WMO Normals 1991-2020 Format and Descriptors

The World Meteorological Organization, in publication [WMO-No. 1203](#) specified a list of Principal parameters, a set of Secondary parameters, and Other parameters that are part of the Climatological Normals program. Climate parameters are defined as an aspect of climate that can be statistically described, such as mean air temperature, precipitation total, or mean sea level pressure. Subject to limitations on available data, eight principal climatological surface parameters (Table 1) receive the highest attention from WMO Member countries and are most often reported.

Table 1. Principal climatological surface parameters.

Parameter Code	Parameter Name	Units
1	Precipitation_Total	mm
2	Number_of_Days_with_Precipitation_≥_1 mm	count
3	Daily_Maximum_Temperature	Deg_C
4	Daily_Minimum_Temperature	Deg_C
5	Daily_Mean_Temperature	Deg_C
6	Mean_Sea_Level_Pressure	hPa
7	Mean_Vapor_Pressure	hPa
8	Total_Number_of_Hours_of_Sunshine	hours

The list of Secondary climatological surface parameters (Table 2) are generally well recognized. Many are counts exceeding a threshold of temperature, precipitation, or wind. When parameter names with the term "threshold" are used, that word has been replaced in the data file with the numerical value representing the threshold being used. These parameters can be provided more than once using different thresholds, and the thresholds can vary by country.

Table 2. Secondary climatological surface parameters.

Parameter Code	Parameter Name	Units
10	Mean_Station-Level_Pressure	hPa
11	Boundaries_of_quintiles_of_monthly_precipitation	mm
12	Number_of_Days_with_Maximum_Temperature_≥_threshold*_Deg_C	count
13	Number_of_Days_with_Minimum_Temperature_≤_threshold*_Deg_C	count
14	Number_of_Days_with_Maximum_Temperature_<_0_Deg_C	count
15	Number_of_Days_with_Minimum_Temperature_<_0_Deg_C	count
16	Number_of_Days_with_Daily_Precipitation_≥_threshold*_mm	count
17	Number_of_Days_with_Snow_Depth_>_threshold*_cm	count

18	Number_of_Days_with_Wind_Speed_≥_threshold*_m/s	count
19	Number_of_Days_with_Visibility_<_threshold*_m	count
20	Highest_Value_of_Mean_Daily_Temperature	Deg_C
21	Lowest_Value_of_Mean_Daily_Temperature	Deg_C
22	Highest_Value_of_Daily_Maximum_Temperature	Deg_C
23	Lowest_Value_of_Daily_Minimum_Temperature	Deg_C
24	Highest_Value_of_Daily_Precipitation	mm
25	Highest_Wind_Gust	m/s
26	Mean_Number_of_Days_with_Thunder	count
27	Mean_Number_of_Days_with_Hail	count
For parameters with the word "threshold" a numerical value or qualifier has been specified by the provider. These parameters can be provided more than once with different thresholds.		

In the "other" category are climatological surface parameters outside the principal and secondary lists. Element-statistics combinations used to define parameters are listed in Table 3 and provide countries with the ability to define country-specific thresholds for count statistics. Note that parameter code 99 is used for Members wanting to submit a climatological surface parameter that is not described in the predefined lists.

Table 3. Other climatological surface parameters.

Parameter Code	Parameter Name	Units
30	Cloud_Amount	okta
31	Global_Solar_Radiation	MJ/m2
32	Direct_Solar_Radiation	MJ/m2
33	Diffuse_Solar_Radiation	MJ/m2
34	Wind_Speed	m/sec
35	Wind_Direction	degrees
36	Soil_Temperature	Deg_C
37	Snowfall	cm
38	Relative_Humidity	%
39	Dewpoint_Temperature	Deg_C
40	Rainfall	mm
41	Bright_Sunshine	hours
42	Calm_Winds	hours
43	Number_of_Days_with_Sandstorm/Thick Dust/Haze	count
44	Number_of_Days_with_Measurable_Bright_Sunshine	count
45	Number_of_Days_with_Lightning	count
46	Number_of_Days_with_Rain_Showers	count
47	Number_of_Days_with_Snowfall	count
48	Number_of_Days_with_Fog/Ice_Fog	count
49	Number_of_Days_with_Fog_Sky_Obscured	count
50	Number_of_Days_with_Fog_Sky_Unobscured	count
51	Number_of_Days_with_Haze/Smoke	count
52	Number_of_Days_with_Dust	count
53	Number_of_Days_with_Blowing_Dust/Sand	count
54	Number_of_Days_with_Visibility_≤_Threshold*_km	count
55	Number_of_Days_with_No_Sunshine	count
56	Number_of_Days_with_Dew	count
57	Number_of_Days_with_Rime/Glaze_Ice	count
58	Number_of_Days_with_Air_Frost	count
59	Number_of_Days_with_Grass_Frost	count
60	Number_of_Days_with_Gale_Force_Winds	count
61	Number_of_Days_Maximum_Temperature_≤_threshold*_Deg_C	count
62	Number_of_Days_Minimum_Temperature_≥_threshold*_Deg_C	count
63	Number_of_Days_with_Dust/Haze/Mist	count

64	Number_of_Days_Maximum_Temperature_>_threshold*_Deg_C	count
65	Number_of_Days_Maximum_Temperature_<_threshold*_Deg_C	count
66	Number_of_Days_Minimum_Temperature_>_threshold*_Deg_C	count
67	Number_of_Days_Minimum_Temperature_<_threshold*_Deg_C	count
68	Number_of_Days_with_Snowfall_≥_threshold*_cm	count
69	Number_of_Days_with_Freezing_Rain/Drizzle	count
70	Number_of_Days_with_Blowing_Snow	count
71	Number_of_Days_with_Rain/Drizzle	count
72	Number_of_Days_with_Snow/Hail	count
73	Number_of_Days_with_Fog/Mist	count
74	Number_of_Days_with_Ice_Storm	count
75	Number_of_Days_with_Thick_Haze	count
76	Number_of_Days_with_Rising_Sand	count
77	Number_of_Days_with_Mist	count
78	Number_of_Days_with_Squalls	count
79	Number_of_Days_with_Duststorm/Sandstorm	count
80	Number_of_Days_with_Sleet/Snow	count
81	Number_of_Days_with_Fog	count
82	Number_of_Days_with_Daily_Max_Wind_Speed_≥_threshold*_m/s	count
99	Custom_Element_Specified_by_Contributor	custom
For parameters with the word "threshold" a numerical value or qualifier is provided and repeated as needed.		

Calculation Methods

For each Parameter a calculation method is necessary for computing each Normal. For example, Parameter 1 (Precipitation) is computed as a sum (Calculation Code 4), while Parameter 3 for example (Daily Maximum Temperature) is computed as a Mean (Calculation code 1). A calculation code (Table 4) is included with each Parameter in each data file.

Table 4. Calculation method names (abbreviated), codes, and parameter calculation method descriptions.

Calculation Name	Calculation Code	Parameter calculation method description
Mean	1	Mean Parameter - mean of daily values during the month
Max	2	Extreme Parameter Maximum - highest value during month
Min	3	Extreme Parameter Minimum - lowest value during month
Sum	4	Sum Parameter - sum of daily values during month
Count	5	Count Parameter - Number of days (cf. section 2.3 below)
Q0	6	Quintile Parameter 0 - Lower bound of quintile 1 (Extreme Minimum)

Q1	7	Quintile Parameter 1 - Upper bound of quintile 1
Q2	8	Quintile Parameter 2 - Upper bound of quintile 2
Q3	9	Quintile Parameter 3 - Upper bound of quintile 3
Q4	10	Quintile Parameter 4 - Upper bound of quintile 4
Q5	11	Quintile Parameter 5 - Upper bound of quintile 5 (Extreme Maximum)
Median	12	Median Monthly Value
SDMean	13	Standard Deviation of Mean Monthly Value
SDMeanD	14	Standard Deviation of Mean Daily Value
MaxDate	15	Date (Year/Day) of Occurrence of Extreme Maximum Daily Value
MinDate	16	Date (Year/Day) of Occurrence of Extreme Minimum Daily Value
MinMon	17	Minimum Monthly Value
DMinMon	18	Year of Occurrence of Minimum Monthly Value
MaxMon	19	Maximum Monthly Value
DMaxMon	20	Year of Occurrence of Maximum Monthly Value
NOY	98	Number of Years Used to Calculate Normal
Custom	99	Custom Parameter or Statistic Specified by Contributor

Station File Format

Each file (or one or more spreadsheets within an Excel file) contains metadata that describes the respective station followed by the Parameters provided by the Member.

The metadata begins with the Country Name and Station Name. These are followed by a record containing the station's WMO Number, Latitude, Longitude, and Elevation. For stations without a WMO Number the country-specific station number is typically provided. The latitude and longitude are provided in Degrees, Minutes, Seconds and the Hemisphere, with each separated by a '|'. Elevation is provided in Meters. These are followed by a WIGOS (WMO Integrated Global Observing System) identifier when available.

The data then begin with the Principal Climatological Surface Parameters. Each Parameter has a record containing the Parameter Code, Parameter Name and Units. These are clearly labeled on the preceding line.

An example from a CSV file follows.

Parameter_Code,Parameter_Name,Units,,,,,,,,,,,,,
1,Precipitation_Total,mm,,,,,,,,,,,,,,

The Parameter descriptors are followed by the Normals data for the Parameter. Each line of data contains the WMO Number, Parameter Code, Calculation Name, and Calculation Code followed by the 12 monthly values and an annual value if computed. Missing values are indicated as an empty column. Each of these data records are also clearly labeled on the first line of the data field.

An example for Parakou, Benin follows. Note that the data for this Parameter includes a record containing the number of years (NOY, Parameter 98) used in the computation of each value. This record is often, but not always, provided for each Parameter.

WMO_Number,Parameter_Code,Calculation_Name,Calculation_Code,January,February,March,April,May,June,July,August,September,October,November,December,Annual
65330,1,Sum,4,4.9,8,33.6,83.2,133.8,157.5,188.8,212,221.5,111.9,6.9,1.9,
65330,1,NOY,98,30,30,29,28,30,30,30,30,30,30,30,30,

WMO guidance specifies a minimum number of 24 years of data for computation of the climatological normal. However, in some cases a country provided a computed normal with fewer than 24 years of data, while specifying the number of years used in the calculation.