

PRECIPITATION PROCESSING SYSTEM
GLOBAL PRECIPITATION MEASUREMENT

Metadata for GPM Products

Version 1.01

April 4, 2014

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1 Introduction

This document describes metadata, organized by group. There are two types of metadata groups: a group with elements and a "Long Metadata Group" which is not divided into elements.

The first type of group has elements, which are shown in a table. If the name of the metadata element is wider than the table column, it will be hyphenated in the table. There is no dash or hyphen in the element name. For example,

SolarBetaAngleAtMiddleOfGranule

would appear in the table as

SolarBetaAngleAt-
MiddleOfGranule

The second type of group, a "Long Metadata Group", has no elements and therefore no table is shown. Since the calls to TKIO to get or set metadata require an element name, the name NULL (in C) or "NULL" (in Fortran) are used as the element name in the TKIO calls.

2 FileHeader

FileHeader contains metadata of general interest. This group appears in all data products. Table 1 through 2 show each metadata element in this group.

3 InputRecord

InputRecord contains a record of input files for this granule. This group appears in Level 1, Level 2, and Level 3 orbital data products. Level 3 time averaged products have the same information separated into 3 groups since they have many inputs.

Table 3 shows each metadata element in this group.

4 InputFileNames

InputFileNames contains a list of input file names for this granule. Since some algorithms may have 2000 input files, this group is a "Long Metadata Group", which has no elements. This group appears in Level 3 time averaged products.

5 InputAlgorithmVersions

InputAlgorithmVersions contains a list of input algorithm versions for this granule. Since some algorithms may have 2000 input files, this group is a "Long Metadata Group", which has no elements. This group appears in Level 3 time averaged products.

6 InputGenerationDateTimes

InputGenerationDateTimes contains a list of input generation datetimes for this granule. Since some algorithms may have 2000 input files, this group is a "Long Metadata Group", which has no elements. This group appears in Level 3 time averaged products.

7 AlgorithmRuntimeInfo

AlgorithmRuntimeInfo contains text runtime information written by the algorithm. This group is a "Long Metadata Group", which has no elements. This group appears in products if the algorithm developer asks for it.

8 NavigationRecord

NavigationRecord contains navigation metadata for this granule. This group appears in Level 1, Level 2, and Level 3 orbital data products.

Table 4 shows each metadata element in this group.

9 FileInfo

FileInfo contains metadata used by the PPS I/O Toolkit. This group appears in all data products.

Table 5 shows each metadata element in this group.

10 JAXAInfo

JAXAInfo contains metadata requested by JAXA. Used by DPR algorithms and GSMaP.

Table 6 shows each metadata element in this group.

11 DPRKuInfo

Contains DPR information. This group appears in 1BKu. Table 7 shows each metadata element in this group.

12 DPRKaInfo

Contains DPR information. This group appears in 1BKa. Table 8 shows each metadata element in this group.

13 GSMaPInfo

GSMaPinfo contains metadata required by GSMaP. This group appears in GSMaP products only. Table 9 shows each metadata element in this group.

14 GprofInfo

GprofInfo contains metadata required by Gprof. This group appears in Gprof products. Table 10 shows each metadata element in this group.

15 XCALinfo

XCALinfo contains metadata required by 1C intercalibrated files. This group appears in 1C intercalibrated products. Table 11 shows each metadata element in this group.

16 SwathHeader

SwathHeader contains metadata for swaths. This group appears in Level 1 and Level 2 data products. Table 12 shows each metadata element in this group.

17 GridHeader

GridHeader contains metadata defining the grids in the grid structure. This group appears in Level 3 products.

Table 13 shows each metadata element in this group.

Table 1: FileHeader Group

| Metadata Element | Estimated Size (bytes) | Description |
|----------------------|------------------------|---|
| DOI | 256 | Digital Object Identifier |
| AlgorithmID | 50 | The algorithm that generated this product, e.g., 2A12. |
| AlgorithmVersion | 50 | The version of the algorithm that generated this product. |
| FileName | 50 | The file name of this granule. |
| SatelliteName | 10 | Values are: TRMM GPM MULTI F10 ... F19 AQUA GCOMW1 CORIOLIS MT1 NOAA15 ... NOAA19 METOPA NPP. More values will be added as they are known. |
| InstrumentName | 10 | Values are: PR TMI VIRS PRTMI KU KA DPR GMI DPRGMI MERGED SSMI SSMIS AMSRE AMSR2 WINDSAT MADRAS AMSUA AMSUB SAPHIR MHS ATMS. More values will be added as they are known. |
| GenerationDateTime | 50 | The date and time this granule was generated. The format is YYYY-MM-DDTHH:MM:SS.sssZ, where YYYY is 4-digit year, MM is month number, DD is day of month, T is "T", HH is hour, MM is minute, SS is second, sss is millisecond, and Z is "Z". All fields are zero-filled. The missing value is constructed by replacing all digits with 9, i.e., 9999-99-99T99:99:99.999Z |
| StartGranuleDateTime | 50 | The start time defining this granule. The format is the same as GenerationDateTime. DETAILS: An orbital granule starts when the satellite is at the position defined by GranuleStart. Thus the start time is not the first scan time. Some algorithms have overlap scans in the file before the start time as defined in SwathHeader. A monthly granule starts on the first ms of the month, for example March 1998 would be 1998-03-01T00:00:00.000Z |
| StopGranuleDateTime | 50 | The stop time defining this granule. The format is the same as GenerationDateTime. DETAILS: An orbital granule stops when the satellite is at the position defined by GranuleStart. Thus the stop time is not the last scan time. Some algorithms have overlap scans in the file after the stop time as defined in SwathHeader. A monthly granule stops on the last ms of the month, for example March 1998 would be 1998-03-31T23:59:59.999Z |

Table 2: FileHeader Group

| Metadata Element | Estimated Size (bytes) | Description |
|-------------------------|-------------------------------|---|
| GranuleNumber | 50 | The number of this granule, which starts as defined in GranuleStart. If the GranuleStart is identical to the orbit start, then the GranuleNumber will be the same as the orbit number. The GranuleNumber will have 6 digits, including leading zeroes, for example 001234. If there is no granule number (NRT or time-averaged products) then GranuleNumber is empty. |
| NumberOfSwaths | 50 | The number of swaths in this granule. |
| NumberOfGrids | 50 | The number of grid structures in this granule. |
| GranuleStart | 50 | The starting place in the orbit of this granule. Currently defined values are "SOUTHERNMOST_LATITUDE" and "NORTHBOUND_EQUATOR_CROSSING". |
| TimeInterval | 50 | The time interval covered by this granule. Values are "ORBIT", "HALF_ORBIT", "PARTIAL_ORBIT", "HALF_HOUR", "HOUR", "3_HOUR", "DAY", "DAY_ASC", "DAY_DES", "MONTH", "CONTACT". |
| ProcessingSystem | 50 | The name of the processing system, e.g., "PPS", "JAXA". |
| ProductVersion | 50 | The data version assigned by the processing system. |
| EmptyGranule | 50 | Whether a granule is empty. Values are "EMPTY" or "NOT_EMPTY". |
| MissingData | 50 | The number of missing scans. |

Table 3: InputRecord Group

| Metadata Element | Estimated Size (bytes) | Description |
|--------------------------|-------------------------------|--|
| InputFileNames | 1000 | A list of input file names for this granule. |
| InputAlgorithmVersions | 1000 | A list of algorithm versions of the input files for this granule. |
| InputGenerationDateTimes | 1000 | A list of generation date times of the input files for this granule. The format is the same as GenerationDateTime. |

Table 4: NavigationRecord Group

| Metadata Element | Estimated Size (bytes) | Description |
|------------------------------------|------------------------|---|
| LongitudeOnEquator | 50 | The longitude where the satellite crosses the equator going from south to north. |
| UTCDateTimeOnEquator | 50 | The UTC time when the satellite crosses the equator going from south to north. The format is the same as GenerationDate Time. |
| MeanSolarBetaAngle | 50 | The average solar beta angle in this granule. |
| EphemerisFileName | 50 | Name of the ephemeris file input for processing. |
| AttitudeFileName | 50 | Name of the attitude file input for processing. |
| GeoControlFileName | 50 | Name of the GeoTK Control Parameters File input for processing. |
| EphemerisSource | 50 | Values are "0_CONSTANT_INPUT_TEST_VALUE", "1_GROUND_ESTIMATED_STATE_(GES)", "2_GPS_FILTERED_SOLUTION_(GEONS)", "3_GPS_POINT_SOLUTION_(PVT)", "4_ON_BOARD_PROPAGATED_(OBP)", "5_OEM_GROUND_EPHEMERIS_FILE", "6_GEONS_WITH_FALLBACK_AS_FLAGGED", "7_PVT_WITH_FALLBACK_AS_FLAGGED", "8_OBP_WITH_FALLBACK_AS_FLAGGED", "9_GES_WITH_FALLBACK_AS_FLAGGED" |
| AttitudeSource | 50 | Values are "0_CONSTANT_INPUTS_FOR_TESTING", "1_ON_BOARD_CALCULATED_PITCH_ROLL_YAW" |
| GeoToolkitVersion | 50 | Version of the GeoToolkit |
| SensorAlignmentFirstRotationAngle | 50 | Alignment angle, first rotation, in degrees. Rotation adjustment from sensor coordinates to the Attitude Control System Flight Coordinates. |
| SensorAlignmentSecondRotationAngle | 50 | Alignment angle, second rotation, in degrees. |
| SensorAlignmentThirdRotationAngle | 50 | Alignment angle, third rotation, in degrees. |
| SensorAlignmentFirstRotationAxis | 50 | Euler rotation sequence, first rotation axis. Values are "1", "2", "3" (representing X, Y, Z). |
| SensorAlignmentSecondRotationAxis | 50 | Euler rotation sequence, second rotation axis. Values are "1", "2", "3" (representing X, Y, Z). |
| SensorAlignmentThirdRotationAxis | 50 | Euler rotation sequence, third rotation axis. Values are "1", "2", "3" (representing X, Y, Z). |

Table 5: FileInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|--------------------|------------------------|--|
| DataFormatVersion | 50 | The version of the data format used to write this file. This version is separate for each AlgorithmID. The order is: "a" "b" ... "z" "aa" "ab" ... "az" "ba" "bb" ... |
| TKCodeBuildVersion | 50 | Usually TK CodeBuildVersion is "1". If the I/O routines built by TKIO change even though the DataFormatVersion is unchanged, then TK CodeBuildVersion increments to "2", "3", ... If subsequently DataFormatVersion changes, TKCodeBuildVersion becomes "1" again. |
| MetadataVersion | 50 | The version of metadata used to write this file. This version is separate for each AlgorithmID. The order is: "a" "b" ... "z" "aa" "ab" ... "az" "ba" "bb" ... |
| FormatPackage | 50 | The underlying format of this granule. Values are "HDF4", "HDF5", "NETCDF", "TKBINARY" |
| BlueprintFilename | 50 | The filename of the primary blueprint file that defined the format used to write this file. |
| BlueprintVersion | 50 | The BlueprintVersion of the format definition |
| TKIOVersion | 50 | The version of TKIO used to create I/O routines to write this file. TKIOVersion does not define the format used to write this file. |
| MetadataStyle | 50 | The style in which the metadata was written, e.g., "PVL". "PVL" means $\langle parameter \rangle = \langle value \rangle$; |
| EndianType | 50 | The endian type of the system that wrote this file. Values are "BIG_ENDIAN" and "LITTLE_ENDIAN". |

Table 6: JAXAInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|-----------------------------|------------------------|---|
| GranuleFirstScanUTCDateTime | 50 | Granule First Scan UTC Date after crossing granule boundary. Date is a 24 character string. The format is YYYY-MM-DDTHH:MM:SS.sssZ, where YYYY is 4-digit year, MM is month number, DD is day of month, T is "T", HH is hour, MM is minute, SS is second, sss is millisecond, and Z is "Z". All fields are zero-filled. |
| GranuleLastScanUTCDateTime | 50 | Granule Last Scan UTC Date before crossing granule boundary. Date is a 24 character string. The format is YYYY-MM-DDTHH:MM:SS.sssZ, where YYYY is 4-digit year, MM is month number, DD is day of month, T is "T", HH is hour, MM is minute, SS is second, sss is millisecond, and Z is "Z". All fields are zero-filled. |
| TotalQualityCode | 50 | Total quality of the GPM product, e.g., "Good", "Fair" or "EG". |
| FirstScanLat | 50 | Latitude of orbit first scan. |
| FirstScanLon | 50 | Longitude of orbit first scan. |
| LastScanLat | 50 | Latitude of orbit last scan. |
| LastScanLon | 50 | Longitude of orbit last scan. |
| NumberOfRainPixelsNS | 50 | Number of rain pixels in the NS swath, judged at DPR L2 algorithm. At DPR L1, value is "-9999". |
| NumberOfRainPixelsMS | 50 | Number of rain pixels in the MS swath, judged at DPR L2 algorithm. At DPR L1, value is "-9999". |
| NumberOfRainPixelsHS | 50 | Number of rain pixels in the HS swath, judged at DPR L2 algorithm. At DPR L1, value is "-9999". |
| ProcessingSubSystem | 50 | The name of the processing sub-system, e.g., "ALGORITHM", "PCS". |
| ProcessingMode | 50 | The name of the processing mode, e.g., "STD", "NRT". |

Table 7: DPRKuInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|---------------------------|------------------------|--|
| scanAngleObsVersion | 100 | The version of scan angle table which is used for non-external calibration mode. |
| scanAngleExtVersion | 100 | The version of scan angle table which is used for external calibration mode. |
| transReceiptCoefVersion | 100 | The version of trans/receipt gain correction value table. |
| fcifIoTableVersion | 100 | The version of FCIF I/O table. |
| eqvWavelength | 100 | Equivalent wavelength (m). |
| logAveOffset | 100 | The offset value (dB) between logarithmic average and normal average. |
| alignmentAngle-BasicEtoA | 100 | Rotation angle (degrees) from electrical axis to antenna axis. |
| alignmentAngle-OffsetAtoM | 100 | Offset angle (degrees) from antenna axis to mechanical axis. |

Table 8: DPRKaInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|---------------------------|------------------------|--|
| scanAngleObsVersion | 100 | The version of scan angle table which is used for non-external calibration mode. |
| scanAngleExtVersion | 100 | The version of scan angle table which is used for external calibration mode. |
| transReceiptCoefVersion | 100 | The version of trans/receipt gain correction value table. |
| fcifIoTableVersion | 100 | The version of FCIF I/O table. |
| eqvWavelength | 100 | Equivalent wavelength (m). |
| logAveOffset | 100 | The offset value (dB) between logarithmic average and normal average. |
| alignmentAngle-BasicEtoA | 100 | Rotation angle (degrees) from electrical axis to antenna axis. |
| alignmentAngle-OffsetAtoM | 100 | Offset angle (degrees) from antenna axis to mechanical axis. |

Table 9: GSMaPInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|---------------------------|------------------------|--|
| AlgorithmName | 100 | Algorithm name of GSMaP module. |
| CoverageRatio | 100 | Ratio of effective (non-missing) pixel number within rainfall retrieval area (60S-60N at present) in percentage. |
| InputMWSFile-Number | 100 | Number of satellites with passive microwave instruments used in the file. |
| InputIRFileNumber | 100 | Number of IR files used in the file. |
| InputAncillaryFile-Number | 100 | Existence of rain gauge correction. For products except monthly products, if number is "1", rain gauge correction is applied, and if "0", rain gauge correction is not applied. For monthly products, total number of days with rain gauge correction is denoted, and date of without gauge correction is also shown as (NoGauge=D1,D2,D3), where D1,D2,D3 are day without gauge correction. |

Table 10: GprofInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|----------------------------|------------------------|--|
| Satellite | 12 | Name of satellite. |
| Sensor | 12 | Name of sensor. |
| PreProcessorVersion | 12 | Version of preprocessor. |
| PostProcessorVersion | 12 | Version of postprocessor. |
| ProfileDatabaseFilename | 128 | Filename of profile database. |
| OriginalRadiometerFilename | 128 | Original filename of the radiometer. |
| ProfileStructureFlag | 1 | Flag as to whether cluster was computed. If cluster was computed, StructureFlag = 1. If cluster was not computed, StructureFlag = 0 and clusterNumber and clusterScale are set to missing. |

Table 11: XCALInfo Group

| Metadata Element | Estimated Size (bytes) | Description |
|---------------------|------------------------|--|
| CalibrationStandard | 50 | The brightness temperature reference standard, e.g., "cc_1.1". |
| CalibrationTable | 50 | The name of a file containing the calibration table used to make this product, e.g., "1C.AQUA.ASMRE.XCAL2013-P.tbl". |
| CalibrationLevel | 50 | <p>The level development of the intercalibration for a given sensor. When this level increases for a given sensor the Level 1C files are reprocessed and the version number will also increment. The intercalibration level is defined as follows:</p> <p>N (None): No intercalibration has been applied. Tbs are unchanged from Level 1B source files.</p> <p>P (Preliminary): A preliminary or beta intercalibration has been applied to match the Tb to the reference.</p> <p>V (Verified): The intercalibration has been verified by at least one independent effort.</p> <p>C (Consensus): The XCAL intercalibration has been finalized and accepted by the Science Team.</p> |

Table 12: SwathHeader Group

| Metadata Element | Estimated Size (bytes) | Description |
|--------------------------|-------------------------------|---|
| NumberScansInSet | 50 | The scans read by TKreadScan are a "set". For single swath data, one scan is read so NumberScansInSet=1. For multiple swath data, one TKreadScan may read more than one scan. For example, for SSM/I data one TKreadScan reads one low frequency scan and two high frequency scans. Therefore NumberScansInSet=1 for the low frequency swath and NumberScansInSet=2 for the high frequency swath. |
| MaximumNumberScansTotal | 50 | The maximum allowed number of total scans in this swath. Total scans = overlap scans before granule + scans in granule + overlap scans after granule. |
| NumberScansBeforeGranule | 50 | The number of overlap scans before the first scan of the granule in this swath. |
| NumberScansGranule | 50 | The number of scans in the granule in this swath. |
| NumberScansAfterGranule | 50 | The number of overlap scans after the last scan of the granule in this swath. |
| NumberPixels | 50 | The number of IFOV in each scan in this swath. |
| ScanType | 50 | The type of scan in this swath. Values are: "CROSSTRACK" and "CONICAL" |

Table 13: GridHeader Group

| Metadata Element | Estimated Size (bytes) | Description |
|-------------------------|-------------------------------|--|
| BinMethod | 50 | Method used to obtain the value in each grid box. The only defined value is "ARITHMEAN". |
| Registration | 50 | Representative location within the grid box. The only defined value is "CENTER". |
| LatitudeResolution | 50 | North-south size of a bin (degrees latitude). |
| LongitudeResolution | 50 | East-west size of a bin (degrees longitude). |
| NorthBoundingCoordinate | 50 | Northern-most latitude (degrees) covered by the grid. |
| SouthBoundingCoordinate | 50 | Southern-most latitude (degrees) covered by the grid. |
| EastBoundingCoordinate | 50 | Eastern-most longitude (degrees) covered by the grid. |
| WestBoundingCoordinate | 50 | Western-most longitude (degrees) covered by the grid. |
| Origin | 50 | Origin of the grid indices, e.g., "SOUTHWEST". |