DATA SET DESCRIPTION

Historical hourly station observations of 2m air temperature and humidity for Germany

Version v006

Cite data set as: DWD Climate Data Center (CDC): Historical hourly station observations of 2m air temperature and humidity for Germany, version v006, 2018.

INTENT OF THE DATASET

These historical data are quality controlled measurements and observations derived from DWD stations and legally and qualitatively equivalent partner stations operated for climatological and climate related applications. Comprehensive station metadata (station relocation, instrument change, time zones, change of algorithms) are included.

POINT OF CONTACT

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DATA DESCRIPTION

Spatial coverage stations in Germany

Temporal coverage 01.01.1893 - 31.12.2017

Temporal resolution hourly

Format(s) The station observations (produkt_*.txt) are zipped together with the station metadata. The latter are given in *.txt as well as *.html. The file Metadaten_Parameter* contains a listing of the parameters measured at the station (the parameter portfolio) with begin, end, units, measurement procedures, averaging formulas, measurement times and applied time units (e.g., MOZ or UTC) which are all related to the Station Id and the station name valid now. The instrument history is sorted according to the parameters (see file Metadaten_Geraete*). There the history of sensor height, type of instrument and measurement procedure is given, together with the historical station names. The station ID is unique and does not change over time. For a convenient documentation of station name change, see Metadaten_Stationsname*. The geographical metadata of the station (longitude, latitude, height) is listed in Metadaten_Geographie*.txt together with the Stations_id and the current station name. All these information is combined into a single zip-file for each station: *_[Stations_id]_[from]_[to]_hist.zip. An overview over all stations with start and end dates is given in the station list: Stationsliste. Note that for convenience, the list comprises not only stations given here, but also stations with more complicated copyright regulations which may be obtained for certain applications, requiring discussion with the point of contact.

Parameters The file produkt*.txt comprises following parameters:

STATIONS_ID	station identification number	
MESS_DATUM	measurement time	yyyymmddhh
QN_9	quality level of next columns	coding see paragraph "Quality information"
TT_TU	2m air temperature	° C
RF_TU	2m relative humidity	%

eor end of record can be ignored
Missing values are marked as -999. The definition of measurement time changed over time, and was done in MOZ, MEZ or UTC, see Metadaten_Paramter* of each station for details. The exact time of measurement was defined by the various observation procedures valid at the different time periods. In the very early days, the exact minute of reading can only be inferred, later the manual reading was aspired to be performed shortly before hh:00. In Western Germany, MOZ was used, in Eastern Germany, MEZ. For Western Germany, with the automatisation 1. generation, 1min-means were reported for 07:30, 14:30, 21:30 MEZ. In the GDR the 1min-mean at :50 (i.e., hh-10min) was taken for the time stamp hh. Since automatisation 2. generation and switching to SYNOP-convention, generally the measurement is taken at the 1-min interval ending hh-10min, e.g., for UTC 11 the 1min-mean from UTC 10:49-10:50 is given.

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. Depending on the application, local, regional and influences changing with time should be considered, which can be location- and parameter specific. Sources of long-term uncertainty are (1) changes in station height when station was re-located, 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 .

Quality information

The quality levels "Qualitätsniveau" (QN) given here apply for the respective following columns. The values are the minima of the QN of the respective daily values. QN denotes the method of quality control, with which erroneous values are identified and apply for the whole set of parameters at a certain time. For the individual parameters there exist quality bytes in the internal DWD data base, which are not published here. Values identifed as wrong are not published. Various methods of quality control (at different levels) are employed to decide which value is identified as wrong. In the past, different procedures have been employed. The quality procedures are coded as following:
quality level (column header: QN_)
1- only formal control during decoding and import
2- controlled with individually defined criteria
3- ROUTINE control with QUALIMET and QCSY
5- historic, subjective procedures
7- ROUTINE control, not yet corrected
8- quality control outside ROUTINE
9- ROUTINE control, not all parameters corrected
10- ROUTINE control finished, respective corrections finished

DATA ORIGIN

These climate data are from the station networks of Deutschen Wetterdienst which are regularly updated with recent data, and with recovered historical data. From 1997 onwards, the data are operationally collected in the central MIRAKEL data base and archived, see Behrendt et al., 2011, and Kaspar et al., 2013. For details on current measurement and observation procedures see VuB 3 Beobachterhandbuch (DWD, 2014a), VuB 3 Technikerhandbuch (DWD, 2014b) and VuB 2 Wetterschlüsselhandbuch (DWD, 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 recorded incompletely 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 automatised.

VALIDATION AND UNCERTAINTY ESTIMATE

Considerations of quality assurance are explained in Kaspar et al., 2013: several steps of quality control, including automatic tests for completeness, temporal and internal consistency, and against statistical thresholds based on the software QualiMet (see Spengler, 2002) and manual inspection had been applied. 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. Data are provided as observed, i.e., no homogenization has been carried out.

CONSIDERATIONS FOR APPLICATIONS

When investigating long term changes or trends, consider changes in station location, changes in instrumentation, measurement procedures and observation intervals - see the various metadata information provided Metadaten_Parameter*, Metadaten_Geraete* und Metadaten_Geographie*. Starting in the nineties, the metadata are electronically recorded and provided together with the station measurements. For the time before, efforts are continuing to digitize the most relevant metadata based on the paper records however, many gaps are still remaining. For detailed studies, DWD can grant access to the station records. 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).

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).

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REVISION HISTORY

The data in the directories */historical/ are provided in approximately annual intervals as versioned data sets to take into account the dataset extension in time and any updates and the historical data rescued in the meantime. Compared to the previous versions, this version includes additional historical data. This document is maintained by the National Climate Data Centre (NKDZ) of DWD, last edited 19.12.2018.