Technical Documentation for the series Data Products of Climate Normals

1. Products Overview

This set of data products provides climatological datasets for stations within the service domain of TPRCC-Network (25-50°N, 65-105°E). It encompasses five key climate variables: mean, maximum, minimum surface air temperature (SAT), total precipitation, and snow depth. The datasets include climatologies for the periods of both 1991-2020 and 1981-2010 (snow depth is available only for the 1991-2020 period), aiming to serve as fundamental reference data for regional climate monitoring, research, and related operational applications.

2. File Naming Convention

For easy identification and usage, the files follow a unified naming format. The filename structure is as follow:

[variable]_climatology_[period]_month_station_tp.csv

in which:

[variable] identifies the climate variable included by the data product, where *tavg*, *tmax*, and *tmin* denote mean, maximum, and minimum SAT, respectively and *pre* and *snowdepth* denote precipitation and snow depth.

[period] identifies the time period used for calculating the climatology. For example, "1991_2020" represents the climatology calculated based on data from 1991 to 2020.

The remaining fields (climatology, month, station, tp) are fixed descriptive terms, representing "climatology", "monthly values", "by station", and "TPRCC service domain" respectively.

Example: tmin_climatology_1991_2020_month_station_tp.csv represents the climatology data of monthly minimum SAT for the 1991-2020 reference period by stations in the service domain of TPRCC-Network.

3. File Format and Content

The data file is in csv format. Each data file contains 15 columns, described as follows:

Column 1 (Station ID): Unique identifier for the station.

Column 2 (Latitude): Station latitude, in degrees (°N).

Column 3 (Longitude): Station longitude, in degrees (°E).

Columns 4 to 15: Correspond to the climatological values for January to December, respectively, where -999 denotes missing values in the data. For SAT variables, the unit is degrees Celsius (°C). For precipitation and snow depth, the units are millimeters (mm) and centimeters (cm), respectively.

4. Methodology of data producing

The producing workflow for these data products is as follows:

(1) Definition of Station Domain

Based on the service domain of TPRCC-Network (25-50°N, 65-105°E), a list of stations shared through the Global Telecommunication System (GTS) were extracted and generated (hereinafter referred to as the "TPRCC Stations List"), serving as the basis for subsequent data screening and producing.

(2) Data Products of Temperature and Precipitation Climatology

The climatology data for mean, maximum, minimum SAT, and precipitation are sourced from the "Global Land Surface Temperature and Precipitation Climatology" data set released by the National Meteorological Information Center, China Meteorological Administration (NMIC/CMA). Data from the stations that match the TPRCC Stations List were directly extracted.

(3) Data Products of Snow Depth Climatology

The snow depth climatology (1991-2020) was calculated based on quality-controlled global daily snow depth observation data set, following below steps:

Step 1: Extraction of Regional Stations. Based on the "TPRCC Stations List," station observation series located within this region were selected from the data set.

Step 2: Calculation of Monthly Value Series. Based on daily data, the monthly average snow depth for each station during the 1991-2020 period was calculated. To

ensure the data completeness, a monthly average was computed only if there were at least 24 days of valid observation data within the month; otherwise, it was recorded as missing.

Step 3: Calculation of Climatology. For each station, based on the 30-year series of monthly averages, the 1991-2020 average was calculated only if there were valid monthly values for at least 24 years to ensure the data completeness; otherwise, it was recorded as missing.

Step 4: Final Quality Control. After generating the monthly climatologies, an overall check was performed on the data product. Station records where climatological values were missing for all 12 months were removed to ensure the overall usability of the final data set.