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Deutscher Wetterdienst
Wetter und Klima aus einer Hand

DATASET DESCRIPTION

Pseudo station data of gridded hourly near-realtime data of surface irradiance and sunshine duration based on surface measurements and satellite observations - DUETT Project

Version: 006

Publication date: 2024

Cite data set as:	Pseudo station data of gridded hourly near-realtime data of surface irradiance and sunshine duration based on surface measurements and satellite observations - DUETT Project, Version 006
Dataset-ID:	urn:wmo:md:de-dwd-cdc:75a88e13-0725-4664-bf8a-2ea448b19504
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/derived_germany/climate/hourly/duett/radiation_global/recent
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/derived_germany/climate/hourly/duett/sunshine_duration/recent
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/derived_germany/climate/hourly/duett/radiation_global/recent/fg_duett_Beschreibung_Stationen.txt
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/derived_germany/climate/hourly/duett/sunshine_duration/recent/sd_duett_Beschreibung_Stationen.txt

ABSTRACT

Based on the DUETT gridded data, additional point data is determined at the coordinates of 576 measurement sites of DWD. These pseudo station data are extracted from the gridded data using a simple ‘nearest neighbour’ assignment and are optimized by a subsequent topography correction. This correction is performed using high-resolution topographic data and it primarily captures the possible blocking of direct solar radiation by surrounding mountains. Associated uncertainties are also determined from the gridded data using a ‘nearest neighbour’ assignment and are not subject to any further adjustment in the current program version.

The data set is separated into two parts: the directory ./{parameter}/recent/ contains the latest data; in the directory ./{parameter}/historical/ older data are archived.

POINT OF CONTACT

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DATASET DESCRIPTION

Parameter	sunshine duration, global radiation
Unit(s)	J/cm², minutes
Temporal coverage	2024-01-01 -- ...
Temporal resolution	
Spatial coverage	stations in Germany
Projection	WGS 84 (EPSG:4326)

Format description recent hourly mean surface downwelling shortwave radiation (SIS) :
The folder .radiation_global/recent/ contains recent hourly pseudo station data files in ASCII format.

Format description recent hourly sunshine duration (SDU) :
The folder .sunshine_duration/recent/ contains hourly pseudo station data of the current year in ASCII format.

Format description List of pseudo-stations: global radiation :
List of pseudo-stations for which global radiation values are derived.

Format description List of pseudo-stations: sunshine duration :
Liste der Pseudo- Stationen, für die Werte der Sonnenscheindauer abgeleitet werden.

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	YYYYMMDDHH24
QN_952	quality level of the following columns		NUMBER	numerical code
FG_DUETT	surface irradiance	J/cm²	NUMBER	999999.9
FG_UN_DUETT	hourly global radiation uncertainty	J/cm²	NUMBER	999999.9
SD_DUETT	hourly sunshine duration	min	NUMBER	999
SD_UN_DUETT	hourly sunshine duration uncertainty	min	NUMBER	999

Quality Information The QUALITAETS_NIVEAU (QN) describes the scope of the input data used for merging.

QN = 500 : DUETT data without station and satellite data
QN = 501 : DUETT data based on station data only
QN = 502 : DUETT data based on satellite data only
QN = 503 : DUETT data based on (max 42) station and satellite data

DATA ORIGIN

The underlying grid data are based on satellite observations and surface measurements. The used satellite data are generated by DWD in near-realtime every 15-min as instantaneous data of the suface radiation in 5 km resolution based on data from the geostationary Meteosat satellite. The surface measurements (aggregated over 10 min) are collected at 42 locations from the DWD netowork (mainly pyranometer instruments). Both data sets are aggregated to synoptic hourly data ((HH-1):50 to HH:50). A geo-statistical algorithm is used to generate the gridded data of surface irradiance and sunshine duration from those two data sources.

RESOURCE MAINTENANCE

In the directories ./{parameter}//recent/ the data files are updated hourly.

In the directories ./{parameter}/historical/ the data files are updated annually.
The hourly data files are merged into monthly files.

VALIDATION AND UNCERTAINTY ESTIMATE

The underlying grid data are regularly compared with direct measurements of sunshine duration and global radiation at independent stations. There are only minor systematic differences (approx. 1 min for the sunshine duration, approx. 10 W/m2 for the global radiation, each approx. 5%); the mean absolute deviations were in the range of approx. 6 min and 30 W/m2, respectively. For specific situations, the deviations can be significantly lower or higher than the average. From version 006, the data also contain information on the uncertainty of the surface irradiance and the sunshine duration. These are estimated on the basis of the statistics of the differences between the satellite and the surface measurement data, the surrounding data variability and the geometric uncertainty of the cloud observation.

UNCERTAINTIES

The main focus of these products is on the provision of near real-time observations. The software for generating the gridded data (source data for pseudo station data) is constantly being improved and updated, which can lead to discontinuities when analysing long time series. In the case of heterogeneous cloud conditions, especially in mountainous regions, the gridded data may differ, sometimes significantly, from the measurements of nearby stations. This is due to the different spatial representativeness of the two measurement methods. Small-scale features such as cumulus clouds or fog patches may not be represented in the gridded data. Further sources of error are geometric errors, which are caused by different positions of the satellite and the sun relative to the observation point. With clear sky and snow cover, there is a potential for a considerable underestimation of solar irradiance and sunshine duration in the gridded data. Since the introduction of version 007 of DUETT (19 Nov 2024), these snow-related errors have been at least partially rectified by using independent cloud mask data as an additional source of information.

CONSIDERATIONS FOR APPLICATIONS

The data represent the value at the specified coordinate, based on the nearest neighbor grid value and topographic shading. The specified MESS_DATUM describes the end of the synoptic hour for which the data apply. The synoptic hour HH:00 denotes the hour from (HH-2):50 to (HH-1):50.

ADDITIONAL INFORMATION

The underlying gridded data are obtained from ground measurements and satellite data using a geo-statistical method. This method and the method for deriving point data is subject to continuous further development; a temporal homogeneity of the data cannot be guaranteed. Changes in the method used are indicated in the file name. A complete check of the data does not take place; we are grateful for information on problematic data points in the gridded data (see Contact).

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REVISION HISTORY

This document is maintained by Deutscher Wetterdienst, CMSAF - Satelliten-gestütztes Klimamonitoring, last edited at 2025-04-04.