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DATA SET DESCRIPTION

Monthly means of hourly grids of global radiation for Germany (project TRY Advancement)

Version V001

Cite data set as: Krähenmann, S., Walter, A., Brienen, S., Imbery, F., Matzarakis, A.: Monthly means of hourly grids of global radiation for Germany (project TRY Advancement), Version V001, DWD Climate Data Center (CDC), DOI:10.5676/DWD_CDC/TRY_Basis_v001, 2016.

INTENT OF THE DATASET

This document describes freely available data of the DWD Climate Data Centre which are the raw data set used for input to generate the German Test Reference Years (2017). The commissioned research project "TRY Advancement" was supported with funding from the Research Initiative Future Building through BBSR.

POINT OF CONTACT

Deutscher Wetterdienst
CDC - Vertrieb Klima und Umwelt
Frankfurter Straße 135
63067 Offenbach
Tel.: + 49 (0) 69 8062-4400
Fax.: + 49 (0) 69 8062-4499
Mail: Klima.Vertrieb@DWD.de

DATA DESCRIPTION

Spatial coverage	Germany
Temporal coverage	01.01.1995 - 31.12.2012
Spatial resolution	1 km x 1 km
Temporal resolution	monthly
Projection	ETRS89 / ETRS-LCC, ellipsoid GRS80, EPSG: 3034, see http://spatialreference.org/ref/epsg/3034/.
Format(s)	NetCDF
Parameters	mean global radiation [Wh/m²] in the data SIS_*monmean.nc
Uncertainties	Uncertainties result from the interpolation procedure and from erroneous or missing observations. When comparing grids of different years, changes of the station network over the time have to be taken into account.

DATA ORIGIN

Input data for the gridding are synoptic station data from the DWD database, supplemented by satellite observations (Müller et al., 2015). Gridding is done using the interpolation method described below. Monthly means are derived by averaging the hourly grids. A comparison between satellite- and ground-based data revealed specific errors depending on location, season and presence of snow.

It is particularly difficult to distinguish snow from clouds as both are good reflectors of shortwave radiation. Radiances obtained at 32 ground-based Pyranometer stations are used to correct for the bias of the satellite-derived shortwave radiances. Surface stations provide point-wise observations, satellites by design spatial mean values (~25 km²). This can lead to substantial differences between the two datasets, particularly when cloud cover is variable and averaging periods are short. Hence, the two datasets cannot be directly merged, yet resolution dependent differences average out over longer time periods (e.g. days). A correction factor is derived on a daily basis, which amounts to the ratio of the daily sums of satellite-based and surface observations. Before the correction factor can be applied, the hourly satellite data are normalized (e.g. removal of geographical effect) by division through the extra-terrestrial radiation of the specific hour. Subsequently, the station-wise derived correction factors are interpolated by IDW, with a distance measure that accounts for geographical coordinates, elevation and the daily sum of the satellite-derived radiation. The interpolated correction factors are then applied to the hourly radiation sums assuming a site specific but constant error throughout the day.

VALIDATION AND UNCERTAINTY ESTIMATE

The 1 km² grid resolution matches the resolution of the digital elevation model. Residual interpolation is error prone. The true information density depends on the station network, particularly in regions of complex terrain. The station density is particularly low, with only about 30 Pyranometer stations contributing to the gridding. To ensure an improvement of the satellite-derived dataset, the correction is only carried out on days for which cross-validation indicates an improvement in terms of both BIAS and MAE.

CONSIDERATIONS FOR APPLICATIONS

The interpolation of hourly values focuses on temporal consistency over a day and consistency between parameters. Due to changes in the station network (openings and closings of stations and relocation), and degradation and change of satellites, climatological analysis (e.g. identification of long-term trends) is not possible.

REFERENCES

Krähenmann S, Walter A, Imbery F, Brienen S, Matzarakis A (2016): High-resolution grids of hourly meteorological variables for Germany. TAAC. DOI:10.1007/s00704-016-2003-7

Müller R, Pfeifroth U, Träger-Chatterjee C, Trentmann J, Cremer R (2015) Digging the METEOSAT Treasure – 3 Decades of Solar Surface Radiation. Remote Sens 7:8067-8101. DOI:10.3390/rs70608067

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REVISION HISTORY

The data are output of a project and not subject to change. This document is maintained by the Climate and Environmental Consultancy Department (KU11), DWD, last edited 19.12.2018.