DOCUMENTATION FOR THE DIGITAL ARCHIVE OF CANADIAN CLIMATOLOGICAL DATA

(SURFACE) IDENTIFIED BY ELEMENT

from web site:

http://www.cmc.ec.gc.ca/climate/document.htm

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INTRODUCTION

Standard record formats have been adopted for climatological data which are

archived at fifteen minute, hourly, daily or monthly intervals. Each record

consists of station identification, date and element number followed by the

data repeated for each time interval. The datum for each time interval is

recorded as a five (5) digit integer plus a leading sign field and a

following flag field. The units are decimal position are implied by the

assigned element number.

RECORD FORMATS

The four (4) record formats are:

**Daily Record of Hourly Data (HLY) - Length 186**

Data repeated

| STN ID | YEAR |MO |DY |ELEM |S| VALUE |F| .... 24 times

|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|

Monthly Record of Daily Data (DLY) - Length 233

Data repeated

| STN ID | YEAR |MO |ELEM |S| VALUE |F| ........ 31 times

|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|

Annual Record of Monthly Data (MLY) - Length 98

Data repeated

| STN ID | YEAR |ELEM |S| VALUE |F| ............ 12 times

|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|

Daily Record of 15 Minute Data (FIF) - Length 691 >

Data repeated

| STN ID | YEAR |MO |DY |ELEM |S| VALUE |F| .... 96 times |FLG|

|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_|\_| |\_\_\_|

Legend

Abbreviation Length Field Data Type

STN ID 7 Station Identification alphanumeric

YEAR 4 Year eg 1998; recent chg, numeric

still avail. in 3 digit form.

MO 2 Month i.e. 01 = Jan. etc. numeric

DY 2 Day numeric

ELEM 3 Element Number numeric

S 1 Sign '-' = negative

'0' = positive

VALUE 5 Data Value numeric

F 1 Flag alphanumeric

FLG 1 Day Flag alphanumeric

Note: In the daily Record of Hourly Data (HLY), the 24 entries represent

the observations taken on the hours 00-23, for elements 071-122 and 156.

For all other elements the entries represent the observations for hours

ending 01-24. All times are local standard with the exception of Sunshine

(element 133) and Radiation (elements 061-068,169-172) which are local

apparent.

FIELD DESCRIPTION

Station Identification

This is the climatological listing number which contains province

and district designation.

Element Number

An assigned element number uniquely identifies each data type and

implies the units and decimal position.

Documentation for each element is organized by record format,

unique to the observing frequency (eg. HLY). Reference is made to

the system under which the data were acquired and quality

controlled (eg. HLY01, see para.4).

Data Value Field

This field records the datum for one time interval. The sign is

explicit if negative and implicit if positive. All value fields

are initialized to -99999M. If the values are missing for all the

time intervals of a record, the record may not be written.

However, if the value is available for one time interval within

the record, the record will be available with the unknown

intervals coded -99999M. In the Monthly Record of Daily Data

(DLY), days in excess of the number of days in the month are

coded -99999M.

The units and decimal position are implied by the element number.

The flag position is used to qualify the value and varies by

element number.

The following are examples of data value fields:

-32 estimated -00032E

-8.034 -08034

Trace 000000T

10.2 000102

Day Flag

If the time is uncertain within this record, 'N' will be entered

in this field.

ARCHIVE FILES

The data are maintained in the archive by system. The various files are

identified by the format and system number. The data set name includes a

field in the format "fffnn"where:

fff = HLY = Daily Record of Hourly Data

= DLY = Monthly Record of Daily Data

= MLY = Annual Record of Monthly Data

= FIF = Daily Record of Fifteen Minute Data

DATA SETS PAGE #

NN = 01 - HOURLY WEATHER...........................HLY01 5

" " - CLOUD LAYERS............HLY01.CLD 6

= 03 - RATE OF RAINFALL.........................HLY03 7

" " " - INTENSITIES...........DLY03 7

= 04 - CLIMATOLOGICAL DATA......................DLY04 8

" " ......................DLY02 8

" " ......................MLY04 9

= 10 - BRIGHT SUNSHINE..........................HLY10 10

= 11 - SOLAR RADIATION..........................HLY11 10

= 12 - SOIL TEMPERATURE.........................DLY12 10

= 13 - PAN EVAPORATION..........................DLY13 11

= 15 - WIND.....................................HLY15 11

= 21 - PRECIPITATION-FISCHER/PORTER.............FIF21 12

" " " .............HLY21 12

" " INTENSITIES........DLY21 12

DOCUMENTATION

TABLE OF FLAGS

Flag Definition Elements

blank Valid Data all except 061-068

A Accumulated amount; previous value 010, 011, 012, 159

C or L for elements 010, 011, 012

K or L for elements 159

B More than one occurrence & estimated 044, 046, 052, 054,

056, 058, 059

C Precipitation occurred, amount 010, 011, 012

uncertain; value is 0

D Derived 061-068

E Estimated all except 061-068

F Accumulated and estimated 010, 011, 012

G Uncorrected 107-122

H Freezing 123, 125-132

I Unadjusted 123, 125-132

J Freezing and unadjusted 123, 125-132

K First occurrence when precip. may 159

or may not have occurred;

value is 0.

L Precipitation may or may not have 010, 011, 012, 159

occurred; value is 0

M Missing all

N Time uncertain 159

N Temperature missing, but known to be

ABOVE freezing. 002

O Not assigned

P Not assigned

Q Not assigned

R Not assigned

S More than one occurrence 023, 024, 044, 046,

052, 054, 056, 058,

059, 157, 158

T Trace. Value is zero 006-013, 039, 048-

052, 054, 056

U Valid datum, unknown snow 061-068

V Valid datum, no snow cover 061-068

W Valid datum, with snow cover 061-068

X Estimated, unknown snow 061-068

Y Estimated, no snow cover 061-068

Y Temperature missing, but known to be

BELOW freezing. 002

Z Estimated, with snow cover 061-068

HOURLY WEATHER (HLY01)

ELEM UNITS CODE DESCRIPTION FLAGS

071 30's of measure Ceiling (Note 6)

072 0.1 km Visibility (Note 7)

073 0.01 kilopascals Sea Level Pressure

074 0.1 deg C Dew Point Temperature

075 10's of deg Wind Direction - U2A (16 pts)

(see 156) to Dec. 1970 (Note 5, 17)

156 10's of deg Wind Direction - U2A (36 pts.)

(see 075) from Jan. 1971 (Note 17)

076 km/hr Wind Speed - U2A (Note 17)

077 .01 Kilopascals Station Pressure

078 0.1 deg C Dry Bulb Temperature

079 0.1 deg C Wet Bulb Temperature

080 % Relative Humidity

081 tenths Total Cloud Opacity

082 tenths Total Cloud Amount

083 1=Yes, 0=No Weather Indicator (Note 1)

084 1, 2, 3 Tornado=1 (TOR), Waterspout=2

Funnel Cloud=3 (Note 2)

085 2, 3 Thunderstorms=2 (T)

Heavy Thunderstorms=3 (T+) (Note 2)

086-098 (.....See Notes 2,3........)

086 1-3 Rain (R)

087 1-3 Rain Showers (RW)

088 1-3 Drizzle (L)

089 1-3 Freezing Rain (ZR)

090 1-3 Freezing Drizzle (ZL)

091 1-3 Snow (S)

092 1-3 Snow Grains (SG)

093 1 Ice Crystals (IC)

094 1-3 Ice Pellets (IP)

095 1-3 Ice Pellet Showers (IPW)

096 1-3 Snow Showers (SW)

097 1-3 Snow Pellets (SP)

098 1-3 Hail (A)

099-106,260 (.....See Note 2......)

099 1 Fog (F)

100 1 Ice Fog (IF)(Note 23)

101 1 Smoke (K)

102 1 Haze (H)

103 1 Blowing Snow (BS)

104 1 Blowing Sand (BN)

105 1 Blowing Dust (BD)

106 1 Dust (D)

260 1 Freezing Fog(FZFG)(Note 23)

107-110 (.....Lowest Cloud Layer.....)

107 tenths Opacity (Note 12, 10) G

108 tenths Amount or Condition (Notes 12, 13, 19) G

109 0-16 Type (Notes 4, 12, 19) G

110 30's of meters Height (Notes 12, 19) G

111-114 (......Second Cloud Layer.....)

111 tenths Opacity (Notes 12, 19) G

112 tenths Amount or Condition (Notes 12, 13, 19) G

113 0-16 Type (Notes 4, 12, 19) G

114 30's of meters Height (Notes 12, 19) G

115-118 (....Third Cloud Layer....)

115 tenths Opacity (Notes 12, 19) G

116 tenths Amount or Condition (Notes 12, 13, 19) G

117 0-16 Type (Notes 4, 12, 19) G

118 30's of meters Height (Note 12, 19) G

119-223 (.....Fourth Cloud Layer.....)

119 tenths Opacity (Notes 12, 19) G

120 tenths Amount or Condition (Notes 12, 13, 19) G

121 0-16 Type (Notes 4, 12, 19) G

122 30's of meters Height (Notes 12, 19) G

RATE OF RAINFALL (HLY03) (SEE ALSO HLY21)

ELEM UNITS CODE DESCRIPTION FLAGS

123 0.1mm Hourly Rainfall H, I, J

RATE OF RAINFALL (DLY03) (SEE ALSO DLY21)

ELEM UNITS CODE DESCRIPTION FLAGS

124 0.01 Adjustment Factor (Note 20)

125-132 (Since Last Chart Change, Greatest Amount of Precipitation in......)

125 0.1mm 5 Minutes H, I, J

126 0.1mm 10 Minutes H, I, J

127 0.1mm 15 Minutes H, I, J

128 0.1mm 30 Minutes H, I, J

129 0.1mm 1 Hours H, I, J

130 0.1mm 2 Hours H, I, J

131 0.1mm 6 Hours H, I, J

132 0.1mm 12 Hours H, I, J

160 Chart Change Hour (Local Standard Time)

DAILY CLIMATOLOGICAL DATA (DLY02,DLY04) - (NOTE 16)

ELEM UNITS CODE DESCRIPTION FLAGS

001 0.1 deg C Daily Maximum Temperature E

002 0.1 deg C Daily Minimum Temperature E,N,Y

003 0.1 deg C Daily Mean Temperature E

004 % Daily Max. Relative Humidity

005 % Daily Min. Relative Humidity

006-009 (.....6 hrly. Precipitation ending)

(.....See Note 15)

006 0.1mm 1200 GMT T

007 0.1mm 1800 GMT T

008 0.1mm 0000 GMT T

009 0.1mm 0600 GMT T

010 0.1mm Total Rainfall E,T,C,L,A,F

011 0.1cm Total Snowfall E,T,C,L,A,F

012 0.1mm Total Precipitation E,T,C,L,A,F

013 whole cm Snow on the Ground (Note 8) E,T

014-022 (....Day with ....See Note 14)

014 1=Yes, 0=No Thunderstorms

015 1=Yes, 0=No Freezing Rain

016 1=Yes, 0=No Hail

017 1=Yes, 0=No Fog or Ice Fog

018 1=Yes, 0=No Smoke or Haze

019 1=Yes, 0=No Blowing Dust or Sand

020 1=Yes, 0=No Blowing Snow

021 1=Yes, 0=No Wind Speed >= 28 Knots

022 1=Yes, 0=No Wind Speed >= 34 Knots

023 10's of deg Direction of Extreme Gust S, E

(See 157) (16 pts) to Dec. 1976 (Note 5)

024 km Speed of Extreme Gust S, E

(Earliest)

157 10's of deg Direction of Extreme Gust S, E

(see 023) (36 pts) from Jan. 1977

MONTHLY CLIMATOLOGICAL DATA (MLY04) - (NOTE 16)

ELEM UNITS CODE DESCRIPTION FLAGS

026-038 (.....Number of Days With.....)

026 Frost

027 Thunderstorms

028 Rain or Drizzle

029 Freezing Rain or Drizzle

030 Hail

031 Snow

032 Measurable Precipitation

033 Fog or Ice Fog

034 Smoke or Haze

035 Blowing Dust or Sand

036 Blowing Snow

037 Wind Speed >= 28 Knots

038 Wind >= 34 Knots

039 whole cm Snow Cover - Last Day of Month E, T

040 0.1 deg C Mean Maximum Temperature E

041 0.1 deg C Mean Minimum Temperature E

042 0.1 deg C Mean Monthly Temperature E

043 0.1 deg C Mean Monthly Temperature E

Difference from Normal (Note 18)

044 0.1 deg C Extreme Maximum Temperature E, S, B

045 Date of Extreme Maximum

Temperature (Earliest)

046 0.1 deg C Extreme Minimum Temperature E, S, B

047 Date of Extreme Minimum

Temperature (Earliest)

048 0.1mm Total Rainfall E, T

049 0.1cm Total Snowfall E, T

050 0.1mm Total Precipitation E, T

051 0.1mm Total Precipitation E, T

Difference from Normal (Note 18)

052 0.1mm Greatest Rainfall E, T, S, B

053 Date of Greatest Rainfall (Earliest)

054 0.1cm Greatest Snowfall E, T, S, B

055 Date of Greatest Snowfall (Earliest)

056 0.1mm Greatest Precipitation E, T, S, B

058 10's of deg Direction of Extreme Gust E, S, B

(16 pts) to Dec. 1976 (Note 9)

059 km/hr Speed of Extreme Gust (Note 9) E, S, B

060 Date of Extreme Gust

(Earliest) (Note 9) E, S, B

158 10's of deg Direction of Extreme Gust E, S, B

(36 pts) from Jan. 1977

BRIGHT SUNSHINE (HLY10)

ELEM UNITS CODE DESCRIPTION FLAGS

133 0.1 hrs Sunshine (Note 21) E

SOLAR RADIATION (HLY11)

ELEM UNITS CODE DESCRIPTION FLAGS

061 .001 MJ/m^2 \*RF1 Global Solar Radiation D,U,V,W,X,Y,Z

062 " \*RF2 Sky (diffuse) Rad. "

063 " \*RF3 Reflected Solar Rad. "

064 " RF4 Net All Wave Rad. "

065 " \*RF5 Total Downward Rad. "

066 " \*RF6 Total Upward Rad. "

067 .01 Kilolux\_hrs \*RF7 Daylight Illumination "

068 .001 MJ/m^2 \*RF8 Direct Solar Rad. "

169 " RF9 Incident Longwave Rad. (shaded) "

170 " RFB Emitted Longwave Rad. "

171 " \*RFC Incident Solar Rad. -green "

172 " \*RFD Incident Solar Rad. -red "

MJ/m^2 = megajoules/metre^2

\* (NOTE 22)

SOIL TEMPERATURE (DLY12)

ELEM UNITS CODE DESCRIPTION FLAGS

134-141 (......AM Soil Temperatures at.....)

134 0.1 deg C 1 cm (Note 10)

135 0.1 deg C 5 cm

136 0.1 deg C 10 cm

137 0.1 deg C 20 cm

138 0.1 deg C 50 cm

139 0.1 deg C 100 cm

140 0.1 deg C 150 cm

141 0.1 deg C 300 cm

142 whole cm AM Snow Depth

143-149 (.....PM Soil Temperatures at......)

143 0.1 deg C 1 cm (Note 10)

144 0.1 deg C 5 cm

145 0.1 deg C 10 cm

146 0.1 deg C 20 cm

147 0.1 deg C 50 cm (Note 10)

148 0.1 deg C 100 cm (Note 10)

149 0.1 deg C 150 cm (Note 10)

150 whole cm PM Snow Depth (Note 10)

PAN EVAPORATION (DLY13)

ELEM UNITS CODE DESCRIPTION FLAGS

151 0.1mm Pan Evaporation E

152 km Wind Mileage E

153 0.1 deg C Water Temperature E

154 0.1 deg C Air Temperature E

155 0.1mm Lake Evaporation E

WIND (HLY15)

ELEM UNITS CODE DESCRIPTION FLAGS

069 10's of deg Direction - 45B Anemometer (8 pts) E

(Note 11, 17)

070 km/hr Run Per Hour - 45B Anemometer E

(Note 17)

076 km/hr Speed - U2A Anemometer E

(Note 17)

156 10's of deg Direction - U2A Anemometer E

(Note 17)

PRECIPITATION (FISCHER/PORTER) DATA (FIF21)

ELEM UNITS CODE DESCRIPTION FLAGS

159 0.1mm Precipitation A, K, L

PRECIPITATION (FISCHER/PORTER) DATA (HLY21)

ELEM UNITS CODE DESCRIPTION FLAGS

123 0.1mm Hourly Rainfall H, I, J

PRECIPITATION (FISCHER/PORTER) DATA (DLY21)

ELEM UNITS CODE DESCRIPTION FLAGS

012 0.1mm Total Precipitation E,T,C,L,A,F

127-161 (....Greatest Amount of Precipitation in....)

127 0.1mm 15 Minutes H, I, J

128 0.1mm 30 Minutes H, I, J

129 0.1mm 1 Hour H, I, J

130 0.1mm 2 Hours H, I, J

131 0.1mm 6 Hours H, I, J

132 0.1mm 12 Hours H, I, J

161 0.1mm 24 Hours H, I, J

NOTES

Note 1: Elements 083

This element indicates the presence or absence of any type of weather or

obstruction to vision. This record will always be available with a code of

0 indicating no weather for the hour. When 1 is entered, one or more of

elements 084-106,260 will be available. Records for elements 084-106,260

will be included only if the phenomena occurred on one or more hours.

Note 2: Elements 084-106,260

A '0' indicates the phenomena did not occur.

Note 3: Elements 086-092 and 094-098

1 = Light; 2 = Moderate; 3 = Heavy

Note 4: Elements 109, 113, 117 and 121

Code Symbol Cloud Type

0 None

1 AC Altocumulus

2 ACC Altocumulus Castellanus

3 AS Altostratus

4 CC Cirrocumulus

5 CS Cirrostratus

6 CI Cirrus

7 CB Cumulonimbus

8 CU Cumulus

9 CF Cumulus Fractus

10 SF Stratus Fractus

11 TCU Towering Cumulus

12 NS Nimbostratus

13 SC Stratocumulus

14 ST Stratus

15 F Fog

16 Obstruction other than Fog

Note 5: Element 075

16 pt. Dir/Range 10's of Deg.

NNE (012-033) 02

NE (034-056) 05

ENE (057-078) 07

E (079-101) 09

ESE (102-123) 11

SE (124-146) 14

SSE (147-168) 16

S (169-191) 18

SSW (192-213) 20

SW (214-236) 23

WSW (237-258) 25

W (259-281) 27

WNW (282-303) 29

NW (304-326) 32

NNW (327-348) 34

N (349-011) 36

CALM 00

Note 6: Element 071

Unlimited Ceiling has been assigned a value of 888.

Note 7: Element 072 (Visibility).

Value (km) Status Miles

25.0 15+

0.0 0

0.2 1/8

0.4 1/4

0.6 3/8

0.8 1/2

1.0 5/8

1.2 3/4

1.6 1

2.0 1 1/4

2.4 1 1/2

2.8 1 3/4

3.2 2

3.6 2 1/4

4.0 2 1/2

4.8 3

ETC

159.3 99

Note 8: Element 013

Daily snow depth is available since 1955 for about 300 primary and selected

climatological stations

The record for this element will not be available if snow on the ground is

reported only on the last day of the month. Last day snow depth is

available from element 039 on the MLY04 file.

In 1981 many non-primary stations began to observe daily snow depth.

Frequently, zero amounts are not entered on the document and are archived

as missing. This deficiency is most evident after the last measured depth

in the spring.

Note 9: Elements 058, 059, 060 and 158.

When no gusting occurs, direction and speed are coded -99999M and the date

is 000000b (b means blank).

Note 10:

Elements 147-150 were discontinued June 1966

Elements 134 & 143 were gradually phased out beginning June 1966.

Note 11: Element 069

8 pt. Dir/Range 10's of Deg.

NE (034-078) 05

E (079-123) 09

SE (124-168) 14

S (169-213) 18

SW (214-258) 23

W (259-303) 27

NW (304-348) 32

N (349-033) 36

CALM 00

Note 12: Elements 107-122

Effective May 1977, cloud layer data which failed quality control were not

subjected to review or corrective action unless ceiling, total opacity

and/or total amount was affected. Any failure caused all values to be

flagged.

Note 13: Elements 108, 112, 116, 120.

Effective January 1977, the layer amount was replaced by a sky condition

code.

Sky Condition Code

-X 1

-SCT 2

SCT 3

-BKN 4

-OVC 5

BKN 7

X 9

OVC 10

Note 14: Elements 014-022.

At primary stations since 1955.

Elements 021 and 022 are available only if stations observe wind hourly.

Elements 014-016 are seldom available at other than primary stations prior

to 1977. Since 1977 they are available but may be unreliable.

Note 15: Elements 006, 007, 008, 009.

Six hourly precipitation totals ending at:

to June, 1961 from July, 1961

elem. 006 1800Z 1200z

elem. 007 0000Z 1800z

elem. 008 0600Z 0000z

elem. 009 1200Z 0600z

Note 16: DLY02, DLY04, MLY04.

Before undertaking any studies involving time relationships, contact the

Canadian Climate Centre to establish time standards in use during the

applicable station history.

Note 17: Elements 069, 070, 075, 076, 156.

Wind data are available in either the HLY01 or HLY15 data sets. U2A

anemometer winds, from stations which also observe other weather elements,

are archived in the HLY01 data sets. Currently, these data are from the SA

type message or form 2322. The HLY15 data sets are primarily 45B anemometer

winds. However, stations equipped with U2A and reporting only winds are

included.

Note 18: Elements 043, 051.

These differences from normal are available since 1977. The 1941-1970

normals were replaced by the 1951-1980 normals with the processing of

January 1982 data.

Note 19: Elements 107-122.

If a cloud observation is taken, the four elements of the lowest (or only)

layer are entered in the archive. If there is no cloud, the height is

assigned a value of 888 and the other elements of the layer are zero. The

second to fourth layers are archived only if cloud is reported.

Note 20: Elements 124.

A factor applied to the hourly and duration amounts to bring them in line

with the daily total measured with a standard MSC Precipitation Gauge. This

element is available since 1978.

Note 21: Elements 133.

Records are not included during the periods of Polar Night.

Note 22: Elements 061-063,065-068,171,172.

Periods of Polar Night are indicated by a data value of -00000 (literally:

minus zero).

Note 23: Elements 100 and 260.

Observations of Element 100 (IF) discontinued November 1, 1999.

Observations of Element 260 (FZFG) commenced November 1, 1999.

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