Concept of and Calculation of Climatological Standard Normals for 1991-2020

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Workshop on Climate Data Management, Data Sharing and Exchange
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Plan

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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

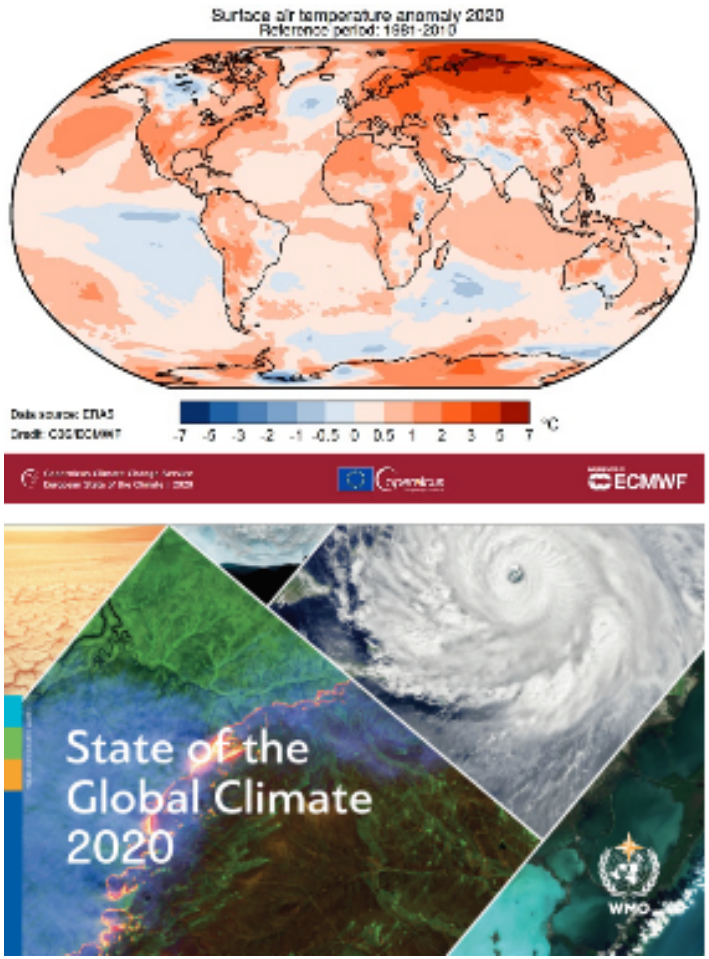
It is noted that in the past Climatological Standard Normals had referred to non-overlapping 30-year periods: 1901-1930, 1931-1960 and 1961-1990.

Importance of Normals

Climatological Standard Normals originates from the recognition that climatological data should be processed over agreed uniform periods, in order **to ensure comparability between data collected at stations all over the world** as well as **to provide a long-term reference value or 'normal' with which shorter** (e.g. monthly) **data can be compared.**

Climatological Standard Normals **serve as a valuable basis for climate research, monitoring, diagnostic studies and for climate applications and services.**

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.**

Plan

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

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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**

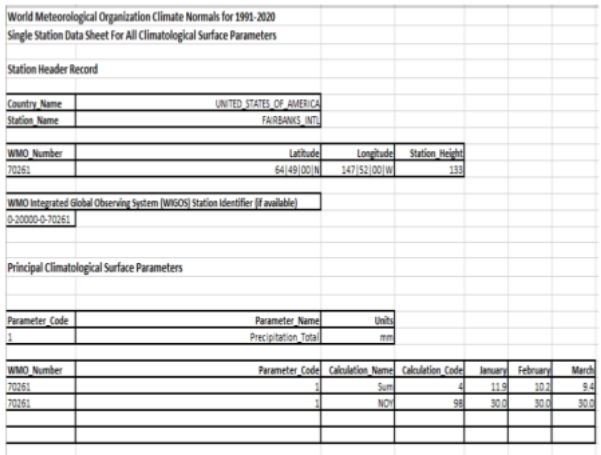
Dear Sir/Madam,

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: ...

Data Quality

Climatological Standard Normals, by nature, constitute **high-quality data**.

Members will carefully **reject stations with doubtful time series data**.

Homogenised time series data are preferred, where available.

Large-scale automation of observational networks started in the 1990ies; this poses a special challenge and requires national wisdom. Processing of high-frequency data: **Conservative approach** (retrieve convential times of observations) in case of doubt.

Data Gaps

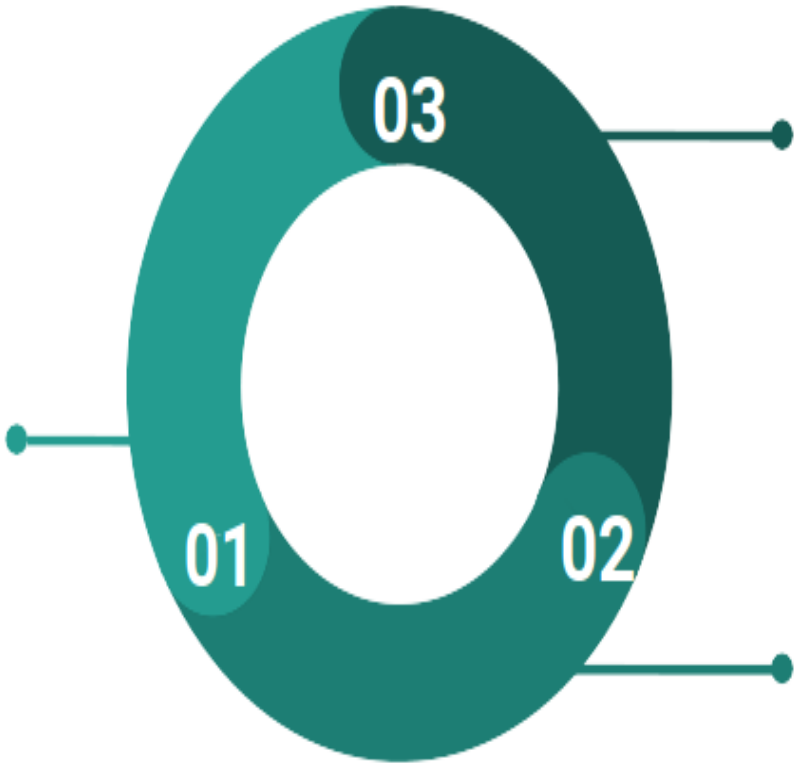
WMO-No. 1203 provides certain **high-level requirements regarding data completeness and data estimation** that should be observed.

National good practices and wisdom are preferred in cases, where global rules are not available or applicable (***the consistency of the national record(s) shall not be compromised***).

Consider **data rescue** prioritisation to generate sufficient time-series data for 1991-2020 CLINO calculation.

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 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).

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

Submission channels and deadline

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
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Tél.: +41 (0) 22 730 81 11
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wmo@wmo.int – public.wmo.int

Ref.: 16953/2021-LTR S/CMP

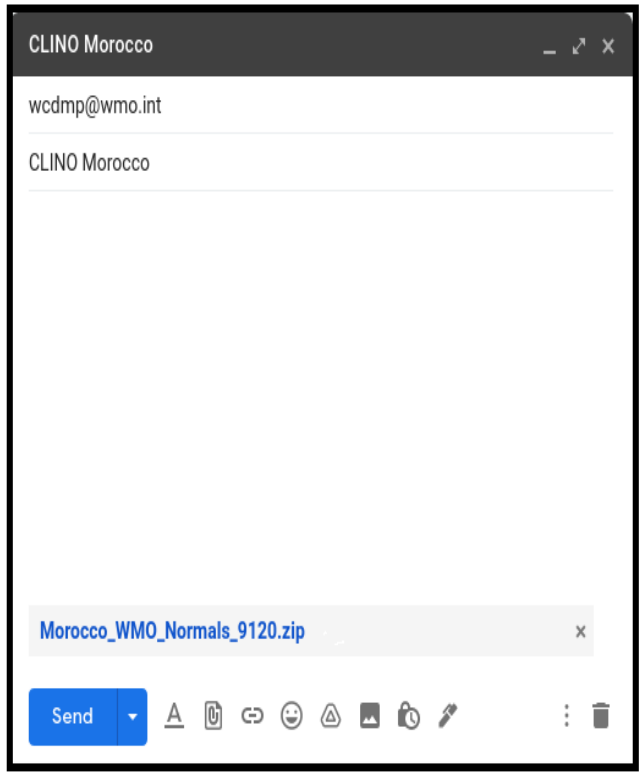
Our ref.: 16953/2021/S/CS/CMP/CLINO9120 4 August 2021

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

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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

CSV file template

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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
```

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/products/wmo-climate-normals.`

Submission of explanatory notes

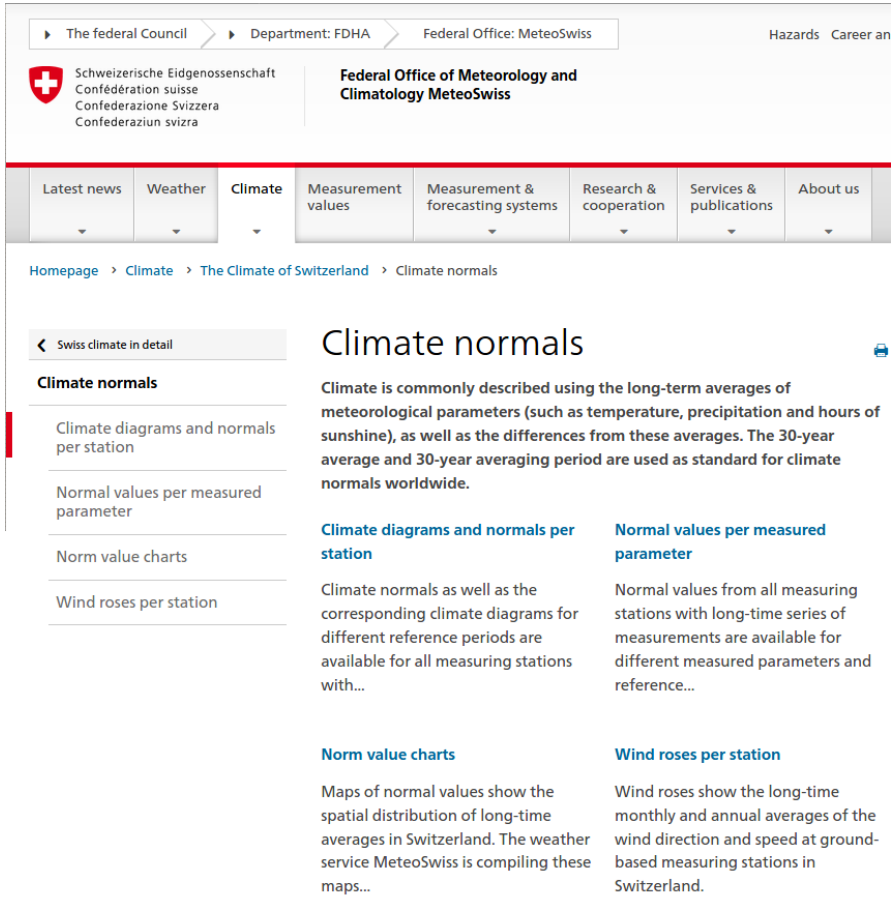
Explanatory notes are strongly encouraged to be provided with the data submission in open text format (**WORD document or TEXT file**; file name: **CountryName_WMO_Normals_9120_Additional.doc**), ideally using one of the WMO languages.

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

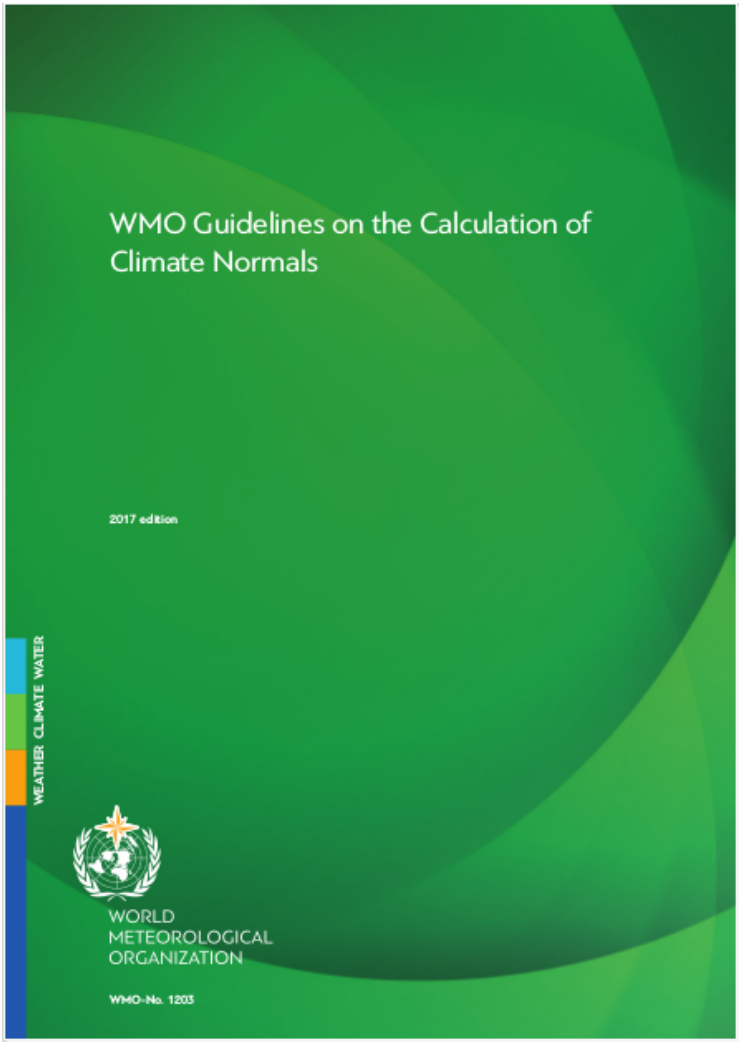
- The definition and use of climate normals need to be documented and communicated clearly and precisely to avoid misinterpretation.
- In case of an update of the climatological standard normal, it is recommended to produce an explanatory note for all users of relevant products and services.
- The process 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

Useful References



World Meteorological Organisation

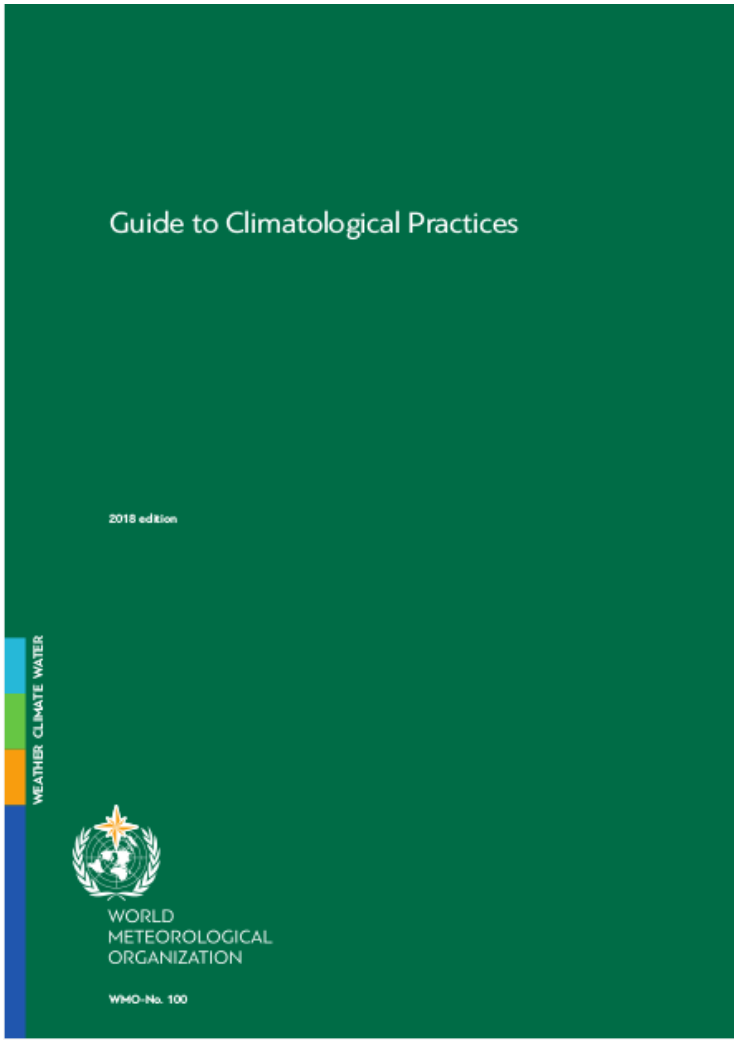
WMO No. 1203

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

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