

DATA SET DESCRIPTION

Historical hourly station observations of sunshine duration for Germany

Version v21.3

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Dataset-ID: urn:x-wmo:md:de.dwd.cdc::obsgermany-climate-hourly-sun-historical

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 1893-01-01 until - 2020-12-31

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.

Units The file produkt*.txt comprises following parameters:

STATIONS_ID	station identification number	
MESS_DATUM	measurement time	yyyymmddhh

QN_7	quality level of next columns	coding see paragraph "Quality information"
SD_SO	hourly sunshine duration	min
eor	end of record	can be ignored

Missing values are marked as -999.

The definition of the hourly interval changed over time: in earlier times the interval was defined with local solar time or "wahre Ortszeit" (WOZ), later with UTC (see the station specific Metadaten_Parameter* for the exact definition). An exact conversion of time units considers the coordinates of the station and the day of year. For instance, hh = 11 WOZ marks the time interval WOZ 10-11, which is for Freiburg on 1st February UTC 9:42-10:42, and on 1st November UTC 9:12-10:12; whereas for Görlitz it is on 1st February UTC 9:13-10:13, and on 1. November UTC 8:43-9:43. Also, with generation from SYNOP messages (which are given in UTC), the hourly interval shifted to 10 minutes earlier, e.g. hh = 11 UTC means the interval UTC 09:51-10:50. Whereas the earlier analysis of registering stripes by hand was naturally an hourly averaging, since the automatization we have an average from the previous six 10-minute-means.

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

Explanation for QB:

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.

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

Explanation for QN:

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.

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.

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 collected in the central MIRAKEL data base and archived, see Behrendt et al., 2011, and Kaspar et al., 2013. For details on the currently applied 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, and might be incompletely recorded in the metadata.

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.

Data are provided "as observed", no homogenization has been carried out. 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.

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.

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).

REFERENCES

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The instructions in https://opendata.dwd.de/climate_environment/CDC/Terms_of_use.pdf should be followed. The DWD website provides comprehensive copyright information.

REVISION HISTORY

This version is a result of a research project. It is possible that errors in the metadata or the data itself are detected and corrected. That will be documented in the file Change_log_REA_OD.txt, however, no versions of the COSMO-REA6 dataset will be saved.

This document is maintained by the Climate Data Center (CDC) of DWD, last edited on \$LAST_MODIFIED;.