NPP Aggregation Tool Components

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This document describes the components of the nagg tool for aggregating and de-aggregating NPP data files. The tool produces a set of NPP data files with the data granules from the original files divided into smaller, larger, or the same size aggregations, according to the specified command line options. The importance of this tool is that it enables NPP data users to work with data in different configurations while having to request and download data only once.

Contents

[1. Introduction 2](#_Toc331407949)

[2. Approach 2](#_Toc331407950)

[3. nagg Example 2](#_Toc331407951)

[4. Structures and Variables 5](#_Toc331407952)

[5. nagg Tool Software Modules 5](#_Toc331407953)

[5.1. Command Parser Module 5](#_Toc331407954)

[5.1.1. Public Function: parse\_options 5](#_Toc331407955)

[5.2. Get Granules Module 6](#_Toc331407956)

[5.2.1. Public Function: nagg\_get\_granules 6](#_Toc331407957)

[5.3. Select Granules Module 7](#_Toc331407958)

[5.3.1. Public Function: select\_granules 7](#_Toc331407959)

[5.4. Write Granules Module 9](#_Toc331407960)

[5.4.1. Public Function: start\_write 9](#_Toc331407961)

[5.4.2. Public Function: write\_granules 10](#_Toc331407962)

[5.4.3. Public Function: end\_write 11](#_Toc331407963)

[6. Appendix 1: granule\_t Structure Members 13](#_Toc331407964)

[7. Appendix 2: Size Definitions for nagg’s Variables 16](#_Toc331407965)

[8. Appendix 3: Product and Geolocation Product Tables 17](#_Toc331407966)

[9. Appendix 4: NPOESS Common Terms 21](#_Toc331407967)

# Introduction

nagg is a tool for aggregating JPSS data granules from existing files into new files with a different number of granules per file than in the original files. The tool may be used to create files with larger or smaller aggregations including de-aggregation to one granule per file. Future versions will also package granules of compatible products into a single set of files or separate granules in previously packaged files into unpackaged files with granules of one product in each.

The tool facilitates creating aggregations and/or packaging without requesting and downloading the same data more than once.

# Approach

The nagg tool is intended to rearrange existing data files into new files with different aggregation sizes or different package combinations of compatible products. The tool creates copies of the existing data and updates metadata to reflect the new aggregation. When required it also creates fill granules with calculated timestamps and fill values for other metadata and for raw data, using existing granules as a pattern. For all operations the tool relies only on information available in the original files. It doesn’t have access to information used to generate the files.

nagg has been implemented with several modules to handle different phases of the process. The “Command Parser” module processes the options specified on the command line and passes them to the other modules. The “Get Granules” module produces a table of all the granules in the input files (see Figure 1). The “Select Granules” module sorts the table, determines the output file names and characteristics, and specifies the writing of the granules to the output files. The “Write Granules” module uses the HDF5 library to create the output files and write the granules as specified by the “Select Granules” module according to the *JPSS Common Data Format Control Books*.

# nagg Example

How does the nagg tool work? This example uses a simple command to create new files each containing 3-granule aggregations of REDRO granules from all the files with names matching the pattern REDRO\*.h5 in the current directory:

nagg -n 3 -t REDRO ./REDRO\*.h5

Each REDRO\*.h5 file has an attribute named /N\_GEO\_Ref whose value is the name of a geolocation file containing the corresponding geolocation granules. If these geolocation files are present, new geolocation files will also be created to match the new 3-granule REDRO files. If the files are not present the tool will fail.

The nagg tool performs these steps to create the new files:

1. Parse the command line flags, their values, and file names.
2. Read data from the input files and the corresponding geolocation files to create a table of granule information.
3. Sort the granules by first Granule ID, then DPID, then by GranuleVersion as shown in Figure 1 below.
4. Select granule aggregations of size specified by the –n flag and identify the aligned boundaries between aggregations according to the *Common Data Format Control Books*. The beginning and ending files may be partial aggregations depending on the available granules and the particular boundaries for the aggregation size. The tool will create fill granules for any missing granules within the sets of available granules. Preceding and trailing fill granules are not written to the first and to the last file respectively.
5. Create files with filenames as specified by the Control Books for each aggregation, and copy the existing data and write fill data for any fill granules to the files.

Figure 1: Example of a granule table produced by the “Get Granules” module and sorted by the “Select Granule” module.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Granule ID | DPID | GranuleIndex | GranuleVersion | BeginningTime | EndingTime | More fields  See Appendix 1 |
| NPP001212767892 | REDRO | 0 | A1 | 1422244825812163 | 1422244855612163 |  |
| NPP001212767892 | GCRIO | 0 | A1 | 1422244825812163 | 1422244855612163 |  |
| NPP001212768212 | REDRO | 1 | A1 | 1422244857812163 | 1422244887612163 |  |
| NPP001212768212 | GCRIO | 1 | A1 | 1422244857812163 | 1422244887612163 |  |
| NPP001212768532 | REDRO | 2 | A1 | 1422244889812163 | 1422244919612163 |  |
| NPP001212768532 | GCRIO | 2 | A1 | 1422244889812163 | 1422244919612163 |  |
| NPP001212768852 | REDRO | 3 | A1 | 1422244921812163 | 1422244951612163 |  |
| NPP001212768852 | GCRIO | 3 | A1 | 1422244921812163 | 1422244951612163 |  |
| NPP001212769172 | REDRO | 4 | A1 | 1422244953812163 | 1422244983612163 |  |
| NPP001212769172 | GCRIO | 4 | A1 | 1422244953812163 | 1422244983612163 |  |
| NPP001212769492 | REDRO | 0 | A1 | 1422244985812163 | 1422245015612163 |  |
| NPP001212769492 | GCRIO | 0 | A1 | 1422244985812163 | 1422245015612163 |  |
| … | … | … | … | … | … |  |

# Structures and Variables

For each granule, the tool gets metadata information needed to produce the output files and stores it in a structure shown in Appendix 1: “granule\_t Structure Members”. See page 12 for more information.

Appendix 2: “Size Definitions for nagg’s Variables” shows miscellaneous variables and their values. Some values affect the current capabilities of nagg. For example, the tool cannot process more than 500 granules (NAGG\_Granules\_selected\_max) or produce more than 30 output file (NAGG\_outputfiles\_max). See page 14 for more information.

# nagg Tool Software Modules

This section describes the functions of the Command Parser, Get Granules, Select Granules, and Write Granules modules.

## Command Parser Module

Purpose:

To parse the command line options, validate the option values, and set the option variables so that the tool may execute according to user request.

### Public Function: parse\_options

parse\_options(int argc, char \* const argv[])

**Parameters**:

argc IN: number of elements in argv

argv IN: the list of command options

**Return Values:**

0 if successful; call leave(EXIT\_FAILURE)if it encounters irrecoverable errors such as illegal options or bad option values.

**Description:**

The parse\_options() function uses the standard *getopt()* function to parse the command options. It will set up the values of the following global variables during its execution.

| **Option** | **Global Variables** | **Description** |
| --- | --- | --- |
| -n | ngranulesperfile | The number of granules per product in each output file. Default is 1. |
| -t | products\_arg | A link list of products to store in each output file |
|  | nproducts | Number of products specified in –t flag. |
| -d | outDir | Directory name in which output files are generated. Default is NULL (generate files in the current directory). |
| -O | origin\_arg | Origin identifier of 4 characters. Default is “XXXX”. |
| -D | domain\_arg | Domain identifier of 3 characters. Default is “XXX”. |
| -g | geofiles\_arg | An enum variable representing different geolocation granules selection criterion of “no”(0), “yes” (1), and “strict”(2). |

<input\_files> …

inputfiles A link list of input files.

ninputfiles Number of elements in *inputfiles*.

## Get Granules Module

Purpose:

To populate the granule table with metadata from the input files.

### Public Function: nagg\_get\_granules

nagg\_get\_granules(char \*\*file\_list, int number\_of\_files,

char \*\*products\_list, int nproducts, geolocation\_t geofiles\_arg,

char \*\*geoproduct granule\_p\_t, \*granule\_info\_p[], int \*number\_of\_granules\_p)

**Parameters**:

|  |  |
| --- | --- |
| file\_list | IN: list of files containing granules to be added to the granule table. |
| number\_of\_files | IN: number of file names in the list. |
| products\_list | IN: list of product types for which granules will be written to a file. |
| nproducts | IN: number of products types in the list. |
| geofiles\_arg | IN: enum value from –g command option (default GEOFILE\_YES). |
| geoproduct | OUT: address of variable to return the DPID of the geolocation product. |
| \*granule\_info\_p[] | INOUT: address of the granule table to be populated. |
| \*number\_of\_granules\_p | INOUT: address of variable for number of granules put in the table. |

**Return Values:**

0 if successful, -1 otherwise

**Description:**

The nagg\_get\_granules() function opens and reads the files in the list provided by the command parser, and then it puts the values of the attributes necessary for re-aggregating the granules in the members of an instance of the granule\_t structure which is added to the granule table. Unless the –g no option is specified or the file is a geolocation file, the file specified by the file’s N\_GEO\_Ref attribute will also be opened and read, and its granules added to the granule table.

Error messages will be returned if a file specified is not an HDF5 file, if the file does not exist or cannot be accessed due to insufficient file permissions, or if the file cannot be opened due to an HDF5 failure. The tool will not continue if any of these errors are encountered.

The attributes from which granule information is gathered are attributes of several different objects in the file. Some are attributes of the root group. Others are attributes of the product groups which are sub-groups of the /Data\_Products group. The function iterates through all sub-groups of /Data\_Products and collects granule information from the groups and their aggregate and granule datasets.

## Select Granules Module

Purpose:

To select granules from the given granule\_info table that matches one of the products in the given products list or the geolocation product according to the given number of granules per file.

This module returns a list of selected granules, including fill granules, to be written to the output file(s).

### Public Function: select\_granules

select\_granules(granule\_p\_t granule\_info[], int \*\_gindex, char \*\*products\_list, int nproducts, int total\_nproducts, char \*geoproduct, granule\_p\_t granules\_selected[], int ngranulesperfile, int \*\_granules\_remain, int \*\_total\_granules\_file)

**Parameters**:

|  |  |
| --- | --- |
| granule\_info | IN: table of granules for selection. |
| \*\_gindex | INOUT: index of the next available granule in the granule\_info for selection. It reaches the end of the table if \_granules\_remain is equal to 0. |
| \*\*products\_list | IN: the list of products to match. |
| nproducts | IN: number of elements in products\_list. |
| total\_nproducts | IN: number of products and the geolocation product if wanted. |
| \*geoproduct | IN: geolocation product (NULL if not wanted.) |
| granules\_selected | INOUT: a table of selected granules for output. It is expected that sufficient space has been allocated for granules\_selected to store all granules selected. |
| ngranulesperfile | IN: number of granules of each product per output file. |
| \*\_granules\_remain | INOUT: number of granules in the granule\_info table available for selection. |
| \*\_total\_granules\_file | OUT: number of granules in the granules\_selected table. |

Return values:

Returns SUCCEED (0) if success; FAIL (-1) otherwise.

If return values is FAIL, the values of the OUT or INOUT parameters are undefined.

Description:

The select\_granules function selects granules that will fit in the output file according to the bucket alignment boundary. The following is a description of the algorithms used.

nagg algorithm in the calculation of bucket alignment:

Let N be the number of granules requested by the nagg user to re-aggregate the NPP product files.

Let Tg be the duration of the first selected granule (This value is different for different products and is defined in the products table).

Then Tbucket = N\*Tg seconds.

Let An be the nth bucket since epoch.

Let Asn and Aen be the starting and ending time of An.

Let Gs be the beginning time of the first selected granule.

Then

An = floor(Gs/Tbucket )

Asn = An\*(Tbucket )

Aen = As + Tbucket

How nagg adds fill granules to produced files:

|  |  |
| --- | --- |
| First produced file | For the first file, if the starting time of the first selected granule is bigger than Asn, no fill granules are added before copying existing granules to the new file. This will produce a partial file (a file with fewer granules than requested). |
| Second to n th-1 files | N existing granules per product requested are copied to each of the new files, and fill granules are inserted in place of any missing granules. |
| Last (nth) file | Remaining granules per product requested are copied to the last file. If the ending time of the last granule is less than the ending time of the last bucket, no fill granules are added. This will produce a partial file. |

## Write Granules Module

Purpose:

To create output files and write granules as directed.

### Public Function: start\_write

start\_write(const char \*\*outfiles, int noutfiles, const char \*outgeofile,

char \*\*products\_list, int nproducts, const char \*creationdate,

const char \*creationtime, int ngranulesperfile)

Parameters:

|  |  |
| --- | --- |
| outfiles | IN: list of file names to be created for writing an output aggregation |
| noutfiles | IN: number of names in the outfiles list. |
| outgeofile | IN: name of the corresponding geolocation file, or null. |
| products\_list | IN: list of DPIDs, one for each product. Only one product is supported for this version. |
| nproduct | IN: number of DPIDs in the products\_list argument. |
| creationdate | IN: date of creation of the output files (for writing to the N\_HDF\_Creation\_Date attribute) |
| creationtime | IN: time of creation of the output files (for writing to N\_HDF\_Creation\_Time attribute). |
| ngranulesperfile | IN: number of granules in each aggregation. |

Return values:

0 if successful, -1 otherwise

Description:

The start\_write() function is the first function called when writing an aggregation of granules. For a single product with the corresponding geolocation granules in a separate file, start\_write() creates the product and geolocation output files. When multiple products are supported in the future, for the –S nagg tool option, start\_write() will create an output file for each product for each aggregation of granules and the geolocation file if geolocation granules are aggregated separately. When packaging is supported, start\_write() will create one output file for all of the products in an aggregation.

All of the granules selected for an aggregation will be written to the output files before any granules are selected for the next aggregation. The granules within an aggregation may be written in any order and typically will be written one to each output file in rotation. The Write Granules module creates an array of product\_info\_t structures to keep track for each product of output filenames, input and output file handles, number of granules written, and a pointer to the previously written granule.

The product\_info\_t structure is shown below.

typedef struct {

const char dpid[DPID\_size+1];

hid\_t infile;

hid\_t outfile;

const char \* outfilename;

int last\_i\_granule;

int granules\_written;

granule\_p\_t prev\_granule;

} product\_info\_t;

A product\_info\_t structure is created and populated for each product and geolocation file by the start\_write() function. The write\_granules() function will then select the product\_info\_t for each granule that matches its DPID. The product\_info\_t for the separate geolocation file is created last so that its index will always be nproducts.

The start\_write() function also writes three attributes to the root group of the files: N\_GEO\_Ref, for files except the geolocation file, N\_HDF\_Creation\_Date, and N\_HDF\_Creation\_Time. Values for these attributes are generated by nagg with the new geolocation file name and the current time.

### Public Function: write\_granules

write\_granules(granule\_p\_t granule, int i\_granule)

Parameters:

|  |  |
| --- | --- |
| granule | IN: pointer to a granule\_t structure containing information about a granule in an input file. |
| i\_granule | IN: the index of this granule in the aggregation. |

Return Values:

0 if successful, -1 otherwise

Description:

The write\_granules() function is called for each granule selected to be written to an aggregation and is responsible for writing most of the data and attributes to the new file. The values that this function writes may be from the original file or may be generated by the nagg tool. The function does the following:

* Selects the product\_info\_t structure matching the granule’s product ID (DPID) to find the correct output file.
* Opens the input file specified by granule->file\_in.
* Initializes the output file when first called with a granule.
  + Copies root group attributes except those written by start\_write() from the input file to the output file.
  + Creates a group structure in the file by creating product groups in /All\_Data and /Data\_Products. Product groups in /All\_Data are named <productname>\_All; those in /Data\_Products are named <productname>.
  + Copies datasets from the /All\_Data group in the input file to the /All\_Data group in the output file; resizes the datasets for the new aggregation size.
  + Copies attributes from the /Data\_Products/<productname> group in the input file to the /Data\_Products/<productname> group in the output file.
* Copies the /Data\_Products/<productname>/<productname>\_Gran\_*n* dataset for the granule in the input file to the dataset for the granule in the output file. References and metadata that are specific to the new file will be overwritten in subsequent steps.
* Copies the granule’s hyperslab for each dataset in /All\_Data from the input file to the output file creating a region reference to the new location in the granules new file’s /Data\_Products/<productname>/<productname>\_Gran\_*n* dataset
* Creates the /Data\_Products/<productname>/<productname>\_Aggr dataset with object references to all the datasets in the /All\_Data/<productname> group. Copies attributes from the dataset in the input file to the dataset in the output file.
* Copies values for the dataset’s AggregateBeginningDate, AggregateBeginningGranuleID, AggregateBeginningOrbitNumber, and AggregateBeginningTime from the first granule in the aggregation.
* Increments the value of the variable that keeps track of the number of granules written.

### Public Function: end\_write

end\_write

Parameters:

There are no parameters for the end\_write function

Return Values:

0 if successful, -1 otherwise

Description:

For each output file in the aggregation, the end\_write() function checks to see if the specified number of granules for an aggregation has been written to the file. If not, error status will be returned and an error message displayed. The function also does the following:

* Update AggregateEndingDate, AggregateEndingGranuleID, AggregateEndingOrbitNumber and AggregateEndingTime from the last granule in the aggregation.
* Update AggregateNumberGranules with the number of granules written.
* Close the file.

# Appendix 1: granule\_t Structure Members

| **Name** | **Type** | **Description (from CDFCB Vol V, Table 4.4.4)** | **Source** |
| --- | --- | --- | --- |
| product\_id | char[] | 5 character DPID | Look up product\_name in table |
| product\_name | char[] | Collection Short Name | Name of group in /Data\_Products |
| granule\_input\_index | int | Index of the granule’s dataset in the input file | Nagg tool |
|  |  | (The rest of these descriptions are the definitions of the attributes in the column to the right. These may need revision.) |  |
| granule\_id | char[] | The unique identifier for each RDR granule composed of the concatenation of two components:  (1) The three character satellite identifier [alias “Platform\_Short\_Name”]  (2) A zero left filled, 12 character number specifying the number of tenths of a second since the first ascending node after launch | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /N\_Granule\_ID |
| granule\_version | char[] | Indicates the version number of the granule that occurs as the result of an automatic repair of a granule, an IDPS operator commanded re-execution of a granule, or a manual execution of a granule. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /N\_Granule\_Version |
| granule\_version\_number | Int | /\*granule version number - derived from granule - version: N/A=>-1, An=>n |  |
| granule\_start\_time\_IET | unsigned long long | The time of the beginning of the temporal range of the data contained in the granule expressed in IET. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /N\_Beginning\_Time\_IET |
| granule\_end\_time\_IET | unsigned long long | The time of the ending of the temporal range of data contained in the granule expressed in IET. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /N\_Ending\_Time\_IET |
| beginning\_date | char[] | Beginning date of the temporal range (observation date) for a granule. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /Beginning\_Date |
| beginning\_time | char[] | Beginning time of the temporal range (observation time) for a granule. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /Beginning\_Time |
| ending\_time | char[] | Ending date of the temporal range (observation date) for a granule. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /Ending\_Time |
| orbit\_number | uint64\_t | The number of the orbit at the start of the data collection for a data granule. | Attribute /<Data\_Products  /<product group>  /<product \_Gran\_*n* dataset>  /N\_Beginning\_Orbit\_Number |
| geofile | char \* | Filename of the HDF5 file containing the related geolocation information. | /N\_GEO\_Ref |
| file\_in | char \* |  | Input file name |

# Appendix 2: Size Definitions for nagg’s Variables

/\*Granule macro definitions \*/

#define NAGG\_Product\_Type\_size 63 /\* up to 63 chars long \*/

#define NAGG\_Granule\_ID\_size 15 /\* Satellite 3 bytes, \*/

/\* 10 microsec: 12 bytes \*/

/\* Total 15 bytes \*/

#define NAGG\_GRANVER\_size 15 /\* Granule version info size \*/

#define NAGG\_DATE\_size 8 /\* Granule date info size \*/

#define NAGG\_TIME\_size 14 /\* Granule time info size \*/

#define NAGG\_Granule\_info\_max 7000 /\* Max number of granules managed \*/

#define NAGG\_Product\_list\_max 30 /\* Max number of products requested \*/

#define NAGG\_outputfiles\_max 30 /\* Max number of output file names \*/

#define NPP\_Product\_max 99 /\* Max number of NPP Products \*/

#define NPP\_Geo\_Location\_max 19 /\* Max number of NPP Geolocations products \*/

#define NAGG\_Granules\_selected\_max 500 /\* Max number of granules selected \*/

/\* to output \*/

#define Product\_DPID 0 /\* DPID column in Product Table\*/

#define Product\_sname 1 /\* short name column in Product Table\*/

#define Product\_lname 2 /\* long name column in Product Table\*/

/\* NPP data product file name struct \*/

#define DPID\_size 5 /\* DPID name size \*/

#define DPID\_NUM\_MAX 30 /\* max number of DPIDs \*/

#define SPACECRAFT\_size 3 /\* Spacecraft ID \*/

#define Data\_date\_size 8 /\* Date: YYYYMMDD \*/

#define Data\_time\_size 7 /\* Time: HHMMSSS \*/

#define Orbit\_number\_size 5 /\* Orbit: nnnnn \*/

#define Creation\_date\_size 20 /\* Creation Date: YYYYMMDDHHMMSSssssss \*/

#define Origin\_size 4 /\* Origin: XXXX \*/

#define Domain\_size 3 /\* Domain: XXX \*/

# Appendix 3: Product and Geolocation Product Tables

Source: Common Data Format Control Book Vol I; Raytheon: INF\_CFG.xml;

JPSS Internal Data Format Control Book Volume III, Appendix A

/\* NPP Products Table

\* The source is NPOESS Common Data Format Control Book Volume I, pp 173-321,

\* Tables A-2 - A-7, Data Record Identifiers and Data Mapping.

\* column 1: DPID

\* column 2: Product Short Name

\* column 3: Granule Nominal Duration (miscroseconds). 0 means unknown.

\* Granule durations extracted from Raytheon's INF\_CFG.xml DDS

\* configuration file.

\* column 4: Geolocation product ID used by this product.

\* Note: any duration value larger than 2\*\*31 (~2 billion) should have a

\* ULL qualifier to avoid constant overflow.

\*

\* 22 Intermediate products from JPSS Internal Data Format Control Book

\* Volume III, Appendix A added to product\_table in version 1.5.1.

\*/

nppproduct\_t product\_table[NPP\_Product\_max] =

{

/\* DPID Short Name Duration GPID \*/

"ICALI", "CrIMSS-CrIS-AVMP-LOS-IR-IP", 31997000, "GCRIO",

"ICALM", "CrIMSS-CrIS-AVMP-LOS-MW-IP", 31997000, "GCRIO",

"ICCCR", "CrIMSS-CrIS-CLOUD-CLEARED-RAD-IP", 31997000, "GCRIO",

"ICISE", "CrIMSS-CrIS-IR-SURF-EMISSIVITY-IP", 31997000, "GCRIO",

"ICMSE", "CrIMSS-CrIS-MW-SURF-EMISSIVITY-IP", 31997000, "GCRIO",

"ICSTT", "CrIMSS-CrIS-SKIN-TEMP-IP", 31997000, "GCRIO",

"ICTLI", "CrIMSS-CrIS-AVTP-LOS-IR-IP", 31997000, "GCRIO",

"ICTLM", "CrIMSS-CrIS-AVTP-LOS-MW-IP", 31997000, "GCRIO",

"IICMO", "VIIRS-CM-IP", 85350000, "GMODO",

"IICMS", "VIIRS-CM-IP-SUB", 85350000, "GMODO",

"SATMR", "ATMS-REMAP-SDR", 31997000, "GATRO",

"SATMS", "ATMS-SDR", 31997000, "GATMO",

"SCRIS", "CrIS-SDR", 31997000, "GCRSO",

"SOMPS", "OMPS-NP-SDR", 37405000, "GONPO",

"SOMTC", "OMPS-TC-SDR", 37405000, "GOTCO",

"SOMSC", "OMPS-TC-Cal-SDR", 2700000000ULL, "GOSCO",

"SOMNC", "OMPS-NP-Cal-SDR", 2700000000ULL, "GONCO",

"SVDNB", "VIIRS-DNB-SDR", 85350000, "GDNBO",

"SVI01", "VIIRS-I1-SDR", 85350000, "GIMGO",

"SVI02", "VIIRS-I2-SDR", 85350000, "GIMGO",

"SVI03", "VIIRS-I3-SDR", 85350000, "GIMGO",

"SVI04", "VIIRS-I4-SDR", 85350000, "GIMGO",

"SVI05", "VIIRS-I5-SDR", 85350000, "GIMGO",

"SVM01", "VIIRS-M1-SDR", 85350000, "GMODO",

"SVM02", "VIIRS-M2-SDR", 85350000, "GMODO",

"SVM03", "VIIRS-M3-SDR", 85350000, "GMODO",

"SVM04", "VIIRS-M4-SDR", 85350000, "GMODO",

"SVM05", "VIIRS-M5-SDR", 85350000, "GMODO",

"SVM06", "VIIRS-M6-SDR", 85350000, "GMODO",

"SVM07", "VIIRS-M7-SDR", 85350000, "GMODO",

"SVM08", "VIIRS-M8-SDR", 85350000, "GMODO",

"SVM09", "VIIRS-M9-SDR", 85350000, "GMODO",

"SVM10", "VIIRS-M10-SDR", 85350000, "GMODO",

"SVM11", "VIIRS-M11-SDR", 85350000, "GMODO",

"SVM12", "VIIRS-M12-SDR", 85350000, "GMODO",

"SVM13", "VIIRS-M13-SDR", 85350000, "GMODO",

"SVM14", "VIIRS-M14-SDR", 85350000, "GMODO",

"SVM15", "VIIRS-M15-SDR", 85350000, "GMODO",

"SVM16", "VIIRS-M16-SDR", 85350000, "GMODO",

"TATMS", "ATMS-TDR", 31997000, "GATMO",

"REDRO", "CrIMSS-EDR", 31997000, "GCRIO",

"OOTCO", "OMPS-TC-EDR", 37405000, "GOTCO",

"VAOOO", "VIIRS-Aeros-EDR", 85350000, "GAERO",

"VCBHO", "VIIRS-CBH-EDR", 85350000, "GCLDO",

"VCCLO", "VIIRS-CCL-EDR", 85350000, "GCLDO",

"VCEPO", "VIIRS-CEPS-EDR", 85350000, "GCLDO",

"VCOTO", "VIIRS-COT-EDR", 85350000, "GCLDO",

"VCTHO", "VIIRS-CTH-EDR", 85350000, "GCLDO",

"VCTPO", "VIIRS-CTP-EDR", 85350000, "GCLDO",

"VCTTO", "VIIRS-CTT-EDR", 85350000, "GCLDO",

"VI1BO", "VIIRS-I1-IMG-EDR", 85350000, "GIGTO",

"VI2BO", "VIIRS-I2-IMG-EDR", 85350000, "GIGTO",

"VI3BO", "VIIRS-I3-IMG-EDR", 85350000, "GIGTO",

"VI4BO", "VIIRS-I4-IMG-EDR", 85350000, "GIGTO",

"VI5BO", "VIIRS-I5-IMG-EDR", 85350000, "GIGTO",

"VISTO", "VIIRS-IST-EDR", 85350000, "GMTCO",

"VLSTO", "VIIRS-LST-EDR", 85350000, "GMTCO",

"VM01O", "VIIRS-M1ST-EDR", 85350000, "GMGTO",

"VM02O", "VIIRS-M2ND-EDR", 85350000, "GMGTO",

"VM03O", "VIIRS-M3RD-EDR", 85350000, "GMGTO",

"VM04O", "VIIRS-M4TH-EDR", 85350000, "GMGTO",

"VM05O", "VIIRS-M5TH-EDR", 85350000, "GMGTO",

"VM06O", "VIIRS-M6TH-EDR", 85350000, "GMGTO",

"VNCCO", "VIIRS-NCC-EDR", 85350000, "GNCCO",

"VNHFO", "VIIRS-NHF-EDR", 85350000, "GNHFO",

"VOCCO", "VIIRS-OCC-EDR", 85350000, "GMTCO",

"VISAO", "VIIRS-SA-EDR", 85350000, "GMTCO",

"VSCDO", "VIIRS-SCD-BINARY-SNOW-FRAC-EDR", 85350000, "GMTCO",

"VSCMO", "VIIRS-SCD-BINARY-SNOW-MAP-EDR", 85350000, "GITCO",

"VSICO", "VIIRS-SIC-EDR", 85350000, "GMTCO",

"VSSTO", "VIIRS-SST-EDR", 85350000, "GMTCO",

"VSTYO", "VIIRS-ST-EDR", 85350000, "GMTCO",

"VSUMO", "VIIRS-SusMat-EDR", 85350000, "GMTCO",

"VIVIO", "VIIRS-VI-EDR", 85350000, "GITCO",

"REDRS", "CrIMSS-EDR-SUB", 31997000, "GCRIO",

"OOTCS", "OMPS-TC-EDR-SUB", 37405000, "GOTCO",

"VAOOS", "VIIRS-Aeros-EDR-SUB", 85350000, "GAERO",

"VCBHS", "VIIRS-CBH-EDR-SUB", 85350000, "GCLDO",

"VCCLS", "VIIRS-CCL-EDR-SUB", 85350000, "GCLDO",

"VCEPS", "VIIRS-CEPS-EDR-SUB", 85350000, "GCLDO",

"VCOTS", "VIIRS-COT-EDR-SUB", 85350000, "GCLDO",

"VCTHS", "VIIRS-CTH-EDR-SUB", 85350000, "GCLDO",

"VCTPS", "VIIRS-CTP-EDR-SUB", 85350000, "GCLDO",

"VCTTS", "VIIRS-CTT-EDR-SUB", 85350000, "GCLDO",

"VISTS", "VIIRS-IST-EDR-SUB", 85350000, "GMTCO",

"VLSTS", "VIIRS-LST-EDR-SUB", 85350000, "GMTCO",

"VNCCS", "VIIRS-NCC-EDR-SUB", 85350000, "GNCCO",

"VNHFS", "VIIRS-NHF-EDR-SUB", 85350000, "GNHFO",

"VOCCS", "VIIRS-OCC-EDR-SUB", 85350000, "GMTCO",

"VISAS", "VIIRS-SA-EDR-SUB", 85350000, "GMTCO",

"VSCDS", "VIIRS-SCD-BINARY-SNOW-FRAC-EDR-SUB", 85350000, "GMTCO",

"VSCMS", "VIIRS-SCD-BINARY-SNOW-MAP-EDR-SUB", 85350000, "GITCO",

"VSICS", "VIIRS-SIC-EDR-SUB", 85350000, "GMTCO",

"VSSTS", "VIIRS-SST-EDR-SUB", 85350000, "GMTCO",

"VSTPS", "VIIRS-ST-EDR-SUB", 85350000, "GMTCO",

"VSUMS", "VIIRS-SusMat-EDR-SUB", 85350000, "GMTCO",

"VIVIS", "VIIRS-VI-EDR-SUB", 85350000, "GITCO",

"INCTO", "OMPS-TC-Oz-Fst-Guess-IP", 37405000, "GOTCO",

"INPAK", "OMPS-NP-Ave-Ker-IP", 37405000, "GOTCO",

"IIROO", "CrIS-IROZ-Prof-IP", 31997000, "GCRIO",

"IIROS", "CrIS-IROZ-Prof-IP-SUB", 31997000, "GCRIO",

"IMOPO", "OMPS-NP-IP", 37405000, "GONPO",

"IVAMI", "VIIRS-Aeros-Modl-Info-IP", 85350000, "GMTCO",

"IVAOT", "VIIRS-Aeros-Opt-Thick-IP", 85350000, "GMTCO",

"IVBPX", "VIIRS-Bright-Pixel-Mod-IP", 85350000, "GMODO",

"IVCBH", "VIIRS-CB-Ht-IP", 85350000, "GMODO",

"IVCDB", "VIIRS-DualGain-Cal-IP", 85350000, "ICDBG",

"IVCLT", "VIIRS-Cd-Cov-Type-IP", 85350000, "GCLDO",

"IVCOP", "VIIRS-Cd-Opt-Prop-IP", 85350000, "GMODO",

"IVCTP", "VIIRS-Cd-Top-Parm-IP", 85350000, "GMODO",

"IVICC", "VIIRS-Cd-Layer-Type-IP", 85350000, "GITCO",

"IVIIC", "VIIRS-I-Conc-IP", 85350000, "GITCO",

"IVIIW", "VIIRS-I-Wts-IP", 85350000, "GITCO",

"IVIQF", "VIIRS-I-Qual-Flags-IP", 85350000, "GITCO",

"IVIRT", "VIIRS-I-Refl-Temp-IP", 85350000, "GITCO",

"IVISR", "VIIRS-Surf-Refl-IP", 85350000, "GITCO",

"IVIWT", "VIIRS-INWCTT-IP", 85350000, "GMODO",

"IVPCM", "VIIRS-Parx-Corr-CM-IP", 85350000, "GMODO",

"IVPCP", "VIIRS-Parx-Corr-Cd-Opt-Prop-IP", 85350000, "GMODO",

"IVPTP", "VIIRS-Parx-Corr-Cd-Top-Parm-IP", 85350000, "GMODO",

"IVSIC", "VIIRS-GridIP-VIIRS-Snow-Ice-Cover-Mod-Gran",85350000, "GITCO",

"IVSTP", "VIIRS-Surf-Temp-I", 85350000, "GITCO"

} ;

/\* NPP Geolocation Table

\* The source is NPOESS Common Data Format Control Book Volume I, pp 328-9,

\* Table A-8, Geolocation Identifiers.

\* column 1: DPID

\* column 2: Product Short Name

\* column 3: Granule Nominal Duration (miscroseconds). Granule durations

\* extracted from Raytheon's INF\_CFG.xml DDS configuration file.

\* column 4: Geolocation product ID used by this product. Is always NULL.

\* Note: any duration value larger than 2\*\*31 (~2 billion) should have a

\* ULL qualifier to avoid constant overflow.

\*

\* 1 geolocation product from JPSS Internal Data Format Control Book

\* Volume III, Appendix A added to geolocation\_table in version 1.5.1.

\*/

nppproduct\_t geolocation\_table[NPP\_Geo\_Location\_max]=

{

/\* DPID Short Name Duration GPID \*/

"GATMO", "ATMS-SDR-GEO", 31997000, NULL,

"GCRSO", "CrIS-SDR-GEO", 31997000, NULL,

"GAERO", "VIIRS-Aeros-EDR-GEO", 85350000, NULL,

"GCLDO", "VIIRS-CLD-AGG-GEO", 85350000, NULL,

"GDNBO", "VIIRS-DNB-GEO", 85350000, NULL,

"GNCCO", "VIIRS-NCC-EDR-GEO", 85350000, NULL,

"GIGTO", "VIIRS-IMG-GTM-EDR-GEO", 85350000, NULL,

"GIMGO", "VIIRS-IMG-GEO", 85350000, NULL,

"GITCO", "VIIRS-IMG-GEO-TC", 85350000, NULL,

"GMGTO", "VIIRS-MOD-GTM-EDR-GEO", 85350000, NULL,

"GMODO", "VIIRS-MOD-GEO", 85350000, NULL,

"GMTCO", "VIIRS-MOD-GEO-TC", 85350000, NULL,

"GNHFO", "VIIRS-NHF-EDR-GEO", 85350000, NULL,

"GOTCO", "OMPS-TC-GEO", 37405000, NULL,

"GOSCO", "OMPS-TC-Cal-GEO", 2700000000ULL, NULL,

"GONPO", "OMPS-NP-GEO", 37405000, NULL,

"GONCO", "OMPS-NP-Cal-GEO", 2700000000ULL, NULL,

"GCRIO", "CrIMSS-EDR-GEO-TC", 31997000, NULL,

"GATRO", "ATMS-REMAP-SDR-GEO", 31997000, NULL,

"ICDBG", "VIIRS-MOD-UNAGG-GEO", 85350000, NULL

};

# Appendix 4: NPOESS Common Terms

**Table 3.5.1-1, NPOESS Data Product Common Terms**

| **Term** | **Definition** |
| --- | --- |
| Aggregation | Dereferences (or “points”) to an HDF5 group that contains one or more datasets. These datasets are the individual RDR granules. Granules are ordered temporally. The aggregation can be accessed with the HDF5 reference object. For a detailed explanation of aggregations, see Section 3.5.12, DDS Aggregation Methodology. |
| Attribute | An attribute is a single, named parameter that has one or more values (where more than one value is applicable, the list of values is stored as an array in the NPOESS HDF5 File). |
| Granule\* | Stored purely as an array of bytes (unsigned char) referenced with a single object ID. |
| HDF5 User Block | A subset of metadata attributes stored in the NPOESS HDF5 File. The User Block can be thought of as a “header” on top of the HDF5 file stored as ASCII and is viewable without the need of the HDF5 API. |
| Metadata\* | Attributes that are attached to datasets and groups within the NPOESS HDF5 file which help identify and describe the data. All of the groups and datasets within the HDF5 file, with the exception of the All\_Data hierarchy and the Data\_Products Group, have a set of these attributes. |
| NPOESS Data Product Profile | An XML representation of Granule properties. Each Product Profile describes the contents and properties of a granule (for example, parameter names, data types, data dimensions, measurement units, which dimension is the aggregation dimension). The NPOESS Data Product Profiles are rendered as tables in the CDFCB–X. NPOESS Data Product Profiles are produced for SDRs, TDRs, EDRs, IPs, and associated geolocations. |
| NPOESS HDF5 File | An aggregation of one or more data product granules with associated metadata. The file organization is depicted with a UML diagram. The granules within a file are described by the Product Profile. The data within the granule is ordered and presented following the Style Guide. An NPOESS HDF5 file is usually one granule type, although multiple granule types are allowed (for example, measurement and geolocation granules delivered together or multiple measurements sharing the same geolocation.) Using the HDF5 API, a user can retrieve granules either singly or together. The organization within the HDF5 file can be explained by using the example of a directory tree. Within the file there is a root directory with two sub-directories, these sub-directories are named “All\_Data” and “Data\_Products”. The All\_Data directory contains all of the data that was requested, and the Data\_Products directory contains sub-directories, which help to organize the data, references to allow extraction of the data, and metadata to identify and describe the data. |
| RDR\* | Raw data received from the spacecraft and packaged into HDF5 is referred to as a Raw Data Record (RDR). The data granules composing an RDR are the actual CCSDS application packets from the sensor and don’t directly map into a set of data arrays. Granules that compose the RDR HDF5 files are aggregated application packets for a given sensor. |
| Style Guide | Section 3.5.4, Data Product Style Guide, constrains the possible choices for how data is stored within a granule: Grid, Swath, and/or Sparse Array. |
| UML Diagram (Class Diagram) | Provides a visual depiction of the NPOESS HDF5 file organization |

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