

DATA SET DESCRIPTION

Hourly station observations of solar irradiation

Version v0.1

Cite data set as: DWD Climate Data Center (CDC): Hourly station observations of solar irradiation, version v0.1, 2015.

INTENT OF THE DATASET

This document describes the freely available station data of the DWD Climate Data Center (CDC). These measurements and observations are derived from DWD stations and legally and qualitatively equivalent partner stations operated for climatological and climate related applications. Comprehensive metadata (station changes, instruments, times of recordings, algorithms) are included.

POINT OF CONTACT

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DATA DESCRIPTION

Spatial coverage Germany

Temporal coverage 31.12.1945 - 31.12.2014

Temporal resolution hourly

Format(s) Measurements and meta-information are zipped according to station, produkt*.txt contains the observed values. *Element*.html contains the details on measured parameters (parameter units, time units, and algorithms for averaging), *Geraete_Detail*.html contains instrument specific metadata (instrument, measurement procedure). Stationsmetadaten*.txt contains the station coordinates and heights. An overview over all stations is given here [Stationsliste](#).

Parameters The file produkt*.txt contains measurements from pyranometers:

STATIONS_ID	station identification number	
MESS_DATUM	mid of interval in UTC	yyyymmddhh:mm
QUALITAETS_NIVEAU	see below	
SONNENSCHENDAUER	sunshine duration	min
DIFFUS_HIMMEL_KW	diffus irradiance from zenith	J/cm ²
GLOBAL_KW_J	global short wave irradiance	J/cm ²
ATMOSPHERE_LW_J	global long wave irradiance	J/cm ²
SONNENZENITH	solar zenith angle	degree
MESS_DATUM_WOZ	mid of interval in local solar time	yyyymmddhh:mm

with missing values are marked as -999. The solar zenith angle is between 0-180 and is related to solar height with: SONNENZENIT=90-solar_height.

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 which is available in Stationsmetadaten*.txt; (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 Beschreibung_klima_Element*.html. Uncertainties are also expected from (4) changes in instrumentation, see Beschreibung*Detail*.html and possibly also from (5) varying quality check 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 QUALITAETS_NIVEAU describes the method of quality control, with which erroneous or suspicious values are identified and set to -999.
QUALITAETS_NIVEAU
1- only formal control
2- controlled with individually defined criteria
3- automatic control and correction
5- historic, subjective procedures
7- second control done, before correction
8- quality control outside ROUTINE
9- not all parameters corrected
10- quality control finished, all 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. Since 1997 are collected in the central MIRAKEL data base and archived, see Behrendt et al., 2011, und 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 incompletely recorded in the metadata. Details on measurement procedures, averaging algorithms, observation interval definitions and time units can be found in Beschreibung*Element*.html in the column Datenquelle(Strukturversion).

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 changes in the observation times or observation intervals - see the various metadata given in Beschreibung*Element*.html, Beschreibung*Detail*.html, and in Stationsmetadaten*.txt within the zip-file. The metadata were electronically recorded since 1995. For the times before, DWD puts effort in digitizing the most relevant metadata from paper recordings, many gaps are remaining, though. Especially for temperature trends the change in station height needs to be taken into account. When investigating the time of the temperature maximum or trends, the changes in the measurement interval should be considered . To get the true time of the reading (in UTC) the given hour (in UTC) has to be converted as following: T_{automatic station 2. generation} in true UTC = given UTC - 10 min ; T_{automatic station 1. generation} in true UTC = given UTC - 30 min ; T_{ analog stationen after 1972} in true UTC = given MEZ +30 min converted in UTC; T_{ analog stationen before 1972} in true UTC = given MOZ converted in UTC. More recent data (where quality control is not completed yet) are stored in subdirectory ../recent/. When data from both directories 'historical' and 'recent' are used together, the difference in the quality control procedure should be considered.

REFERENCES

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

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Behrendt, J., E. Penda, A. Finkler, U. Heil, C. Polte-Rudolf: Beschreibung der Datenbasis des NKDZ. Version 3.5, Offenbach, 15.02.2011.

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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.

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REVISION HISTORY

This document is maintained by the National Climate Data Centre (NKDZ) of DWD, last edited 26.01.2016.