

## DATA SET DESCRIPTION

### *Monthly means of hourly grids of upwelling longwave radiation for Germany (project TRY Advancement)*

#### Version V001

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#### 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

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#### DATA DESCRIPTION

<b>Spatial coverage</b>	Germany
<b>Temporal coverage</b>	01.01.1995 - 31.12.2012
<b>Spatial resolution</b>	1 km x 1 km
<b>Temporal resolution</b>	monthly
<b>Projection</b>	ETRS89 / ETRS-LCC, ellipsoid GRS80, EPSG: 3034, see <a href="http://spatialreference.org/ref/epsg/3034/">http://spatialreference.org/ref/epsg/3034/</a> .
<b>Format(s)</b>	NetCDF
<b>Parameters</b>	mean longwave upwelling radiation [Wh/m <sup>2</sup> ] in the data SOL_*monmean.nc
<b>Uncertainties</b>	Uncertainties result from the gridding procedure and from errors in the model and the satellite data. When comparing grids of different years, changes of the satellite instruments over the time have to be taken into account.

#### DATA ORIGIN

Input data for the gridding are model data (COSMO-CLM) and satellite observations (CM-SAF). Gridding is done using the interpolation method described below. Monthly means are derived by averaging the hourly grids. COSMO-CLM provides surface upwelling longwave (SOL) radiation at a spatial resolution of 2.8 km. Downscaling of SOL to 1 km<sup>2</sup> is done using an approach by Karlsson et al. (2013).

In a first step surface temperature ( $T_{surf}$ ) is derived from SOL and surface emissivity at model resolution. Surface emissivity was derived from land use classes (see Wilber et al., 1999) of the Global Land Cover 2000 dataset (GLC2000; Bartholome et al., 2005). To downscale  $T_{surf}$  to 1 km<sup>2</sup>, a dry adiabatic temperature gradient of -9.81 °C/km is assumed. Application the Stefan-Boltzmann equation and accounting for reflection of downwelling longwave radiation yields the hourly SOL pattern.

## VALIDATION AND UNCERTAINTY ESTIMATE

The 1 km<sup>2</sup> grid resolution matches the resolution of the digital elevation model. Representativity of the longwave radiation data is limited by the coarse resolution (~ 25 km<sup>2</sup>) of the satellite data. Surface emissivity and lapse rate of the surface temperature are kept constant over the day and the year. In addition, no station data are used for bias correction.

## CONSIDERATIONS FOR APPLICATIONS

Due to degradation and change of satellites, climatological analysis (e.g. identification of long-term trends) is not possible. These grids represent a first pragmatic estimation and should therefore be used with caution. Application of the dataset requires thorough validation before any application. The dataset has proven to be excellently suited for its original application (test reference years).

## REFERENCES

Bartholome E, Belward, AS (2005) GLC2000: A new approach to global land-cover mapping from Earth observation data. *Int J Remote Sens* 26(9):1959-1977. <http://dx.doi.org/10.1080/01431160412331291297>

Karlsson GK, Riihelä A, Müller R, Meirink JF, Sedlar J, Stengel M, Lockhoff M, Trentmann J, Kaspar F, Hollmann R, Wolters E (2013) CLARA-A1: a cloud, albedo, and radiation dataset from 28yr of global AVHRR data. *Atmos Chem Phys* 13:5351-5367. doi:10.5194/acp-13-5351-2013

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Wilber AC, Kratz DP, Gupta SK (1999) Surface emissivity maps for use in satellite retrievals of longwave radiation. NASA Langley Research Centre, Hampton

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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.