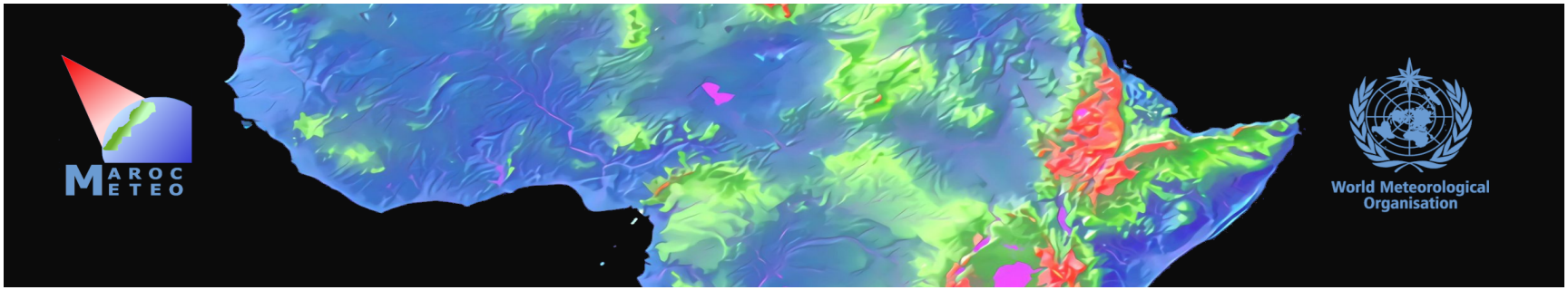

Training Session on Calculation of Climatological Standard Normals for 1991-2020

Driss BARI

National Center of Climate
Moroccan Meteorological Service, Casablanca, Morocco
bari.driss@gmail.com

Workshop on Climate Data Management, Data Sharing and Exchange
DGM-WMO 13 December 2021

Plan

1 Quick Introduction about the Climate Normals

2 WMO Guidelines on the Calculation of Climate Normals

3 WMO Submission and Collection Mechanisms for CLINO

4 Useful references

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Definition

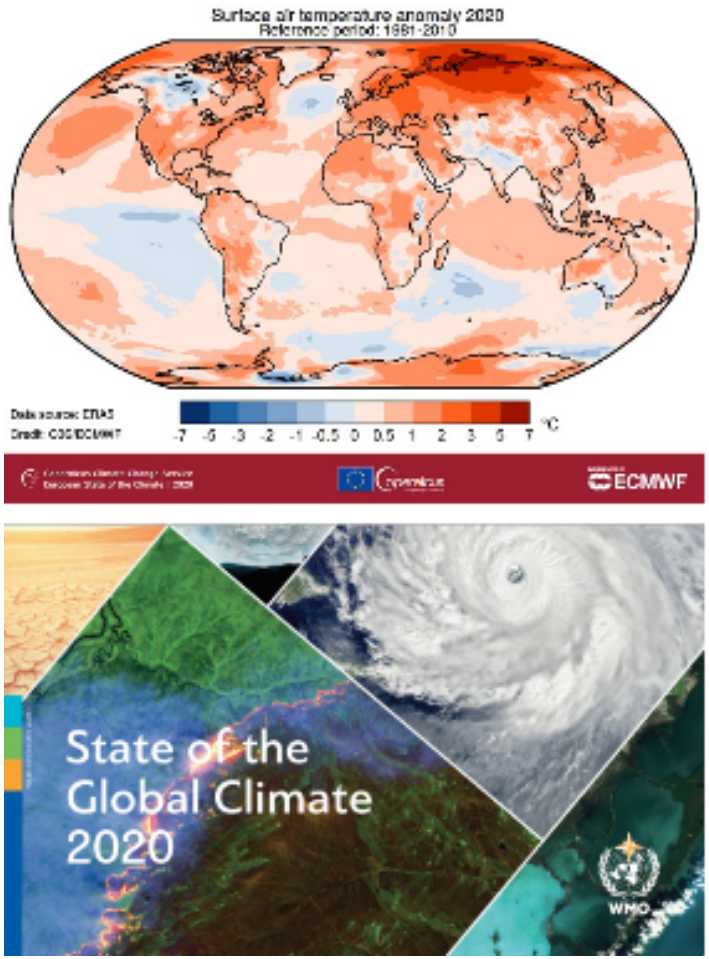
Resolution 16 (Cg-17) in 2015 approved the proposed amendments to the Technical Regulations (WMO-No. 49), Volume I, with respect to the definition of Climatological Standard Normals as follows:

Climatological Standard Normals: Averages of climatological data computed for the following consecutive periods of 30 years ending in '0': 1 January 1981–31 December 2010, 1 January 1991–31 December 2020, and so forth;

WMO Reference Period for long-term climate change assessment: The consecutive period of 30 years from 1 January 1961 to 31 December 1990

It is noted that in the past Climatological Standard Normals had referred to non-overlapping 30-year periods: 1901-1930, 1931-1960 and 1961-1990.

Purpose



Climate normals are used for two principal purposes :

- They serve as a **benchmark against which recent or current observations** can be compared, including providing a basis for many anomaly-based climate datasets (for example, global mean temperatures : year yyyy was z degrees too warm/too cold).
- They are also widely used, implicitly or explicitly, as a **prediction of the conditions most likely to be experienced in a given location.**

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WMO Call

WMO OMM
World Meteorological Organization
Organisation météorologique mondiale
Organización Meteorológica Mundial
Всемирная метеорологическая организация
المنظمة العالمية للأرصاد الجوية
世界气象组织

Secrétariat
7 bis, avenue de la Paix – Case postale 2300
CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11
Fax: +41 (0) 22 730 81 81
wmo@wmo.int – public.wmo.int

Ref.: 16953/2021-1.15 S/CMP

Our ref.: 16953/2021/S/CS/CMP/CLINO9120 4 August 2021

Annexes: 2 (available in English only)

Subject: WMO collection of the Climatological Standard Normals for 1991–2020

Action required: Submission of data at your earliest convenience from 1 October 2021, **but not later than 31 March 2022**

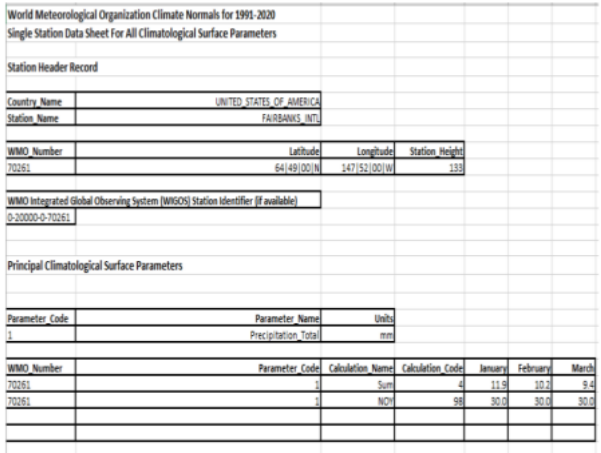
Dear Sir/Madam,

I wish to inform you that arrangements have been made for the World Meteorological Organization (WMO) collection of the Climatological Standard Normals 1991–2020. As you may recall, the Seventeenth World Meteorological Congress (Cg-17) in 2015, through Resolution 16 (Cg-17) – Report of the Sixteenth Session of the Commission for

WMO Call provides detailed guidance on the CLINO submission process including stations, parameters and formats.

Submissions (EXCEL or ASCII) to be sent to wcdmp@wmo.int

ANNEXE 2, p. 2



World Meteorological Organization Climate Normals for 1991-2020
Single Station Data Sheet For All Climatological Surface Parameters

Station Header Record

Country_Name	UNITED_STATES_OF_AMERICA
Station_Name	FAIRBANKS_INTL

WMO_Number	Latitude	Longitude	Station_Height
70261	64|49|00|N	147|52|00|W	133

WMO Integrated Global Observing System (WIGOS) Station Identifier (if available)
0-20000-0-70261

Principal Climatological Surface Parameters

Parameter_Code	Parameter_Name	Units
1	Precipitation_Total	mm

WMO_Number	Parameter_Code	Calculation_Name	Calculation_Code	January	February	March
70261	1	Sum	4	11.9	10.2	9.4
70261	1	NOY	98	30.0	30.0	30.0

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CLINO stations

Members are asked to submit CLINO from **as many stations as possible**, including stations **registered in OSCAR/Surface** and **in particular** for stations that

- constitute the **Regional Basic Climatological Networks** (RBCN),
- report monthly **CLIMAT** messages
- contribute to the **World Weather Records** collection.

CLINO elements

Principal climatological surface parameters:

- Precipitation total
- Number of days with precipitation ≥ 1 mm
- Monthly mean values of maximum, minimum and daily mean temperatures
- Mean value of sea-level pressure
- Mean vapour pressure
- Total number of hours of sunshine

Secondary climatological surface parameters: ...

Other climatological surface parameters: ...

Principal climatological surface parameters

Principal climatological surface parameters		
Parameter	*Units*	*Comments*
Precipitation total	mm	Definition of observation day should be according to national standards and documented in metadata (see also section 4.9)
Number of days with precipitation ≥ 1 mm	count	
Monthly mean values of maximum, minimum and daily mean temperatures	°C	Definition of observation day, and the way in which daily mean temperature is calculated, should be according to national standards and documented in metadata (see also section 4.9). Different methods are in operational use for the calculation of daily mean temperature.
Mean value of sea-level pressure	hPa	Daily values should be calculated, if possible, as the mean of either eight evenly spaced 3-hourly observations or four evenly spaced 6-hourly observations. If this is not possible, they should use a set of observation times that is consistent over time at that station and documented in metadata. At high-elevation stations, mean geopotential height at a set pressure level (for example, 850 hPa or 700 hPa) may be used as a substitute for mean sea-level pressure.
Mean vapour pressure	hPa	Should be calculated as the mean of daily values. Daily values should be calculated, if possible, as the mean of either eight evenly spaced 3-hourly observations or four evenly spaced 6-hourly observations. If this is not possible, they should use a set of observation times that is consistent over time at that station and documented in metadata. It is important that monthly means of vapour pressure are calculated from daily values of vapour pressure and not from monthly means of relative humidity or dewpoint temperature, as those methods will give different results.
Total number of hours of sunshine	hours	

Secondary climatological surface parameters

Secondary climatological surface parameters		
Parameter	*Units*	*Comments*
Mean value of station-level pressure	hPa	Calculated as for mean sea-level pressure above
Boundaries of quintiles of precipitation*	mm	See section 4.5
Mean number of days with maximum temperature ≥25, 30, 35, 40 °C	count	
Mean number of days with maximum temperature < 0 °C	count	
Mean number of days with minimum temperature < 0 °C	count	
Mean number of days with daily precipitation ≥ 5, 10, 50, 100, 150 mm	count	
Mean number of days with snow depth > 0, 1, 10, 50 cm	count	
Mean number of days with wind speed ≥ 10, 20, 30 m/s	count	Wind speed used for this element is the highest 10-minute mean wind recorded during the day. This is a different definition to the highest wind gust.
Mean number of days with visibility < 50, 100, 1000 m	count	Refers to days when visibility is reported as being below the specified threshold at any observation during the day
Highest and lowest recorded values of mean daily temperature	°C	
Highest recorded value of daily maximum temperature*	°C	
Lowest recorded value of daily minimum temperature*	°C	
Highest recorded value of daily precipitation	mm	
Highest recorded wind gust	m/s	
Mean number of days with thunder	count	
Mean number of days with hail	count	

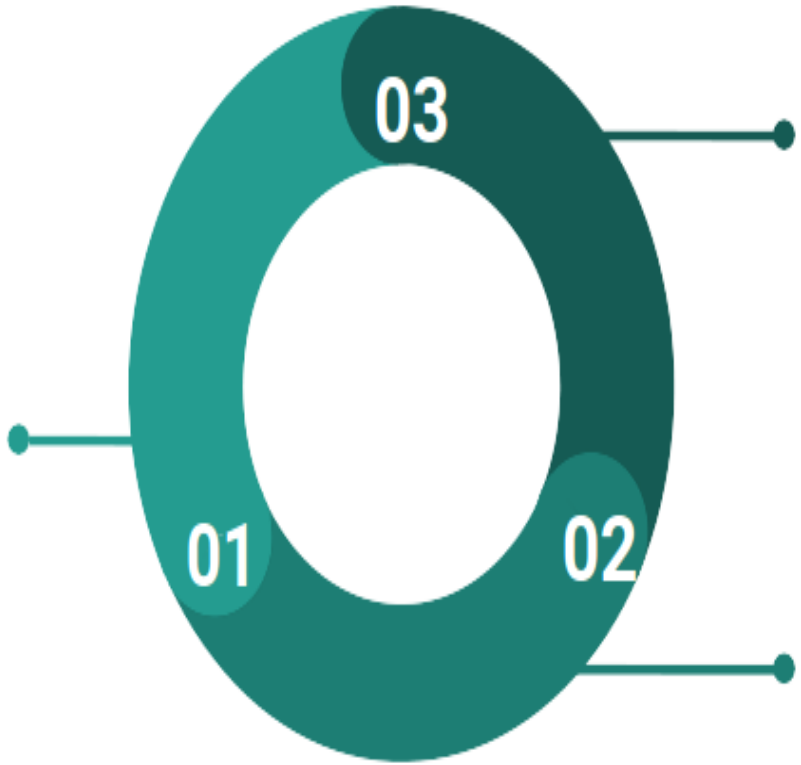
Other climatological surface parameters

Other climatological surface parameters

No specific guidance is given for these parameters. Examples of such parameters that may be of value for national or regional purposes include:
Mean or total values of parameters relating to elements not listed above (for example, cloud amount, pan evaporation, solar radiation, wind speed, soil temperature or snow fall) and alternative expressions relating to an element (for example, relative humidity or dewpoint);
Counts of days of values above/below thresholds other than those listed above;
Mean values of parameters relating to observations at a specific time of day (for example, mean temperature at 0900);
Counts of days with phenomena (other than thunder or hail);
Statistical descriptors other than those listed (for example, lowest value of daily maximum temperature).
Note that values for mean relative humidity and mean wind speed are reported for some stations in *1961-1990 Global Climate Normals* (CLINO) (WMO, 1998), but no provision currently exists for these parameters in CLIMAT messages.

CLINO calculation

Calculation of an individual monthly value from the underlying daily data (for some variables, the underlying daily data may involve the calculation of a value from sub-daily data);

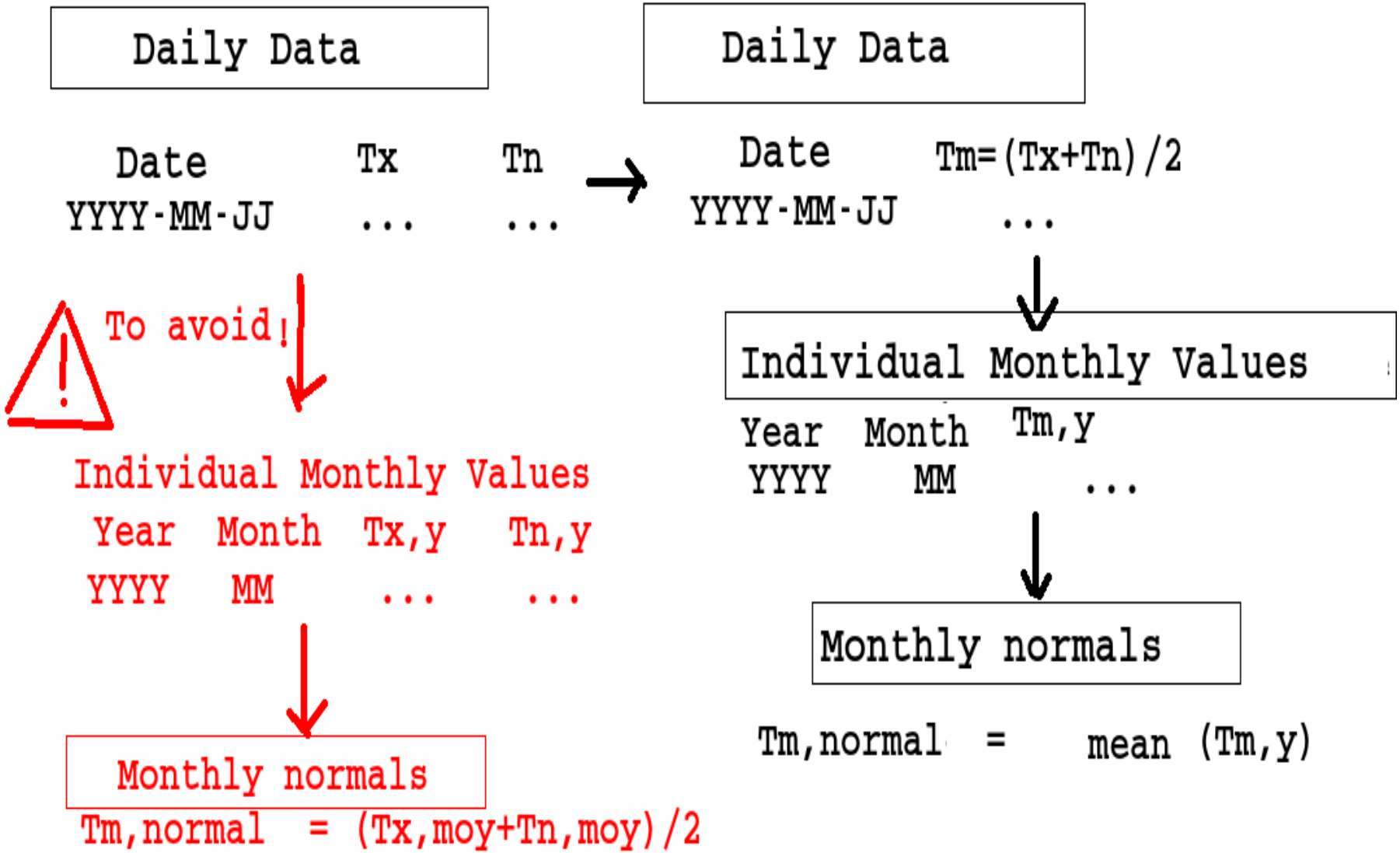


Calculation of normals for multi-month periods (for example, annual) **from the monthly values**

Calculation of a normal for a month from each of the individual monthly values during the averaging period;

Annual normals should be calculated from the monthly normals, and not from the individual annual values. The two methods will produce identical results (apart, possibly, from small differences due to rounding) if there are no missing monthly values, but may differ if some monthly values are missing.

CLINO calculation



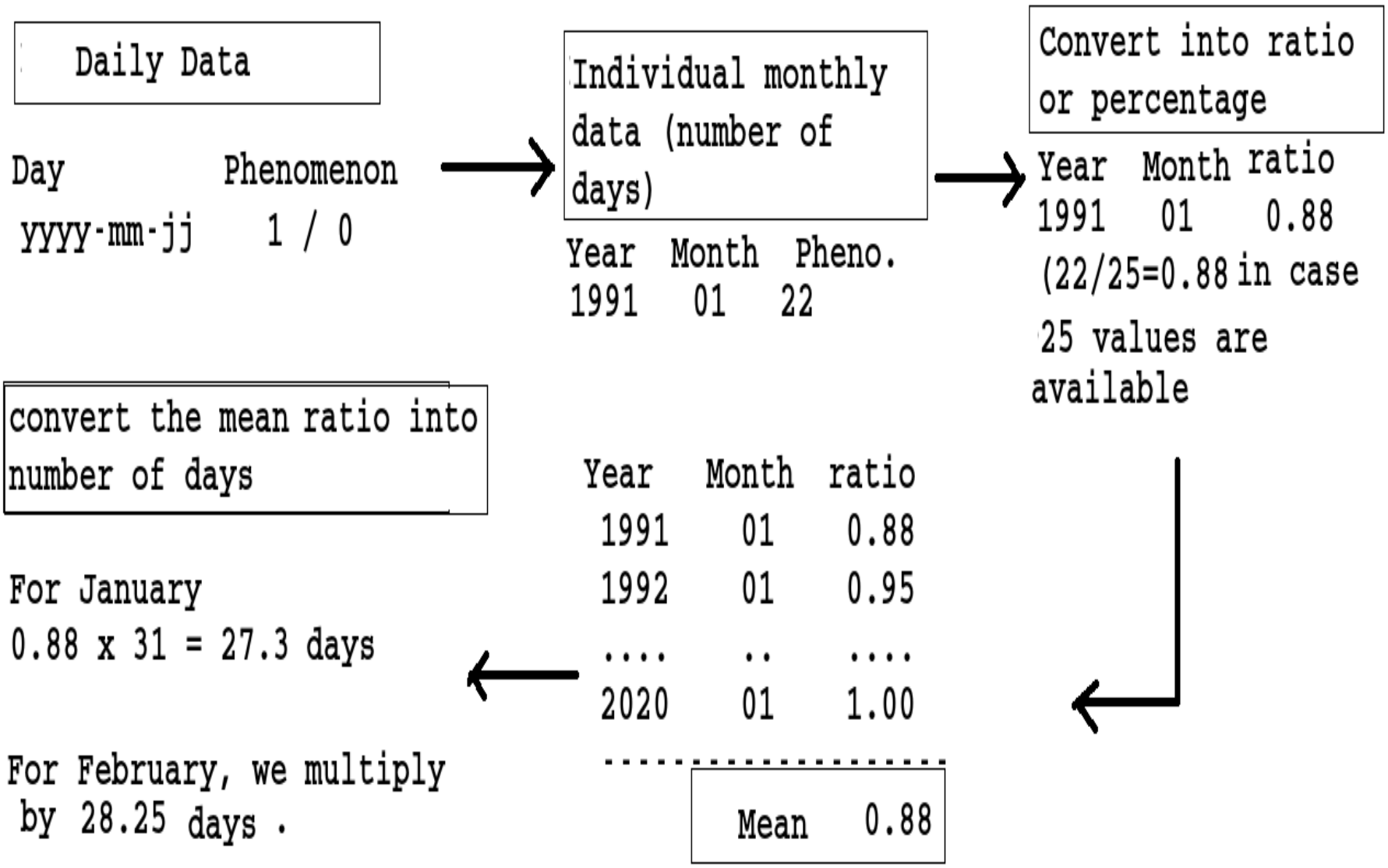
CLINO parameters

	Mean parameter	Extreme parameter	Sum parameter	Count parameter
Individual monthly value	The mean of the daily values during the month	The highest or lowest (as appropriate) value recorded during the month.	The sum of the daily values during the month	See next slide
Monthly normals	The mean of all non-missing values during the averaging period for the month in question.	The highest (or lowest) value during the averaging period for the month in question.	The mean of all non-missing values during the averaging period for the month in question.	
multi-months normals	The mean of the monthly normals for the months concerned	The highest/lowest of the monthly values for the months concerned.	The sum of the monthly normals for the months concerned	

CLINO parameters

	Count parameter
Individual monthly value	For a count parameter, **the number of days in which an event occurs** (or a threshold that is exceeded) **should be converted to a ratio or percentage of the number of days on which observations were made.** For example, if the event occurred on 22 days and there were 25 days in the month with observations, this should be considered as 0.88 or 88%.
Monthly normals	Initially, **a mean ratio/percentage for the month should be calculated from the ratio/percentage values for each month during the averaging period**. The mean ratio/percentages should then be **reconverted to a mean number of days for the month by multiplying it by the number of days in the month.** For example, a mean ratio of 0.88 for January converts to (0.88 x 31) = 27.28 days, or 27.3 days rounded (February values should be multiplied by 28.25 days).

CLINO calculation



Data Completeness

	Single Monthly Value	Monthly Normals
Mean parameter	it should not be calculated if either of the following criteria are satisfied: **-> Observations are missing for 11 or more days during the month;** **-> Observations are missing for a period of 5 or more consecutive days during the month.**	It can be calculated **where there are valid monthly values in at least 80% of the years in the averaging period** (with no additional consecutive-years criterion);
Count parameter		
Sum parameter	**It can only be calculated if there are complete data over the month** (exceptions: availability of cumulative values, potential for estimation; above 11/5 rule applies!)	
Extreme parameter	**It should be calculated for a month, regardless of the amount of available data during that month.**	**where there are valid monthly values for the mean of the underlying element in at least 80% of the years in the averaging period**

Data Completeness

- In all cases, a normal value should be calculated only if **the data completeness criteria are met.** However, national good practices are preferred in cases, where global rules are not available or applicable (**the consistency of the national record(s) shall not be compromised**).

- A value that is found to be **suspect or incorrect** after undergoing quality control should be considered to be missing.

- If the **monthly normal** for any of the constituent months of the period of interest **is missing**, then the **multi-month normal** should also be considered as **missing**.

Data precision and rounding

- Normals should be reported to **a precision of one decimal place**.
- **For rounding, "ties to even"** (where a value ending in .5 is rounded to the nearest even number) **is preferred.**

Metadata

Metadata that should be included with climate normals include:

- Current **identifiers of each station** (WMO number, domestic identifiers and station name);
- The **latitude, longitude and elevation** of each station as at the end of the averaging period;
- **Information on any significant changes** at stations during, or after, the averaging period, and, if any adjustments have been carried out, the methods used for doing so;
- **The definition of the climatological day**;
- **The method of calculation** for daily means of temperature, pressure and vapour pressure.

Plan

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4 Useful references

Submission channels and deadline

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale
Organización Meteorológica Mundial
Всемирная метеорологическая организация
المنظمة العالمية للأرصاد الجوية
世界气象组织

Secrétariat
7 bis, avenue de la Paix – Case postale 2300
CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11
Fax: +41 (0) 22 730 81 81
wmo@wmo.int – public.wmo.int

Ref.: 16953/2021-LTR S/CMP

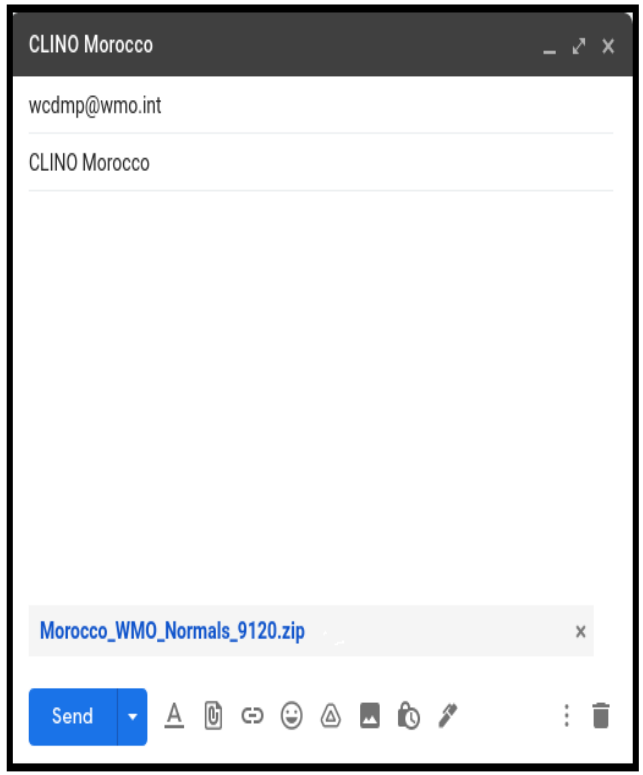
Our ref.: 16953/2021/S/CS/CMP/CLINO9120 — 4 August 2021

Annexes: 2 (available in English only)

Subject: WMO collection of the Climatological Standard Normals for 1991–2020

Action required: Submission of data at your earliest convenience from 1 October 2021, **but not later than 31 March 2022**

To facilitate the publication of WMO Climatological Standard Normals for the period 1991–2020, I should be grateful if you could send your contribution at your earliest convenience from 1 October 2021 **but not later than 31 March 2022**, to the WMO Secretariat (wcdmp@wmo.int). Please use the following subject for your submission: "CLINO [name of country/territory]" (example: CLINO Germany).



Formatting

- **File names for single station files: StationName_Number.xls (.csv) with no spaces or special characters**.
- If needed, submit compressed and zipped in a standard manner compatible with Windows. The file name should be **CountryName_WMO_Normals_9120.zip with no spaces**.
- ASCII submissions: **Each *.csv station file should be for only one station.**
- Excel submissions: **A country can submit files individually for each station**, or using a **single Excel file for all stations.** For files with multiple stations, do not put multiple stations in a single table. **Each station should have its own tab**, with the name of each tab constructed as: **StationName_Number with no spaces or special characters.**
- If a value is **missing**, then leave the field **blank**. **Decimal points** are represented as **dots** ".". If precipitation is **zero** or trace, the field should be **"0.0"**.

Excel file template

World Meteorological Organization Climate Normals for 1981-2010
Single Station Data Sheet For All Climatological Surface Parameters

Station Header Record

Country_Name	UNITED_STATES_OF_AMERICA
Station_Name	FAIRBANKS_INTL

WMO_Number	Latitude	Longitude	Station_Height
70261	64|49|00|N	147|52|00|W	133

WMO Integrated Global Observing System (WIGOS) Station Identifier (if available)
0-20000-0-70261

Principal Climatological Surface Parameters

Parameter_Code	Parameter_Name	Units
1	Precipitation_Total	mm

WMO_Number	Parameter_Code	Calculation_Name	Calculation_Code	January	February	March
70261	1	Sum	4	11.9	10.2	9.4
70261	1	NOY	98	30.0	30.0	30.0

Parameter_Code	Parameter_Name	Units
2	Number_of_Days_with_Precipitation_>=_1_mm	count_%

WMO_Number	Parameter_Code	Calculation_Name	Calculation_Code	January	February	March
70261	2	Count %	5	12.3	9.9	9.7
70261	2	NOY	98	30.0	30.0	30.0

https://community.wmo.int/wmo-climatological-normals

Excel file template

Station Header Record

Row 6: Country Name – Column B

Row 7: Station Name – Column B

Row 10: WMO Number – Column A formatted as 5 digit number

Latitude – Column B formatted as deg|min|sec|N or S

Longitude – Column C formatted as deg|min|sec|E or W

Station_Height – Column D formatted as 4 digit number in meters

Row 13: WIGOS Station ID (if available) – Column A formatted as 12 digits

	A	B	C	D	
1	World Meteorological Organization Climate Normals for 1981-2010				
2	Single Station Data Sheet For All Climatological Surface Parameters				
3					
4	Station Header Record				
5					
6	Country_Name	UNITED_STATES_OF_AMERICA			
7	Station_Name	FAIRBANKS_INTL			
8					
9	WMO_Number	Latitude	Longitude	Station_Height	
10	70261	64|49|00|N	147|52|00|W	133	
11					
12	WMO Integrated Global Observing System (WIGOS) Station Identifier (if available)				
13	0-20000-0-70261				

CSV file template

```
World Meteorological Organization Climate Normals for 1981-2010
Single Station Data Sheet For All Climatological Surface Parameters

Station Header Record

Country_Name,UNITED_STATES_OF_AMERICA
Station_Name,FAIRBANKS_INTL

WMO_Number,Latitude,Longitude,Station_Height
70261,64|49|00|N,147|52|00|W,133

WMO Integrated Global Observing System (WIGOS) Station Identifier (if available)
0-20000-0-70261


Principal Climatological Surface Parameters


Parameter_Code,Parameter_Name,Units
1,Precipitation_Total,mm

WMO_Number,Parameter_Code,Calculation_Name,Calculation_Code,January,February,March,April,May,
70261,1,Sum,4,11.9,10.2,9.4,8.1,15.5,34.8,47.5,49.8,24.1,22.9,20.3,21.6,276.1
70261,1,NOY,98,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0



Parameter_Code,Parameter_Name,Units
2,Number_of_Days_with_Precipitation_>=_1_mm,count_%

WMO_Number,Parameter_Code,Calculation_Name,Calculation_Code,January,February,March,April,May,
70261,2,Count %,5,12.3,9.9,9.7,9.0,12.3,23.7,28.0,27.4,8.7,21.3,20.0,18.4,17.6
70261,2,NOY,98,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0,30.0
```

https://community.wmo.int/wmo-climatological-normals

CLINO collection

These Normals will be gathered and housed for global access at the U.S. National Oceanic and Atmospheric Administration as done during the mid-1990s, when 1961–1990 Climatological Standard Normals were collected for the WMO and are still available at the World Data Center for Meteorology Asheville website:

`https://www.ncei.noaa.gov/pub/data/normals/WMO/`

Submission of explanatory notes

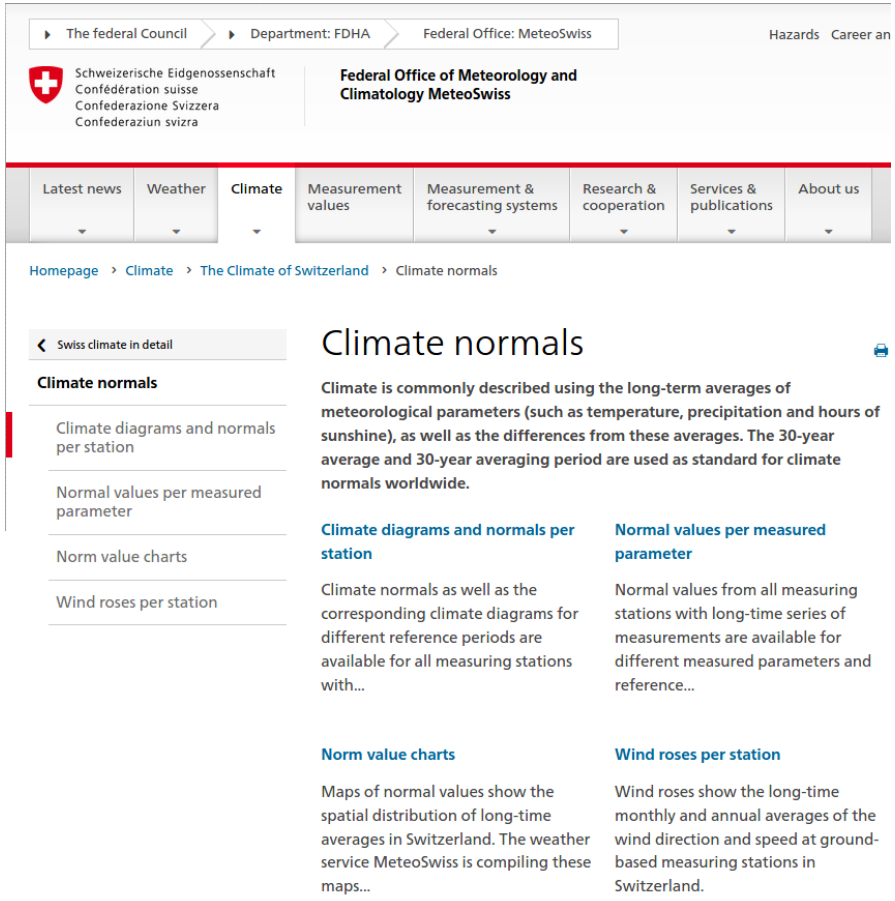
Explanatory notes are strongly encouraged to be provided with the data submission in open text format (**WORD document or TEXT file**; file name: **CountryName_WMO_Normals_9120_Additional.doc**), ideally using one of the WMO languages.

Explanatory notes document information necessary to correctly interpret Climatological Standard Normals submitted. Examples for Explanatory notes include information on

- homogeneity of underlying time series,
- use of data estimation methods to fill data gaps in underlying time series,
- observing time constraints,
- implications of station automation,
- less than 30 years of observations,
- formula used for vapour pressure calculation
- etc.

Notes on communication aspects

- The definition and use of climate normals need to be documented and communicated clearly and precisely to avoid misinterpretation.
- In case of an update of the climatological standard normal, it is recommended to produce an explanatory note for all users of relevant products and services.
- The process for calculating CLINO shall be well documented internally. This includes datasets used, calculation methods, data adjustments etc. Such documentation is indispensable for future questions, evaluations, applications, re-calculation etc., bearing in mind the importance and validity period of Climatological Standard Normals.



https://www.meteoswiss.admin.ch/home/climate/the-climate-of-switzerland/climate-normals.html

Plan

1 Quick Introduction about the Climate Normals

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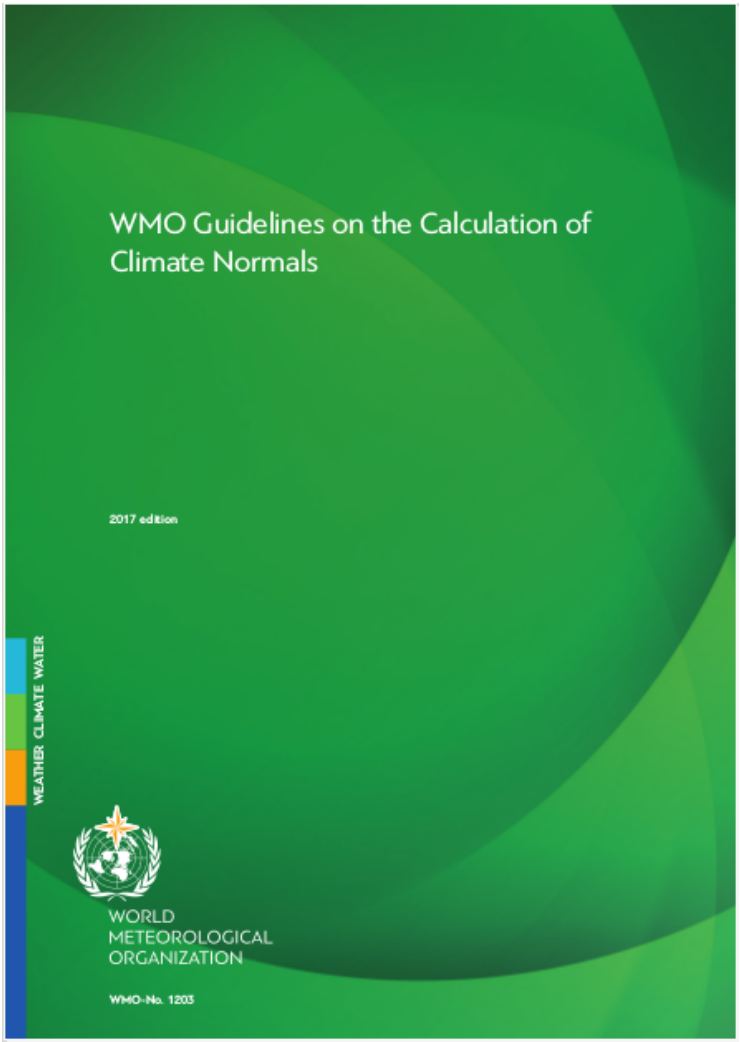
4 Useful references

Useful References



World Meteorological Organisation

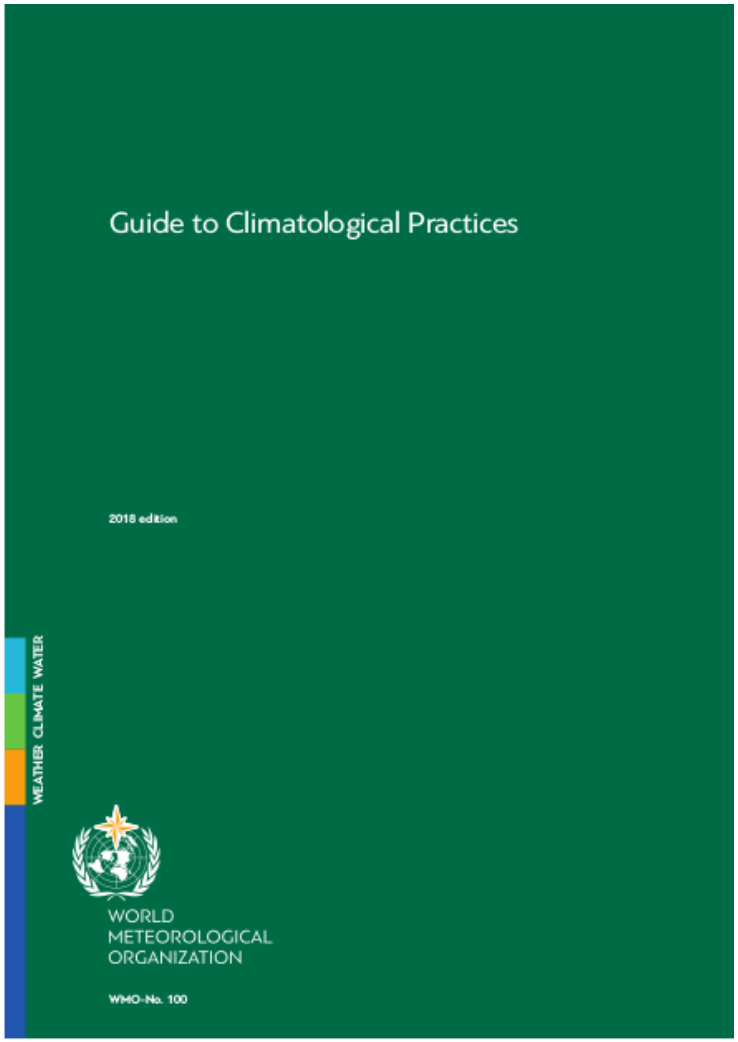
WMO No. 1203

WMO Guidelines on the Calculation of Climate Normals

Edition 2017

`https://library.wmo.int/doc_num.php?explnum_id=4166`

Useful References



World Meteorological Organisation

WMO No. 100

Guide to Climatological Practices

Edition 2018

`https://library.wmo.int/doc_num.php?explnum_id=5541`

THANK YOU

Driss BARI
bari.driss@gmail.com