

**B/C30 – Regulations for reporting CLIMAT data in TDCF****TM 307073 - BUFR template for reports of monthly values from a land station suitable for CLIMAT data**

<b>3 07 073</b>		<b>Sequence for representation of monthly values suitable for CLIMAT data</b>
	3 07 071	Monthly values from a land station
	3 07 072	Monthly normals for a land station

<b>Monthly values from a land station (data of CLIMAT Sections 0, 1, 3 and 4)</b> Sequence BUFR descriptor <b>&lt;3 07 071&gt;</b> expands as shown in the leftmost column below.				
3 01 090			<b>Fixed surface station identification, time, horizontal and vertical coordinates</b>	Unit, scale
	3 01 004		Surface station identification	
		0 01 001	WMO block number	Numeric, 0
		0 01 002	WMO station number	Numeric, 0
		0 01 015	Station or site name	CCITT IA5, 0
		0 02 001	Type of station	Code table, 0
	3 01 011	0 04 001	Year <sup>(1)</sup>	Year, 0
		0 04 002	Month <sup>(1)</sup>	Month, 0
		0 04 003	Day (= 1) <sup>(1)</sup>	Day, 0
	3 01 012	0 04 004	Hour (= 0) <sup>(1)</sup>	Hour, 0
		0 04 005	Minute (= 0) <sup>(1)</sup>	Minute, 0
	3 01 021	0 05 001	Latitude (high accuracy)	Degree, 5
		0 06 001	Longitude (high accuracy)	Degree, 5
	0 07 030		Height of station ground above msl	m, 1
	0 07 031		Height of barometer above msl	m, 1
			<b>Monthly mean values of pressure, temperature, extreme temperatures and vapour pressure</b>	
<b>0 04 074</b>			<b>Short time displacement (= UTC - LST)<sup>(1)</sup></b>	Hour, 0
0 04 023			Time period (= number of days in the month)	Day, 0
0 08 023			First order statistics (= 4; mean value)	Code table, 0
0 10 004			Pressure $\overline{P_o P_o P_o P_o}$	Pa, -1
0 10 051			Pressure reduced to msl $\overline{PPPP}$	Pa, -1
0 07 004			Pressure (standard level) (for lowland stations = missing value)	Pa, -1
0 10 009			Geopotential height of the standard level $\overline{PPPP}$ (for lowland stations = missing value)	gpm, 0
0 07 032			Height of sensor above local ground <sup>(3)</sup>	m, 2
0 12 101			Temperature/dry-bulb temperature $s_n \overline{TTT}$	K, 2
0 02 051			Indicator to specify observing method for extreme temperatures <sup>(3)</sup> $i_y$	Code table, 0
0 04 051			Principal time of daily reading of maximum temperature $G_x G_x$	Hour, 0

# World Meteorological Organization

0 12 118			Maximum temperature at height specified, past 24 hours $s_n T_x T_x T_x$	K, 2
0 04 052			Principal time of daily reading of minimum temperature $G_n G_n$	Hour, 0
0 12 119			Minimum temperature at height specified, past 24 hours $s_n T_n T_n T_n$	K, 2
0 13 004			Vapour pressure $\overline{eee}$	Pa, -1
0 08 023			First order statistics (set to missing to cancel the previous value)	Code table, 0
0 12 151			Standard deviation of daily mean temperature $s_t s_t s_t$	K, 2
0 07 032			Height of sensor above local ground (set to missing to cancel the previous value)	m, 2
			<b>Number of days in the month for which values are missing</b>	
1 02 005			Replicate 2 descriptors 5 times	
0 08 050			Qualifier for number of missing values in calculation of statistic (= 1; pressure) (= 2; temperature) (= 4; vapour pressure) (= 7; maximum temperature) (= 8; minimum temperature)	Code table, 0
0 08 020			Total number of missing entities (days) $m_p m_p$ (for pressure) $m_T m_T$ (for temperature) $m_e m_e$ (for vapour pressure) $m_{Tx}$ (for maximum temperature) $m_{Tn}$ (for minimum temperature)	Numeric, 0
			<b>Monthly duration of sunshine</b>	
0 14 032			Total sunshine $S_1 S_1 S_1$	Hour, 0
0 14 033			Total sunshine $p_s p_s p_s$	%, 0
0 08 050			Qualifier for number of missing values in calculation of statistic (= 6; sunshine duration)	Code table, 0
0 08 020			Total number of missing entities (days) $m_s m_s$	Numeric, 0
			<b>Number of days with parameters beyond certain thresholds; number of days with thunderstorm and hail</b>	
1 02 018			Replicate 2 descriptors 18 times	
0 08 052			Conditions for which number of days of occurrence follows (= 0; wind $\geq 10 \text{ m s}^{-1}$ ) (= 1; wind $\geq 20 \text{ m s}^{-1}$ ) (= 2; wind $\geq 30 \text{ m s}^{-1}$ ) (= 3; max. T $< 273.15 \text{ K}$ ) (= 4; max. T $\geq 298.15 \text{ K}$ ) (= 5; max. T $\geq 303.15 \text{ K}$ ) (= 6; max. T $\geq 308.15 \text{ K}$ ) (= 7; max. T $\geq 313.15 \text{ K}$ ) (= 8; min. T $< 273.15 \text{ K}$ ) (= 16; sss $> 0.00 \text{ m}$ ) (= 17; sss $> 0.01 \text{ m}$ ) (= 18; sss $> 0.10 \text{ m}$ ) (= 19; sss $> 0.50 \text{ m}$ ) (= 20; horizontal visibility $< 50 \text{ m}$ ) (= 21; horizontal visibility $< 100 \text{ m}$ )	Code table, 0

# World Meteorological Organization

			(= 22; horizontal visibility < 1000 m) (= 23; hail) (= 24; thunderstorm)	
0 08 022			Total number (of days) $f_{10}f_{10}$ (wind $\geq 10 \text{ m s}^{-1}$ ) $f_{20}f_{20}$ (wind $\geq 20 \text{ m s}^{-1}$ ) $f_{30}f_{30}$ (wind $\geq 30 \text{ m s}^{-1}$ ) $T_{x0}T_{x0}$ ( $T_x < 273.15 \text{ K}$ ) $T_{25}T_{25}$ ( $T_x \geq 298.15 \text{ K}$ ) $T_{30}T_{30}$ ( $T_x \geq 303.15 \text{ K}$ ) $T_{35}T_{35}$ ( $T_x \geq 308.15 \text{ K}$ ) $T_{40}T_{40}$ ( $T_x \geq 313.15 \text{ K}$ ) $T_{n0}T_{n0}$ ( $T_n < 273.15 \text{ K}$ ) $s_0s_0$ (SSS > 0.00 m) $s_1s_1$ (SSS > 0.01 m) $s_{10}s_{10}$ (SSS > 0.10 m) $s_{50}s_{50}$ (SSS > 0.50 m) $V_1V_1$ (h. viz. < 50 m) $V_2V_2$ (h. viz. < 100 m) $V_3V_3$ (h. viz. < 1000 m) $D_{gr}D_{gr}$ (hail) $D_{ts}D_{ts}$ (thunderstorm)	Numeric, 0
			<b>Occurrence of extreme values of temperature and wind speed</b>	
0 07 032			Height of sensor above local ground	m, 2
0 08 053			Day of occurrence qualifier (= 0; on 1 day only) (= 1; on 2 or more days)	Code table, 0
0 04 003			Day $y_x y_x$	Day, 0
0 12 152			Highest daily mean temperature $s_n T_{xd} T_{xd} T_{xd}$	K, scale 2
0 08 053			Day of occurrence qualifier (= 0; on 1 day only) (= 1; on 2 or more days)	Code table, 0
0 04 003			Day $y_n y_n$	Day, 0
0 12 153			Lowest daily mean temperature $s_n T_{nd} T_{nd} T_{nd}$	K, 2
0 08 053			Day of occurrence qualifier (= 0; on 1 day only) (= 1; on 2 or more days)	Code table, 0
0 04 003			Day $y_{ax} y_{ax}$	Day, 0
0 08 023			First order statistics (= 2; maximum value)	Code table, 0
0 12 101			Temperature/dry-bulb temperature $s_n T_{ax} T_{ax} T_{ax}$	K, scale 2
0 08 053			Day of occurrence qualifier (= 0; on 1 day only) (= 1; on 2 or more days)	Code table, 0
0 04 003			Day $y_{an} y_{an}$	Day, 0
0 08 023			First order statistics (= 3; minimum value)	Code table, 0
0 12 101			Temperature/dry-bulb temperature $s_n T_{an} T_{an} T_{an}$	K, 2
0 08 023			First order statistics (set to missing to cancel the previous value)	Code table, 0
0 07 032			Height of sensor above local ground	m, 2
0 02 002			Type of instrumentation for wind measurement	Flag table, 0
0 08 053			Day of occurrence qualifier (= 0; on 1 day only) (= 1; on 2 or more days)	Code table, 0
0 04 003			Day $y_{fx} y_{fx}$	Day, 0
0 11 046			Maximum instantaneous wind speed $f_x f_x f_x$	$\text{m s}^{-1}$ , 1
0 08 053			Day of occurrence qualifier	Code table, 0

## World Meteorological Organization

			(set to missing to cancel the previous value)	
			<b>Monthly precipitation data</b>	
0 04 003			Day (= 1) <sup>(2)</sup>	Day, 0
0 04 004			Hour (= 6) <sup>(2)</sup>	Hour, 0
0 04 023			Time period (= number of days in the month) <sup>(2)</sup>	Day, 0
0 07 032			Height of sensor above local ground <sup>(3)</sup>	m, 2
0 13 060			Total accumulated precipitation <b>R<sub>1</sub>R<sub>1</sub>R<sub>1</sub>R<sub>1</sub></b>	kg m <sup>-2</sup> , 1
0 13 051			Frequency group; precipitation <b>R<sub>d</sub></b>	Code table, 0
0 04 053			Number of days with precipitation equal to or more than 1 mm <b>n<sub>r</sub>n<sub>r</sub></b>	Numeric, 0
0 08 050			Qualifier for number of missing values in calculation of statistic (= 5; precipitation)	Code table, 0
0 08 020			Total number of missing entities (days) <b>m<sub>R</sub>m<sub>R</sub></b> (for precipitation)	Numeric, 0
			<b>Number of days with precipitation beyond Certain thresholds</b>	
1 02 006			Replicate 2 descriptors 6 times	
0 08 052			Conditions for which number of days of occurrence follows (= 10; precipitation ≥ 1.0 kg m <sup>-2</sup> ) (= 11; precipitation ≥ 5.0 kg m <sup>-2</sup> ) (= 12; precipitation ≥ 10.0 kg m <sup>-2</sup> ) (= 13; precipitation ≥ 50.0 kg m <sup>-2</sup> ) (= 14; precipitation ≥ 100.0 kg m <sup>-2</sup> ) (= 15; precipitation ≥ 150.0 kg m <sup>-2</sup> )	Code table, 0
0 08 022			Total number (of days) <b>R<sub>1</sub>R<sub>1</sub></b> (precipitation ≥ 1.0 kg m <sup>-2</sup> ) <b>R<sub>5</sub>R<sub>5</sub></b> (precipitation ≥ 5.0 kg m <sup>-2</sup> ) <b>R<sub>10</sub>R<sub>10</sub></b> (precipitation ≥ 10.0 kg m <sup>-2</sup> ) <b>R<sub>50</sub>R<sub>50</sub></b> (precipitation ≥ 50.0 kg m <sup>-2</sup> ) <b>R<sub>100</sub>R<sub>100</sub></b> (precipitation ≥ 100.0 kg m <sup>-2</sup> ) <b>R<sub>150</sub>R<sub>150</sub></b> (precipitation ≥ 150.0 kg m <sup>-2</sup> )	Numeric, 0
			<b>Occurrence of extreme precipitation</b>	
0 08 053			Day of occurrence qualifier (= 0; on 1 day only) (= 1; on 2 or more days)	Code table, 0
0 04 003			Day <b>y<sub>r</sub>y<sub>r</sub></b>	Day, 0
0 13 052			Highest daily amount of precipitation <b>R<sub>x</sub>R<sub>x</sub>R<sub>x</sub></b>	kg m <sup>-2</sup> , 1
0 07 032			Height of sensor above local ground (set to missing to cancel the previous value)	m, 2
<b>Monthly normals for a land station (data of CLIMAT Section 2)</b>				
Sequence BUFR descriptor <3 07 072> expands as shown in the leftmost column below.				
			<b>Normals of pressure, temperatures, vapour pressure, standard deviation of daily mean temperature, and sunshine duration</b>	Unit, scale
0 04 001			Year (of beginning of the reference period)	Year, 0
0 04 001			Year (of ending of the reference period)	Year, 0
0 04 002			Month	Month, 0
0 04 003			Day (= 1) <sup>(1)</sup>	Day, 0
0 04 004			Hour (= 0) <sup>(1)</sup>	Hour, 0
0 04 074			Short time displacement (= UTC - LST) <sup>(1)</sup>	Hour, 0
0 04 022			Time period (= 1)	Month, 0
0 08 023			First order statistics (= 4; mean value)	Code table, 0
0 10 004			Pressure <b>P<sub>o</sub>P<sub>o</sub>P<sub>o</sub>P<sub>o</sub></b>	Pa, -1
0 10 051			—	Pa, -1

## World Meteorological Organization

			Pressure reduced to msl <b>PPPP</b>	
0 07 004			Pressure (standard level)	Pa, -1
0 10 009			Geopotential height of the standard level <b>PPPP</b>	Gpm
0 07 032			Height of sensor above local ground <sup>(3)</sup>	m, 2
0 12 101			Temperature/dry-bulb temperature <b>s<sub>n</sub>TTT</b>	K, 2
0 02 051			Indicator to specify observing method for extreme temperatures <sup>(3)</sup> <b>i<sub>y</sub></b>	Code table, 0
0 04 051			Principal time of daily reading of maximum temperature <b>G<sub>x</sub>G<sub>x</sub></b>	Hour, 0
0 12 118			Maximum temperature at height specified, past 24 h. <b>s<sub>n</sub>T<sub>x</sub>T<sub>x</sub>T<sub>x</sub></b>	K, 2
0 04 052			Principal time of daily reading of minimum temperature <b>G<sub>n</sub>G<sub>n</sub></b>	Hour, 0
0 12 119			Minimum temperature at height specified, past 24 h. <b>s<sub>n</sub>T<sub>n</sub>T<sub>n</sub>T<sub>n</sub></b>	K, 2
0 13 004			Vapour pressure <b>eee</b>	Pa, -1
0 12 151			Standard deviation of daily mean temperature <b>s<sub>t</sub>s<sub>t</sub>s<sub>t</sub></b>	K, 2
0 07 032			Height of sensor above local ground (set to missing to cancel the previous value)	m, 2
0 14 032			Total sunshine <b>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub></b>	Hour, 0
0 08 023			First order statistics (set to missing to cancel the previous value)	Code table, 0
			<b>Normals of precipitation</b>	
0 04 001			Year (of beginning of the reference period)	Year, 0
0 04 001			Year (of ending of the reference period)	Year, 0
0 04 002			Month	Month, 0
0 04 003			Day (= 1) <sup>(2)</sup>	Day, 0
0 04 004			Hour (= 6) <sup>(2)</sup>	Hour, 0
0 04 022			Time period (= 1)	Month, 0
0 07 032			Height of sensor above local ground <sup>(3)</sup>	m, 2
0 08 023			First order statistics (= 4; mean value)	Code table, 0
0 13 060			Total accumulated precipitation <b>R<sub>1</sub>R<sub>1</sub>R<sub>1</sub>R<sub>1</sub></b>	kg m <sup>-2</sup> , 1
0 04 053			Number of days with precipitation equal to or more than 1 mm <b>n<sub>r</sub>n<sub>r</sub></b>	Numeric, 0
0 08 023			First order statistics (set to missing to cancel the previous value)	Code table, 0
			<b>Number of missing years</b>	
1 02 008			Replicate 2 descriptors 8 times	
0 08 050			Qualifier for number of missing values in calculation of statistic (= 1; pressure) (= 2; temperature) (= 3; extreme temperatures) <sup>(4)</sup> (= 4; vapour pressure) (= 5; precipitation) (= 6; sunshine duration) (= 7; maximum temperature) <sup>(4)</sup> (= 8; minimum temperature) <sup>(4)</sup>	Code table, 0

## World Meteorological Organization

0 08 020			Total number of missing entities (years) $y_p y_p$ (for pressure) $y_T y_T$ (for temperature) $y_{Tx} y_{Tx}$ (for extreme temperatures) <sup>(4)</sup> $y_e y_e$ (for vapour pressure) $y_R y_R$ (for precipitation) $y_s y_s$ (for sunshine duration) for maximum temperature <sup>(4)</sup> for minimum_temperature <sup>(4)</sup>	Numeric, 0
----------	--	--	---	------------

**Notes:**

- (1) The time identification refers to the beginning of the one-month period. Except for precipitation measurements, the one-month period is recommended to correspond to the local standard time (LST) month. [7]
- (2) In case of precipitation measurements, the one-month period begins at 06 UTC on the first day of the month and ends at 06 UTC on the first day of the following month. [5]
- (3) If the height of the sensor or observing method for extreme temperatures was changed during the period specified, the value shall be that which existed for the greater part of the period.
- (4) The number of missing years within the reference period from the calculation of normal for mean extreme air temperature should be given, if available, for both the calculation of normal maximum temperature and for the calculation of normal minimum temperature in addition to the number of missing years for the extreme air temperatures reported under 0 08 020 preceded by 0 08 050 in which the figure 3 is used.

## Regulations:

- B/C 30.1 Section 1 of BUFR or CREX
- B/C 30.2 Monthly values from a land station
  - B/C 30.2.1 Station identification, date/time, horizontal and vertical coordinates
  - B/C 30.2.2 Monthly mean values of pressure, temperature, extreme temperatures and vapour pressure; standard deviation of daily mean temperature
  - B/C 30.2.3 Monthly duration of sunshine
  - B/C 30.2.4 Number of days with parameters beyond certain thresholds; number of days with thunderstorm and hail
  - B/C 30.2.5 Occurrence of extreme values of temperature and wind speed
  - B/C 30.2.6 Monthly precipitation data
  - B/C 30.2.7 Number of days with precipitation beyond certain thresholds
  - B/C 30.2.8 Occurrence of extreme precipitation
- B/C 30.3 Monthly normals for a land station
  - B/C 30.3.1 Normals of pressure, temperatures, vapour pressure, standard deviation of daily mean temperature, and sunshine duration
  - B/C 30.3.2 Normals of precipitation
  - B/C 30.3.3 Number of missing years
- B/C 30.4 Data required by regional or national reporting practices

### **B/C 30.1 Section 1 of BUFR or CREX**

#### **B/C 30.1.1 Entries required in Section 1 of BUFR**

The following entries shall be included in BUFR Section 1:

- BUFR master table,
- identification of originating/generating centre,
- identification of originating/generating sub-centre,
- update sequence number,
- identification of inclusion of optional section,
- data category (= 000 for CLIMAT data),
- international data sub-category <sup>(1), (2)</sup>,
- local data subcategory,
- version number of master table,
- version number of local tables,
- year (year of the century up to BUFR edition 3) <sup>(3)</sup>,
- month (for which the monthly values are reported) <sup>(3)</sup>,
- day (= 1) <sup>(3)</sup>,
- hour (= 0) <sup>(3)</sup>,
- minute (= 0) <sup>(3)</sup>.

Notes:

- (1) Inclusion of this entry is required starting with BUFR edition 4.
- (2) If required, the international data sub-category shall be included for CLIMAT data as 020.
- (3) The time identification refers to the beginning of the month for which the monthly mean values are reported.

#### **B/C 30.1.2 Entries required in Section 1 of CREX**

The following entries shall be included in CREX Section 1:

- CREX master table,



- CREX edition number,
- CREX table version number,
- version number of BUFR master table <sup>(1)</sup>,
- version number of local tables <sup>(1)</sup>,
- data category (= 000 for CLIMAT data),
- international data sub-category <sup>(1), (2)</sup>,
- identification of originating/generating centre <sup>(1)</sup>,
- identification of originating/generating sub-centre <sup>(1)</sup>,
- update sequence number <sup>(1)</sup>,
- number of subsets <sup>(1)</sup>,
- year <sup>(1), (3)</sup>,
- month (for which the monthly values are reported) <sup>(1), (3)</sup>,
- day (= 1) <sup>(1), (3)</sup>,
- hour (= 0) <sup>(1), (3)</sup>,
- minute (= 0) <sup>(1), (3)</sup>.

Notes:

(1) Inclusion of these entries is required starting with CREX edition 2.

(2) If inclusion of international data sub-category is required, Note (2) under B/C 30.1.1 applies.

(3) Note (3) under B/C 30.1.1 applies.

## **B/C 30.2 Monthly values from a land station <3 07 071>**

### **B/C 30.2.1 Station identification, date/time, horizontal and vertical coordinates <3 01 090>**

#### **B/C 30.2.1.1 Station identification**

WMO block number station (0 01 001) and WMO station number (0 01 002) shall be always reported as a non-missing value.

Station or site name (0 01 015) shall be reported as published in WMO-No. 9, Volume A, Observing Stations, provided that the station name does not exceed 20 characters. A shortened version of the name shall be reported otherwise.

Type of station (0 02 001) shall be reported to indicate the type of the station operation (manned, automatic or hybrid).

#### **B/C 30.2.1.2 Date/time (of beginning of the month)**

Date <3 01 011> and time <3 01 012> shall be reported, i.e. year (0 04 001), month (0 04 002), day (0 04 003) and hour (0 04 004), minute (0 04 005) of beginning of the month for which the monthly values are reported. Day (0 04 003) shall be set to 1 and both hour (0 04 004) and minute (0 04 005) shall be set to 0.

#### **B/C 30.2.1.3 Horizontal and vertical coordinates**

Latitude (0 05 001) and longitude (0 06 001) of the station shall be reported in degrees with precision in  $10^{-5}$  of a degree.

Height of station ground above mean sea level (0 07 030) and height of barometer above mean sea level (0 07 031) shall be reported in meters with precision in tenths of a meter.

### **B/C 30.2.2 Monthly mean values of pressure, temperature, extreme temperatures and vapour pressure; standard deviation of daily mean temperature**

The monthly mean values of pressure, pressure reduced to mean sea level or geopotential height, temperature, extreme temperatures and vapour pressure shall be reported. Any missing element shall be reported as a missing value.



**B/C 30.2.2.1 Reference period for the data of the month**

Monthly data (with the exception of precipitation data) are recommended to be reported for one-month period, corresponding to the local standard time (LST) month. In that case, short time displacement (0 04 074) shall specify the difference between UTC and LST (set to *non-positive values in the eastern hemisphere, non-negative values in the western hemisphere*).

Time period (0 04 023) represents the number of days in the month for which the data are reported, and shall be expressed as a *positive value* in days.

Note:

- (1) A BUFR (or CREX) message shall contain reports for one specific month only. [71.1.4]

**B/C 30.2.2.2 First order statistics – Code table 0 08 023**

This datum shall be set to 4 (mean value) to indicate that the following entries represent mean values of the elements (pressure, pressure reduced to mean sea level or geopotential height, temperature, extreme temperatures and vapour pressure) averaged over the one-month period.

**B/C 30.2.2.3 Monthly mean value of pressure**

Monthly mean value of pressure shall be reported using 0 10 004 (Pressure) in pascals (with precision in tens of a pascal).

**B/C 30.2.2.4 Monthly mean value of pressure reduced to mean sea level**

Monthly mean value of pressure reduced to mean sea level shall be reported using 0 10 051 (Pressure reduced to mean sea level) in pascals (with precision in tens of a pascal), if the air pressure at mean sea level can be computed with reasonable accuracy.

**B/C 30.2.2.5 Monthly mean value of geopotential height**

Monthly mean value of geopotential height of a standard level shall be reported using 0 10 009 (Geopotential height) in geopotential meters from high-level stations which cannot give pressure at mean sea level to a satisfactory degree of accuracy. The standard isobaric level is specified by the preceding entry Pressure (0 07 004).

**B/C 30.2.2.6 Height of sensor above local ground**

Height of sensor above local ground (0 07 032) for temperature and humidity measurement shall be reported in meters (with precision in hundredths of a meter).

This datum represents the actual height of temperature and humidity sensors above ground at the point where the sensors are located.

Note:

- (1) If the height of the sensor was changed during the period specified, the value shall be that which existed for the greater part of the period.

**B/C 30.2.2.7 Monthly mean value of temperature**

Monthly mean value of temperature shall be reported using 0 12 101 (Temperature/dry bulb temperature) in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius). Temperature data shall be reported with precision in hundredths of a degree even if they are available with the accuracy in tenths of a degree.

Notes:

- (1) This requirement is based on the fact that conversion from the Kelvin to the Celsius scale has often resulted into distortion of the data values.
- (2) Temperature  $t$  (in degrees Celsius) shall be converted into temperature  $T$  (in degrees Kelvin) using equation:  $T = t + 273.15$ .

**B/C 30.2.2.8 Indicator to specify observing method for extreme temperatures – Code table 0 02 051**

## World Meteorological Organization

This datum shall be set to 1 (maximum/minimum thermometers) or to 2 (automated instruments) or to 3 (thermograph) to indicate observing method for extreme temperatures.

Note:

- (1) If the observing method for extreme temperatures was changed during the period specified, the code figure shall be that which existed for the greater part of the period.

### **B/C 30.2.2.9 Monthly mean value of maximum temperature**

Monthly mean value of maximum temperature shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Notes:

- (1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.
- (2) The monthly mean value of maximum temperature shall be reported using 0 12 118 (Maximum temperature at height specified, past 24 hours). The height is specified by the preceding entry 0 07 032. Principal time of daily reading of maximum temperature (0 04 051) indicates the end of the 24 hour period to which the daily maximum temperature refers.

### **B/C 30.2.2.10 Monthly mean value of minimum temperature**

Monthly mean value of minimum temperature shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Notes:

- (1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.
- (2) The monthly mean value of minimum temperature shall be reported using 0 12 119 (Minimum temperature at height specified, past 24 hours). The height is specified by the preceding entry 0 07 032. Principal time of daily reading of minimum temperature (0 04 052) indicates the end of the 24 hour period to which the daily minimum temperature refers.

### **B/C 30.2.2.11 Monthly mean value of vapour pressure**

Monthly mean value of vapour pressure shall be reported using 0 13 004 (Vapour pressure) in pascals (with precision in tens of a pascal).

### **B/C 30.2.2.12 First order statistics – Code table 0 08 023**

This datum shall be set to missing to indicate that the following entries do not represent the monthly mean values.

### **B/C 30.2.2.13 Standard deviation of daily mean temperature**

Standard deviation of daily mean temperature (0 12 151) shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius). [71.3.1]

### **B/C 30.2.2.14 Number of days in the month for which values are missing**

Number of days in the month for which values are missing shall be reported using Total number of missing entities (0 08 020) being preceded by Qualifier for number of missing values in calculation of statistic (0 08 050) in each of the required five replications (1 02 005).

Qualifier for number of missing values in calculation of statistic (0 08 050) is - set to 1 (pressure) in the first replication,

- set to 2 (temperature) in the second replication,
- set to 4 (vapour pressure) in the third replication,
- set to 7 (maximum temperature) in the fourth replication,
- set to 8 (minimum temperature) in the fifth replication.

The number of days in the month for which values of the parameter are missing, shall be reported using 0 08 020 in the corresponding replication.

### B/C 30.2.3 Monthly duration of sunshine

#### B/C 30.2.3.1 Total sunshine duration

The monthly values of total duration of sunshine shall be reported in hours using Total sunshine (0 14 032) and the percentage of the normal that that value represents shall be reported using Total sunshine (0 14 033). Any missing element shall be reported as a missing value.

Note:

- (1) If the percentage of the normal is 1% or less but greater than 0, Total sunshine 0 14 033 shall be set to 1.
- (2) If the normal is zero hours, *Total sunshine 0 14 033 shall be set to 510.*
- (3) If the normal is not defined, Total sunshine 0 14 033 shall be set to missing. [71.3.3]

#### B/C 30.2.3.2 Number of days in the month for which sunshine data are missing

Number of days in the month for which sunshine data are missing shall be reported using Total number of missing entities (0 08 020) being preceded by Qualifier for number of missing values in calculation of statistic (0 08 050) set to 6 (sunshine duration).

#### B/C 30.2.4 Number of days with parameters beyond certain thresholds and number of days with thunderstorm and hail

Number of days in the month with parameters beyond certain thresholds and with thunderstorm and hail shall be reported using Total number (0 08 022) being preceded by Conditions for which number of days of occurrence follows (0 08 052) in each of the required eighteen replications (1 02 018).

Conditions for which number of days of occurrence follows (0 08 052) is

- set to 0 (mean wind speed over 10-minute period  $\geq 10 \text{ m s}^{-1}$ ),
- set to 1 (mean wind speed over 10-minute period  $\geq 20 \text{ m s}^{-1}$ ),
- set to 2 (mean wind speed over 10-minute period  $\geq 30 \text{ m s}^{-1}$ ),
- set to 3 (maximum temperature  $< 273.15 \text{ K}$ ),
- set to 4 (maximum temperature  $\geq 298.15 \text{ K}$ ),
- set to 5 (maximum temperature  $\geq 303.15 \text{ K}$ ),
- set to 6 (maximum temperature  $\geq 308.15 \text{ K}$ ),
- set to 7 (maximum temperature  $\geq 313.15 \text{ K}$ ),
- set to 8 (minimum temperature  $< 273.15 \text{ K}$ ),
- set to 16 (snow depth  $> 0.00 \text{ m}$ ),
- set to 17 (snow depth  $> 0.01 \text{ m}$ ),
- set to 18 (snow depth  $> 0.10 \text{ m}$ ),
- set to 19 (snow depth  $> 0.50 \text{ m}$ ),
- set to 20 (horizontal visibility  $< 50 \text{ m}$ ),
- set to 21 (horizontal visibility  $< 100 \text{ m}$ ),
- set to 22 (horizontal visibility  $< 1000 \text{ m}$ ),
- set to 23 (occurrence of hail),
- set to 24 (occurrence of thunderstorm) in the last replication.

The number of days in the month with parameters beyond the specified thresholds and with thunderstorm and hail shall be reported using 0 08 022 in the corresponding replication.

Note:

- (1) Number of days in the month with horizontal visibility beyond the specified thresholds is the number of days with visibility less than 50, 100 and 1000 m, respectively, *irrespective of the duration of the period* during which horizontal visibility below the specified thresholds was observed or recorded.

**B/C 30.2.5 Occurrence of extreme values of temperatures and wind speed**

**B/C 30.2.5.1 Height of sensor above local ground (for temperature)**

Height of sensor above local ground (0 07 032) for temperature measurement shall be reported in meters (with precision in hundredths of a meter).

This datum represents the actual height of temperature sensor above ground at the point where the sensor is located.

**B/C 30.2.5.2 Occurrence of the highest daily mean temperature**

The day on which the highest daily mean temperature occurred shall be reported using Day (0 04 003). If the highest daily mean temperature occurred on only one day, the preceding entry 0 08 053 (Day of occurrence qualifier) shall be set to 0. If the highest daily mean temperature occurred on more than one day, the first day shall be reported for 0 04 003 and the preceding entry 0 08 053 shall be set to 1. [71.6.1]

Highest daily mean temperature (0 12 152) shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Note:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

**B/C 30.2.5.3 Occurrence of the lowest daily mean temperature**

The day on which the lowest daily mean temperature occurred shall be reported using Day (0 04 003). If the lowest daily mean temperature occurred on only one day, the preceding entry 0 08 053 (Day of occurrence qualifier) shall be set to 0. If the lowest daily mean temperature occurred on more than one day, the first day shall be reported for 0 04 003 and the preceding entry 0 08 053 shall be set to 1. [71.6.1]

Lowest daily mean temperature (0 12 152) shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Note:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

**B/C 30.2.5.4 Occurrence of the highest air temperature of the month**

The day on which the highest air temperature occurred shall be reported using Day (0 04 003). If the highest air temperature occurred on only one day, the preceding entry 0 08 053 (Day of occurrence qualifier) shall be set to 0. If the highest air temperature occurred on more than one day, the first day shall be reported for 0 04 003 and the preceding entry 0 08 053 shall be set to 1. [71.6.1]

The highest air temperature of the month shall be reported using 0 12 101 (Temperature/dry bulb temperature), preceded by First order statistics (0 08 023) set to 2 (maximum value). The temperature shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Note:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

**B/C 30.2.5.5 Occurrence of the lowest air temperature of the month**

The day on which the lowest air temperature occurred shall be reported using Day (0 04 003). If the lowest air temperature occurred on only one day, the preceding entry 0 08 053 (Day of occurrence qualifier) shall be set to 0. If the lowest air temperature occurred on more than one day, the first day shall be reported for 0 04 003 and the preceding entry 0 08 053 shall be set to 1. [71.6.1]

The lowest air temperature of the month shall be reported using 0 12 101 (Temperature/dry bulb temperature), preceded by First order statistics (0 08 023) set to 3 (minimum value). The

## World Meteorological Organization

temperature shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Note:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

### **B/C 30.2.5.6 Height of sensor above local ground (for wind measurement)**

Height of sensor above local ground (0 07 032) for wind measurement shall be reported in meters (with precision in hundredths of a meter).

This datum represents the actual height of wind sensors above ground at the point where the sensors are located.

### **B/C 30.2.5.7 Type of instrumentation for wind measurement - Flag table 0 02 002**

This datum shall be used to specify whether the wind speed was measured by certified instruments (bit No. 1 set to 1) or estimated on the basis of the Beaufort wind scale (bit No. 1 set to 0), and to indicate the original units for wind speed measurement. Bit No. 2 set to 1 indicates that wind speed was originally measured in knots and bit No. 3 set to 1 indicates that wind speed was originally measured in kilometers per hour. Setting both bits No.2 and No.3 to 0 indicates that wind speed was originally measured in meters per second.

In CREX, type of instrumentation for wind measurement (0 02 002) shall be reported in octal representation. For example, if wind speed was measured by instruments in knots (bit No.1 and bit No.2 set to 1), then this datum shall be reported as 14.

### **B/C 30.2.5.8 Occurrence of the highest instantaneous wind speed of the month**

The day on which the highest instantaneous wind speed occurred shall be reported using Day (0 04 003). If the highest instantaneous wind speed occurred on only one day, the preceding entry 0 08 053 (Day of occurrence qualifier) shall be set to 0. If the highest instantaneous wind speed occurred on more than one day, the first day shall be reported for 0 04 003 and the preceding entry 0 08 053 shall be set to 1. [71.6.1]

The highest instantaneous wind speed of the month shall be reported using 0 11 046 (Maximum instantaneous wind speed) in meters per second (with precision in tenths of a meter per second).

## **B/C 30.2.6 Monthly precipitation data**

### **B/C 30.2.6.1 Date/time (of beginning of the one-month period for precipitation data)**

Day (0 04 003) and hour (0 04 004) of the beginning of the one-month period for monthly precipitation data are reported. Day (0 04 003) shall be set to 1 and hour (0 04 004) shall be set to 6.

Notes:

- (1) In case of precipitation measurements, a month begins at 0600 hours UTC on the first day of the month and ends at 0600 hours UTC on the first day of the following month [Guide to Climatological Practices, WMO-No. 100].
- (2) Year (0 04 001), month (0 04 002) and minute (0 04 005) of the beginning of the one-month period specified in the Regulations B/C 30.2.1.2 apply.

### **B/C 30.2.6.2 Period of reference for precipitation data of the month**

Time period (0 04 023) represents the number of days in the month for which the monthly mean data are reported, and shall be expressed as a *positive value* in days.

Note:

- (1) A BUFR (or CREX) message shall contain reports for one specific month only. [71.1.4]

#### **B/C 30.2.6.3 Height of sensor above local ground**

Height of sensor above local ground (0 07 032) for precipitation measurement shall be reported in meters (with precision in hundredths of a meter).

This datum represents the actual height of the rain gauge rim above ground at the point where the rain gauge is located.

Note:

- (1) If the height of the sensor was changed during the period specified, the value shall be that which existed for the greater part of the period.

#### **B/C 30.2.6.4 Total amount of precipitation of the month**

Total accumulated precipitation (0 13 060) which has fallen during the month shall be reported in kilograms per square meter (with precision in tenths of a kilogram per square meter).

Note:

- (1) Trace shall be reported as “- 0.1 kg m<sup>-2</sup>”.

#### **B/C 30.2.6.5 Indication of frequency group**

Frequency group in which the total amount of precipitation of the month falls shall be reported using Code table 0 13 051 (Frequency group; precipitation).

Note:

- (1) If for a particular month the total amount of precipitation is zero, the code figure for 0 13 051 shall be given by the highest number of quintile which has 0.0 as lower limit (e.g. in months with no rainfall in the 30-year period, 0 13 051 shall be set to 5). [71.3.2]

#### **B/C 30.2.6.6 Number of days with precipitation equal to or greater than 1 mm**

Number of days in the month with precipitation equal to or greater than 1 kilogram per square meter shall be reported using 0 04 053 (Number of days in the month with precipitation equal to or greater than 1 mm).

#### **B/C 30.2.6.7 Number of days in the month for which precipitation data is missing**

Number of days in the month for which precipitation is missing shall be reported using Total number of missing entities (0 08 020) being preceded by Qualifier for number of missing values in calculation of statistic (0 08 050) set to 5 (precipitation).

#### **B/C 30.2.7 Number of days with precipitation beyond certain thresholds**

Number of days in the month with precipitation beyond certain thresholds shall be reported using Total number (0 08 022) being preceded by Conditions for which number of days of occurrence follows (0 08 052) in each of the required six replications (1 02 006).

Conditions for which number of days of occurrence follows (0 08 052) is

- set to 10 (precipitation  $\geq 1.0 \text{ kg m}^{-2}$ ) in the first replication,
- set to 11 (precipitation  $\geq 5.0 \text{ kg m}^{-2}$ ),
- set to 12 (precipitation  $\geq 10.0 \text{ kg m}^{-2}$ ),
- set to 13 (precipitation  $\geq 50.0 \text{ kg m}^{-2}$ ),
- set to 14 (precipitation  $\geq 100.0 \text{ kg m}^{-2}$ ),
- set to 15 (precipitation  $\geq 150.0 \text{ kg m}^{-2}$ ) in the last replication.

The number of days in the month with precipitation beyond the specified thresholds shall be reported using 0 08 022 in the corresponding replication.

#### **B/C 30.2.8 Occurrence of extreme precipitation**

The day on which the highest daily amount of precipitation occurred shall be reported using Day (0 04 003). If the highest daily amount of precipitation occurred on only one day, the preceding entry 0 08 053 (Day of occurrence qualifier) shall be set to 0. If the highest daily amount of precipitation occurred on more than one day, the first day shall be reported for 0 04 003 and the preceding entry 0 08 053 shall be set to 1. [71.6.1]



## World Meteorological Organization

Highest daily amount of precipitation (0 13 052) shall be reported in kilograms per square meter (with precision in tenths of a kilogram per square meter).

Note:

(1) Trace shall be reported as “- 0.1 kg m<sup>-2</sup>”.

### **B/C 30.3 Monthly normals for a land station <3 07 072>**

Meteorological Services shall submit to the Secretariat complete normal data of the elements for stations to be included in the CLIMAT bulletins. The same shall apply when Services consider it necessary to make amendments to previously published normal values. [71.4.1]

#### **B/C 30.3.1 Normals of pressure, temperatures, vapour pressure, standard deviation of daily mean temperature, and sunshine duration**

Normal values of pressure, pressure reduced to mean sea level or geopotential height, temperature, extreme temperatures, vapour pressure, standard deviation of daily mean temperature, and sunshine duration shall be reported. Any missing element shall be reported as a missing value.

##### **B/C 30.3.1.1 Reference period for normal data**

Reference period for calculation of the normal values of the elements shall be reported using two consecutive entries 0 04 001 (Year). The first 0 04 001 shall express the year of beginning of the reference period and the second 0 04 001 shall express the year of ending of the reference period.

Note:

(1) The normal data reported shall be deduced from observations made over a specific period defined by *Technical Regulations*. [71.4.2]

##### **B/C 30.3.1.2 Specification of the one-month period for which normals are reported**

The one-month period for which the normal values are reported shall be specified by month (0 04 002), day (0 04 003) being set to 1, hour (0 04 004) being set to 0, short time displacement (0 04 074) and time period (0 04 022) being set to 1, i.e. 1 month.

Short time displacement (0 04 074) shall be set to *non-positive values in the eastern hemisphere, negative values in the western hemisphere*.

##### **B/C 30.3.1.3 First order statistics – Code table 0 08 023**

This datum shall be set to 4 (mean value) to indicate that the following entries represent mean values of the elements (pressure, pressure reduced to mean sea level or geopotential height, temperature, extreme temperatures, vapour pressure, standard deviation of daily mean temperature and sunshine duration) averaged over the reference period specified in Regulation B/C 30.3.1.1.

##### **B/C 30.3.1.4 Normal value of pressure**

Normal value of pressure shall be reported using 0 10 004 (Pressure) in pascals (with precision in tens of a pascal).

##### **B/C 30.3.1.5 Normal value of pressure reduced to mean sea level**

Normal value of pressure reduced to mean sea level shall be reported using 0 10 051 (Pressure reduced to mean sea level) in pascals (with precision in tens of a pascal), if the air pressure at mean sea level can be computed with reasonable accuracy.

##### **B/C 30.3.1.6 Normal value of geopotential height**

Normal value of geopotential height of a standard level shall be reported using 0 10 009 (Geopotential height) in geopotential meters from high-level stations which cannot give



## World Meteorological Organization

pressure at mean sea level to a satisfactory degree of accuracy. The standard isobaric level is specified by the preceding entry Pressure (0 07 004).

### **B/C 30.3.1.7 Height of sensor above local ground**

Regulation B/C 30.2.2.6 shall apply.

### **B/C 30.3.1.8 Normal value of temperature**

Normal value of temperature shall be reported using 0 12 101 (Temperature/dry bulb temperature) in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Note:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

### **B/C 30.3.1.9 Indicator to specify observing method for extreme temperatures –**

Code table 0 02 051

Regulation B/C 30.2.2.8 shall apply.

### **B/C 30.3.1.10 Normal value of maximum temperature**

Normal value of maximum temperature shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Notes:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

(2) Note (2) under Regulation B/C 30.2.2.9 shall apply.

### **B/C 30.3.1.11 Normal value of minimum temperature**

Normal value of minimum temperature shall be reported in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

Notes:

(1) Notes (1) and (2) under Regulation B/C 30.2.2.7 shall apply.

(2) Note (2) under Regulation B/C 30.2.2.10 shall apply.

### **B/C 30.3.1.12 Normal value of vapour pressure**

Normal value of vapour pressure shall be reported using 0 13 004 (Vapour pressure) in pascals (with precision in tens of a pascal).

### **B/C 30.3.1.13 Normal value of standard deviation of daily mean temperature**

Normal value of standard deviation of daily mean temperature shall be reported using 0 12 151 in degrees Kelvin (with precision in hundredths of a degree Kelvin); if produced in CREX, in degrees Celsius (with precision in hundredths of a degree Celsius).

### **B/C 30.3.1.14 Normal of monthly sunshine duration**

Normal of monthly sunshine duration shall be reported in hours using 0 14 032 (Total sunshine).

## **B/C 30.3.2 Normals of precipitation**

Normal values of monthly amount of precipitation and of number of days in the month with precipitation equal to or greater than 1 mm, shall be reported. Any missing element shall be reported as a missing value.

### **B/C 30.3.2.1 Reference period for normal values of precipitation**

Reference period for calculation of the normal values of precipitation shall be reported using two consecutive entries 0 04 001 (Year). The first 0 04 001 shall express the year of

beginning of the reference period and the second 0 04 001 shall express the year of ending of the reference period.

Note:

- (1) Note (1) under Regulation B/C 30.3.1.1 shall apply.

#### **B/C 30.3.2.2 Specification of the one-month period for which normals are reported**

The one-month period for which the normals of precipitation are reported shall be specified by month (0 04 002), day (0 04 003) being set to 1, hour (0 04 004) *being set to 6* and time period (0 04 022) being set to 1, i.e. 1 month.

Note:

- (1) Note (1) under Regulation B/C 30.2.6.1 shall apply.

#### **B/C 30.3.2.3 Height of sensor above local ground**

Regulation B/C 30.2.6.3 shall apply.

#### **B/C 30.3.2.4 First order statistics – Code table 0 08 023**

This datum shall be set to 4 (mean value) to indicate that the following entries represent mean values of precipitation data, averaged over the reference period specified in Regulation B/C 30.3.2.1.

#### **B/C 30.3.2.5 Normal value of monthly amount of precipitation**

Normal value of monthly amount of precipitation shall be reported in kilograms per square meter (with precision in tenths of a kilogram per square meter) using 0 13 060 (Total accumulated precipitation).

Note:

- (1) Trace shall be reported as “- 0.1 kg m<sup>-2</sup>”.

#### **B/C 30.3.2.6 Normal value of number of days with precipitation ≥ 1 mm**

Normal value of number of days in the month with precipitation equal to or greater than 1 kilogram per square meter shall be reported using 0 04 053 (Number of days in the month with precipitation equal to or greater than 1 mm).

#### **B/C 30.3.3 Number of missing years**

Number of missing years within the reference period shall be reported using Total number of missing entities (0 08 020) being preceded by Qualifier for number of missing values in calculation of statistic (0 08 050) in each of the required eight replications (1 02 008).

Qualifier for number of missing values in calculation of statistic (0 08 050) is

- set to 1 (pressure) in the first replication,
- set to 2 (temperature),
- set to 3 (extreme temperatures),
- set to 4 (vapour pressure),
- set to 5 (precipitation),
- set to 6 (sunshine duration),
- set to 7 (maximum temperature),
- set to 8 (minimum temperature) in the last replication.

The number of missing years within the reference period for calculation of the normal values of the element shall be reported using 0 08 020 in the corresponding replication.

Note:

- (1) The number of missing years within the reference period from the calculation of normal for mean extreme air temperature should be given, if available, for both the calculation of normal maximum temperature and for the calculation of normal minimum temperature in addition to the number of missing years for the extreme air temperatures reported under 0 08 020 preceded by 0 08 050 in which Figure 3 is used.

**B/C 30.4 Data required by regional or national reporting practices**

No additional data are currently required by regional or national reporting practices for CLIMAT data in Manual on Codes, WMO-No. 306, Volume II.