Deutscher Wetterdienst
Wetter und Klima aus einer Hand

A-21: GPCC's 2018-version of gridded reference data sets of observed monthly (daily) land-surface precipitation since 1891 (1982) useful for multiple purposes including global water cycle studies

U. Schneider, A. Becker, A. Meyer-Christoffer, M. Ziese, and P. Finger

For almost 30 years (since 1989) the Global Precipitation Climatology Centre (GPCC) collects in-situ data from rain gauges world-wide in order to provide gridded high quality land-surface precipitation analyses as mandated by WMO's World Climate Research Programme and the Global Climate Observing System (GCOS).

Monthly

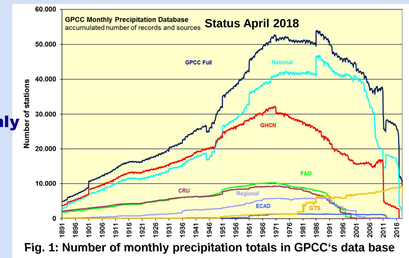


Fig. 1: Number of monthly precipitation totals in GPCC's data base

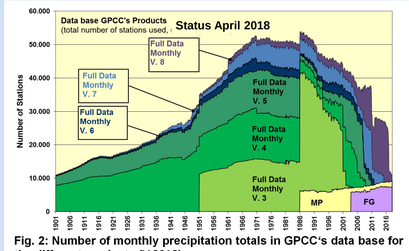


Fig. 2: Number of monthly precipitation totals in GPCC's data base for the different products (V.2018)

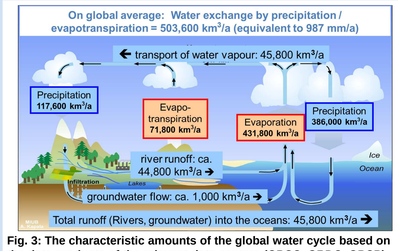


Fig. 3: The characteristic amounts of the global water cycle based on the data products of the relevant data centers (GPCC, GRDC, GPCP)

Daily

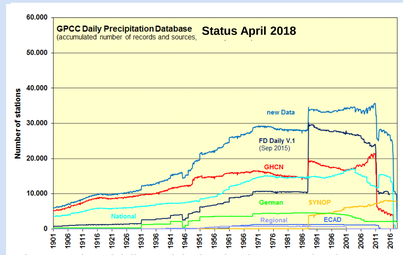
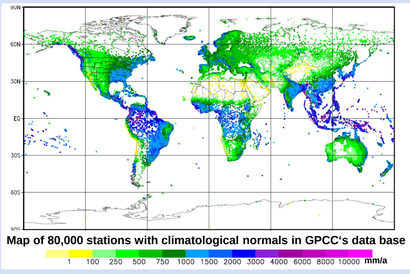


Fig. 4: Number of daily precipitation data in GPCC's data base.

First Guess Daily product available for the period since Jan. 2009

Full Data Daily product available for period 1988-2013. Update for 1982-2016 in preparation



Data base and processing

A thorough multi-level quality-control (QC) is performed on the raw station data prior to its integration into the GPCC data archive being the world-wide largest with monthly totals for about 116,000 stations. Since 2012 data processing has been extended to include also daily data and the archive already holds daily data for more than 81,000 stations with the aim to reach the same scope as for monthly data, ultimately.

All archived data stems from various sources, e.g. national meteorological and hydrological services and regional or global data collections and is stored in source specific slots, allowing cross-checks on redundant records and subsequent QC at different sophistication levels depending on each product.

In March 2018, GPCC received a copy of the INTENSE hourly data set (Blenkinsop et al., 2017).

Gridded data products

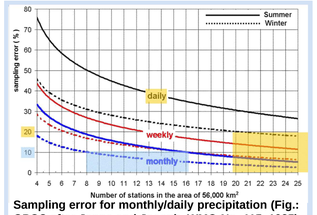
All GPCC data products are referenced by digital object identifiers (DOIs, all starting with "10.5676/DWD_GPCC/") and thus published in public domain (http://gpcc.dwd.de) for a minimum of 10 years per product and version.

In June 2018 the monthly Full Data Monthly and the Precipitation Climatology product releases of May 2015 are due for update. GPCC's new Full Data Monthly, as an important input data set for the GPCP data set over land, will also help to improve new versions of the GPCP data set.

As the new Precipitation Climatology product is also used as background climatology for all other GPCC analyses, the Monitoring Product shall be reprocessed for all years since 1982 too.

Moreover the First Guess Products (daily and monthly) will benefit from the improved climatology.

GPCC will release its second Full Data Daily analysis comprising the land-surface precipitation for every day since 1 January 1982. It has been extended backward in course of GPCC's participation in the ERA-CLIM2 reanalysis project (Buizza et al., 2017). The daily products, accompanied by larger sampling errors than the monthly ones, will enable studies of precipitation characteristics (i.e. frequency, intensity) over the land-surface. Finally GPCC will support the activities of the INTENSE project.



Sampling error for monthly/daily precipitation (Fig.: GPCC after Jenne and Joseph, WMO-No. 115, 1985)

Uncertainty information

The 2018-version of the GPCC Full Data product will feature enhanced uncertainty information:

- Sampling error (Yamamoto, 2000)
- Undo Climatological Infilling option

The sampling error might be underestimated in areas where climatological infilling was applied, making the undo option important.

Updated global water cycle

A combination of its Precipitation Climatology (Meyer-Christoffer et al., 2015) with results of the Global Runoff Data Centre (GRDC; Wilkinson, 2014), the Global Precipitation Climatology Project (GPCP; Adler et al., 2016) and studies by Trenberth et al. (2007) and Rodell et al. (2015) enabled the GPCC to come up with estimates for the global water cycle (Schneider et al., 2017). The new 2018-version will provide for a further update of the figures.

References

Adler, R.F.; M. Sapiano; G.J. Huffman; D. Bolvin; J.J. Wang; G. Gu; E. Nelkin; P. Xie; L. Chiu; R. Ferraro; U. Schneider; A. Becker: New Global Precipitation Climatology Project monthly analysis product corrects satellite data shifts. GEWEX News 2016, 26 No. 4, 7-9.

Blenkinsop S, Lewis E, Chan SC, Fowler HJ, 2017. An hourly precipitation dataset and climatology of extremes for the UK. International Journal of Climatology, 37, 722-740. doi:10.1002/joc.4735.

Meyer-Christoffer, A.; A. Becker; P. Finger; B. Rudolf; U. Schneider, M. Ziese: GPCC Climatology Version 2015 at 0.25°: monthly land-surface precipitation climatology for every month and the total year from rain-gauges built on GTS-based and historic data. 2015, doi: 10.5676/DWD_GPCC/CLIM_M_V2015_025

Rodell, M.; H.K.Beaudoing; T.S. L'Ecuyer; W.S. Olson; J.S. Famiglietti; P.R. Houser; R.F. Adler; M.G. Bosilovich; C.A. Clayson; D. Chambers; E. Clark; E.J. Fetzer; X. Gao; G. Gu; K. Hilburn; G.J. Huffman; D.P. Lettenmaier; W.T. Liu; F.R. Robertson; C.A. Schlosser; J. Sheffield; E.F. Wood: The observed state of the water cycle in the early twenty-first century. J. Climate 2015, 28, 8289-8318.

Schneider, U., P. Finger, A. Meyer-Christoffer, E. Rustemeier, M. Ziese and A. Becker: Evaluating the Hydrological Cycle over Land using the newly-corrected Precipitation Climatology from the Global Precipitation Climatology Centre (GPCC), Atmosphere 2017 8(3), 52, Special Issue: Global Precipitation with Climate Change, doi:10:3390/atmos8030052

Trenberth K.E.; Smith, L.; Qian, T.; Dai, A.; Fasullo, J. Estimates of the global water budget and its annual cycle using observational and model data. J. Hydrometeorology 2007, 8, 758–769.

Wilkinson, K.; von Zabern, M.; Scherzer, J. Global Freshwater Fluxes into the World Oceans. Technical Report prepared for the Global Runoff Data Centre, Federal Institute of Hydrology (BfG), GRDC Report No. 44, 2014, doi:10.5675/GRDC_Report_44

Yamamoto, J., 2000 An Alternative Measure of the Reliability of Ordinary Kriging Estimates Mathematical Geology, Mathematical Geology, Kluwer Academic Publishers-Plenum Publishers, 32, 489-509.

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