

## Global Precipitation Climatology Project (GPCP)

### *Description:*

The suite of GPCP products includes the core monthly product (1979-present), a pentad (five day) analysis (1979-present) and a daily product available for a shorter period (1997-present). The monthly and daily products are globally complete, with the pentad product having some missing grid values at very high latitudes. Although these three products have been developed separately and using different input data sets and analysis techniques, the higher time resolution products are adjusted to the core monthly analysis, thus giving a consistent set of analyses. If a user is interested in seasonal, inter-annual and longer time scales the product of choice is the monthly analysis. For finer time scale requirements, e.g., for study of tropical waves, hydrological applications, etc., the pentad and daily products provide useful information within the constraint of the climate (monthly) product values.

The GPCP monthly precipitation analysis (Adler *et al.*, 2003; Huffman, *et al.*, 2009) is a globally complete, monthly estimate of surface precipitation at  $2.5^\circ \times 2.5^\circ$  latitude–longitude resolution that spans the period 1979 to the present. It is a merged, monthly analysis that employs precipitation estimates from low-orbit–satellite SSM/I and SSMIS microwave data to perform a calibration, that varies by month and location, of geosynchronous-orbit–satellite infrared (IR) data in the latitude band  $40^\circ\text{N-S}$ . At higher latitudes the SSM/I and SSMIS microwave estimates are combined with estimates based on the TIROS Operational Vertical Sounder or the Atmospheric Infrared Sounder (calibrated by gauges over land and microwave estimates over ocean at lower latitudes) to provide globally complete satellite-only precipitation estimates. These multi-satellite estimates are combined with rain-gauge analyses (over land) in a two-step process that adjusts the satellite estimates to the large-scale bias of the gauges and then combines the adjusted satellite and gauge fields with weighting by inverse error variance. The monthly product is typically produced about two months after the end of the observation month.

The GPCP pentad precipitation analysis (Xie *et al.* 2003) is calculated by adjusting the pentad CPC Merged analysis of Precipitation (CMAP) pentad analysis against the monthly GPCP product so that the overall magnitude of the pentad GPCP matches that of the monthly GPCP while the sub-monthly variability in the pentad CMAP is retained. The spatial resolution is  $2.5^\circ \times 2.5^\circ$  latitude–longitude.

The GPCP daily precipitation analysis (Huffman *et al.*, 2001) uses a Threshold-Matched Precipitation Index (TMPI) in the latitude band  $40^\circ\text{N-S}$  to produce instantaneous precipitation from the geo-IR  $T_b$ , using SSM/I- and SSMIS-based GPROF estimates of precipitation fractional coverage to set the  $T_b$  threshold such that instantaneous geo-IR fractional coverage equals the GPROF-SSM/I and -SSMIS estimation. Then a single rainrate for "raining" geo-IR pixels is computed for each grid box that makes the full month of TMPI sum to the local GPCP monthly value. Outside of  $40^\circ$  latitude TOVS and AIRS precipitation estimates are adjusted in terms of frequency of precipitation using

GPROF frequencies at 40° latitude and in terms of the amount by the monthly analysis. The spatial resolution is 1° x 1° latitude–longitude.

***Data Availability:***

The GPCP data sets are available from World Data Center A, which is hosted at NOAA/NCDC (<http://www.ncdc.noaa.gov/oa/wmo/wdcamet-ncdc.html>) and from <http://precip.gsfc.nasa.gov>.

***Quality:***

The GPCP merged data sets are designed to be as homogeneous as possible in both space and time, with the core monthly product using high quality microwave observations to calibrate or adjust infrared estimates, which have superior sampling, but poorer quality. Bias adjustment of satellite estimates using gauges over land provides an improved land product. Absolute magnitudes are considered reliable and inter-annual changes are robust. Because of the inhomogeneous nature of the data set, trends and other small signals should be interpreted cautiously. The monthly data set includes fields of random error estimates for use in understanding the utility of the analysis. The pentad and daily analyses are constrained locally by the monthly analysis, so that magnitudes and long-term changes are comparable with those of the monthly analysis. Shorter-term variations will have larger sampling errors and depend more on information from geo-IR-based estimates, which are of lower quality. Precipitation may be underestimated in mountainous areas, although the latest version (Version 2.1) has improved in this regard.

***Relationship to other GEWEX products:***

The GPCP data sets have been derived independently of the other GEWEX data sets, although they can be used jointly, especially since they have long periods of overlap. Some of the GEWEX data sets have three-hour resolution while the GPCP's finest resolution is daily at present.

***References:***

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