ICESAT-2 STANDARD DATA PRODUCTS

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ABSTRACT: The ICESat-2 SIPS (Science Investigator-led Processing System) software development team is designing and implementing ICESat-2 standard data products. A key goal is to design and create data products that will be standards-compliant and interoperable with other past, present and future Earth Science missions.

Research-Class NASA Decadal Survey Mission.

ICESat follow-on; but uses different measurement technique.

Launches in July 2017.

Products delivered to National Snow and Ice Data Center (NSIDC).

Science Objectives:
- Determine polar ice sheet mass balance; understand controlling mechanisms; examine how ice sheets will impact global sea level and ocean circulation in a changing climate.
- Use sea-ice thickness to understand ice-ocean/air exchanges of energy, mass and moisture.

Mission Characteristics:
- Advanced Topographic Laser Altimeter System (ATLAS)- New Micro Pulse Altimeter, High PRF, low pulse energy, Multi-beam photon counting system.
- Repeat ICESat ground-track.
- Orbit: 495 km, 94° inclination, 91-day repeat.
- 10,000 shots/sec; 6 beams, ~3 photons/shot/beam.

HDF5 Earth Science (H5-ES)
- Implements the ICESat-2 “flavor” of HDF5.
- Evolved via GLAS_HDF, MABEL & SIMPL.
- Is fairly consistent with Aura & SMAP.
- Is the ICESat-2 product development tool.
- PHP Web interface, MySQL back-end.
- Import/export & code generation.
- Template-based approach.
- Includes a Fortran 2003 HSLT-like API.

Data Characteristics
- 80 GB L0 data daily.
- 1 TB of L1A-L3B daily.
- 3.5 PB over 3 years.
- Every photon geolocated to a precise lat/lon/hgt.
- Sparse multi-rate data.
- Sparse along-track products.
- Gridded discipline-specific products.
- Land Ice, Sea Ice, Ocean, Land, Atmosphere
- Over 3,200 science parameters (and counting…)

Product Characteristics
- Science data stored as simple HDF5 datasets.
- HDF5 chunking and internal gzip compression.
- HDF5 grouping.
- Ancillary data stored as ‘compact’ HDF5 datasets.
- Embedded structured metadata (HDF5 Groups)
- Extracted ISO19115 metadata. (ISO19139 XML)
- CF/ACDD global metadata. (HDF5 Attributes)
- CF/ACDD parameter metadata. (HDF5 Attributes)
- Best-effort NetCDF compatibility.

20 Standard Data Products (L1A->L3B)
Produced by the ICESat-2 Science Investigator-led Processing System (SIPS) at GSFC

Metadata/Browse/QA Strategy
- “Granules are Forever” – Ted H.
- Metadata, QA and Browse embedded in standard data product.
- Utility software extracts metadata and reformats to ISO19139.
- Utility software extracts QA and feeds into a trend database.
- Utility software creates a data dictionary from product content.

Example Data Dictionary

Tool Developers...

Is there value in storing the structured metadata, QA, and browse on the products in a “standard” manner?

ESIP Summer 2014

CF Support:
- name, long_name, standard_name, units, source, coordinates, valid_min, valid_max, _FillValue
- flag_meanings, flag_masks, flag_values
- NetCDF Support:
  - dimension_scales

This process eliminates the need to write the code that defines the product structure and a significant amount of the metadata. By manually editing the H5-ES template, you can fix a description or misspelling without editing any code at all.