DATA SET DESCRIPTION

Hourly grids of dew point temperature 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. 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	dew point temperature [1/10 °C] in 2m above ground in the data TD_*.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 MIRAKEL database, supplemented by satellite observations (CM-SAF) and model data (COSMO-CLM). Gridding is done using the interpolation method described below. It is applied to hourly values. The calculations are based on a concept developed by Frei (2014), which yields particularly well results in regions of complex terrain. The method combines a non-linear profile of the dew point temperature with inverse distance weighted (IDW) interpolation, for which a non-euclidean distance metric is used. To ensure temporal consistency of the dew point grids a three step interpolation process is

applied. In step one, a non-linear dew point profile is regionally fit to the topography and merged to a background field for Germany. The dew point profile comprises two linear sections (above and below the inversion layer) having the same lapse rate. The two profiles are displaced to each other, connected within the inversion layer via a continuous function. The vertical profiles are derived for eight subjectively defined sub-regions that are then merged by linear weighting across an overlapping area. The vast area of Germany and its climatic diversity requires a more refined regionalization of the vertical dew point dependence in the background field. The sub-regions were defined accounting for weather barriers, distance to sea and the Alpine foothills. This reduces disturbance of the vertical dew point gradient by horizontal gradients. Estimation of the background field is done seven times per day. In step two hourly background fields are calculated by weighting the three temporally closest background fields. Hourly residual interpolation is performed in the third step. Moreover, a simple gap-filling procedure is applied to provide complete time series on a daily basis (only for single missing hours). The urban heat island effect (UHI) is also considered in the dew point grids. The current UHI intensity is calculated using a method described by Wienert et al. (2013), depending on time of the day and season, current weather conditions (average cloud cover and wind speed in the last 24 hours) and the building structure and density within a radius of 3 km around a station (derived from CLC land use data; Keil et al., 2011).

VALIDATION AND UNCERTAINTY ESTIMATE

The 1 km² resolution of the grids matches the resolution of the digital elevation model. Processes affected by climate and weather (e.g. cold drainage flow) which are not directly captured by the station network or by the regression approach are not considered in the grids. The true information density depends on the station density, particularly in regions of complex terrain. Over the period 1995-2012 data from about 300 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), climatological analysis (e.g. identification of long-term trends) are not possible. The gridding procedures (and the background maps) are based on the assumption that dew point is spatially well correlated. This is an often made assumption for monthly data and yields satisfactory results. However, for hourly grids this assumption does not always hold. The hourly grids represent an experimental dataset and should be used with caution. Application of the hourly requires thorough validation before any application. The dataset has proven to be excellently suited for its original application (test reference years).

REFERENCES

Frei C (2014) Interpolation of temperature in a mountainous region using nonlinear profiles and non-Euclidean distances. Int J Climatol 34:1585-1605. doi:10.1002/joc.3786

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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 16.12.2016.