DATASET DESCRIPTION

Monthly station observations (temperature, precipitation, sunshine duration, wind and cloud cover) for Germany

Version: v24.03

Publication date: 2024

Cite data set as:	Monthly station observations (temperature, precipitation, sunshine duration, wind and cloud cover) for Germany, Version v24.03
Dataset-ID:	urn:wmo:md:de-dwd-cdc:obsgermany-climate-monthly-kl
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/monthly/kl/recent/
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/monthly/kl/historical/
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/monthly/kl/timeseries_overview
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/monthly/kl/historical/KL_Monatswerte_Beschreibung_Stationen.txt

ABSTRACT

These data originate from the stations of the DWD and legally as well as qualitatively equal partner network stations. Extensive station metadata, such as station relocations, instrument changes, reference time changes, algorithm changes or operator information are included.

The dataset is divided into a versioned part with completed quality check, in the directory ./historical/.

And a part for which the quality check has not yet been completed, in the directory ./recent/.

The folder ./timeseries_overview/ contains information about long time series.

POINT OF CONTACT

Deutscher Wetterdienst
CDC - Vertrieb Klima und Umwelt
Frankfurter Strasse 135
63067 Offenbach
Tel:+ 49 (0) 69 8062-4400
Fax:+ 49 (0) 69 8062-4499
E-Mail:klima.vertrieb@dwd.de

DATASET DESCRIPTION

Parameter	wind force, wind gust, air temperature at 2 m, precipitation height, cloud coverage, sunshine duration
Temporal coverage	1719-01-01 -- ...
Temporal resolution	1 month
Spatial coverage	stations in Germany
Projection	WGS 84 (EPSG:4326)
Format description	obsgermany-climate-monthly-kl-recent : In the folder recent/ for each station a zip-archive is provided. The zip-archive contains the data and meta information about the station, instruments and algorithms. The naming schema of the zip-archives is: *_{product_code}_{station_id}_akt.zip

Format description	[obsgermany-climate-monthly-kl-historical](#) : In the folder recent/ for each station a zip-archive is provided. The zip-archive contains the data and meta information about the station, instruments and algorithms. The naming schema of the zip-archives is: *_{product_code}_{station_id}_{begin_date}_{end_date}_hist.zip
Format description	[obsgermany-climate-monthly-kl-timeseries_overview](#) : In the folder ./timeseries_overview, information on long time series is available. The files provided (TimeSeries_[DataType]_[Interval]_GE_[XXXYears]_[Parameter].html or ***.txt) contain a sorted overview of stations for which time series of >=100, >=50 and >=30 years are available. Information on the proportion of missing values is also provided. Content description Stations_id := Identifier of the station; Start := Start date of the time series; End := End date of the time series; Number_years := Number of years of measurement operation; Missing_Years := Number of missing years of measurement operation; Missing_values := number of missing values ; max(Missing_period)>=25 := More than 25 years missing in the time series: Indication of start date and end date; Station name := Station name of the current location ; Federal state := Name of the federal state Translated with www.DeepL.com/Translator (free version)
Format description	[KL_Monatswerte_Beschreibung_Stationen](#) : List of stations providing KL_Monatswerte. The file contains the geographical information for locating the stations.
application schema	csv dialect description

delimiter	line terminator	header	quote char
;	\\r\\n	true	\"

csv content description

column name	description	uom	type	format
STATIONS_ID	DWD station identification number		VARCHAR2	
MESS_DATUM_BEGINN	begin of interval		NUMBER	YYYYMMDD
MESS_DATUM_ENDE	end of interval		NUMBER	YYYYMMDD
QN_4	quality level of the data in the following columns		NUMBER	numerical code
MO_N	monthly mean of cloud cover	1/8	NUMBER	
MO_TT	monthly mean temperature 2 m above ground	°C	NUMBER	
MO_TX	monthly mean of daily temperature maxima at 2 m above ground	°C	NUMBER	
MO_TN	monthly mean of daily temperature minima in 2 m above ground	°C	NUMBER	
MO_FK	monthly mean of daily wind speed	Bft	NUMBER	
MX_TX	monthly maximum of daily temperature maxima in 2 m above ground	°C	NUMBER	
MX_FX	monthly maximum of daily wind speed	m/s	NUMBER	
MX_TN	monthly minimum of daily temperature minima in 2 m above ground	°C	NUMBER	
MO_SD_S	monthly sum of sunshine duration	h	NUMBER	
QN_6	quality level of the data in the following columns		NUMBER	numerical code
MO_RR	monthly sum of precipitation height	mm	NUMBER	
MX_RS	monthly maximum of daily precipitation height	mm	NUMBER	

Quality Information

The QUALITAETS_NIVEAU (QN) shows the quality control procedure applied for a data report (of several parameters) for a certain reporting time.

Data before and including 1980 can reach as best quality check level QN=5. Data after 1980 can reach QN=10 as best quality check level.

QN = 1 : only formal control;
QN = 2 : controlled with individually defined criteria;
QN = 3 : automatic control and correction;
QN = 5 : historic, subjective procedures;
QN = 7 : second control done, before correction;
QN = 8 : quality control outside ROUTINE;
QN = 9 : not all parameters corrected;
QN = 10 : quality control finished, all corrections finished.

The QUALITAETS_BYTE (QB) denotes whether the value was objected to and/or corrected.

QB = 0 : denotes not flagged,
QB = 1 : had no objections (either checked and not objected, or not checked and not objected, this can be interpreted only when considering QN);
QB = 2 : corrected;
QB = 3 : confirmed with objection rejected;
QB = 4 : added or calculated;
QB = 5 : objected;
QB = 6 : only formally checked;
QB = 7 : formal objection;
QB = -999 : quality flag does not exist.

DATA ORIGIN

The monthly means are calculated for each month from the respective daily values (of the same version), and only in the case the daily values are complete. If some daily valus are missing, no monthly mean is given. For some stations monthly values exist and no daily values are available (e.g., burned in the wars, or not yet digitized). For these cases, the monthly values are included here.

RESOURCE MAINTENANCE

The data files in the recent/ directory are updated on a monthly basis. The data files for the current year are exchanged. Quality control has not yet been completed for these data, so there may occur changes in the values.

In the directory historical/ the data files are updated annually. Quality control has been completed for this data, so that the values for the version are constant. During the annual version change, both corrections and historical additions are incorporated.

VALIDATION AND UNCERTAINTY ESTIMATE

The quality of the monthly values depends on the quality of daily values, the quality level (Qualitätsniveau) is deduced accordingly. The quality of monthly means which were not calculated from daily means is not evaluated.

UNCERTAINTIES

The stations are nowadays selected and operated according to WMO guidelines. Though these guidelines aim at minimizing possible local effects, still some applications of certain parameters may require the consideration of local and regional effects. Note that when going back to historical times, such guidelines might not have been in place. In special circumstances, local or regional influences on the meteorological parameters have to be considered, possibly also with a time dependency. Sources of long-term uncertainty are (1) changes in station height when station was re-located (especially for wind and temperaturee), information on this is within the station's zip-files in Metadaten_Geographie* ; (2) changes in the observation times and (3) changes in the averaging interval. Details on (2) and (3) can be found in the stationwise zipped Metadaten_Parameter*. Uncertainties are also expected from (4) changes in instrumentation, see Metadaten_Geraete* and possibly also from (5) varying quality control procedures (Behrendt et al., 2011). Further, uncertainties are known to come from (6) errors during data transfer or errors in the software, (7) change of observing personnel, and (8) others, see Freydank, 2014.

CONSIDERATIONS FOR APPLICATIONS

For studies of long-term change, the metadata in Metadaten_Parameter*, Metadaten_Geraete* and Metadaten_Geographie* have to be considered. With the change to SYNOP at the end of the nineties, the metadata were collected electronically. These metadata are provided for each station within the *.zip. For the time span before, relevant station metadata are extracted from the paper records and digitized by DWD. These metadata are also included. Note the rescuing of metadata is work in progress.

For detailed studies, you can apply for access to the paper archive. For statistical analysis, consider the formula (which may be changing over time, and for each station individually) used to calculate the daily means (see Metadaten_Parameter*). Only from 1936 onwards standardized formulas were applied. From 1900-1935 the regulations of the respective small German states were applied, and before 1900 such regulations were station specific (and not all regulations are electronically recorded yet).

For temperaturee trends, note especially the changes in station height and the changes in the "Klimatermine", i.e., changes in the definition of fixed times were measurements had been performed, the latter effect was shown to be marginal when changing to automatisation (Kaspar et al., 2016). For long-term effects in precipitation note that the height of the instrument changed systematically over time: in earlier years, and at mountain stations, was the precipitation measurement 1.5 m above ground, afterwards at lower heights at a increasing number of stations (details are not included in the metadata yet). Missing precipitation observation during 1940-1950 were derived from neighbouring stations. Before 1969, in East Germany, and before 1971 in West Germany, the integrated precipitation recordings were stored for the day on which the morning reading was performed. Here, all values are converted and related to the day contributing the largest part of the measurement interval.

Generally, all data given are converted to the same units. The recording units differ, though. For instance, temperaturee before 1880 was recorded in different units, and converted to degree Celsius many decades later. Cloud cover was observed in 1/10 before the seventies, but had been converted to the common 1/8 here.

The wind data in this data set are meant to used as auxilliary data for the interpretation of the other parameters, as wind velocity was partly estimated with the Beaufort scale in the years before the automatization. Such observations were used for the time periods where in Metadaten_Geraete* no instrument is given. However, in early years also measured wind velocities were converted to Bft. Only with the automated transfer of wind values at the beginning of this millenium the change to m/sec occured, see Metadaten_Parameter* for details. For wind velocities which were exclusively measured (i.e., not observed with Bft scale) use https://opendata.dwd.de/climate_environment /CDC/observations_germany/climate/hourly/wind/.

ADDITIONAL INFORMATION

For extending the time series with recent data (where quality control is not completed yet), see subdirectories ../recent/. When data from both directories "historical" and "recent" are used together, the difference in the quality control procedure should be considered. There are still issues to be discovered in the historical data. We welcome any hints to improve the data basis (see contact).

LITERATURE

Behrendt, J., et al.: Beschreibung der Datenbasis des NKDZ. Version 3.5, Offenbach, 15.02.2011.

DWD Vorschriften und Betriebsunterlagen Nr. 2 (VuB 2), Wetterschlüsselhandbuch Band D, Nov 2013.

DWD Vorschriften und Betriebsunterlagen Nr. 3 (VuB 3), Beobachterhandbuch (BHB) für Wettermeldestellen des synoptisch-klimatologischen Mess- und Beobachtungsnetzes, März 2014a.

DWD Vorschriften und Betriebsunterlagen Nr. 3 (VuB 3), Technikerhandbuch (THB) für Wettermeldestellen des synoptisch-klimatologischen Mess- und Beobachtungsnetzes, März 2014b.

Freydank, E.: 150 Jahre staatliche Wetter- und Klimabeobachtungen in Sachsen. Tharandter Klimaprotokolle Band 21, 2014.

Kaspar, F., et al.: Climate reference stations in Germany: Status, parallel measurements and homogeneity of temperature time series. Adv. Sci. Res., 13, doi:10.5194/asr-13-163-2016, 163-171, 2016.

Kaspar, F., et al.: Monitoring of climate change in Germany – data, products and services of Germany`s National Climate Data Centre. Adv. Sci. Res., 10, doi:10.5194/asr-10-99-2013, 99–106, 2013.

Spengler, R.: The new Quality Control- and Monitoring System of the Deutscher Wetterdienst. Proceedings of the WMO Technical Conference on Meteorological and Environmental Instruments and Methods of Observation, Bratislava, 2002.

COPYRIGHT

REVISION HISTORY

This document is maintained by Deutscher Wetterdienst, Climate Data Center (CDC) - Betrieb, last edited at 2024-06-06.