

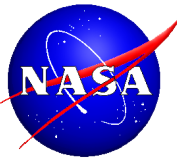
ESDIS Data Product Standards



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ESDIS Project, NASA GSFC Code 423**



Standards Requirements



■ NASA Earth Science Satellite Mission Data Systems Level 1 Requirements

4.5.1.1 SCIENCE DATA REQUIREMENTS

a) <<project/instrument name(s)>> science data product formats shall conform to the <<standard selected from the [published list](#) of ESD-approved Data System Standards>>.

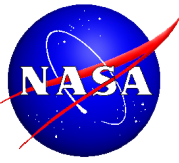
b) The <<mission/instrument name(s)>> science data products metadata shall conform to ISO 19115 Geographic Information - Metadata standards and adhere to the *Metadata Requirements – Base Reference for NASA Earth Science Data Products* document published at <http://earthdata.nasa.gov/about-eosdis/requirements>, and the <<project name>> shall baseline to a specific initial version before launch.

- <http://science.nasa.gov/earth-science/earth-science-data/satellite-mission-data-system-requirements/>

■ ROSES 2013 Appendix A.29, Section 2.2.1

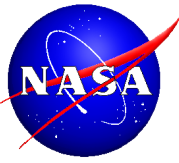
- Ensure that standard products conform to a NASA Earth Science Division (ESD)-approved standard format and include metadata conforming to ESD-approved standards.

Data Format Standards



- The list of approved standards and information about them can be found on the EOSDIS web site
 - <http://earthdata.nasa.gov/data/standards-and-references/data-format-standards>
 - HDF5, HDF-EOS 5, and netCDF4 are recommended
 - HDF4 and HDF-EOS 2 are deprecated
 - <https://www.hdfgroup.org/h5h4-diff.html>
 - GeoTIFF is not an official ESDS standard but is going through the standards process and is approved for use
- Why were these standards chosen?
 - They facilitate data interoperability and exchange
 - Self-describing, machine independent file formats
 - Large number existing, robust tools
 - OPeNDAP, GRADS, Panoply, IDV, Ferret, HDFView, NCL, NCO and many others
 - Supported by multiple languages
 - Matlab, IDL, C, Fortran, Python, Perl, Java, etc
 - Widely accepted in the earth science community
 - Strong support by the Earth Science Data Systems program
 - In addition, the aforementioned characteristics facilitates the development of value-added tools and data services such as reformatting, reprojection, and subsetting.

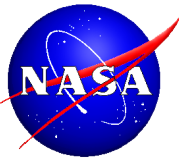
HDF Product Designer



- ESDIS is funding The HDF Group to build a tool to assist data providers with product design and implementation.
 - Based on a concept originated by Jeff Lee of the ICESat-2 team.

- What is it?
 - Application to facilitate the creation of HDF products that are compliant with community conventions (i.e. easily shared) and international standards (i.e. easily understood).
 - Application for organizing HDF5 file content to data and metadata
 - Built-in support for conventions
 - Create and re-use parts of file content
 - Collaborative design process
 - Generate HDF5 template file, or code that produces the designed file for several programming languages
 - HDF5 template has structure and metadata

HDF Product Designer



■ Design Process

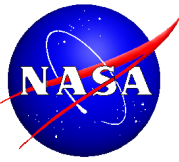
- Create and organize content:
 - Files, groups, datasets, attributes
 - Many parameters of datasets and attributes can be set
 - Re-use any part of content elsewhere in the same or another file
 - All the work is saved in a database
- After a File is Designed
 - Export description of the file's content into a tab-delimited text file
 - This *description* file can be opened with Excel
 - Content description can be edited
 - Description file can be imported back into the Product Designer
 - A template HDF5 file can be generated
 - Code can be produced for reading and writing designed file
 - The generated write code can be edited to fill in real data

■ Convention compliance and interoperability checkers are planned to be included

■ The HDF Product Designer is now available as an initial release.

- User's Guide/Source Code: (<http://hpd.readthedocs.org/en/latest/>)
- Demonstrating tool to and working with user groups for guidance on future development directions. (<https://github.com/HDFGroup/hpd/wiki>)

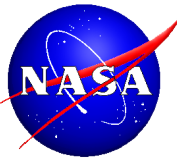
HDF Product Designer



- The development team is looking for partners
 - New missions
 - Projects upgrading from HDF4 to HDF5
 - Projects reprocessing their data to increase interoperability
 - Use cases

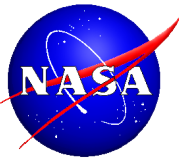
- Contact: eoshelp@hdfgroup.org if you are interested

- Contact: Alfreda.A.Hall@nasa.gov if you are interested in attending an overview of the tool, June 2015



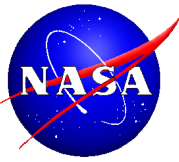
- ISO 19115 is now required by ESD
- ESDIS has been working for several years on preparing to support this
- Metadata Evolution for NASA Data Systems (MENDS) activity
 - Successfully mapped ECHO, ECS, and DIF attributes to ISO 19115
 - Supported development of SMAP ISO metadata model
 - Developed first draft of NASA ISO 19115 Best Practices (aka NASA Flavor)
 - Developed NASA Base Metadata Requirements
- How to get started
 - DO: Visit the “NASA ISO for EOSDIS” wiki site and see the following links under the Best Practices (<https://wiki.earthdata.nasa.gov/display/NASAISO/NASA+ISO+for+EOSDIS>)
 - NASA Base Metadata Requirements
 - Addressing NASA Metadata Requirements with ISO Standards
 - NASA ISO Conventions
 - Downloads and Documents (contains schemas as well as ECHO and ECS crosswalks)
 - DO NOT: Attempt to read the original ISO 19115 documentation. You will regret it.

SIPS MetGen Tool



- ESDIS has developed a standalone tool to assist data providers with the generation of granule level metadata and submission of data products to the DAAC via the ECS SIPS (PDR) protocol
 - ftp://n5eil01u.ecs.nsidc.org/PullDir/OIB_SIPSMetGen/latest/
 - Username: anonymous
 - Password: email address
- Designed originally for airborne data providers but is generic enough to be used by others
- Relieves data providers of having to learn and write code to support complex structured metadata formats.
 - Provider generates a simple Parameter=Value text file with granule level metadata values (based on the product level metadata definition) as well as list of lat/lon coordinates for each data point
 - The tool creates a bounding polygon for inclusion in the metadata and generates the appropriately formatted metadata file
- Optionally generate PDRs and submit data for ingest
- Currently supports the ECS data model and ISO 19115

Summary



- Format and metadata standards are required by ESD
- Formats
 - HDF5 or netCDF4 are preferred
 - HDF Product Designer tool is available as an initial release
 - CF compliance is not required but strongly encouraged where possible and applicable.
- Metadata
 - ISO 19115 is required
 - Documentation, guidance, and technical support are available
 - Work is being done to finalize the NASA ISO Best Practices as well as the Unified Metadata Model for Collections (UMM-C) and Granules (UMM-G).
 - UMM is the new metadata model for the Common Metadata Repository (CMR)
 - SIPS MetGen tool supports ISO 19115
- There are no ESDIS or ESD requirements for file naming conventions.
- For standards related questions or issues contact the ESDIS Standards Office Leads or Alfreda Hall (alfreda.a.hall@nasa.gov)
 - Jeff Walter (jeff.walter@nasa.gov)
 - Andy Mitchell (andrew.e.mitchell@nasa.gov)