection Dates	Type of Data Collected
Beach, Ridge	Churchill, MB	58° 44' N, 93° 53' W	Upland lichen-heath terrain, 20 km east of Churchill, MB and 800 m south of Bird Cove, located on a raised beach complex and was referred to as the Ridge site in 1991 and the Beach site in 1996.	21 June to 23 August 1991 4 June to 23 August 1996	soil temperature, temperature and humidity profiles, soil heat flux, net wave radiation
Rocky	Churchill, MB	58° 47' N, 93° 58' W	Exposed bedrock and lichen-heath mats 13 km east of Churchill, MB located on the high bedrock bluffs near the coast of Hudson Bay, north of "Launch road" and 200 m NE of an old Department of National Defense building.	27 June to 24 August 1995	soil temperature, temperature and humidity profiles, soil heat flux, net wave radiation
Twin Lakes	Churchill, MB	58° 37' N, 93° 49' W	The site was a mixed conifer stand covering ~3500 ha surrounding two small lakes (locally known as the Twin Lakes). It is situated -40 km to the east of Churchill and 15 km south of the coast of Hudson Bay	No files were found that contain data from this site.	
Golf Lake	Churchill, MB	58° 45' N, 93° 58' W	Medium-sized tundra lake approximately 15 km east of Churchill, MB.	21 June to 24 August 1991 17 June to 24 August 1995	Net and reflected solar radiation and water surface temperature, soil heat flux of the bottom of the lake

Site Name (unofficial)	Location	Lat/Lon	Description	Data Collection Dates	Type of Data Collected
RCT-1	Churchill, MB	Unknown	Located 400 m east of the Churchill airport control tower situated in solid Ordovician sandstone	25 May to 31 December 1994 1 January to 31 December 1995 1 January to 31 December 1996 1 January to 31 December 1997 1 January to 28 October 1998	permafrost temperatures, air temperature, and relative humidity
RCT-2	Churchill, MB	Unknown	sedge-dominated wetland area with hummock and hollow topography located approximately 700 m due west of the midpoint of Churchill's longest (paved) runway, just south of a gravel road along an abandoned railway spur	15 June to 31 December 1996 1 January to 31 December 1997 1 January to 31 December 1998	permafrost temperature and soil heat flux
Airport (AES)	Churchill, MB	58° 44' N, 94° 04' W	Churchill Airport	No files were found that contain data from this site.	
Eastern Creek	Churchill, MB	Unknown	Three stream gauging stations were set up; two at the Eastern Creek sources (Willow Creek and Upper Eastern Creek), and one near the mouth of the creek where it flows under Launch Road and into Hudson Bay (Lower Eastern Creek).	12 June to 25 August 1991 11 June to 26 August 1992 17 June to 26 August 1993 16 June to 26 August 1994	water velocity and water depth

Site Name (unofficial)	Location	Lat/Lon	Description	Data Collection Dates	Type of Data Collected
Site1 (1987)	Churchill, MB	Unknown	Located in a coastal marsh area along the coast of Hudson Bay, near Bird Cove. The predominant vegetation was tall grasses, sedges, and reeds.	1 June to 15 August 1987	temperature (air and soil)
Site2 (1987)	Churchill, MB	Unknown	Located in a sedge meadow several kilometers inland from the coast of Hudson Bay.	1 June to 16 August 1987	temperature (air and soil)
Site3 (1987)	Churchill, MB	Unknown	Located in a sedge meadow 10 km inland from the coast of Hudson Bay.	1 June to 13 August 1987	temperature (air and soil)
Eastern Creek Basin	Churchill, MB	58° 45' N, 93° 57' W	Network of 18 stations along two transects that ran through the Eastern Creek drainage basin.	9 June to 24 August 1991 11 June to 26 August 1992 20 June to 26 August 1993 14 June to 26 August 1994	water table location and rainfall amounts
Pfrost	Churchill, MB	Unknown	Permafrost site installed at the main Sedge site in Churchill	30 August to 31 December 1995 1 January to 26 December 1996	Permafrost temperature
Eddy	Churchill, MB	Unknown	Eddy site setup over wet tundra, 100 m north of the present Sedge site in Churchill.	16 September to 16 October 1995 2 January to 31 December 1996 1 January to 12 February 1997	soil heat flux

Site Name (unofficial)	Location	Lat/Lon	Description	Data Collection Dates	Type of Data Collected
LowTVC (lowland)	Inuvik, NWT	68° 44' 13" N, 133° 30' 21" W	Wetland in Trail Valley Creek, approximately 75 km NNE of Inuvik, NWT	22 May to 31 December 1996 1 January to 31 December 1997 1 January to 17 August 1998	soil heat flux, radiation, temperature (air and surface)
Mobile Qg	Churchill, MB	Unknown	Network of four sites with different terrain types (sedge, forest, lichen-heath, and willow-birch) in the Churchill, MB area. Sedge: located near the main Sedge site, north of the Twin Lakes forest Forest: located near the Twin Lakes site Lichen: located in an extensive area of lichen mats on a raised beach ridge, 400 m north of Lindy Lake Willow: located near the main Willow site	Sedge: 19 June to 6 July 1994 Forrest: 9 July to 25 July 1994 Lichen: 26 July to 10 August 1994 Willow: 10 August to 26 August 1994	soil heat flux
Main (1984,1985)	Churchill, MB	58° 45' N, 93° 58' W	Dry, well drained and sparsely vegetated terrain located 15 km east of Churchill, MB on a sandy raised beach plateau, 500 m north of Golf Lake and 300 m south of Launch road.	14 May to 21 August 1984 26 April to 19 September 1985	soil temperature, temperature and humidity profiles, soil heat flux, net wave radiation

Site Name (unofficial)	Location	Lat/Lon	Description	Data Collection Dates	Type of Data Collected
Marantz	Marantz Lake, MB	58° 8' N, 93° 59' W	A peat plateau (approximately 2 m deep), covered by thick lichen mats near an abandoned military installation located near Marantz Lake in Northern Manitoba	14 May to 18 August 1984 4 June to 15 September 1985	soil temperature, temperature and humidity profiles, soil heat flux, net wave radiation
UpTVC (upland)	Inuvik, NWT	68° 44' 13" N, 133° 30' 19" W	Upland area located on the north side of Trail Valley Creek, approximately 75 km NNE of Inuvik, NWT	20 May to 31 December 1997 1 January to 17 August 1998	soil heat flux, radiation, temperature (air and surface)
Rodney	Churchill, MB	Unknown	Permafrost site located on a raised beach ridge 1 km due south of Bird Cove, Churchill, MB	10 June to 31 December 1996 1 January to 12 February 1997	permafrost temperature and soil heat flux
Waterhole Lake	Marantz Lake, MB	58° 44' N, 93° 49' W	Medium-sized tundra lake in Northern Manitoba	15 June to 16 August 1985	evaporation, net radiation, heat flux, temperature

3.5 Temporal Coverage and Resolution

The various climate measurements were taken between 1984 and 1998, generally in regular intervals ranging from seasonally to every 15 minutes, but usually half hourly, for approximately 75 to 150 consecutive days in each year. The dates that measurements were taken at each site are listed in Table 4. Detailed information of temporal coverage and resolution regarding each site location can be found in the Readme files that accompany the data files as well as in the descriptions of each site in Section 5 of the ClimoBase Users Manual (Boudreau, 1999).

3.6 Parameters

177 different parameters dealing with surface-climate measurements are available from this data set including solar time, wind speed, wind direction, soil temperature, soil heat flux, albedo, temperature (air, water, and surface), and vapor pressure. See Table 5 for the complete list of parameters with their descriptions and units.

3.6.1 Parameter Description

Table 5. Parameter Description and Codes

Code	Parameter	Description	Units
001	ALBEDO	Albedo (K↑/ K↓)	unitless
002	ALPHA	Priestley-Taylor alpha coefficient (Qe/Qeq)	unitless
003	AM32_T	Reference temperature (for TC's) of AM32 multiplexer	°C
004	AM416_T	Reference temperature (for TC's) of AM416 multiplexer	°C
005	Autowell	Depth of water table (negative values=depth below surface)	mm
006	AVG_MRG	Average rainfall from several manual rain gauges (E. Creek Basin)	mm
007	BETA	Bowen ratio (Q_h/Q_e)	unitless
008	CLD_cov	Cloud cover as observed at the Churchill Weather Station	tenths
009	CLD_opc	Cloud opacity as observed at the Churchill Weather Station	tenths
010	CO2	Mean ambient CO_2 concentration	ppm
011	CO2(#)	Carbon Dioxide concentration at level # (1=bottom)	ppm
012	CO2(Humm)	Mean ambient CO_2 concentration 0.10 m above a hummock	ppm
013	CO2/z	Mean CO_2 gradient between 0.35 m and 3.2 m	ppm m^{-1}
014	CO2mV(#)	Non-linear CO_2 IRGA voltage at level # (1=bottom)	mV

Code	Parameter	Description	Units
015	CR10_Batt	Campbell CR10 data logger's battery voltage	V
016	CS615per	Period measured by the CS615 TDR (soil moisture 0 - 20 cm)	ms
017	DAY	Day of the month	unitless
018	DEPTH	Mean depth of Golf Lake (areally weighted)	m
019	DIR	Wind Direction	°
020	DIR_SD	Standard deviation of wind direction	°
021	DOY	Day of the year	unitless
022	Dry_GT(#)	Ground temperature at various levels (#) below a dry area	°C
023	dS	CO_2 storage term	g m^{-2} d^{-1}
024	e	Ambient vapour pressure at a reference height	kPa
025	E	Number of periods (48 or 24 per day) with East winds	Periods d^{-1}
026	e(#)	Vapour pressure at level # (1=bottom)	kPa
027	e0	Estimated surface vapour pressure (from e profile extrapolation)	kPa
028	eCR7(#)	Vapour pressure as computed by the CR7 logger (1984-85)	kPa
029	Encl_T	Insulated IRGA enclosure temperature (@ back of IRGA)	°C
030	Evap	Evaporation calculated from Q_e and L_v (based on Tair)	mm
031	FAN_Batt	Voltage of the Q* fan and enclosure heater battery	V
032	Fc	CO_2 flux after the Webb correction for Q_e was applied	mg m^{-2} s^{-1}
033	Fc_AERO	CO_2 flux before the Webb corrections (calc. using wind profile)	mg m^{-2} s^{-1}
034	Fc_BREB	CO_2 flux before the Webb corrections (calc. using K_c from Q_h)	mg m^{-2} s^{-1}
035	Fc_EC	CO_2 flux (eddy corr.) after the Q_e Webb correction was applied	mg m^{-2} s^{-1}
036	Fc_ECraw	Eddy correlation CO_2 flux before the Webb corrections	mg m^{-2} s^{-1}
037	Fc_raw	CO_2 flux before the Webb corrections	mg m^{-2} s^{-1}
038	Fc_raw2	CO_2 flux before the Webb corrections (post 1995)	g m^{-2} d^{-1}
039	Frac_JD	Fractional day of year expressed as DOY + a decimal fraction	unitless
040	FT	Frost table depth as estimated by the zero degree isotherm	m
041	FT_man	Frost table depth as estimated by manual probing	m
042	GT(#)	Ground temperature at level # (1=closest to surface)	°C

Code	Parameter	Description	Units
043	GTlg(#)	Ground temperature at the Sedge site long sensor rod (2.25 m)	°C
044	GTsh(#)	Ground temperature at the Sedge site short sensor rod (0.90 m)	°C
045	H20%	CS615 TDR volumetric soil water content (m^3 m^{-3} X 100%)	%
046	HEIGHT	Height of the balloon sonde above the surface (±5 m)	m
047	Holl_GT(#)	Ground temperature at various levels (#) below a hollow	°C
048	Holl_H20%	Volumetric soil water content (m^3 m^{-3}×100%) beneath a hollow	%
049	HR (CST)	Central Standard Time (Churchill, MB). Format: hh:mm	hh:mm
050	HR (GMT)	Greenwich Mean Time (Universal Co-ordinated Time)	hh:mm
051	HR (MST)	Mountain Standard Time (Inuvik, NWT)	hh:mm
052	HR (Solar)	Solar hour for longitude of site	hh:mm
053	HT(#)	Instrument height of each level (#=1-3) above Golf L. surface	m
054	Humm_GT(#)	Ground temperature at various levels (#) below a hummock	°C
055	Humm_$H_2$0%	Volumetric soil water content (m^3 m^{-3}×100%) beneath a hummock	%
056	In_Temp	Inflow temperature of CO_2 sample at IRGA	°C
057	IRGA_T	Optical bench temperature (exterior) in the IRGA	°C
058	K↑	Reflected solar radiation flux density	W m^{-2}
059	K↓	Incoming solar radiation flux density	W m^{-2}
060	Kh	Turbulent transfer coefficient for sensible heat (eddy conductivity)	m^2 s^{-1}
061	L↓	Incoming long-wave radiation flux density (pyrgeometer)	W m^{-2}
062	L↓_TEMP	Internal temperature of the pyrgeometer (used for correction)	°C
063	LATERAL	Lateral winds: (>270° and <315°) OR (>70° and <136°) (SECTOR #3)	
064	LEC_Q	Discharge at the Lower Eastern Creek gauging station	m^3 s^{-1}
065	LOG_Batt	Campbell data logger's battery voltage	V
066	Lv_CO2	Levels used for CO_2 concentration profile (#=used, 0=not)	unitless
067	Lv_TEMP	Levels used for temperature (dry-bulb) profile (#=used, 0=not)	unitless

Code	Parameter	Description	Units
068	Lv_VAP	Levels used for vapour pressure (wet-bulb) profile (#=used, 0=not)	unitless
069	Lv_WIND	Levels used for horizontal wind profile (#=used, 0=not)	unitless
070	Mesic_GT(#)	Ground temperature at various levels (#) below a moist area	°C
071	MN	Month	unitless
072	MRG_Avg	Rainfall from a manual rain gauge (when it fell; partitioned w/TB)	mm d^{-1}
073	MRG_Rain	Rainfall recorded by a manual rain gauge	mm d^{-1}
074	N	Number of periods (48 or 24 per day) with North winds	Periods d^{-1}
075	NE	Number of periods (48 or 24 per day) with Northeast winds	Periods d^{-1}
076	NEE	Net ecosystem exchange (analogous to Fc, except includes dS)	g m^{-2} d^{-1}
077	NW	Number of periods (48 or 24 per day) with Northwest winds	Periods d^{-1}
078	OFFSHORE	# periods of offshore winds: >=136° and <=270° (SECTOR #2)	unitless
079	ONSHORE	# periods of onshore winds: >=315° or <=70° (SECTOR #1)	unitless
080	Out_Temp	Outflow temperature of CO_2 sample at IRGA	°C
081	Pa	Atmospheric pressure	kPa
082	PAR↓	Incoming photosynthetically-active radiation	µmol mol^{-1}
083	PAR↑	Reflected photosynthetically-active radiation	µmol mol^{-1}
084	PRECIP	Total precipitation (rainfall and snow water equivalent)	mm
085	Q*	Net all-wave radiation flux density	W m^{-2}
086	Q*(mV)	Net all-wave radiation (before use of calibration multiplier)	mV
087	Qb_Grd	Heat flux through lake bottom sediments based on temp. gradient	W m^{-2}
088	Qb_Plt	Heat flux through lake bottom sediments using a heat flux plate	W m^{-2}
089	Qe	Definitive latent heat flux form the BREB and AERO methods	W m^{-2}
090	Qe_AERO	Latent heat flux calculated from the Aerodynamic ratio method	W m^{-2}
091	Qe_BREB	Latent heat flux calculated from the Bowen ratio method	W m^{-2}

Code	Parameter	Description	Units
092	QE_calc	Latent heat flux calculated as a residual (Q_e=Q*-Q_g-Q_h_EC)	W m^{-2}
093	Qeq	Equilibrium evaporation	W m^{-2}
094	Qg	Ground (soil) heat flux density	W m^{-2}
095	QgFlat	Flat ground heat flux plate	W m^{-2}
096	QgHeath	Heath ground heat flux plate	W m^{-2}
097	QgHoll	Hollow ground heat flux plate	W m^{-2}
098	QgHumm	Hummock ground heat flux plate	W m^{-2}
099	QgLich	Lichen ground heat flux plate	W m^{-2}
100	QgPlt (Canopy)	Ground heat flux plate below the willow canopy	W m^{-2}
101	QgPlt (Dry)	Dry ground heat flux plate	W m^{-2}
102	QgPlt (Mesic)	Moist ground heat flux plate	W m^{-2}
103	QgPlt (Open)	Ground heat flux plate in an open, *C. aquatilis*-covered area	W m^{-2}
104	QgPlt(#)	Soil heat flux plate (# indicates one of several)	W m^{-2}
105	QgPlt_AVG	Average heat flux plate value (weighted average of several T.U.)	W m^{-2}
106	QgPool	Wet ground heat flux plate in an ephemeral pool	W m^{-2}
107	QgWill	Willow ground heat flux plate	W m^{-2}
108	Qh	Definitive sensible heat flux form the BREB and AERO methods	W m^{-2}
109	Qh_AERO	Sensible heat flux calculated from the Aerodynamic method	W m^{-2}
110	Qh_BREB	Sensible heat flux calculated from the Bowen ratio method	W m^{-2}
111	Qh_EC	Sensible heat flux measured with the eddy correlation technique	W m^{-2}
112	QHnw	Sensible heat flux from eddy cor. system on NW side of tower	W m^{-2}
113	QHse	Sensible heat flux from eddy cor. system on SE side of tower	W m^{-2}
114	Qs	Total heat storage for twin Lakes forest (Qg+canopy?)	W m^{-2}
115	Qw	Heat storage in a water volume (Golf Lake). ½-hr. computation	W m^{-2}
116	Qw_Grd	Heat storage in a water volume based on Qw water+Qb_Grd	W m^{-2}
117	Qw_Plt	Heat storage in a water volume based on Qw water+Qb_Plt	W m^{-2}

Code	Parameter	Description	Units
118	Qw_Ts	Heat storage in a water volume based only on surface temp, TsGolf	W m^{-2}
119	Qw1.5	Heat storage in a water volume (Golf Lake). 1.5 hr. running mean	W m^{-2}
120	Qw2.5	Heat storage in a water volume (Golf Lake). 2.5 hr. running mean	W m^{-2}
121	RG(#)	Rainfall recorded by a gauge (#=1-18) in the Eastern Creek basin	mm d^{-1}
122	RH	Relative humidity	%
123	Ri	Richardson stability index	unitless
124	RO	Runoff from the Eastern Creek drainage basin, RO=LEC-(UEC+Will)	m^3 s^{-1}
125	S	Number of periods (48 or 24 per day) with South winds	Periods d^{-1}
126	SE	Number of periods (48 or 24 per day) with Southeast winds	Periods d^{-1}
127	SECTOR	Wind direction sector (1=Onshore, 2=Offshore, 3=Lateral)	unitless
128	SNOW	Snowfall accumulation	cm
129	Stg_LEC	Stage (water depth) at the Lower Eastern Creek gauging station	m
130	Stg_UEC	Stage (water depth) at the Upper Eastern Creek gauging station	m
131	Stg_Willow	Stage (water depth) at the Willow Creek gauging station	m
132	SW	Number of periods (48 or 24 per day) with Southwest winds	Periods d^{-1}
133	T_LOG	Campbell data logger's panel temperature	°C
134	T0	Estimated surface temperature (from T profile extrapolation)	°C
135	Tair	Ambient air temperature at a reference height (3.2 m)	°C
136	TB_Rain	Rainfall recorded by a tipping bucket rain gauge	mm
137	Td(#)	Psychrometer dry-bulb temperature at level # (1=bottom)	°C
138	Therm(#)	Soil temperature at level (#) as measured manually by thermistors	°C
139	ThermHR	Solar time at which the thermistors were measured	hh:mm
140	TIME (solar)	Solar time in the format hh:mm:ss	unitless
141	Tpool(#)	Temperature of a small ephemeral pool	°C

Code	Parameter	Description	Units
142	Tpot.	Potential temperature (adjusted with the DALR=0.0098 °C m^{-1})	K
143	Ts(#)	Surface temperature of a certain terrain type	°C
144	Ts_AVG	Average surface temperature based on several terrain types	°C
145	Tsea	Ocean temperature (flooded tidal flats) near Half-Way Point	°C
146	Tsed	Temperature of the lake bottom sediment (in gycha) <-sp.?	°C
147	TsFlat	Surface temperature on flat ground	°C
148	TsGolf	Surface temperature of Golf lake	°C
149	TsHoll	Surface temperature in a hollow	°C
150	TsHumm	Surface temperature on a hummock	°C
151	TsLich	Surface temperature of lichen	°C
152	Tsoil	Soil temperature from psychrometer reference plug (7-10cm deep)	°C
153	Tsurf (Driest)	Driest ground surface temperature	°C
154	Tsurf (Dry)	Dry ground surface temperature	°C
155	Tsurf (Mesic)	Moist ground surface temperature	°C
156	Tsurf (Wet)	Wet ground surface temperature	°C
157	Tsurf (Wettest)	Wettest ground surface temperature	°C
158	Tsurf	Soil surface temperature	°C
159	TsWill	Surface temperature under willows	°C
160	Tw(#)	Psychrometer wet-bulb temperature at level # (1=bottom)	°C
161	Twater(#)	Water temperature at level # (1=closest to surface) in a lake	°C
162	u	Ambient horizontal wind speed at a reference height	m s^{-1}
163	u(#)	Anemometer horizontal wind speed at level # (1=bottom)	m s^{-1}
164	u*	Friction velocity	m s^{-1}
165	u_SD	Standard deviation of wind speed	m s^{-1}
166	UEC_Q	Discharge at the Upper Eastern Creek gauging station	m^3 s^{-1}
167	VPD	Ambient vapour pressure deficit at a reference height	kPa
168	VPD(#)	Vapour pressure deficit at level # (1=bottom)	kPa
169	W	Number of periods (max. 48 or 24 per day) with West winds	Periods d^{-1}

Code	Parameter	Description	Units
170	WEBB	Webb correction for Q_e and Q_h combined (used after 1995)	g m^{-2} d^{-1}
171	Wet_GT(#)	Ground temperature at various levels (#) below a wet area	°C
172	Willow_Q	Discharge at the Willow Creek gauging station	m^3 s^{-1}
173	WT	Water table level relative to the surface where the well is	m
174	WT(#)	Water table depth at wells in the Eastern Creek basin (#=1-18)	m
175	wTprime	(w'T') Fluctuation of vertical wind and temp. about their means	m s^{-1} °C
176	YR	Year	unitless
177	z0	Surface roughness	m

Table 6. Unit and Codes for Readme Files

Code	Units	Code	Units
01	°C	16	m s^{-1} °C
02	K	17	mm d^{-1}
03	kPa	18	RESERVED
04	mm	19	Periods d^{-1}
05	cm	20	mV
06	m	21	V
07	ppm	22	RESERVED
08	W m^{-2}	23	ms
09	µmol mol^{-1}	24	hh:mm
10	ppm m^{-1}	25	RESERVED
11	m s^{-1}	26	Tenths
12	m^2 s^{-1}	27	Degrees
13	m^3 s^{-1}	28	%
14	g m^{-2} d^{-1}	29	RESERVED
15	mg m^{-2} s^{-1}		

4 DATA ACQUISITION AND PROCESSING

These data were originally measured and collected via ground stations coordinated by Dr. Wayne Rouse from 1984 to 1998 and then compiled into a database in 1999 so that there was a central repository to house the data. NSIDC received a CD-ROM containing the data as well as ancillary information in 2001. In 2013, Katie Schmitt, of the Graduate School of Library and Information Science at the University of Illinois at Urbana-Champaign, worked on the collection. Ms. Schmitt migrated the original binary data files, written in a format meant to be used by FORTRAN-77 processing code, to text files (CSV and TXT) so that the data might be more readily used by scientific researchers. She did this as part of a course on the Foundations of Data Curation taught by NSIDC's Ruth Duerr. Ms. Schmitt also provided NSIDC with documentation based on information from the ClimoBase Users Manual (Boudreau, 1999).

Updating the data for publication included replacing space delimiters with commas and cleaning the data by replacing erroneous data, previously flagged -6999, with the term NULL. Data that were merged in the original files were separated with commas when the original value could be determined. If the value could not be determined, the data were replaced with NULL. This occurred in a few instances when data appeared in the binary files in a format such as "0.457.3467.1223.", and we could not find information that would allow interpreting these values as measurements. The

readme files were migrated to a plain text format, but the content was not changed. Here is a summary of steps taken:

- Open the data files and replace all of the space delimiters with commas, then save them as .csv
- Separate any merged data such as '+6.879+2.987' or '56.789-3.42,' with a comma before the second '+' or '-' sign
- Replace any merged data with multiple decimal points ('36.4226.769.5') with the accurate number of NULL values
- Replace and data that was flagged missing or erroneous, previously flagged with -6999, with NULL

In 2014, these data were added to the NOAA@NSIDC collection at NSIDC.

4.1 Sensor or Instrument Description

The measurements for this data set were taken at 24 different ground stations using energy balance sensors such as temperature, humidity, and wind speed sensors; net radiometers, and heat flux plates to name a few. The details of each sensor can be found in Section 5 of the CllimoBase Users Manual (Boudreau, 1999) which lists published papers that can be referenced for specific instrumentation information at each ground station.

4.2 Quality Assessment

The ClimoBase Users Manual states that "these data originated from many different sources and required varying levels of rescue, their quality cannot be guaranteed. Most of the data in ClimoBase has gone through at least a basic level of automated batch quality control and the majority is believed to be of high quality, however, the onus is on the user to conduct their own due diligence by carefully scrutinizing the data they extract from ClimoBase. During the batch QC process, highly suspicious or irregular data have been flagged as bad/missing... On the other hand, extreme values that could not be readily discounted by available information were normally left intact and their use will be left up to the user’s discretion" (Boudreau, 1999, p. 6).

5 REFERENCES AND RELATED PUBLICATIONS

CAG. 1998. 1998 CAG Award for Scholarly Distinction in Geography: Wayne Robert Rouse. Retrieved June 15, 2014, from http://www.cag-acg.ca/en/wayne_robert_rouse.html.

Boudreau, D. 1999. ClimoBase Users Manual — A Climatological Database of Dr. Wayne Rouse's Data 1984 - 1998: Churchill, MB; Marantz Lake, MB; Inuvik, NWT. *Environment Canada.*

5.1 Related Publications

Bailey, W. G., T. R. Oke, and W. R. Rouse, eds. 1997. The Surface Climates of Canada. Vol. 4. McGill−Queen's University Press..

Rouse, W. R., M. S. V. Douglas, R. E. Hecky, A. E. Hershey, G. W. Kling, L. Lesack, P. Marsh, M. Mcdonald, B. J. Nicholson, N. T. Roulet, and J. P. Smol. 1997. Effects Of Climate Change On The Freshwaters Of Arctic And Subarctic North America. Hydrological Processes 11(8): 873–902.

6 CONTACTS AND ACKNOWLEDGMENTS

Acknowledgments:

We thank Dr. Wayne Rouse for his commitment to data stewardship and sharing.

Katie Schmit's curation work on these data was arranged by Ruth Duerr and Florence Fetterer.

NOAA NESDIS NGDC supported the publication of these data through its funding for NOAA@NSIDC.

7 DOCUMENT INFORMATION

7.1 Document Authors

This documentation was prepared by Katie Schmitt based on information in correspondence with Florence Fetterer and the NSIDC staff and on the ClimoBase Users Manual (Boudreau, 1999). The document was edited and finalized for publication by Ann Windnagel.

7.2 Document Creation Date

June 2014

7.3 Date Last Updated

December 2020