DATA SET DESCRIPTION

Hourly grids of cloud cover 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

Spatial coverage	Germany
Temporal coverage	01.01.1995 - 31.12.2012
Spatial resolution	1 km x 1 km
Temporal resolution	hourly
Projection	ETRS89 / ETRS-LCC, ellipsoid GRS80, EPSG: 3034, see http://spatialreference.org/ref/epsg/3034/.
Format(s)	NetCDF
Parameters	mean cloud cover [1/8] in the data N_*.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 and the satellite sensor over the time have to be taken into account.

DATA ORIGIN

Data source for the gridding are synoptic station data from the DWD MIRAKEL database, supplemented by satellite observations (CM-SAF). Satellite-derived cloud cover provides comprehensive information on the current cloud pattern in high spatial (~25 km²) and temporal (30 minutes) resolution. Cloud albedo (CAL) is derived from radiances in the visible spectrum and hence only available during daytime (MVIRI instrument on the geostationary satellite). Only since 2005 the SEVIRI instrument provides information in the near infrared spectrum and enables cloud fraction (CFC) detection by day or night. For consistency reasons cloud cover is derived from CAL whenever available. Hourly CAL data is weighted averaged from the three temporally closest half-hourly obtained values. CAL-derived cloud cover serves as background field, and in-situ observations are treated as the truth. Since, ground-based data are valid for a circle of about 30 km radius (~2800 km², in flat areas) and CAL data for an area of about 25 km², residuals are computed from averages of the nearest 200 grid points to every station. Residual interpolation is done by IDW interpolation, using the twelve closest stations. Summation of background field and interpolated residuals yields the cloud cover grids. To derive nocturnal cloud cover grids before 2005 the dominating cloud cover patterns derived from principal components analysis (PCA) serve as predictors. These patterns are related to often re-occurring weather conditions and contain local features. Interpolation consists of two steps including multiple linear regression and residual interpolation using IDW. The first 13 PCA loadings (~80% explained variance), longitude, latitude and elevation serve as predictors for the regression. Residual interpolation uses the twelve closest stations for weighting. As for CAL interpolation, residuals are computed from averages of the nearest 200 grid points to every station.

VALIDATION AND UNCERTAINTY ESTIMATE

The 1 km² grid resolution matches the resolution of the digital elevation model. Representativity of the cloud cover data is limited by the station network and due to the coarse resolution (~ 25 km²) of the satellite data. Topographically induced blocking of clouds or convection is only representative on the resolution of the satellite data. In addition, residual interpolation is error prone. Over the period 1995-2012 data from about 150 stations contributed to the gridding. The station number varies with time. Changes of station elevations due to station relocations are consider within the interpolation process.

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. Cloud cover may vary strongly in time and space. Moreover, orographic blocking and strong winds produce complex spatial cloud structures which are only representative on the resolution of the satellite data. It is assumed that satellite-derived cloud cover spatial distribution is overall correct. In addition, the assumption is made that any bias inherent to the satellite date is spatially well correlated. These are often made assumptions for monthly data which yield satisfactory results. However, for hourly grids these assumptions do not always hold. Thus, hourly grids should be used with caution, and they should be validated before any application. The dataset has proven to be excellently suited for its original application (test reference years).

REFERENCES

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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.