MULTI-SAT - GPCP - Surface Rainrate - 1

General information

Dataset name:	MULTI-SAT - GPCP - Surface Rainrate - 1
Created on:	2016-03-29
Useful in the framework of:	OPERATIONAL-DATA > Satellite products
Purpose:	This data set is a companion to the GPCP Version 2 Combination (which the reader should see for descriptions,including references). Many users need precipitation estimates at finer space and time scales than the operational data set provides. Starting in October 1996 the GPCP began producing 3-hourly merged global infrared (IR) brightness temperature (Tb) histograms on a 1°x1° grid in the band 40°N-40°S, and this collection has prompted this new global One-Degree Daily (1DD) product.

In this first official release, the 1DD uses the "best" quasi-global observational estimators of underlying statistics to adjust quasi-global observational datasets that have desirable time/space coverage. Specifically,

- Special Sensor/Microwave Imager (SSM/I; 0.5°x0.5° by orbit, GPROF6.0 algorithm) provides fractional occurrence, and

- GPCP Version 2 Satellite-Gauge (SG) combination (2.5°x2.5° monthly) provides monthly accumulation

- to algorithms working on

- geosynchronous-orbit IR (geo-IR) Tb histograms(as above),

- low-orbit IR (leo-IR) GOES Precipitation Index (GPI; same time/space grid as geo-IR), and

- TIROS Operational Vertical Sounder (TOVS; 1°x1° on daily nodes, Susskind algorithm).

Even though microwave precipitation estimates and gauge analyses do not explicitly appear in this list due to sampling limitations, the calibration to the Version 2 SG ensures that they do have a strong influence on the overall scaling. The differences between the IR and TOVS datasets required that the 1DD be formulated in two parts, with smoothing from 40° to 50° in each hemisphere to patch the data boundary.

In the band 40°N-S the Threshold-Matched Precipitation Index (TMPI) produces approximate instantaneous precipitation from the geo-IR Tb with fill-in by rescaled leo-IR GPI. It is a GPI-type algorithm with locally calibrated Tb threshold and rainrate. To do this, time/space-matched geo-IR Tb and GPROF fractional coverage data are used to set the Tb threshold such that instantaneous geo-IR fractional coverage equals GPROFs. 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 SG (monthly) value. Mismatches in geo-IR and GPROF precipitation cause some unrealistic TMPI conditional rain rates, so an "auditing" technique was developed to fill in reasonable values and re-estimate the geo-IR threshold. A less tractable problem is that the warmest geo-IR histogram bin starts at Tb=270K, which prevents correctly setting the threshold in regions with only warm-top clouds.

The leo-IR GPI data tend to exhibit a very high number of rain days. To overcome this, the local number of leo-IR GPI rain days was reduced by the ratio of the total number of GPROF6.0 and leo-IR GPI rain days. The remaining non-zero daily rain amounts are rescaled to start at zero and sum over the month to the (local) SG value.

Similarly, the original TOVS dataset tends to exhibit a very high number of rain days. To overcome this, in each hemisphere the local number of TOVS rain days was reduced by the ratio of the total number of TMPI and TOVS rain days at 40°. The remaining non-zero daily rain amounts are rescaled to start at zero and sum over the month to the (local) SG value.

The 1DD has been computed for 1997-1999, and the instantaneous TMPI show good consistency between hours and with the daily TMPI, GPI, and rescaled TOVS fields. The daily 1DD correctly sum to the monthly SG, except in the subtropical highs where geo-IR threshold saturation becomes a problem. Even before smoothing, there is good continuity across the 40° N and S data boundary, perhaps in part because the IR and TOVS datasets both largely represent clouds. This dependence on scaled cloud information implies that users should expect large error bars on the individual daily values, and preliminary validation results support this view. Space and/or time averages should be more reliable.

It is expected that the 1DD will see extensive development work. This might include: diurnally varying calibrations; extension back in time, even if at lower quality; additional sensors, including daily gauges and Microwave Sounding Unit; direct use of microwave estimates; and refined combination approaches.

The current data set extends from January 1997--December 1999, and subsequently it will be extended from 1997--present (with some delay to allow the scaling to the monthly GPCP Version 2 Combination SG). The primary product in the 1DD dataset is a combined observation-only dataset. That is, a gridded analysis based on satellite estimates of rainfall is constrained by a monthly analysis that is based on gauge and satellite observations. The initial product suite includes the "final" estimates of precipitation. The data set archive consists of unformatted REAL*4 binary month files that contain 1 row (1440 B) of header and then all the days of the month, stacked sequentially. Missing days (if any) are filled with the missing flag -99999. These files are gziped. Each gziped file occupies about 3.5 MB, and the whole data set contains about 126 MB. The grid on which each field of values is presented is a 1 ° x1 °

latitude--longitude (Cylindrical Equal Distance) global array of points. It is size 360x180, with X (longitude) incrementing most rapidly West to East from the Prime Meridian, and then Y (latitude) incrementing North to South. Whole- and half-degree values are at grid edges:

First point center = (89.5°N,0.5°E)

Second point center = (89.5°N,1.5°E)

Last point center = (89.5°S,0.5°W)

Missing values are denoted by the value -99999., and the units are mm/day.

Contact(s)

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Instrument

Satellite:	MULTI-SAT
Instrument:	GPCP

Parameter

Surface Rainrate

Parameter name:	Surface Rainrate
Parameter keyword:	Atmosphere > Precipitation

Coverage

Temporal coverage

Date begin (yyyy-mm-jj):	1996-10-01
Date end (yyyy-mm-jj):	2013-02-28

Geographic coverage

Data resolution

Temporal resolution:	0000-00-01 00:00:00
Latitude resolution:	1
Longitude resolution:	1

Data use information

    Use constraints: Public data

    Data policy: AMMA data policy

    Original data format(s):   NetCDF