

Precipitation Processing System (PPS)



Gridded Text Product File Specifications Version 1

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July 2020



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1.0 GPM GRIDDED TEXT PRODUCTS

1.1 INTRODUCTION

The gridded text product is created by the Precipitation Processing System (PPS) at NASA Goddard to assist researchers with reading the orbital data from the Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measurement (GPM) satellites and from the associated constellation of passive-microwave precipitation-estimating instruments on polar-orbiting satellites. These gridded text products are available for download from the "textgrid" directories of the PPS online archive and from the PPS data ordering system called STORM: <https://storm.pps.eosdis.nasa.gov/>.

The concept of the gridded text precipitation products was developed during the early TRMM era. At that time, few external tools supported the Hierarchical Data Format (HDF) in which the TRMM products were stored. In addition, most of the standard products contained many more parameters than just precipitation estimates.

To complicate matters for those wishing to compare the precipitation estimates from the TRMM Microwave Imager (TMI), Ku-band (Ku) radar, and the combined TMI/radar algorithm, one would have to retrieve three separate and very large products. If one wanted an entire day for comparison, one would need to retrieve 14 or 15 orbits of each product, and then develop the programs to read the different formats, all before any research on the precipitation could begin.

The solution to this difficulty was to create a product that would be easy to read. As a result, it was determined that American Standard Code for Information Interchange (ASCII) text with each line terminated with a linefeed (LF) would be the easiest format to use. In addition, the precipitation of each of the main instruments (e.g., radiometer, radar, and combined) would be included on the line. Each group would contain the same information. This ensured that the format was consistent and easy to read and use.

As the network bandwidth was not as high during the TRMM era, the files were gzipped and had truncated lines when a sensor lacked data. This combination of compression techniques made the files much smaller for download.

This group of TRMM precipitation products were known as the 3G68 products. The name was derived by adding the numeric identifiers of the radiometer (2A12), radar (2A25), and combined (2B31) precipitation retrieval products (12+25+31=68). The 3G indicated that they were gridded (time and space) Level 3 products. During the TRMM era, the 3G68 products started as hourly grids packaged as daily files. Each grid was originally 0.5 × 0.5 degree. Eventually, the standard space resolution became 0.25 × 0.25 degree.

The GPM project decided that a similar product should be produced during the GPM era from the GPM core satellite instrument precipitation retrievals as well as from the constellation radiometer precipitation retrievals. Again, the products were to be ASCII text with hourly grids with 0.25 × 0.25 degree resolution. These hourly grids were to be packaged into daily files. In addition, the TRMM-era 3G68 products were to be modified so that the basic format of the

TRMM gridded text products and the GPM gridded text products were almost identical, the major difference being that TRMM obviously had no dual-frequency radar precipitation retrieval.

As network bandwidth has improved, no special internal compression scheme has been used in the GPM gridded text products. In other words, each data line has exactly the same format. No special check needs to be made to determine whether a line had been internally compressed. Having a fixed number of fields on each line makes it easier to develop reading routines in Python, Interactive Data Language (IDL), MATLAB, or other languages.

1.2 SCOPE

This document contains the file specifications for the gridded text products currently in the GPM archive, including products for the TRMM satellite (January 1998 to March 2015), the GPM satellite (March 2014 to present), and the GPM constellation of radiometers (March 2014 to present). For each observation set, there is both a daily and monthly gridded text product. The monthly gridded text product differs from the daily product in two important ways: The monthly product has an extra decimal of accuracy for the average precipitation rates (5 instead of 4 digits) and the monthly product in the GPM archive has only a single grid rather than the 24 single-hour grids in the daily product. When requested by researchers, PPS can create monthly or longer gridded text products that preserve the 24 separate one-hour grids in the file. Such files can be useful for studying the diurnal properties of GPM observations, although the limited sampling of these instruments limits the diurnal patterns that can be extracted.

When precipitation estimates are not available for a particular sensor, the count fields are set to 0 and the non-count fields are set to a missing-data value of -9. Missing data occurs when one sensor has data at a particular time and grid box, but another sensor does not. Missing data can occur during brief outages for a variety of reasons, including during orbital maneuvers. In a multi-satellite gridded text product, missing values can also occur because a particular satellite has not yet been launched or is no longer operational.

This document is merely a file specification document, not an Algorithm Theoretical Basis Document (ATBD).

1.2.1 GPM Core Satellite

GPM core satellite gridded text contains four types of precipitation estimates: Radiometer precipitation information, Ku radar precipitation information, dual-frequency radar precipitation information, and combined radiometer/radar precipitation information. The radiometer on the GPM core satellite is the GPM Microwave Imager (GMI).

1.2.2 TRMM Satellite

The TRMM satellite product is similar to the old 3G68 but has the format of the GPM core satellite product. It contains three types of precipitation estimates: TRMM radiometer, Ku radar, and combined radiometer/radar.

1.2.3 GPM Constellation Conically Scanning Radiometers

This product contains the precipitation information from the conically scanning imager radiometers whose data is processed by the GPM mission. Every line of the file contains data fields for all of the radiometers. When a radiometer was not yet launched or had stopped working, its data fields are filled with missing-data values. The details are in Section 4 of this document.

1.2.4 GPM Constellation Cross-Track Scanning Radiometers

This product contains the precipitation information from all the cross-track scanning sounder radiometers of the GPM Mission. Every line of the file contains data fields for all of the radiometers. When a radiometer was not yet launched or had stopped working, its data fields are filled with missing-data values. The details are in Section 5 of this document.

1.3 GENERAL FORMAT OF GRIDDED TEXT PRODUCTS

To the extent possible, the same kind of data are included from each sensor in a gridded text file. In a data row of a file, the data fields are the number of observations in that grid box, the number of observations with non-zero precipitation, the average precipitation rate, the average convective precipitation rate, and the average frozen precipitation rate. A data row also includes information on the location and time of the observations.

1.3.1 Metadata

The first five lines of every gridded text file contains metadata. The first four metadata lines contain the same number of fields in each kind of gridded text product. The last line of metadata varies in length in each kind of gridded text product because that line lists the names of the data fields in that text grid product.

1.3.2 Data Line

After the five lines of metadata at the beginning of the file, the remainder of the file consists of data lines. Each data line provides the information for a particular grid box of the 0.25×0.25 degree grid. Each of these is an hourly universal grid; there are 24 hours of these hourly grids. Hour number starts at 00, and the last hour is 23.

1.3.2.1 Grid-Specific Information

The first four integer items on the data line are information about the 0.25×0.25 degree grid:

1. Grid hour of the first pixel in that grid box.
2. Grid minute of the first pixel in that grid box.
3. Grid row.
4. Grid column.

The row and column are integers that can be converted into the latitude and longitude for the grid box. The same formula applies for all gridded text products regardless of whether they are for TRMM-era or GPM-era data. In the following formula, LAT and LON are the grid box center in degrees north latitude and east longitude, and ROW and COLUMN are the integers stated in a data row of a gridded text file and DELTA is the size of a single grid box (i.e., 0.25 degrees):

$$\begin{aligned} \text{LAT} &= 0.25 \cdot \text{ROW} - 90.0 + 0.5 \cdot \text{DELTA} \\ \text{LON} &= 0.25 \cdot \text{COLUMN} - 180.0 + 0.5 \cdot \text{DELTA} \end{aligned}$$

1.3.2.2 Precipitation Information Groups

The number of groups equals the number of precipitation-estimation algorithms summarized by that kind of gridded text product. For example, in the GPM core satellite gridded text product, there are four groups: One for GMI, one for the Ku radar, one for the dual-frequency radar, and one for the combined GMI/radar algorithm.

Each group contains the following six items for a single precipitation-estimation algorithm:

1. Total number of pixels for that group in the grid box.
2. Number of precipitation pixels for that group in the grid box.
3. Mean precipitation rate for the group in the grid box or a missing-data value of -9 in the event that the total number of pixels in item #1 is zero.
4. Mean convective precipitation rate for the group in the grid box or a missing-data value of -9 in the event that the total number of pixels in item #1 is zero.
5. Mean frozen precipitation rate for the group in the grid box or a missing-data value of -9 in the event that the total number of pixels in item #1 is zero.
6. Data quality of the least reliable pixel for the group in the grid box or a missing-data value of -9 in the event that the total number of pixels in item #1 is zero.

2.0 GPM SATELLITE GRIDDED TEXT PRODUCT

The GPM core satellite text product contains precipitation retrievals from GMI, Ku, Dual-Frequency Precipitation Radar (DPR), and the Combined Radar-Radiometer (CORRA) GMI/radar. The format is shown in the following subsections.

2.1 FILE METADATA

The first five lines of text contain the file metadata that fully describe the data contain and data line format, as outlined below.

2.1.1 Metadata Line 1

1. The product data type designator.
2. Algorithm version.
3. Place holder.
4. Place holder.
5. Producing agency.
6. Date/time of product creation.
7. Digital Object Identifier (DOI) short name.
8. Product DOI.

2.1.2 File Metadata Line 2

1. Total number of latitude grids (row).
2. Total number of longitude grids (column).
3. Latitude for row grid number 0.
4. Longitude for column grid number 0.
5. Date of the data.

2.1.3 File Metadata Line 3

1. Southernmost latitude of GPM data, based on GMI instrument field of view (IFOV).
2. Northernmost latitude of GPM data, based on GMI IFOV.
3. Westernmost longitude of GPM data.
4. Easternmost longitude of GPM data.

2.1.4 File Metadata Line 4

1. Grid number for the first row.
2. Center latitude for the first grid row.
3. Grid number for the first column.
4. Center longitude for the first grid column.
5. Grid cell resolution.
6. File time resolution.

2.1.5 File Metadata Line 5

Line 5 provides the parameters contained on each data line in the file:

1. Hour of the first pixel in the grid.
2. Minute of the first pixel in the grid.
3. Grid row number.
4. Grid column number.
5. Total number of GMI pixels in the grid box.
6. Number of precipitating pixels in the grid box.
7. GMI precipitation rate in mm/hr. (provided to 4 decimal places).
8. GMI convective precipitation rate in mm/hr. (provided to 4 decimal places).
9. GMI frozen precipitation rate in mm/hr. (provided to 4 decimal places).
10. GMI data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).
11. Ku radar precipitation rate in mm/hr. (provided to 4 decimal places).
12. Ku radar convective precipitation rate in mm/hr. (provided to 4 decimal places).
13. Ku radar frozen precipitation rate in mm/hr. (provided to 4 decimal places).
14. Ku radar data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).
15. Dual-frequency radar precipitation rate in mm/hr. (provided to 4 decimal places).
16. Dual-frequency radar convective precipitation rate in mm/hr. (provided to 4 decimal places).
17. Dual-frequency radar frozen precipitation rate in mm/hr. (provided to 4 decimal places).
18. Dual-frequency radar data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).
19. CORRA combined GMI/radar precipitation rate in mm/hr. (provided to 4 decimal places).
20. CORRA combined GMI/radar convective precipitation rate in mm/hr. (provided to 4 decimal places).
21. CORRA combined GMI/radar frozen precipitation rate in mm/hr. (provided to 4 decimal places).
22. CORRA combined GMI/radar data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).

2.2 METADATA EXAMPLE

Example of five metadata lines (*note that a blank line is shown between the metadata lines in the example; there is no blank line in the file*):

```
3B-DAY.GPM.GMIRADARCMB.GRIDTXT25 V05_2-2-1 NONE NONE NASA
2018-10-13T22:26UTC 3GQDEGGPM_DAY 10.5067/GPM/DPRGMICMBTXT/3B-DAY/06
```

```
720 1440 -90 -180 0.25 20150801
```

```
-70 70 -180 180
```

Grid_First_Row=0 Grid_Center_Latitude=-89.875 Grid_First_Column=0
Grid_Center_Longitude=-179.875 Grid_Cell_Resolution=0.25 Duration=Day

hour minute row column GMI_total_pixels GMI_precip_pixels GMI_mean_mm/hr
GMI_convective_Rate_mm/hr GMI_frozen_Rate_mm/hr GMI_qualityCode Ku_total_pixels
Ku_precip_pixels Ku_mean_mm/hr Ku_convective_Rate_mm/hr Ku_frozen_Rate_mm/hr
Ku_qualityCode DPR_MS_total_pixels DPR_MS_precip_pixels DPR_MS_precip_mean_mm/hr
DPR_MS_convective_Rate_mm/hr DPR_MS_frozen_Rate_mm/hr DPR_MS_qualityCode
Comb_MS_total_pixels Comb_MS_precip_pixels Comb_MS_precip_mean_mm/hr
Comb_MS_convective_Rate_mm/hr Comb_MS_frozen_Rate_mm/hr Comb_MS_qualityCode

2.3 DATA LINE CONSTRUCTION

As can be seen from the metadata description of the data line, each data line has five types of data:

1. Information about the grid.
2. Precipitation information from GMI retrievals.
3. Precipitation information from Ku radar retrievals.
4. Precipitation information from a dual-radar frequency retrieval.
5. Precipitation information from the combined GMI/radar retrieval.

The details about item #1 in the list above is provided in Section 1.3.2.1, “Grid-Specific Information.” As for items #2 to #5 in the list above, each instrument precipitation block has the same information as follows:

1. Total number of pixels from the instrument in the grid box: **INTEGER**.
2. Precipitating number of pixels from the instrument in the grid box: **INTEGER**.
3. Mean precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
4. Convective precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
5. Frozen precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
6. Data quality indicator for the instrument: **INTEGER**.

Note: Whenever a sensor did not have any pixels in the grid box, a -9 indicating a missing value is put in each field except for the pixel count fields.

3.0 TRMM SATELLITE GRIDDED TEXT PRODUCT

The GPM core satellite text product contains precipitation retrievals from TMI, Ku, and the CORRA TMI/radar. It has the following format:

3.1 FILE METADATA

The first five lines of text contain the file metadata that fully describe the data contain and data line format, as outlined below.

3.1.1 File Metadata Line 1

1. The product data type designator.
2. Algorithm version.
3. Place holder.
4. Place holder.
5. Producing agency.
6. Date/time of product creation.
7. DOI short name.
8. Product DOI.

3.1.2 File Metadata Line 2

1. Total number of latitude grids (row).
2. Total number of longitude grids (column).
3. Latitude for row grid number 0.
4. Longitude for column grid number 0.
5. Date of the data.

3.1.3 File Metadata Line 3

1. Southernmost latitude of GPM data, based on TMI IFOV.
2. Northernmost latitude of GPM data, based on TMI IFOV.
3. Westernmost longitude of GPM data.
4. Easternmost longitude of GPM data.

3.1.4 File Metadata Line 4

1. Grid number for the first row.
2. Center latitude for the first grid row.
3. Grid number for the first column.
4. Center longitude for the first grid column.
5. Grid cell resolution.
6. File time resolution.

3.1.5 File Metadata Line 5

Line 5 provides the parameters contained on each data line in the file:

1. Hour of the first pixel in the grid.
2. Minute of the first pixel in the grid.
3. Grid row number.
4. Grid column number.
5. Total number of TMI pixels in the grid box.
6. Number of precipitating pixels in the grid box.
7. TMI precipitation rate in mm/hr. (provided to 4 decimal places).
8. TMI convective precipitation rate in mm/hr. (provided to 4 decimal places).
9. TMI frozen precipitation rate in mm/hr. (provided to 4 decimal places).
10. TMI data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).
11. Ku radar precipitation rate in mm/hr. (provided to 4 decimal places).
12. Ku radar convective precipitation rate in mm/hr. (provided to 4 decimal places).
13. Ku radar frozen precipitation rate in mm/hr. (provided to 4 decimal places).
14. Ku radar data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).
15. CORRA combined TMI/radar precipitation rate in mm/hr. (provided to 4 decimal places).
16. CORRA combined TMI/radar convective precipitation rate in mm/hr. (provided to 4 decimal places).
17. CORRA combined TMI/radar frozen precipitation rate in mm/hr. (provided to 4 decimal places).
18. CORRA combined TMI/radar data quality of the worst pixel used for calculation (the higher the number, the worse the data quality).

3.2 METADATA EXAMPLE

Example of five metadata lines (*note that a blank line is shown between the metadata lines in the example; there is no blank line in the file*):

```
3B-DAY.TRMM.TRMMPRCMB.GRIDTXT25 V06_1_1 NONE NONE NASA
2019-11-03T19:09UTC 3GQDEGTRMM_DAY 10.5067/TRMM/PRTMICMBTXT/3B-
DAY/06
```

```
720 1440 -90 -180 0.25 20130801
```

```
-40 40 -180 180
```

```
Grid_First_Row=0 Grid_Center_Latitude=-89.875 Grid_First_Column=0
Grid_Center_Longitude=-179.875 Grid_Cell_Resolution=0.25 Duration=Day
```

hour minute row column TMI_total_pixels TMI_precip_pixels TMI_mean_mm/hr
 TMI_convective_Rate_mm/hr TMI_frozen_Rate_mm/hr TMI_qualityCode PRKu_total_pixels
 PRKu_precip_pixels PRKu_mean_mm/hr PRKu_convective_Rate_mm/hr
 PRKu_frozen_Rate_mm/hr PRKu_qualityCode Comb_NS_total_pixels Comb_precip_pixels
 Comb_precip_mean_mm/hr Comb_convective_Rate_mm/hr Comb_frozen_Rate_mm/hr
 Comb_qualityCode

3.3 DATA LINE CONSTRUCTION

As can be seen from the metadata description of the data line, each data line has four types of data:

1. Information about the grid.
2. Precipitation information from TMI retrievals.
3. Precipitation information from Ku radar retrievals.
4. Precipitation information from the combined TMI/radar retrieval.

Each instrument precipitation block has the same information as follows:

1. Total number of pixels from the instrument in the grid box: **INTEGER**.
2. Precipitating number of pixels from the instrument in the grid box: **INTEGER**.
3. Mean precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
4. Convective precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
5. Frozen precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
6. Data quality indicator for the instrument: **INTEGER**.

Note: Whenever a sensor did not have any pixels in the grid box, a -9 indicating a missing value is put in each field except for the pixel count fields.

4.0 CONSTELLATION CONICALLY SCANNING RADIOMETER

The gridded text data products for conically scanning radiometers are only produced starting with data after the GPM launch. The first gridded text product for this group of radiometers is for 1 March 2014.

This group of radiometers is the conically scanning radiometers. The precipitation retrievals are from the GPM Profiling Algorithm (GPROF). The data fields, except of GMI and Advanced Microwave Scanning Radiometer 2 (AMSR2), are named from the satellite. F16, etc. are all Special Sensor for Microwave Imager/Sounder (SSMIS) radiometers, so to differentiate the fields, the satellite on which the SSMIS appears is used for the name.

4.1 FILE METADATA

The first five lines of text contain the file metadata that fully describe the data contain and data line format, as outlined below.

4.1.1 File Metadata Line 1

1. The product data type designator.
2. Algorithm version.
3. Place holder.
4. Place holder.
5. Producing agency.
6. Date/time of product creation.
7. DOI short name.
8. Product DOI.

4.1.2 File Metadata Line 2

1. Total number of latitude grids (row).
2. Total number of longitude grids (column).
3. Latitude for row grid number 0.
4. Longitude for column grid number 0.
5. Date of the data.

4.1.3 File Metadata Line 3

1. Southernmost latitude of GPM data, based on TMI IFOV.
2. Northernmost latitude of GPM data, based on TMI IFOV.
3. Westernmost longitude of GPM data.
4. Easternmost longitude of GPM data.

4.1.4 File Metadata Line 4

1. Grid number for the first row.
2. Center latitude for the first grid row.
3. Grid number for the first column.
4. Center longitude for the first grid column.
5. Grid cell resolution.
6. File time resolution.

4.1.5 File Metadata Line 5

The fifth metadata lines contain the names of the parameters and their order as they appear on each of the data lines following the five lines of metadata. The details of each line can be obtained in Section 4.3. These provide information about the grid cell as well as the precipitation information for each of the conically scanning radiometers: GMI; AMSR2; and SSMIS/F16, F17, F18, and F19.

4.2 METADATA EXAMPLE

Example of five metadata lines (*note that a blank line is shown between the metadata lines in the example; there is no blank line in the file*):

```
3B-DAY.GPM.CONSTIMAGER.GRIDTXT25 V05_2-1-1_imager NONE NONE NASA
```

```
2017-08-09T16:20UTC 3GIDEGGPM_DAY 10.5067/GPM/GMICONSTXT/DAY/05
720 1440 -90 -180 0.25 20140331
```

```
-90 90 -180 180
```

```
Grid_First_Row=0 Grid_Center_Latitude=-89.875 Grid_First_Column=0
Grid_Center_Longitude=-179.875 Grid_Cell_Resolution=0.25 Duration=2014-03-01-2014-03-31
```

```
hour minute row column GMI_total_pixels GMI_precip_pixels GMI_mean_mm/hr
GMI_convective_Rate_mm/hr GMI_frozen_Rate_mm/hr GMI_qualityCode
AMSR2_total_pixels AMSR2_precip_pixels AMSR2_mean_mm/hr
AMSR2_convective_Rate_mm/hr AMSR2_frozen_Rate_mm/hr AMSR2_qualityCode
F16_total_pixels F16_precip_pixels F16_mean_mm/hr F16_convective_Rate_mm/hr
F16_frozen_Rate_mm/hr F16_qualityCode F17_total_pixels F17_precip_pixels
F17_mean_mm/hr F17_convective_Rate_mm/hr F17_frozen_Rate_mm/hr F17_qualityCode
F18_total_pixels F18_precip_pixels F18_mean_mm/hr F18_convective_Rate_mm/hr
F18_frozen_Rate_mm/hr F18_qualityCode F19_total_pixels F19_precip_pixels
F19_mean_mm/hr F19_convective_Rate_mm/hr F19_frozen_Rate_mm/hr F19_qualityCode
```

4.3 DATA LINE CONSTRUCTION

Each data line has exactly the same format. The data starts on line 6 of the file. Each data line describes a particular grid cell precipitation information.

Each data line has seven types of data, and the exact name of the parameter can be seen on line 4 of the metadata.

1. Information about the grid.
2. Precipitation information from GMI retrieval.
3. Precipitation information from AMSR2 retrieval.
4. Precipitation information from SSMIS/F16 retrieval.
5. Precipitation information from SSMIS/F17 retrieval.
6. Precipitation information from SSMIS/F18 retrieval.
7. Precipitation information from SSMIS/F19 retrieval (F19 was only available a short time).

Each instrument precipitation block has the same information as follows:

1. Total number of pixels from the instrument in the grid box: **INTEGER**.
2. Precipitating number of pixels from the instrument in the grid box: **INTEGER**.
3. Mean precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
4. Convective precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
5. Frozen precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
6. Data quality indicator for the instrument: **INTEGER**.

Note: Whenever a sensor did not have any pixels in the grid box, a -9 indicating a missing value is put in each field except for the pixel count fields.

5.0 CONSTELLATION CROSS-TRACK SCANNING RADIOMETERS

This gridded text file provides the GPROF algorithm precipitation retrieval for the cross-track scanning radiometers that are part of the constellation. They are named for the satellite on which they fly; for example, Meteorological Operational (Spacecraft) A (MetOp-A), MetOp-B, National Oceanic and Atmospheric Administration Satellite 18 (NOAA-18), etc. are Microwave Humidity Sounders (MHS). At the time of this data product version, MetOp-C MHS has not yet been launched. The same is true for the NOAA-20 Advanced Technology Microwave Sounder (ATMS). These will be included in the next reprocessing cycle.

Note: Currently the Sondeur Atmospherique du Profil d'Humidite Intertropicale par Radiometrie (SAPHIR) retrievals are just empty values. This is because there is no GPROF retrieval made for the SAPHIR sounder.

5.1 FILE METADATA

The first five lines of text contain the file metadata that fully describe the data contain and data line format, as outlined below.

5.1.1 File Metadata Line 1

1. The product data type designator.
2. Algorithm version.
3. Place holder.
4. Place holder.
5. Producing agency.
6. Date/time of product creation.
7. DOI short name.
8. Product DOI.

5.1.2 File Metadata Line 2

1. Total number of latitude grids (row).
2. Total number of longitude grids (column).
3. Latitude for row grid number 0.
4. Longitude for column grid number 0.
5. Date of the data.

5.1.3 File Metadata Line 3

1. Southernmost latitude of GPM data, based on TMI IFOV.
2. Northernmost latitude of GPM data, based on TMI IFOV.
3. Westernmost longitude of GPM data.
4. Easternmost longitude of GPM data.

5.1.4 File Metadata Line 4

1. Grid number for the first row.
2. Center latitude for the first grid row.
3. Grid number for the first column.
4. Center longitude for the first grid column.
5. Grid cell resolution.
6. File time resolution.

5.1.5 File Metadata Line 5

The fifth metadata lines contain the names of the parameters and their order as they appear on each of the data lines following the five lines of metadata. The details of each line can be obtained in Section 4.3. These provide information about the grid cell as well as the precipitation information for each of the conically scanning radiometers: GMI; AMSR2; and SSMIS/F16, F17, F18, and F19.

5.2 METADATA EXAMPLE

Example of five metadata lines (*note that a blank line is shown between the metadata lines in the example; there is no blank line in the file*):

```
3B-DAY.GPM.CONSTSOUNDER.GRIDTXT25 V05_2-1-1_sounder NONE NONE NASA
2017-10-24T13:31UTC 3GSDEGGPM_DAY 10.5067/GPM/SOUNDERTXT/DAY/05
```

```
720 1440 -90 -180 0.25 20140301
```

```
-90 90 -180 180
```

```
Grid_First_Row=0 Grid_Center_Latitude=-89.875 Grid_First_Column=0
Grid_Center_Longitude=-179.875 Grid_Cell_Resolution=0.25 Duration=Day
```

```
hour minute row column SAPHIR_total_pixels SAPHIR_precip_pixels SAPHIR_mean_mm/hr
SAPHIR_convective_Rate_mm/hr SAPHIR_frozen_Rate_mm/hr SAPHIR_qualityCode
METOPA_total_pixels METOPA_precip_pixels METOPA_mean_mm/hr
METOPA_convective_Rate_mm/hr METOPA_frozen_Rate_mm/hr METOPB_qualityCode
METOPB_total_pixels METOPB_precip_pixels METOPB_mean_mm/hr
METOPB_convective_Rate_mm/hr METOPB_frozen_Rate_mm/hr METOPB_qualityCode
NOAA18_total_pixels NOAA18_precip_pixels NOAA18_mean_mm/hr
NOAA18_convective_Rate_mm/hr NOAA18_frozen_rate_mm/hr NOAA18_qualityCode
NOAA19_total_pixels NOAA19_precip_pixels NOAA19_mean_mm/hr
NOAA19_convective_Rate_mm/hr NOAA19_frozen_Rate_mm/hr NOAA19_qualityCode
ATMS_total_pixels ATMS_precip_pixels ATMS_mean_mm/hr
ATMS_convective_Rate_mm/hr ATMS_frozen_Rate_mm/hr ATMS_qualityCode
```

5.3 DATA LINE CONSTRUCTION

Each data line has exactly the same format. The data starts on line 6 of the file. Each data line describes a particular grid cell precipitation information.

Each data line has seven types of data; the exact name of the parameter can be seen on line 4 of the metadata.

1. Information about the grid.
2. Precipitation information from SAPHIR retrieval.
3. Precipitation information from retrieval.
4. Precipitation information from SSMIS/F16 retrieval.
5. Precipitation information from SSMIS/F17 retrieval.
6. Precipitation information from SSMIS/F18 retrieval.
7. Precipitation information form SSMIS/F19 retrieval (F19 was only available for a short time).

Each instrument precipitation block has the same information as follows:

1. Total number of pixels from the instrument in the grid box: **INTEGER**.
2. Precipitating number of pixels from the instrument in the grid box: **INTEGER**.
3. Mean precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
4. Convective precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
5. Frozen precipitation rate in mm/hr.: **FLOAT** (4 decimal places).
6. Data quality indicator for the instrument: **INTEGER**.

Note: Whenever a sensor did not have any pixels in the grid box, a -9 indicating a missing value is put in each field except for the pixel count fields.

APPENDIX A. ACRONYMS AND ABBREVIATIONS

AMSR2	Advanced Microwave Scanning Radiometer 2
ASCII	American Standard Code for Information Interchange
ATBD	Algorithm Theoretical Basis Document
ATMS	Advanced Technology Microwave Sounder
CORRA	Combined Radar-Radiometer
DOI	Digital Object Identifier
DPR	Dual-Frequency Precipitation Radar
GMI	GPM Microwave Imager
GPM	Global Precipitation Measurement
GPROF	GPM Profiling Algorithm
HDF	Hierarchical Data Format
IDL	Interactive Data Language
IFOV	Instrument Field of View
Ku	Ku-band
LF	Linefeed
MetOp-A	Meteorological Operational (Spacecraft) A
MetOp-B	Meteorological Operational (Spacecraft) B
MetOp-C	Meteorological Operational (Spacecraft) C
MHS	Microwave Humidity Sounder
NOAA	National Oceanic and Atmospheric Administration
PR	Precipitation Radar
SAPHIR	Sondeur Atmospherique du Profil d'Humidite Intertropicale par Radiometrie
SSMIS	Special Sensor for Microwave Imager/Sounder
TMI	TRMM Microwave Imager
TRMM	Tropical Rainfall Measuring Mission