TRMM and Other Data Precipitation Data Set Documentation

George J. Huffman
David T. Bolvin

Mesoscale Atmospheric Processes Laboratory, NASA Goddard Space Flight Center
and Science Systems and Applications, Inc.

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22 May 2012 Version 7 of TRMM products 3B42 and 3B43 has now been implemented, which supersedes all previous versions, including the recent Versions 6 and 6a (ended on 30 June 2011). For more details, see the technical documentation (available as *http://precip.gsfc.nasa.gov/pub/trmmdocs/3B42_3B43_doc.pdf*), particularly "Transition from Version 6 to Version 7" and "intercomparison results". A summary is provided below. As a new product, users are particularly asked to inform the dataset developers of any problems that they encounter. The shift of the Real-Time TMPA (products 3B40RT, 3B41RT, and 3B42RT) to Version 7 should occur within the next month.

The **transition from Version 6 to Version 7** for TRMM datasets occurred on 30 June 2011, with June 2011 being the final month of Version 6 data. Thereafter, the Precipitation Processing System (PPS) was reconfigured to start the parallel activities of Version 7 "initial processing" (IP) for new data (starting 1 July 2011), and Version 7 reprocessing (RP) for the entire archive starting 1 January 1998. The TMPA lagged the other TRMM products to allow for calibration and to finalize use of SSMIS data. This release incorporated several important changes as part of the upgrade to Version 7:

- Additional satellites, including the early parts of the MHS record, the entire operational SSMIS record, and slots for future satellites.
- A new IR brightness temperature dataset for the period before the start of the CPC 4-km Merged Global IR Dataset (i.e., January 1998 – February 2000). Unlike the old GPCP histograms used in Version 6, the NCDC GridSat-B1 features spatial resolution finer than the TMPA 0.25 grid and full coverage of the TMPA domain.
- Uniformly reprocessed input data using current algorithms, most notably for AMSU and MHS, but also including TCI, TMI, AMSR-E, and SSMI.
- Use of a single, uniformly processed surface precipitation gauge analysis using current algorithms as computed by the Global Precipitation Climatology Centre (GPCC).
- Use of a latitude-band calibration scheme for all satellites (see "HQ").
- Additional output fields in the data files, including sensor-specific source and overpass time.

The complete Version 6 archive will be maintained for public access throughout and beyond the cutover to Version 7. Residual issues with satellite intercalibration, particularly for the early IR data and the SSMIS precipitation estimates, are currently being worked for the TMPA. For Initial Processing (IP), our switch to the GPCC gauge analysis necessitates increasing the latency of the products from 10 days after the month, which was the case in Version 6, to about two months after the end of the month. The real-time TMPA (products 3B40RT, 3B41RT, and 3B42RT) will continue to be produced in their current form, with upgrades to improved and additional sensors and to Version 7 calibration planned for June 2012. Note that the RT products take on additional importance during Version 7 due to the increased latency of the official production datasets.

Initial testing shows that the revisions have eliminated the unrepresentatively low bias in ocean values for 2001-2007 that were related to how we treated an early version of AMSU-based precipitation. However, we find that the V7 tropical-ocean average precipitation is consistently some 5% higher than the combined TMI-PR product (2B31) that serves as the calibrator. The basis for this difference is not explicated at this point, but the value is small enough and consistent enough that we are choosing to release the data as background work continues.
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The TMPA **intercomparison results** continue to be developed. Table 9 provides long-term (1998-2010) comparisons for the latitude band 30°N-S against several other data sets. The 100% water column provides information on the performance over open ocean. 3B43 V6 is low partially because its calibrator (2B31 V6, not shown) is about 0.11 mm/d lower than the corresponding 2B31 V7, and partially due to unrepresentatively low values that resulted from our treatment of an early version of the NOAA AMSU estimates. The fact that 3B43 V7 is 5% higher than its calibrator (2B31 V7) is still under investigation.

The 75% columns provide a typical land/ocean separation (working here at the 2.5° lat./long. scale). Note that all schemes are sensitive to the definition of "ocean", with the addition of near-coastal areas adding about 8% to the ocean total.

The land values for 3B43 V7 and GPCP SG V2.2 are very close to each other because they use the same GPCC gauge analysis and because the gauge tends to dominate the land bias in most places by construction. The increase in 3B43 land fromV6 to V7 results both from the shift to the new GPCC analysis, and the shift to using GPCC throughout, rather than employing CAMS after April 2005. For the first, GPCC shifted from analyzing the gauge values to creating the analysis on gauge anomalies, which are then added to a high-resolution climatology. As well, many additional stations have been added. For the second, the CAMS was used to get a timely product in V6, but experience showed that it tended to introduce a low bias.

Table 9. Averages for several precipitation data sets for the latitude band 30°N-S over the years 1998-2010, all in mm/d. Working on 2.5° lat./long. gridboxes, the first column is restricted to gridboxes with 100% water, representing open ocean, while the next two columns use a more typical land/ocean split at 75% water.

(mm/d)	*100% water*	*75% water*		
	ocean	*ocean*	*land*	*total*
2B31 V7	2.86	3.08	2.94	3.04
3B43 V7	3.00	3.27	3.19	3.25
3B43 V6	2.66	2.90	2.89	2.90
GPCP SG V2.2	2.79	3.01	3.16	3.05

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Users interested in *obtaining data* should access the 3B42 and 3B43 product listings at *http://mirador.gsfc.nasa.gov/cgi-bin/mirador/presentNavigation.pl?tree=project &project=TRMM&dataGroup=Gridded&CGISESSID=d660bf019d3f9906573bde73378e537c*or by contacting the representative listed in section 12.

As well, Web-based interactive access to the TMPA and related data is provided by TOVAS; see that topic for details.
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The *3B42 data fields* provide a variety of information for users and data developers:

Table 2. List of data fields, their variable names (in the data structure), and the data units for 3B42 data files.

Index	*Data field*	*Variable name*	*Units*
1	precipitation	precipitation	mm/hr
2	precipitation random error*	relativeError	mm/hr
3	satellite observation time	satPrecipitationSource	min. from nominal
4	HQ precipitation	HQprecipitation	mm/hr
5	IR precipitation	IRprecipitation	mm/hr
6	satellite precipitation source	satObservationTime	n/a

* Note the mismatch between the data field "random error" and the assigned variable name "relativeError". The first is accurate.

Because the data are provided at nominal UTC hours, each 3B42 data set represents a nominal +/-90-minute span around the nominal hour. Thus, the 00 UTC images include data from the very end of the previous UTC day.
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The *3B43 data fields* provide a variety of information for users and data developers:

Table 3. List of data fields, their variable names (in the data structure), and the data units for 3B43 data files.

Index	*Data field*	*Variable name*	*Units*
1	precipitation	precipitation	mm/hr
2	precipitation random error*	relativeError	mm/hr
3	gauge relative weighting	gaugeRelativeWeighting	fraction

* Note the mismatch between the data field "random error" and the assigned variable name "relativeError". The first is accurate.

Because the input HQ data are provided at nominal UTC hours, the 3B43 data set is built with a nominal +/-90-minute span around the nominal hour. Thus, a month of 3B43 month contains 90 minutes of information into the previous and next months with half weighting.
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The inventory of *sensors contributing to TMPA* is summarized here for convenience; refer to the individual sensor descriptions in the technical document for additional details.

Table 8. Inventory of sensors contributing to the TPMA data, including start/stop dates, institutional source of the sensor data and precipitation estimate, and explanatory comments.

Sensor	*Start Date*	*End Date*	*Source*	*Comment(s)*
AMSR-E	19 June 2002	3 Oct 2011	NSIDC AE_Rain.2 V10 GPROF	frozen at V10/V11 (GPROF2004)
SSMI DMSP F13	1 Jan 1998	31 July 2009	CSU GPROF2010 V1a	coverage too sparse later
SSMI DMSP F14	1 Jan 1998	23 Aug 2008	CSU GPROF2010 V1a	
SSMI DMSP F15	23 Feb 2000	13 Aug 2006	CSU GPROF2010 V1a	beacon interference later
SSMIS DMSP F16	20 Nov 2005	ongoing	CLASS TDR, GPROF2004V	start of CLASS TDR archive
SSMIS DMSP F17	19 Mar 2008	ongoing	CLASS TDR, GPROF2004V	start of CLASS TDR archive
SSMIS DMSP F18	8 Mar 2010	ongoing	CLASS TDR, GPROF2004V	start of CLASS TDR archive
AMSU-B NOAA-15	1 Jan 2000	14 Sep 2010	CICS; CLASS	CICS before 1 June 2007
AMSU-B NOAA-16	4 Oct 2000	30 Apr 2010	CICS; CLASS	CICS before 1 June 2007
AMSU-B NOAA-17	28 Jun 2002	17 Dec 2009	CICS; CLASS	CICS before 1 June 2007
MHS NOAA-18	25 May 2005	ongoing	CICS; CLASS	CICS before 1 June 2007
MHS NOAA-19	9 Mar 2009	ongoing	CICS; CLASS	CLASS starts 7 May 2009
MHS MetOp-A	5 Dec 2006	ongoing	CICS; CLASS	CICS before 1 June 2007
TMI	1 Jan 1998	ongoing	CSU GPROF2010 V1	
TCI	1 Jan 1998	ongoing	PPS	
IR	1 Jan 1998	ongoing	B1; CPC 4km Tb	B1 before 17 Feb 2000
Gauge	Jan 1998	ongoing	GPCC 1° Full/Monitoring	use Full through Dec 2010

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