DWD
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

DATASET DESCRIPTION

Historical daily station observations (temperature, pressure, precipitation, sunshine duration, etc.) for Germany

Version: v23.3

Publication date: 2023

Cite data set as:	Historical daily station observations (temperature, pressure, precipitation, sunshine duration, etc.) for Germany, Version v23.3
Dataset-ID:	urn:x-wmo:md:de.dwd.cdc::obsgermany-climate-daily-kl-historical
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/daily/kl/historical/

ABSTRACT

These data originate from the stations of the DWD and legally and qualitatively equivalent partner networks. Extensive station metadata (station relocations, instrument changes, change of reference time, changes in algorithms) are included in the download.
Quality control has been completed for the data.

POINT OF CONTACT

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DATASET DESCRIPTION

Parameter	form of precipitation, air temperature at 2 m, precipitation parameters, precipitation height, wind velocity, cloud coverage, snow depth, sunshine duration, air temperature near ground, kind of precipitation, wind gust, air pressure at station level, vapor pressure, relative humidity
Unit(s)	eighth, °C, %, m/s, hPa, cm, beaufort, mm
Statistical processing	daily mean, daily max, daily min, time series, daily sum
Temporal coverage	1781-01-01 -- 2022-12-31
Spatial coverage	stations in Germany
Projection	WGS 84 (EPSG:4326)
Format description	For each station in the historical/ folder a zip archive is provided . The zip archive contains the data and meta information on the station, instruments and algorithms. The naming scheme of the zip archives is: {product_code}_{station_id}_{begin_date}_{end_date}_hist.zip

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	Station ID		VARCHAR2	
MESS_DATUM	reference date		NUMBER	YYYYMMDD
QN_3	quality level of the following columns		NUMBER	numerical code
FX	daily maximum of windgust	m/s	NUMBER	9990.0
FM	daily mean of wind velocity	m/s	NUMBER	9990.0
QN_4	quality level of the following columns		NUMBER	numerical code
RSK	daily precipitation height	mm	NUMBER	9990.0
RSKF	precipitation form	numerical code	NUMBER	
SDK	daily sunshine duration	h	NUMBER	9990.0
SHK_TAG	daily snow depth	cm	NUMBER	9990.0
NM	daily mean of cloud cover	1/8	NUMBER	9990.0
VPM	daily mean of vapor pressure	hPa	NUMBER	9990.0
PM	daily mean of pressure	hPa	NUMBER	9990.0
TMK	daily mean of temperature	°C	NUMBER	9990.0
UPM	daily mean of relative humidity	%	NUMBER	9990.0
TXK	daily maximum of temperature at 2 m height	°C	NUMBER	9990.0
TNK	daily minimum of temperature at 2m height	°C	NUMBER	9990.0
TGK	daily minimum of air temperature at 5 cm above ground	°C	NUMBER	9990.0

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 data are taken from the station measuring networks of Deutscher Wetterdienst as well as its predecessor organisations.

The dataset is regularly updated with recent as well as with recovered historical data.

From 1997 onwards, the data have been imported operationally into the central specialist database and archived, see Behrendt et al., 2011, and Kaspar et al., 2013.

Note that when going back to historical times, guidelines on observation procedure, instruments and observation times were issued by the authority in charge (see, e.g., Freydank, 2014), and might be incompletely recorded in the metadata.

As explained in Kaspar et al., 2013 in the early years numerous meteorological agencies were active in the area of todays Germany. After establishment of the der International Meteorological Organization (IMO) in 1873, the various standards were gradually harmonized, resulting in a single standard 1936.

After 1945, the standards in East and West Germany developed differently, and were harmonized again after re-unification in 1990.

Between the end of the nineties and 2009 many stations were changed from manual to automated.

RESOURCE MAINTENANCE

In order to incorporate newly digitised historical data and to make corrections and improvements, the dataset is replaced annually by a new version. In addition, the versioned data is extended in time by the previous and completed year.

VALIDATION AND UNCERTAINTY ESTIMATE

Considerations of quality assurance are explained in Kaspar et al., 2013: several steps of quality control, including and manual inspection and automatic tests for completeness, temporal and internal consistency, and against statistical thresholds based on the software QualiMet (see Spengler, 2002). The automatic quality control aims to identify and to correct random and gross errors. No systematic corrections (like "Richter correction") are applied. The values collected electronically from 2003 onward are checked with QualiMet. Some doubtful values remain, especially in data prior to 1979. The digitized paper records are quality controlled. The data given here were not subjected to homogenization procedures.

The history of instrumental design, observation practice, and possibly changing representativity has to be considered for the individual stations when interpreting changes in the statistical properties of the time series. It is strongly suggested to investigate the records of the station history which are provided together with the data. Note that in the 1990s many stations had the transition from manual to automated stations, entailing possible changes in certain statistical properties.

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 temperature), 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 this 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 temperature 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 from traditional observing times ("Mannheimer Stunden") to automatic measurements with higher temporal resolution (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 an 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, temperature 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 be 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/. Before 1967, for the stations of the 'Meteorologische Dienst der DDR ' (i.e., East Germany) no daily maximum of wind gust was given. In the period 1967-1972, a daily maximum of wind gust was given only when the threshold of 12 m/s was exceeded, from 01.01.1973 onwards it was given only when the threshold of 5 m/s was exceeded.

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

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REVISION HISTORY

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