
# Extreme Precipitation 24, 48 and 72 hour

## Introduction

The CPC daily precipitation is applied to generate global extreme precipitation data through a GEV extreme value analysis method. The CPC data are a gauge-based analysis of daily precipitation over the global land areas. Gauge reports from over 30,000 stations are collected from multiple sources including GTS, COOP, and other national and international agencies. Quality control is performed through comparisons with historical records and independent information from measurements at nearby stations, concurrent radar / satellite observations, as well as numerical model forecasts. Quality controlled station reports are then interpolated to create analysed fields of daily precipitation with consideration of orographic effects (Xie et al., 2007). The daily analysis is constructed on a 0.125-degree latitude/longitude grid over the entire global land areas and released on a 0.5-degree latitude/longitude grid over the global domain for a period from 1979 to the present.

The CHIRPS daily precipitation is used to produce quasi-global extreme precipitation data. Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) is a 30+ year quasi-global rainfall dataset (50°S-50°N and all longitudes) starting in 1981 to near-present. CHIRPS incorporate 0.05° resolution satellite imagery with station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring.

In Climate Insights, three rainfall duration of 24-, 48- and 72-hours and nine average reoccurrence intervals (ARIs in year) of 2, 5, 10, 25, 50, 100, 200, and 500 years are provided along with 5, 50 and 95% confidence intervals.

Following is a list of regional risk data or raw climate data typically applied in Climate Insights to estimate extreme precipitation. This is not an exhaustive list and will be updated as new data is available.

- NOAA Atlas 14 Precipitation Frequency Estimates in the USA

NOAA Atlas 14 contains precipitation frequency estimates for the United States and U.S. affiliated territories with associated 90% confidence intervals and supplementary information on temporal distribution of heavy precipitation, analysis of seasonality and trends in annual maximum series data, etc. It includes pertinent information on development methodologies and intermediate results. The results are published through the Precipitation Frequency Data Server.

- KOSTRA-DWD - Grids of heavy precipitation (design precipitation) over Germany

These data sets contain statistical precipitation values as a function of the duration and the return period. The scope of the data is the engineering dimensioning of water management structures. These include, sewerage networks, sewage treatment plants, pumping stations, and retention basins. They are also often used for the dimensioning of drainage systems and infiltration systems. With the help of the data, however, it is also possible to estimate the precipitation level of severe heavy precipitation events with regard to their return periods. This estimation is often used to assess damage events.

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- Virtual Climate station Network (VCSN) data in New Zealand

VCSN data are estimates of daily rainfall, potential evapotranspiration, air and vapour pressure, maximum and minimum air temperature, soil temperature, relative humidity, solar radiation, wind speed and soil moisture on a regular (~5km) grid covering the whole of New Zealand.

- Spain02: A set of gridded precipitation and temperature datasets

Spain02 is a series of high-resolution daily precipitation and (maximum and minimum) temperature gridded datasets developed for peninsular Spain and the Balearic Islands. A dense network of ~2500 quality-controlled stations (~250 for temperatures) for the period 1950-2007 was selected from the Spanish Meteorological Agency (AEMET) in order to build the gridded products for the different versions. Note that daily precipitation records (and the resulting gridded values) for any given day n correspond to the precipitation registered between 0700UTC of day n and 0700UTC of day n+1. The latest version (Spain02 v5) provides daily data for both temperature and precipitation from 1951 to 2015 in a 0.1º (~10km) regular grid.

- UKCP09: Met Office Gridded land surface climate observations

This collection contains datasets of climate variables derived from the network of UK land surface observations. The data have been interpolated from meteorological station data onto a uniform grid to provide complete and consistent coverage across the UK. The data sets cover the UK at 5 x 5 km resolution and span the period 1910 - 2015. They are available at daily, monthly, and annual timescales, as well as long-term averages for the periods 1961 - 1990, 1971 - 2000, and 1981 - 2010. Baseline averages are also available at 25 x 25 km resolution to match the UKCP09 climate change projections.

- CN05.1: gridded daily dataset over China

The gridded daily dataset with the resolution of 0.25 degrees latitude by 0.25 degrees longitude, CN05.1, is constructed for the purpose of high-resolution climate model validation over China region. The dataset is based on the interpolation from over 2400 observing stations in China, includes 4 variables: daily mean, minimum and maximum temperature, daily precipitation.

- High resolution daily rainfall gridded datasets from 1900 onwards in Australia

These rainfall grids are computer generated using a sophisticated analysis technique. It incorporates an optimised Barnes successive correction technique that applies a weighted averaging process to the station data. Topographical information is included by using rainfall ratio (actual rainfall divided by monthly average) in the analysis process. Each grid-point represents an approximately square area with sides of about 5 kilometres (0.05 degrees). The size of the grids is limited by the data density across Australia.

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- Daily 10 km Gridded Climate Dataset in Canada

The data for Canada 1961-2003 (ANUSPLIN Point Grid) contains gridded point locations of daily maximum temperature (°C), minimum temperature (°C), and precipitation (mm) for the Canadian landmass south of 60°N. Each daily grid contains interpolated point estimates arranged in a regular grid with a spacing of 10 km. Grids are interpolated from daily Environment Canada climate station observations using a thin plate smoothing spline surface fitting method implemented by ANUSPLIN V4.3.

- seNorge_2018: daily precipitation, and temperature datasets over Norway

eNorge_2018 is a collection of observational gridded datasets over Norway for daily total precipitation: daily mean, maximum, and minimum temperatures. The period covers 1957 to 2017, and the data are presented over a high-resolution terrain-following grid with 1 km spacing in both meridional and zonal directions. The observational dataset is based on MET Norway's climate data, which have been integrated by the "European Climate Assessment and Dataset" database. Two distinct statistical interpolation methods have been developed, one for temperature and the other for precipitation. They are both based on a spatial scale-separation approach where, at first, the analysis (i.e., predictions) at larger spatial scales is estimated. Subsequently they are used to infer the small-scale details down to a spatial scale comparable to the local observation density.

- E-OBS v20.0e – An Ensemble Version of Temperature and Precipitation Datasets over Europe

The data has been extended with global radiation fields (abbreviation QQ, starting 1980-01-01). The full ensemble (100 members for temperature, precipitation, and sea level pressure, and 10 members for radiation) can be made available on request. New series and updates are included for Italy, Croatia, Norway, and Russia. Monthly, half-yearly and yearly updates are continued for Germany, Czech Republic, Bosnia and Herzegovina, Norway, Slovenia, Finland, Ireland, Sweden, Luxembourg, Netherlands, Portugal, Spain, Switzerland, France, Denmark, UK and the regional meteorological service of Catalonia (Spain).

- APHRODITE - Asian precipitation

This daily gridded precipitation is the only long-term (1951 - 2007) continental-scale daily product that contains a dense network of daily rain-gauge data for Asia including the Himalayas, South and Southeast Asia and mountainous areas in the Middle East. The number of valid stations was between 5000 and 12,000, representing 2.3 to 4.5 times the data available through the Global Telecommunication System network, which was used for most daily grid precipitation products. The products are available on a regional basis.


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**Daily GCMs for Extreme Precipitation Analysis**

| | Model | Country | Spatial resolution for atmospheric variable (longitude*latitude) | Spatial resolution for ocean variable (longitude*latitude) |
|---|---|---|---|---|
| 1 | ACCESS1.3 | Australia | 192*145 | 360*300 |
| 2 | CanESM2 | Canada | 128*64 | 256*192 |
| 3 | CCSM4 | USA | 288*192 | 320*384 |
| 4 | CESM1-BGC | USA | 288*192 | 320*384 |
| 5 | CMCC-CM | Italy | 480*240 | 182*149 |
| 6 | CMCC-CMS | Italy | 192*96 | 182*149 |
| 7 | CNRM-CM5 | France | 256*128 | 362*292 |
| 8 | CSIRO-Mk3-6-0 | Australia | 192*96 | 192*189 |
| 9 | GFDL-ESM2G | USA | 144*90 | 360*210 |
| 10 | GFDL-ESM2M | USA | 144*90 | 360*200 |
| 11 | HadGEM2-ES | UK | 192*145 | 360*216 |
| 12 | INMCM4 | Russia | 180*120 | 360*340 |
| 13 | IPSL-CM5A-LR | France | 96*96 | 182*149 |
| 14 | IPSL-CM5A-MR | France | 144*142 | 182*149 |
| 15 | IPSL-CM5B-LR | France | 96*96 | 182*149 |
| 16 | MIROC5 | Japan | 256*128 | 256*224 |
| 17 | MIROC-ESM | Japan | 128*64 | 256*192 |
| 18 | MIROC-ESM-CHEM | Japan | 128*64 | 256*192 |
| 19 | MPI-ESM-LR | Germany | 192*96 | 256*220 |
| 20 | MPI-ESM-MR | Norway | 192*96 | 802*404 |
| 21 | MRI-CGCM3 | Japan | 320*160 | 360*368 |
| 22 | NorESM1-M | Norway | 144*96 | 320*384 |