National Aeronautics and Space Administration
Goddard Space Flight Center

> Visit NASA.gov
> Contact NASA

Search | GO

ICESat-2 HDF-ES Builder

This tool helps design NASA Earth Science data products that employ standards-compliant format and content.

ICESat-2 HDF5 Earth Science Product Builder & Creator

A Preview
April 4, 2013

Jeffrey.e.lee@nasa.gov

SPACE FLIGHT CENTER

NASA Official: Thorsten Markus
Developer: SGT/Jeffrey Lee
Page Last Updated: (Dynamic)

> Privacy Policy & Important Notices
> Contact Us

ICESat2-Style HDF5 Characteristics

- HDF5 grouping.
- Science data stored as HDF5 chunked datasets with CF attributes and internal Gzip compression.
- Ancillary Data stored as HDF5 compact datasets with CF attributes.
- Embedded metadata sufficient to generate an ISO19115 representation stored in HDF5 group/ attribute structure.
- Best-effort netCDF-extended compatiblity.

The Challenge

- ICESat2 is a research-class mission with many data products (16+) and many, many parameters per product.

- Parameters may be passed from one product to another. It would be nice to make changes in one place and have that change reflected wherever appropriate.

- The ability to trace parameters through products would be very nice.

- Implementing CF attributes & ISO19115 metadata -- that's a lot of code to write!

A Solution

- A web-based product data dictionary (database) to store and maintain relationships between files/groups/attributes/parameters (mySQL/PHP : **h5es_builder**).

- A utility program to read output from the product database and create a HDF5 template (Fortran : **h5es_creator**).

Component Definitions

- Files
  - A science product implemented in HDF5
- Groups
  - HDF5 groups
- Attributes
  - HDF5 attributes
- Parameters
  - Datasets: chunked/zipped HDF5 primary datasets with attached CF attributes
  - Dimension_Scales: HDF5 dimension scales with attached CF attributes
  - Ancillary_Data: Data ancillary to the primary data (ie: NASA additional_attributes). Stored as HDF5 compact datasets with attached CF attributes.
- Blocks
  - Saved presets for commonly used structures

HDF5 Description File

- Created from h5es_builder database.
- Excel-friendly TAB-delimited text file that describes an ICESat2-style HDF5 file.
- Import/Export Capability

HDF5 Templates

- H5es_creator reads the HDF5 Description File, parses it, and creates a corresponding 'HDF5 template' file.

- A 'HDF5 template' is a valid HDF5 file with all groups, attributes and datasets created, but no (or little) data values filled-in.

- CF and other attributes <u>are</u> filled-in, meaning no code has to be written in order to implement them.

Relationships

- Files contain groups.
- File/group combinations contain parameters.
- Attributes may be attached to file/group combinations.
- All these relationships are maintained in a single table of linked ids.
- Since relationships are maintained by links, change a file/group/parameter/attribute in one place, and it is essentially updated in all places it is used.

Functions Implemented

- Full database with PHP web-based interface and relationships defined by linked lists.

- Multiple project/database support. (ie: ISO metadata is big enough to need its own database)

- Import/Export HDF Description Files (Excel).

- Create HDF Template File

- Generate IDL & Fortran example code to fill HDF Template File with random numbers.

- Provide support routines for example code and derived science algorithms.

Workflow
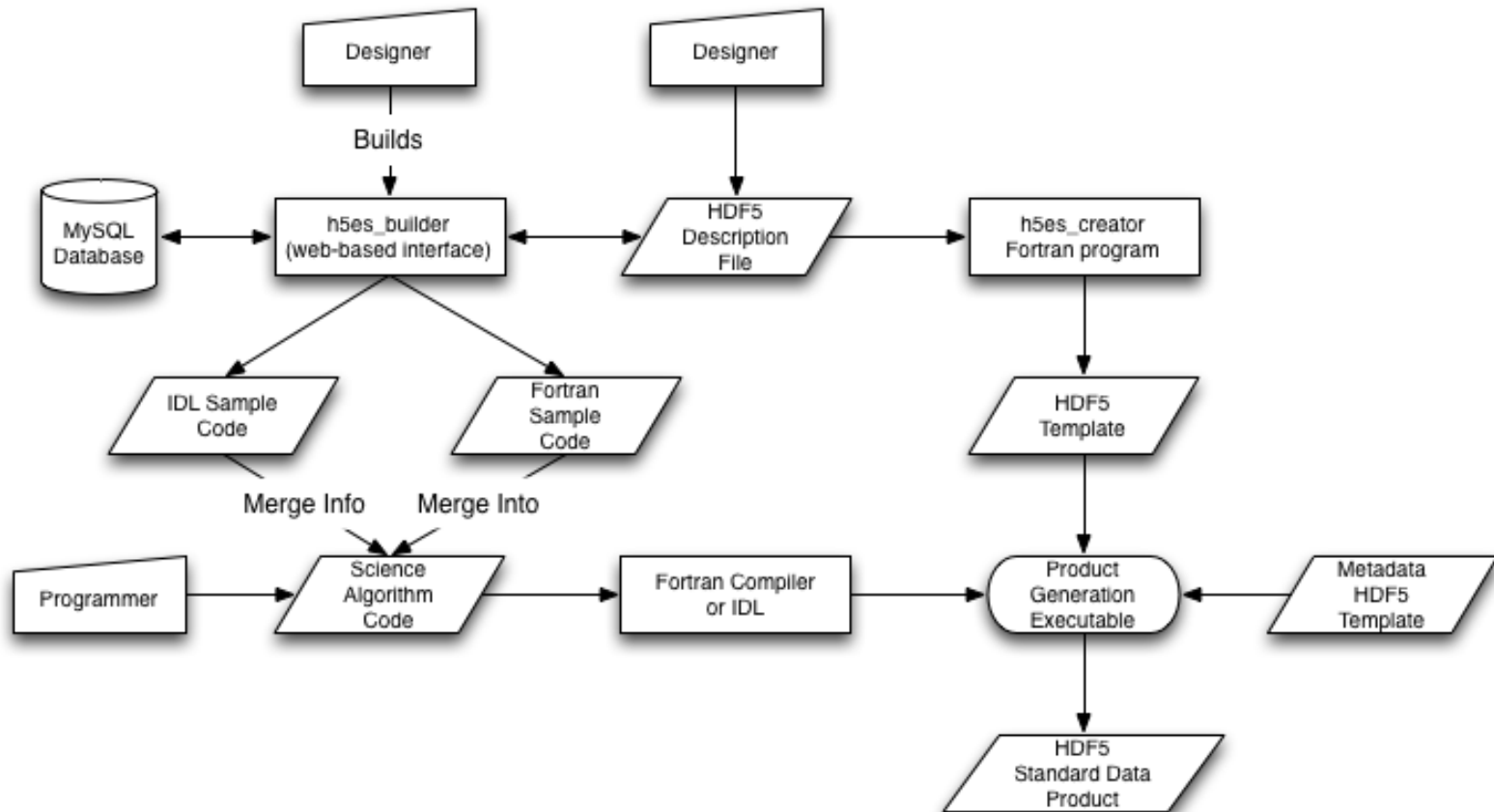
Workflow (in Text)

- Product designers work with database interface and/or HDF5 Description Files.

- Once satisfied, they generate a HDF5 Template and example code.

- A programmer takes the example code and merges it with science algorithms to create a PGE.

- The PGE "fills-in" the template with science data values to create a Standard Data Product.

- The PGE adds metadata from a metadata template (that has been created/maintained with the same process as above.)

The Benefits

- Traceability of parameters from one product to another.

- Improved consistency between data products.

- Allows for rapid, relatively inexpensive modification of data products.

- <u>Significant</u> reduction in amount of code written.
  – Will create an unfilled HDF5 template file with <u>NO</u> coding.
  – Will provide code fragments from the generated example programs that can be incorporated within science algorithms (or a data conversion program).

Hardware/Software Requirements

- Running on my MacBook Pro.
- Requires MAMP/LAMP stack (or equivalent) http://bitnami.com/stack/mamp
- Requires gfortran compiler & HDF5 library. IDL is optional.
- h5es_creator requires several library routines from ICESat-2 codebase.
- All code necessary to fill-in HDF5 template is provided.
- No security implemented (yet). Don't allow public access.

Status

- 90% Implemented.
- Designed for a very specific "flavor" of HDF5 (ICESat-2, GLAS_HDF, Mabel, SIMPL).
- Intending to develop/maintain to level necessary for use with ICESat-2.
- Would be really, really good project for someone to develop further and make non-ICESat-2 specific.
- Need to figure out interface for dimension scales.
- Need to test, test, test.

A Visual Tour...

ICESat-2 HDF-ES Builder

This tool helps design NASA Earth Science data products that employ standards-compliant format and content.

Project 'playground'

Files	Groups	Parameters	Attributes	Blocks

HDF5 Earth Science Product Builder

The HDF5 Earth Science Product builder is designed to perform as a database for files, datasets, and attributes related to [   ]ducts. ICESat-2 standard data products are designed to use an ICESat-2 flavor of HDF5 (HDF-ES), which includes such features

The Main Menu

- Science data stored as simple HDF5 datasets.
- HDF5 chunking and gzip compression.
- HDF5 grouping.
- Metadata and descriptive information stored as HDF5 attributes.
- Ancillary Data stored as HDF5 compact datasets.
- Embedded Metadata sufficient to generate an ISO19115 representation.
- Attached Metadata compliant with CF conventions.
- Best-effort netCDF-extended compatiblity.

Files contain Groups. **Groups** contain Parameters and Attributes. **Parameters** can be datasets, ancillary_data, or dimension_scales. **datasets** contain primary science data values and include attached CF attributes. **dimension_scales** are datasets that identify the dimension(s) of other datasets and included for NetCDF compatibility. **ancillary_data** are stored as a compact HDF5 dataset with CF attributes and contain relatively small amounts (less than 64K) of ancillary data. **Attributes** are HDF5 attributes attached to combinations of files/groups that provide labelling or additional information. **Blocks** are sets of predefined groups/parameters/attributes that can be attached in bulk to a file.

All relationships between files/parameters/attributes are defined by dynamic links. This means, for example, that when the description of a parameter is changed in one place, those changes are reflected in all other places that parameter is referenced. When displaying/editing an item, a list of all references to that item is displayed on the page. This provides traceability for the item in order to help prevent unwanted changes rippling throughout.

Output from this tool is provided in tab-delimited text format suitable for a spreadsheet. This spreadsheet is considered an **HDF5-ES description file** and can be parsed by an associated tool (**h5es_creator**) to generate an HDF5 template file.

An **HDF5 template** is a valid HDF5 file that contains the structural elements defined for the target file type. Science algorithm software can then fill in the data values required within the HDF5 template to create a full-blown data product.

This tool also writes example Fortran or IDL code to write/read the information within the a HDF5 template. Developers can embed pieces of the example code within their science algorithms.

Export

Create HDF5 template for [ATL06 ⇕] [Create HDF5]

Export file [ATL06 ⇕] as tab-delimited text. [Export Excel] | Open **help page** for Excel file.

Generate example Fortran code for [ATL06 ⇕] [Generate Fortran] | Download the required **[Fortran Module]** (V0.0 Last Updated : 2013-03-13)

Generate example IDL code for [ATL01 ⇕] [Generate IDL] | Download the required **[IDL Library]** (V0.0 Last Updated : 2013-03-20)

Generate a full data dictionary with cross-references.

[Export a full backup] of the database.

Import

Import a HDF-ES definition file. It is recommended that you use h5es_creator to create a HDF5 template with the   the database. h5es_creator will provide a significant level of validation for the definitions file. When importing a definition file that corresponds to a   ll links to the existing file are deleted and re-created based on information in the definition file. Any item with an ID number in the first column is updated. Any   number is inserted as a new item. For safety, make a backup of the database before replacing existing information.

[Choose File] no file selected   [Import]
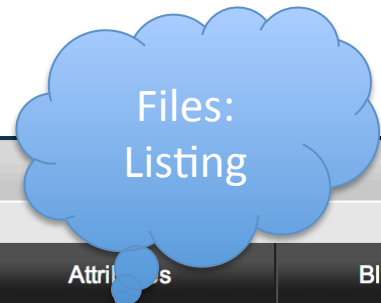
NASA Official: Thorsten Markus
Developer: SGT/Jeffrey Lee
Page Last Updated: (Dynamic)

› Privacy Policy & Important Notices
› Contact Us

NASA
Goddard SPACE FLIGHT CENTER

Main Menu:
Export Options

Import
Options

Project 'playground'

Files: Listing

File List

This page contains a list of HDF5 files available for editing.

Edit will allow you to change the name and other descriptive information relating to the file. **Delete** will delete that file and any links to groups/attributes/parameters attached to that file. Associated groups/attributes/parameters are **not** deleted from the database. Only the links between the deleted file and groups/attributes/parameters are deleted. **Copy** will create a new file that contains the same information as the file being copied. This is not a recursive copy. None of the groups/parameters/attributes linked to the file are copied. **New File** will create a new file. While it is possible to create a new file with the same name as an existing file, it is not recommended.

Search

Search for files with names or descriptions containing : [   ] [Search]

List of Available Files

Name	Shortname	Title	Level	Description	Action
ATL01	ATL01	Reformatted Telemetry	1A	Decommutated and formatted to HDF5 time ordered telemetry	**Edit** | **Delete** | **Copy**
ATL06	ATL06	Antarctica Ice Sheet Elevation / Greenland Ice Sheet Elevation	3A	Surface elevations for each beam, along and across-track slopes calculated for beam pairs. All parameters are calculated for the same along-track increments for each beam and repeat.	**Edit** | **Delete** | **Copy**

Project 'playground'

| Main Menu | Files | Groups | Parameters | Attributes | Blocks | Copy | Delete |

File Edit

This page displays the content of the selected file. **Save Changes** will save any changes made to the file information.
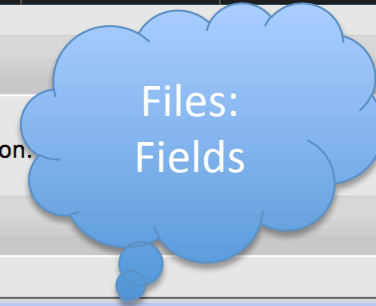
File Form

Name	Short Name	Level	Title
ATL06	ATL06	3A	Antarctica Ice Sheet Elevation / Greenland Ice Sheet Elevation

Description
Surface elevations for each beam, along and across-track slopes calculated for beam pairs. All parameters are calculated for the same along-track increments for each beam and repeat.

Name should contain the project-specific identifier for the file. (eg: ATL01). **Short name** should contain the NASA-style shortname that identifies the file type. This may or may no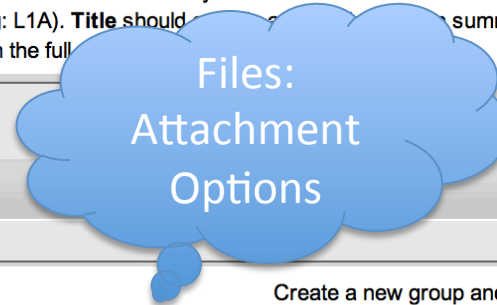t be the same as the Name. (eg: ATL01). **Level** should contain the ECS level designation of the file. (eg: L1A). **Title** should summarizing the content and/or purpose of the file. (eg: Parsed, partially reformatted, time ordered telemetry.). **Description** should contain the full

[Save Changes]

Actions

Attach group(s) named like [_____] to this file. [Attach Group(s)]   Create a new group and attach it to this file. [New Group]

Attach [parameter ↕] named like [_____] to group [/ ↕] on this file. [Attach Item(s)]

Create a new parameter and attach to group [/ ↕] on this file. [New Parameter]

Create a new attribute and attach to group [/ ↕] on this file. [New Attribute]

Copy the content of block [↕] to this file. [Attach Block]

Files: Fields

Files: Attachment Options

Content

▶ Disclosure triangles under group names within the Item column hide/show any attached attributes.

Item	Name	Datatype	Max Dims	Description / Default Value	
Group ▶	/			The root group. (Base group of each file. This group should never be deleted. A root group is automatically inserted into every file created.)	
Group ▶	/combined_photon_correction			Contains parameters relating to the combined photon correction.	
DATASET	tot_corr	DOUBLE	unlimited x 6	total correction to the mean elevation	☐
DATASET	tot_corr_sigma	DOUBLE	unlimited x 6	Estimated error in tot_corr	☐
DATASET	tot_le_corr	DOUBLE	unlimited x 6	total correction to the leading-edge elevation	☐
DATASET	tot_le_corr_sigma	DOUBLE	unlimited x 6	Estimated error in tot_LE_corr	☐
DATASET	tot_md_corr	DOUBLE	unlimited x 6	total correction to the median elevation	☐
DATASET	tot_md_corr_sigma	DOUBLE	unlimited x 6	Estimated error in tot_md_corr	☐
Group ▶	/dem			Digitial elevation model parameters	☐
DATASET	dem_elev	DOUBLE	unlimited x 6	Digital Elevation Model Value at the location	☐
DATASET	dem_src	INTEGER	unlimited x 6	Flag to specify who the source provider was for the high resolution DEM	☐
DATASET	gd_ht	DOUBLE	unlimited x 6	The height of the geoid above the ellipsoid	☐
Group ▶	/first_photon_bias			Contains parameters related to first photon bias.	☐
DATASET	ppb_corr	DOUBLE	unlimited x 6	Estimated first-photon bias correction to mean segment elevation	☐
DATASET	ppb_corr_sigma	DOUBLE	unlimited x 6	Estimated error in ppb_corr	☐
DATASET	ppb_le_corr	DOUBLE	unlimited x 6	Estimated first-photon bias correction to leading-edge segment elevation	☐
DATASET	ppb_le_corr_sigma	DOUBLE	unlimited x 6	Estimated error in ppb_LE_corr	☐
DATASET	ppb_md_corr	DOUBLE	unlimited x 6	Estimated first-photon bias correction to median segment elevation	☐
DATASET	ppb_md_corr_sigma	DOUBLE	unlimited x 6	Estimated error in ppb_md_corr	☐
Group ▶	/fit_parameters			Contains parameters related to fit.	☐
DATASET	dz_fit_dx	INTEGER	unlimited x 6	along-track slope from along-track segment fit	☐
DATASET	dz_fit_dy	DOUBLE	unlimited x 6	Across track slope from segment fits means to weak and strong beam, same slope is report for both laser beams in a pair	☐
DATASET	elevation_fit_quality_flag	INTEGER	unlimited x 6	Flag describing the success/failure of the along-track fit. 0=success; 1=failure of the along-track fit.	☐
DATASET	n_fit_photons	INTEGER	unlimited x 6	Number of photons used in determining z_fit.	☐
DATASET	refl_pw_est	DOUBLE	unlimited x 6	Reflected Pulse width estimate	☐
DATASET	sigma_z_fit	DOUBLE	unlimited x 6	Propagated error due to photon-elevation sampling error	☐
DATASET	z_expected_rms	DOUBLE	unlimited x 6	Expected RMS misfit between photon elevations and along-track segment fit	☐

Project 'playground'

Group List

This page contains a list of groups available for inclusion within a HDF5 file.

Edit will allow you to change the name and/or description of the group. These changes will be reflected in all products containing that group. **Delete** will delete all occurrences of that group, attributes/parameters contained within that group from all files. The root group (/) should **NEVER** be deleted. **Copy** will create a new group that contains the same information as the group, recursive copy. None of the parameters/attributes attached to the group are copied. **New Group** creates a new group. While it is possible to create a new group with the same name, recommended due to potential confusion when attaching groups to files.

All groups should be full group paths, starting with the slash (/) character.

Search

Search for groups with names or descriptions containing : [_____] [Search]

List of Available Groups

Name	Description	Action
/	The root group. (Base group of each file. This group should never be deleted. A root group is automatically inserted into every file created.)	Edit | Delete | Copy
/combined_photon_correction	Contains parameters relating to the combined photon correction.	Edit | Delete | Copy
/dem	Digitial elevation model parameters	Edit | Delete | Copy
/first_photon_bias	Contains parameters related to first photon bias.	Edit | Delete | Copy
/fit_parameters	Contains parameters related to fit.	Edit | Delete | Copy
/forward_scattering	Contains parameters related to forward scattering.	Edit | Delete | Copy
/geolocation	Contains parameters related to geolocation.	Edit | Delete | Copy
/geolocation	Contains parameters related to geolocation.	Edit | Delete | Copy
/LRSfstmHK	Contains parameters relating to the Failsafe Housekeeping Packet. The (Failsafe mode) Housekeeping Packet provides all LRS health and safety data during Failsafe Mode. It is reported and normally stored at a 1 Hz rate.	Edit | Delete | Copy
/LRSfstmRTDP	Contains parameters relating to the Failsafe Real Time Memory Dump Packet. The (Failsafe mode) Real Time Memory Dump Packet provides the contents of an LRS memory block (formatted and tagged for the real time telemetry stream) during Failsafe Mode. It is reported when commanded by a Failsafe Dump Memory Command, at which time it will be bursted at 50 Hz and buffered in the MEB.	Edit | Delete | Copy
/LRSfstmSSRDP	Contains parameters relating to the Failsafe SSR Memory Dump Packet. The (Failsafe mode) Solid State Recorder (SSR) Memory Dump Packet provides the contents of an LRS memory block (formatted and tagged for the stored telemetry stream) during Failsafe Mode. It is reported when commanded by a Failsafe Dump Memory Command (LRSfscmDPMEM), at which time it will be bursted at 50 Hz and forwarded by the MEB to the SSR.	Edit | Delete | Copy
/LRStmCONFIG	The (Application Mode) Configuration Data Packet contains data about the LRS internal	Edit | Delete | Copy

Groups :
List

Project 'playground'

Parameter List

This page contains a list of HDF5 parameters available for editing.

Edit will allow you to change the name and other descriptive information relating to the parameter. **Delete** will delete the parameter and any links to files/groups/... files/groups/attributes are **not** deleted from the database. Only the links to the deleted parameter are removed. **Copy** will create a new parameter that contain... is not a recursive copy. None of the attributes attached to the parameter are copied. **New Parameter** will create a new parameter. While it is possible to crea... parameter, it is not recommended.

Parameters: List

Search

Search for parameters with names or descriptions containing : [_____] [Search]

List of Available Parameters

Name	Parameter Type	Data Type	Dims	Long Name	Units	Description	Action
address_of_command_buffer	DATASET	INTEGER	unlimited	Address of Command Buffer	counts	Address of Command Buffer - The 32-bit value is a copy of the LRS FPGA register contents. It is included to provide diagnostic information for debugging and maintenence activities, and are fully defined in ICESat-2 ATLAS LRS FPGA Specification.	Edit | Delete | Copy
address_of_housekeeping_data_storage	DATASET	INTEGER	unlimited	Address of Housekeeping Data Storage	counts	Address of Housekeeping Data Storage - The 32-bit value is a copy of the LRS FPGA register contents. It is included to provide diagnostic information for debugging and maintenence activities, and are fully defined in ICESat-2 ATLAS LRS FPGA Specification.	Edit | Delete | Copy
address_of_laser_dark_calibration_section	DATASET	INTEGER	unlimited	Address of Laser Dark Calibration Section	counts	Address of Laser Dark Calibration Section - The 32-bit value is a copy of the LRS FPGA register contents. It is included to provide diagnostic information for debugging and maintenence activities, and are fully defined in ICESat-2 ATLAS LRS FPGA Specification.	Edit | Delete | Copy
address_of_laser_side_dsp_storage	DATASET	INTEGER	unlimited	Address of Laser Side DSP Storage	counts	Address of Laser Side DSP Storage - The 32-bit value is a copy of the LRS FPGA register contents. It is included to provide diagnostic information for debugging and maintenence activities, and are fully defined in ICESat-2 ATLAS	Edit | Delete | Copy

Parameter Form

Name	Parameter Type	Data type	Unsigned	Byte Order	String Len
tot_corr	DATASET	DOUBLE	☐	NATIVE	0

Name should contain a unique identifier that corresponds with project naming conventions. (eg: delta_time). **Datatype/Unsigned** and **Byte Order** describe the file storage of the parameter. **String Len** is only require... **Datatype** is string.

Rank	Max Dimensions	Storage Layout	Chunk Size	Gzip and Leve...
2	unlimited x 6	CHUNKED	10000 x 6	☑ 6

Rank identifies the number of dimensions for the parameter. **Max Dimensions** defines the maximum size of the dimensions. Separate dimension sizes with 'x'. Use 'unlimited' to specify an unknown size. (example: 'unlimited x 10'). The number of sizes specified in **Max Dimensions** must correspond to the number identified in **Rank**. **Storage Layout** determines if the parameter will be chunked or contiguous. Since gzip requires chunked data, 'CHUNKED' is recommended. **Chunk size** defines the chunk size of the chunked data. It must be specified in the same manner as **Max Dimensions**. (Example: '10000 x 10'). Storage Layout, Chunk Size and Gzip are irrelevant if the Parameter type is ANCILLARY.

Long Name (CF)	Standard Name (CF)	Units (CF)	Hertz	Source (CF)	Coordinates (CF)
tot_corr		meters			

Long Name (CF) should contain the descriptive name of the parameter (suitable for plot labels). **Standard Name (CF)** should identify an equivalent parameter as described in the CF standard_name table. **Units (CF)** Units should identify the units of the parameter with a UDUNITs-compliant label. **Hertz** should identify the data rate of the parameter. **Source (CF)** should identify the originating source of the parameter (Examples: ATLAS telemetry, L1A processing, etc), **Coordinates (CF)** identifies auxiliary coordinate variables, label variables, and alternate coordinate variables. All fields are optional. The CF Standard Names table is here: http://cf-pcmdi.llnl.gov/documents/cf-standard-names

Minimum Value (CF)	Maximum Value (CF)	Fill Value (CF)

Minimum Value (CF) should contain the the minimum valid value for the datatype. **Maximum Value (CF)** should contain the maximum valid value for the datatype. **Fill Value (CF)** should contain the value that indicates the parameter is not valid. All values should be respective to the parameter **Datatype** and **Datasize**. All fields are optional.

Flag Meanings (CF)	Flag Values (CF)	Flag Masks (CF)

These fields are optional and only applicable to flag parameters. Three different combinations of **flag_values/flag_meanings/flag_masks** can be used to describe a flag in different ways. In general, the **flag_values** attribute is the same type as the variable to which it is attached, and contains a comma-separated list of the possible flag values. The **flag_meanings** attribute is a string whose value is a blank-separated list of descriptive words or phrases, one for each flag value. The **flag_masks** attribute is the same type as the variable to which it is attached, and contains a list of values matching unique bit fields. A flagged condition is identified by performing a bitwise AND of the variable value and each flag_masks value; a non-zero result indicates a true condition. For more information, see http://cf-pcmdi.llnl.gov/documents/cf-conventions/1.6/cf-conventions.html#flags.

Description (CF)
total correction to the mean elevation

Description should contain the full description of the data and/or its content.

[Save Changes]

Parameters: Fields

Project 'atlas'

Main Menu	Files	Groups	Parameters	Blocks	New Attribute

Attribute List

This page contains a list of HDF5 attributes available for editing.

Edit will allow you to change the name and other information relating to the attribute. **Delete** will delete the attribute and any links to files/groups attached to that attri[...]ed from the database. Only the links to the deleted attribute are removed. **Copy** will create a new attribute that contains the same information as the attribute being copied [...]ile it is possible to create a new attribute with the same name as an existing attribute, it is not recommended.

Search

Search for attributes with names or default values containing : [_____] [Search]

List of Available Attributes

Name	Datatype	Dims	Default Values	Action
contributor_name	STRING	1		Edit | Delete | Copy
contributor_role	STRING	1		Edit | Delete | Copy
creator_email	STRING	1		Edit | Delete | Copy
featuretype	STRING	1	timeSeries	Edit | Delete | Copy
granuletimeduration	INTEGER	1	60	Edit | Delete | Copy
license	STRING	1		Edit | Delete | Copy
references	STRING	1		Edit | Delete | Copy
sciencemimetype	STRING	1	application/x-hdfeos	Edit | Delete | Copy
summary	STRING	1		Edit | Delete | Copy
title	STRING	1		Edit | Delete | Copy

Attributes: List

Disclosure triangles under group names within the Item column hide/show any attached attributes.

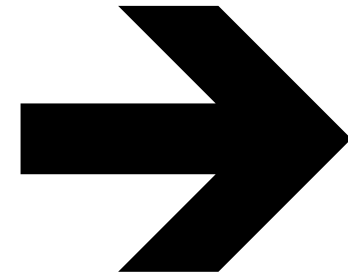| Item	Name	Datatype	Max Dims	Description / Default Value	
Group ▶	**/** The root group. (Base group of each file. This group should never be deleted. A root group is automatically inserted into every file created.)				
Group ▼	**/METADATA**				
Group ▼	**/METADATA/COLLECTIONMETADATA**				
Attribute	**AccessConstraints**	STRING	1	Data may not be reproduced or distributed without including the CitationForExternalPublication for this product included in this Metadata. Data may not be distributed in an altered form without the written permission of the ICESat-2 Science Project Office at NASA/GSFC.	☐
Attribute	**BrowseMimeType**	STRING	1	application/x-hdfeos	☐
Attribute	**CitationforExternalPublicati on**	STRING	1	The data used in this study were produced by the ICESat-2 Science Project Office at NASA/GSFC. The data archive site is TBD.	☐
Attribute	**CollectionDescription**	STRING	1	Data granules consist of approximately 1 minute of HDF5 data and include decommutated raw MABEL data in engineering units reformatted into HDF5. Some parameters are converted for data handling and ordering.	☐
Attribute	**CollectionState**	STRING	1	In Work	☐
Attribute	**DataFileFormat**	STRING	1	HDF5	☐
Attribute	**DLLName**	STRING	1	libDsESDTSyBASIC.001Sh.so	☐
Attribute	**GranuleTimeDuration**	FLOAT	1	not_set	☐
Attribute	**LongName**	STRING	1	not_set	☐
Attribute	**MaintenanceandUpdateFreq uency**	STRING	1	Daily	☐
Attribute	**ScienceMimeType**	STRING	1	application/x-hdfeos	☐
Attribute	**ShortName**	STRING	1	not_set	☐
Attribute	**SpatialKeyword**	STRING	1	Global	☐
Attribute	**SpatialSearchType**	STRING	1	NotSupported	☐
Attribute	**TemporalKeyword**	STRING	1	Day	☐
Attribute	**VersionID**	STRING	1	not_set	☐
Group ▼	**/METADATA/COLLECTIONMETADATA/AdditionalAttributes**				☐
Attribute	**Flightline**	STRING	1	AdditionalAttributesContainer	☐
Attribute	**identifier_file_uuid**	STRING	1	AdditionalAttributesContainer	☐
Attribute	**identifier_product_doi**	STRING	1	AdditionalAttributesContainer	☐
Attribute	**identifier_product_doi_auth ority**	STRING	1	AdditionalAttributesContainer	☐
Group ▶	**/METADATA/COLLECTIONMETADATA/AdditionalAttributes/Flightline**				☐

Attributes: Attached to a Group

Does It Work?

- Well, so far so good.

Product Database Definition

| Item	Name	Datatype	Max Dims	Description	
Attribute	contributor_name	STRING	1	Name of the person who collected the data.	☐
Attribute	contributor_role	STRING	1	The role of the individual or institution that contributed to the creation of this data. Ensure that the listed roles are comma separated and in the same order as listed in the contributor_name attribute.	☐
Attribute	creator_email	STRING	1	Email address of the person or institution that collected the data.	☐
Attribute	featuretype	STRING	1	Categorization based on fundamental relationships among the spatiotemporal coordinates.	☐
Attribute	license	STRING	1	Describe the restrictions to data access and distribution.	☐
Attribute	references	STRING	1	Published or web-based references that describe the data or methods used to produce it.	☐
Attribute	summary	STRING	1	One paragraph describing the data set.	☐
Attribute	title	STRING	1	One sentence about the data contained within the file.	☐
Group	/combined_photon_correction		Contains parameters relating to the combined photon correction.		☐
Dataset	tot_corr	DOUBLE	unlimited x 6	total correction to the mean elevation	☐
Dataset	tot_corr_sigma	DOUBLE	unlimited x 6	Estimated error in tot_corr	☐
Dataset	tot_le_corr	DOUBLE	unlimited x 6	total correction to the leading-edge elevation	☐
Dataset	tot_le_corr_sigma	DOUBLE	unlimited x 6	Estimated error in tot_LE_corr	☐
Dataset	tot_md_corr	DOUBLE	unlimited x 6	total correction to the median elevation	☐
Dataset	tot_md_corr_sigma	DOUBLE	unlimited x 6	Estimated error in tot_md_corr	☐
Group	/dem		Digitial elevation model parameters		☐
Dataset	dem_elev	DOUBLE	unlimited x 6	Digital Elevation Model Value at the location	☐
Dataset	dem_src	INTEGER	unlimited x 6	Flag to specify who the source provider was for the high resolution DEM	☐
Dataset	gd_ht	DOUBLE	unlimited x 6	The height of the geoid above the ellipsoid	☐
Group	/first_photon_bias		Contains parameters related to first photon bias.		☐
Dataset	ppb_corr	DOUBLE	unlimited x 6	Estimated first-photon bias correction to mean segment elevation	☐
Dataset	ppb_corr_sigma	DOUBLE	unlimited x 6	Estimated error in ppb_corr	☐
Dataset	ppb_le_corr	DOUBLE	unlimited x 6	Estimated first-photon bias correction to leading-edge segment elevation	☐
Dataset	ppb_le_corr_sigma	DOUBLE	unlimited x 6	Estimated error in ppb_LE_corr	☐
Dataset	ppb_md_corr	DOUBLE	unlimited x 6	Estimated first-photon bias correction to median segment elevation	☐
Dataset	ppb_md_corr_sigma	DOUBLE	unlimited x 6	Estimated error in ppb_md_corr	☐
Group	/fit_parameters		Contains parameters related to fit.		☐
Dataset	dz_fit_dx	INTEGER	unlimited x 6	along-track slope from along-track segment fit	☐
Dataset	dz_fit_dy	DOUBLE	unlimited x 6	Across track slope from segment fits means to weak and strong beam, same slope is report for both laser beams in a pair	☐
Dataset	elevation_fit_quality_flag	INTEGER	unlimited x 6	Flag describing the success/failure of the along-track fit. 0=success; 1=failure of the along-track fit.	☐
Dataset	n_fit_photons	INTEGER	unlimited x 6	Number of photons used in determining z_fit	☐
Dataset	refl_pw_est	DOUBLE	unlimited x 6	Reflected Pulse width estimate	☐
Dataset	sigma_z_fit	DOUBLE	unlimited x 6	Propagated error due to photon-elevation sampling error	☐
Dataset	z_expected_rms	DOUBLE	unlimited x 6	Expected RMS misfit between photon elevations and along-track segment fit	☐
Dataset	z_fit	DOUBLE	unlimited x 6	Mean elevation from along-track segment fit	☐
Dataset	z_fit_rms	DOUBLE	unlimited x 6	RMS misfit between photon elevations and along-track segment fit	☐
Dataset	z_fit_sigma	DOUBLE	unlimited x 6	Propagated error due to photon-elevation sampling error	☐
Dataset	z_robust_spread	DOUBLE	unlimited x 6	Spread of residuals, estimated from the 14th and 84th percentiles of the residuals	☐
Group	/forward_scattering		Contains parameters related to forward scattering.		☐
Dataset	fs_corr	DOUBLE	unlimited x 6	Forward scattering correction to the mean elevation	☐

Export TAB-delimited Text

(Excel is optional)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
2	Name	ATL06														
3	Short Name	ATL06														
4	Level	3A														
5	Title	Antarctica Ice Sheet Elevation / Greenland Ice Sheet Elevation														
6	Description	Surface elevations for each beam, along and across-track slopes calculated for beam pairs. All parameters are calculated for the same along-track increments for each beam and repeat.														
7																
8	Type	Name	Data Type	String Len	Rank	Max Dims	Layout	Chunk Size	Gzip	Level	Long Name	Standard Na	Units	Hertz	Source	Coordinates	Min
9	Attribute	contributor_	STRING			1										
10	Attribute	contributor_	STRING			1										
11	Attribute	creator_ema	STRING			1										
12	Attribute	featuretype	STRING			1										
13	Attribute	license	STRING			1										
14	Attribute	references	STRING			1										
15	Attribute	summary	STRING			1										
16	Attribute	title	STRING			1										
17																
18	Group	/combined_photon_correction														
19	Dataset	tot_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	tot_corr		meters			
20	Dataset	tot_corr_sig	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	tot_corr_sigma		meters			
21	Dataset	tot_le_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	tot_le_corr		meters			
22	Dataset	tot_le_corr_	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	tot_le_corr_sigma		meters			
23	Dataset	tot_md_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	tot_md_corr		meters			
24	Dataset	tot_md_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	tot_md_corr_sigma		meters			
25																
26	Group	/dem														
27	Dataset	dem_elev	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	DEM Elevation		meters			
28	Dataset	dem_src	INTEGER	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	DEM Source Flag		unitless			
29	Dataset	gd_ht	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Geoid Height		meters			
30																
31	Group	/first_photon_bias														
32	Dataset	ppb_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	ppb_corr		meters			
33	Dataset	ppb_corr_sig	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	ppb_corr_sigma		meters			
34	Dataset	ppb_le_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	ppb_le_corr		meters			
35	Dataset	ppb_le_corr_	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	ppb_LE_corr_sigma		meters			
36	Dataset	ppb_md_cor	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	ppb_md_corr		meters			
37	Dataset	ppb_md_cor	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	ppb_md_corr_sigma		meters			
38																
39	Group	/fit_parameters														
40	Dataset	dz_fit_dx	INTEGER	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	dz_fit_dx		meters			
41	Dataset	dz_fit_dy	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	dz_fit_dy		meters			
42	Dataset	elevation_fit	INTEGER	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Elevation Fit Quality Flag					
43	Dataset	n_fit_photon	INTEGER	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Number of Photons in Fit					
44	Dataset	refl_pw_est	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Reflected Pulse width estir		meters			
45	Dataset	sigma_z_fit	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Sigma_z_fit		meters			
46	Dataset	z_expected_	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	z_expected_RMS		meters			
47	Dataset	z_fit	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Z Fit		meters			
48	Dataset	z_fit_rms	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	z_fit_rms		meters			
49	Dataset	z_fit_sigma	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	z_fit_sigma		meters			
50	Dataset	z_robust_spr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	z_robust_spread					
51																
52	Group	/forward_scattering														
53	Dataset	fs_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	fs_corr		meters			
54	Dataset	fs_corr_sigm	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Forward Scattering Correc		meters			
55	Dataset	fs_le_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	fs_le_corr		meters			
56	Dataset	fs_le_corr_si	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	fs_le_corr_sigma		meters			
57	Dataset	fs_md_corr	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	gs_md_corr		meters			
58	Dataset	fs_md_corr_	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	fs_md_corr_sigma		meters			
59																
60	Group	/geolocation														
61	Dataset	cycle	INTEGER	0		1	unlimited	CHUNKED	10000	1	6	Cycle Number					
62	Dataset	delta_time	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	GPS elapsed time		seconds		telemetry	
63	Dataset	latitude	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Latitude	latitude	degrees_north		ATL04	
64	Dataset	longitude	DOUBLE	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Longitude	longitude	degrees_east		ATL04	
65	Dataset	m	INTEGER	0		2	unlimited x 6	CHUNKED	10000 x 6	1	6	Reference Point					
66	Dataset	orbit_number	INTEGER	0		1	unlimited	CHUNKED	10000	1	6	Orbit Number					
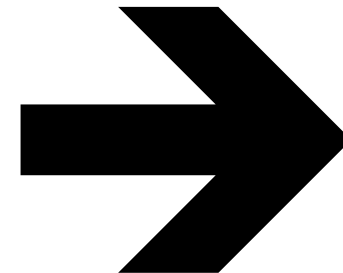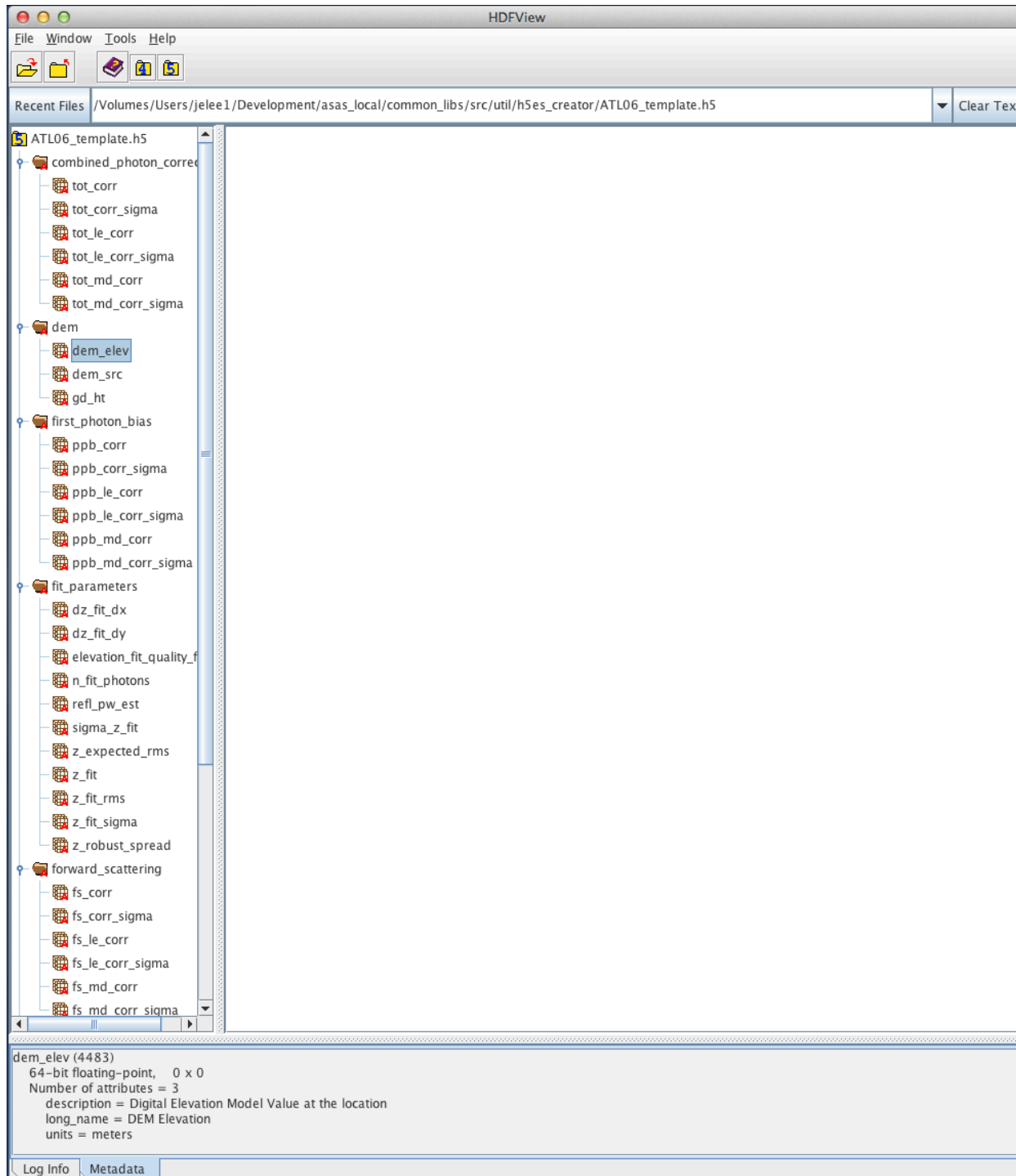
Create HDF5 Template
And open in H5View

Lines of Code Written=0