



DATASET DESCRIPTION

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

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Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/grids_germany/hourly/duett/radiation_global/recent
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/grids_germany/hourly/duett/sunshine_duration/recent
Dataset-URL:	https://opendata.dwd.de/climate_environment/CDC/grids_germany/hourly/duett/DUETT_ListOfStations.csv

ABSTRACT

These data are generated by combining satellite-based and surface-measured data of the surface irradiance (global radiation) and the sunshine duration. The associated algorithms have been developed within the DUETT-project and are continuously adjusted and improved. Gridded data (EPSG-3034 projection, Germany) of the surface irradiance and the sunshine duration are generated with a spatial resolution of 2 km and a temporal resolution of 1 hour (average / sum for synoptic hours, ending at minute 50). 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
Temporal coverage	2024-01-01 -- ...
Temporal resolution	
Spatial coverage	stations in Germany
Projection	ETRS89 / LCC Europe
Format description	recent hourly mean surface downwelling shortwave radiation (SIS) : The folder <code>.radiation_global/recent/</code> contains recent hourly gridded data files in netcdf-format. The naming of the files follows: <code>{parameter}_duett_2km_DE_60min_{YYYYmmddHHMM}_{version}.nc</code>
Format description	recent hourly sunshine duration (SDU) : The folder <code>.sunshine_duration/recent/</code> contains hourly gridded data of the current year in netcdf format. The naming convention of the netcdf-files is: <code>{parameter}_duett_2km_DE_60min_{YYYYmmddHHMM}_{version}.nc</code>
Format description	List of stations : Liste der Stationen mit Insitu-Messungen, welche zur Erzeugung des Rasterproduktes verwendet werden.

DATA ORIGIN

The gridded 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 surface 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 network (mainly pyranometer instruments). Both data sets are aggregated to synoptic hourly data. A geostatistical algorithm is used to generate the gridded data of surface irradiance and sunshine duration from those two data sources.

RESOURCE MAINTENANCE

In the directory `./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 gridded 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 are 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. Since Version 006 the data contain also 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 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 spatially averaged value for the specified grid area.

ADDITIONAL INFORMATION

The gridded data are obtained from ground measurements and satellite data using a geo-statistical method. This method 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 raster data (see Contact).

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REVISION HISTORY

This document is maintained by Deutscher Wetterdienst, CMSAF - Satelliten-gestütztes Klimamonitoring, last edited at 2024-11-29.