



DATASET DESCRIPTION

10-minute station observations of solar and sunshine for Germany

Version: v24.03

Publication date: 2024-03-29

Cite data set as:	10-minute station observations of solar and sunshine for Germany, Version v24.03
Dataset-ID:	urn:x-wmo:md:de.dwd.cdc::obsgermany-climate-10min-solar
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/10_minutes/solar/historical/
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/10_minutes/solar/historical/zehn_min_sd_Beschreibung_Stationen.txt
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/10_minutes/solar/meta_data
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/10_minutes/solar/now
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/observations_germany/climate/10_minutes/solar/recent

ABSTRACT

These data originate from the stations of the DWD and legally as well as qualitatively equal partner networks. Extensive station metadata (station relocations, instrument changes, reference time changes, algorithm changes) are included with the download.

The dataset is divided into:

- directory `./historical/`, a versioned part with completed quality check
- directory `./recent/`, a daily updating part, for which the quality check has not yet been completed
- directory `./now/`, an hourly updating part for which the quality check has not yet been completed
- directory `./metadata/`, a daily updating part with the metadata about the stations, their instruments and measurement rules.

POINT OF CONTACT

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DATASET DESCRIPTION

Parameter	diffuse radiation, , global radiation, sunshine duration
Unit(s)	hours, J/cm ²
Statistical processing	10-minute sum, time series
Temporal coverage	1989-07-03 -- ...
Spatial coverage	stations in Germany
Projection	WGS 84 (EPSG:4326)
Format description	In the folder <code>historical/</code> for each station a zip-archive is provided. The naming schema of the zip-archives is: <code>*_{product_code}_{station_id}_{begin_date}_{end_date}_hist.zip</code> . The measurements are assigned to a time stamp in MEZ before the year 2000, and to a time stamp in UTC from the year 2000 dedicated.

Format description	The file zehn_min_sd_Beschreibung_Stationen.txt contains information on the recent geographical position and the temporal data coverage per station.																																											
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application schema	csv dialect description <table border="0"> <tr> <td>delimiter</td> <td>line terminator</td> <td>header</td> <td>quote char</td> </tr> <tr> <td>;</td> <td>\\r\\n</td> <td>true</td> <td>"</td> </tr> </table> csv content description <table border="0"> <thead> <tr> <th>column name</th> <th>description</th> <th>uom</th> <th>type</th> <th>format</th> </tr> </thead> <tbody> <tr> <td>MESS_DATUM</td> <td>reference date</td> <td></td> <td>NUMBER</td> <td>YYYYMMDDHH24</td> </tr> <tr> <td>QN</td> <td>quality level</td> <td>numerical code</td> <td>NUMBER</td> <td>990</td> </tr> <tr> <td>DS_10</td> <td>[sum of diffuse sky radiation during the previous 10 minutes\,missing_value=-999]</td> <td>J/cm²</td> <td>NUMBER</td> <td>9990.0</td> </tr> <tr> <td>GS_10</td> <td>[sum of global radiation during the previous 10 minutes\,missing_value=-999]</td> <td>J/cm²</td> <td>NUMBER</td> <td>9990.0</td> </tr> <tr> <td>SD_10</td> <td>[sum of sunshine duration during the previous 10 minutes\,missing_value=-999]</td> <td>h</td> <td>NUMBER</td> <td>90.990</td> </tr> <tr> <td>LS_10</td> <td>[sum of longwave radiation during the previous 10 minutes\,missing_value=-999]</td> <td>J/cm²</td> <td>NUMBER</td> <td>9990.0</td> </tr> </tbody> </table>	delimiter	line terminator	header	quote char	;	\\r\\n	true	"	column name	description	uom	type	format	MESS_DATUM	reference date		NUMBER	YYYYMMDDHH24	QN	quality level	numerical code	NUMBER	990	DS_10	[sum of diffuse sky radiation during the previous 10 minutes\,missing_value=-999]	J/cm ²	NUMBER	9990.0	GS_10	[sum of global radiation during the previous 10 minutes\,missing_value=-999]	J/cm ²	NUMBER	9990.0	SD_10	[sum of sunshine duration during the previous 10 minutes\,missing_value=-999]	h	NUMBER	90.990	LS_10	[sum of longwave radiation during the previous 10 minutes\,missing_value=-999]	J/cm ²	NUMBER	9990.0
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Quality Information	The QUALITAETS_NIVEAU (QN) shows the quality control procedure applied for a data report (of several parameters) for a certain reporting time. QN = 1 : only formal control; QN = 2 : controlled with individually defined criteria; QN = 3 : automatic control and correction;																																											

DATA ORIGIN

These data are from the station networks of Deutschen Wetterdienst and legally as well as qualitatively equal partner networks. For details on the measurement procedures VuB 3 Beobachterhandbuch (DWD, 2014a), VuB 3 Technikerhandbuch (DWD, 2014b) and VuB 2 Wetterschlüsselhandbuch (DWD, 2013).

RESOURCE MAINTENANCE

In the now/ directory, the data is updated at a frequency of < 1 h. The data of the previous day is exchanged on a rolling basis until the last available measurement.
Quality control has not yet been completed for these data, so there may always be 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.

In the directory recent/ the data files are updated daily. On a rolling basis, the data of the last 500 days - up to yesterday - are exchanged.
Quality control has not yet been completed for these data, so there may always be changes in the values.

VALIDATION AND UNCERTAINTY ESTIMATE

The quality check and uncertainty assessment routines are explained in Kaspar et al., 2013. In addition to automated tests that check completeness, temporal and spatial consistency and compare them against statistical thresholds (QualiMet software, Spengler, 2002), an additional manual quality control is carried out.

UNCERTAINTIES

The stations in the DWD monitoring networks are set up and operated according to WMO regulations. Stations in the equivalent partner networks may deviate from WMO regulations.

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*. Uncertainties are also expected from (2) changes in instrumentation, see Metadaten_Geraete* and possibly also from (3) varying quality control procedures (Behrendt et al., 2011). Further, uncertainties are known to come from (4) errors during data transfer or errors in the software, (5) change of observing personnel, and (6) others, see Freydank, 2014.

CONSIDERATIONS FOR APPLICATIONS

When using the "historical/", "recent/" and "now" directories together, the temporal overlap and the different type of quality control must be taken into account.

Data sets with quality level QN=1 may contain significant errors. Users have to decide whether for their particular application the more error-prone 10-minute data should be used or rather higher quality data (hourly or daily values).

When investigating long-term changes or trends, consider the station-specific metadata provided in Metadaten_Parameter*, Metadaten_Geraete*, and Metadaten_Geographie*, which are provided for each station in the directory "meta_data/" as a zip file.

The solar incoming radiation includes the direct and the diffuse part of the solar radiation with respect to the horizontal plane. It is sometimes also referred to as "shortwave", including the solar spectrum up to 2.8 micron, as opposed to "longwave", which refers to the thermal radiation of the atmosphere.

At stations that are nowadays only equipped with radiation measuring instruments (pyranometers), the sunshine duration in the course of changed data acquisition procedures is calculated from the measured values of global and diffuse radiation. The change of instruments to pyranometers can be taken from the station-specific metadata file Metadata_Geraete*.

ADDITIONAL INFORMATION

For the most recent data the quality control is not completed yet. There are still issues to be discovered in the historical data. We welcome any hints to improve the data basis (see contact).

LITERATURE

[Becker, R. and Behrens, K.: Quality assessment of heterogeneous surface radiation network data, Adv. Sci. Res., 8, 93-97, doi:10.5194/asr-8-93-2012, 2012.](#)

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[Long, C. and Dutton, E.: BSRN Global Network recommended QC tests, V2.0, Tech. rep., 2002.](#)

[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 Deutscher Wetterdienst, Climate Data Center (CDC) - Betrieb, last edited at 2024-05-06.