ESDIS Standards Office

Presentation to DAAC Managers
March 22, 2021

Standards and NASA Earth Science Data Systems

- In the Beginning:
  - Standard Data Format: HDF
  - Standard Version 0 Information Management System protocol
  - Standard Data Products
- The Value of Standards
  - Fosters development of ecosystems of tools (e.g., netCDF ecosystem, XMosaic)
  - Enables interoperability amongst disparate parties: V0 IMS
  - Sets expectations and fosters trust in the broad community

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Standards are critical enablers of community development.

Agenda

1. Background
2. Community process
3. Document Repository
4. Forward-Looking activities
5. Closing - Q & A

ESO's role within EOSDIS

ESO provides

- Standards guidance and leadership for EOSDIS via a dedicated staff

- Expertise in the development, review and maintenance of ESDIS-approved standards & practices for use in NASA Earth science data systems

- A coordination function by managing a standards repository, web presence and by providing support for community engagement.

ESO History

- **~2001 NewDISS - New Data and Information Systems and Services**
  - Concept: Published, open "Standards and Practices" kept by NewDISS management, compiled by NewDISS participants, included in Research Announcements for Mission Data Systems, and Science Data Centers

- **2003 SEEDS - Strategic Evolution of Earth Science Enterprise Data Systems**
  - Standards Process Working Group initiated

- **2004 Chartered as ESDS Standards Process Group (SPG)**
  - Permanent working group that operated as a part of Earth Science Data System Working Groups (ESDSWG)

- **2013 "Graduated" to become ESDIS Standards Office (ESO)**
  - assist the ESDIS Project in formulating the standards policy for NASA ESDS,
  - coordinate standards activities within ESDIS and
  - provide technical expertise to standards related ESDSWG tasks

- **2020 ESO Staff expanded**
  - Added staff from several DAACs
  - Current staff: Chris Lynnes, Steve Olding, Allan Doyle, Ed Armstrong (PO.DAAC), John Scialdone (SEDAC), Joseph Koch (ASDC), Shannon Leslie (NSIDC), Siri Jodha Khalsa (NSIDC), Yaxing Wei (ORNL DAAC)
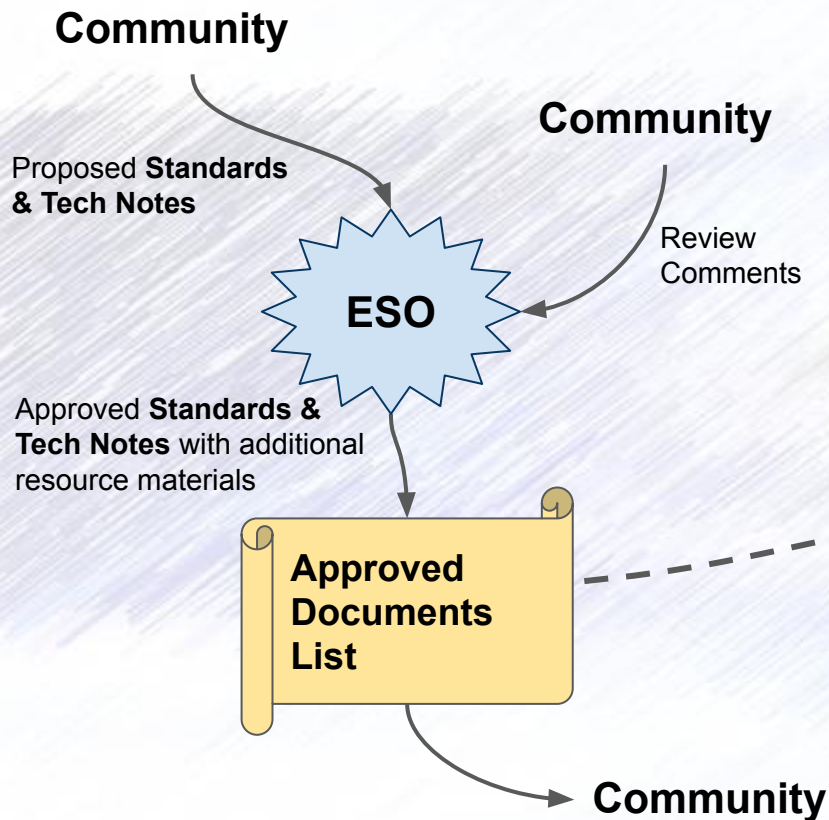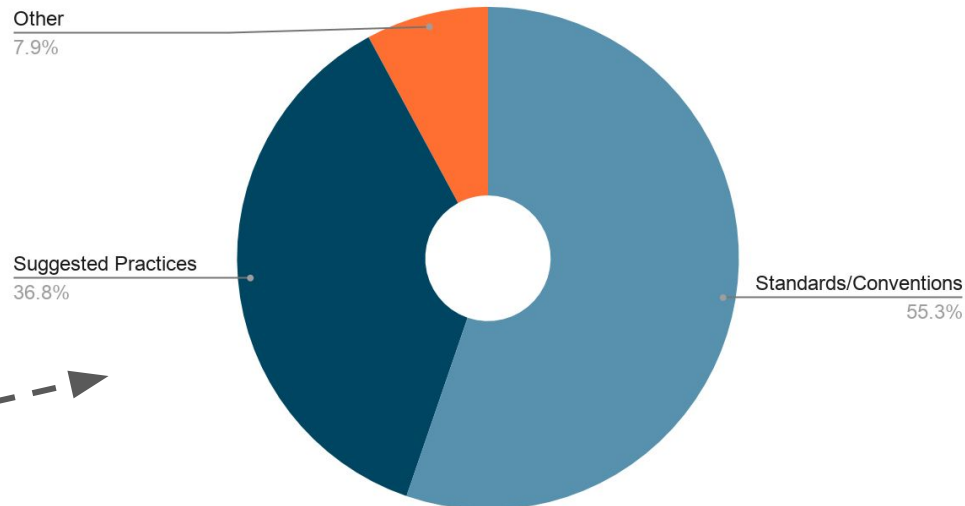
"**The process, however, results in high quality documents that are useful to the stakeholders for whom the documents are intended**. **A good thing** … **is that a broad community is involved. The published documents** … **will be useful more broadly as evidenced by some informal comments from non-NASA ESIP members**."

Hampapuram Ramapriyan - SSAI & ESDIS Project
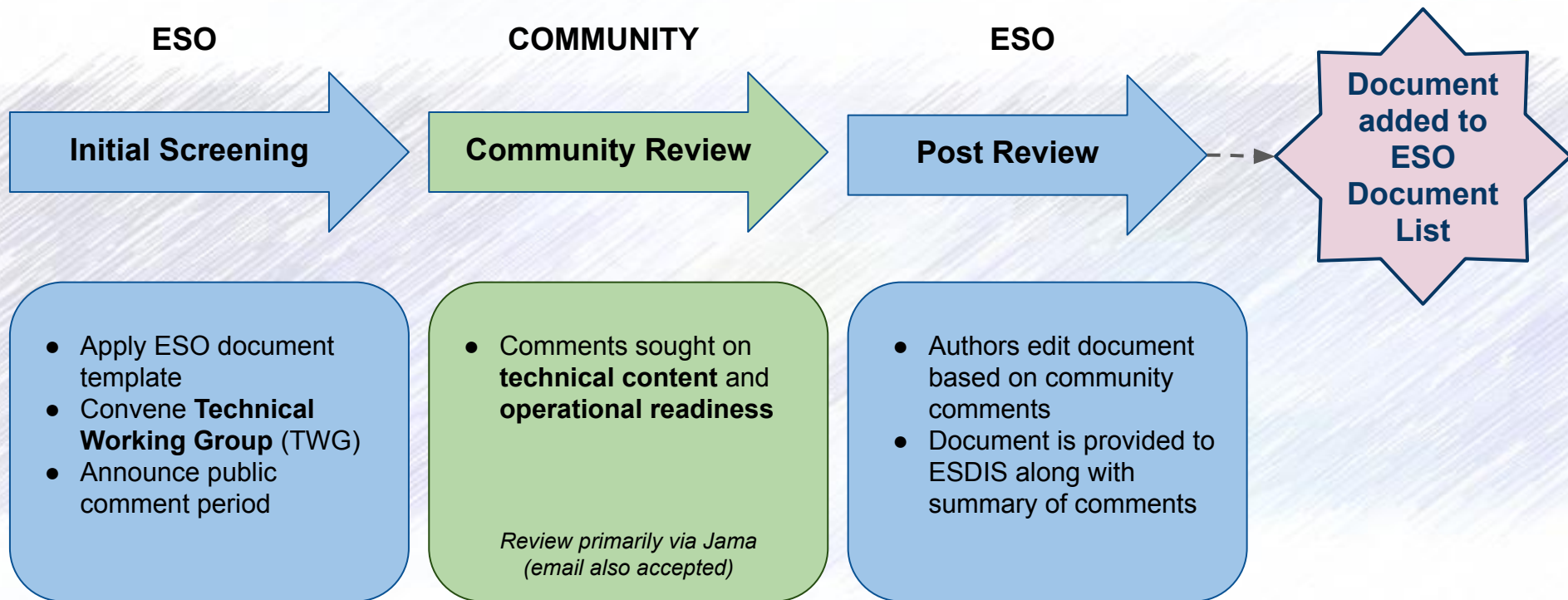
Community Standards Process

Community

Community

Proposed **Standards & Tech Notes**

Review Comments

ESO

Approved **Standards & Tech Notes** with additional resource materials

Approved Documents List

Community

Approved Documents List: Document Types

Other
7.9%

Suggested Practices
36.8%

Standards/Conventions
55.3%

https://earthdata.nasa.gov/standards

Inside the Process

ESO

COMMUNITY

ESO

Initial Screening →

Community Review →

Post Review ⇢

Document added to ESO Document List

- Apply ESO document template
- Convene **Technical Working Group** (TWG)
- Announce public comment period

- Comments sought on **technical content** and **operational readiness**

  Review primarily via Jama (email also accepted)

- Authors edit document based on community comments
- Document is provided to ESDIS along with summary of comments

https://earthdata.nasa.gov/esdis/eso/standards-process

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Standards Outreach

ESIP
- ESO staff regularly attends meetings
- ESO chairs sessions at many meetings
  - Metadata, KML, Emerging formats, Vector data formats, ARD
- ESO overview posters
- Research as Art
- Many one-to-one conversations
- Encourage document submissions to ESO

ESDSWG
- ESO staff regularly attends meetings
- ESO overview posters
- Participate in working groups as observers
- Many one-to-one conversations
- Encourage document submissions ESO

OGC
- ESO staff participates in
  - GeoTIFF Standards Working Group
  - Earth Observation Exploitation Platform Domain Working Group
- Monitor other working groups

AGU
- Posters & Papers in 2019, 2011, 2009, 2006

https://earthdata.nasa.gov/standards

#eosdis-standards on EOSDIS Slack

eso-staff@lists.nasa.gov

"... the RFC ... made our work, and the work of other implementers (PyDAP, TDS, ERDAP) possible. Without the specification, DAP2 would never have been developed by other groups. It's hard to overstate how positive that is."

James Gallagher - President, OPeNDAP.org

Document Repository

Documents by Category

https://earthdata.nasa.gov/standards

Documents by Number

https://earthdata.nasa.gov/esdis/eso/standards-and-references/eso-document-list

Document Landing Pages

https://earthdata.nasa.gov/standards

ESO Wiki Space

"**ESO and ESDSWG Working Groups were invaluable in helping ICESat-2 design HDF5 products that contain many of the features provided by netCDF.**"

Jeff Lee - KBR | ATLAS Science Algorithm Software Development Team Lead

Proactive engagement in key topics

- **Analysis Ready Data**
  - Developing a white paper on ARD for EOSDIS for community input
  - Hosted ESIP session on ARD in science and industry
  - Participated in ESDIS workshop on ARD and CEOS
  - Goal is to develop recommendations for how to define ARD for disciplines that do not already have such a definition (e.g., SST, atmospheric chemistry, atmospheric dynamics, cryopsphere)

- **Cloud-friendly Point Cloud data formats**
  - Investigating community usage, tool support, storage efficiency and analysis performance characteristics
  - Goal is to develop awareness of current practices and identify promising areas of convergence towards common formats and tools

- **Open Geospatial Consortium**
  - Working on OGC Cloud-Optimized GeoTIFF (COG) spec

Emerging standards & practices

- SpatioTemporal Asset Catalog (STAC)
  - Tie-in with ARD and Cloud Analytics

- Open Geospatial Consortium Application Programming Interface standards (OGC-API)
  - Modernization & harmonization of several OGC standards used by NASA including
    - Web Coverage Service (WCS)
    - Web Map Service (WMS)
    - Web Map Tile Service (WMTS)
    - Web Feature Service (WFS)

- SpatioTemporal Adaptive Resolution Encoding (STARE)
  - Unifies Swath, Point, and Grid data models into an index that allows efficient integration of data

Upcoming document reviews

- Preservation Content Specification
  - Updates 423-SPEC-001, Revision B
  - Submitted March 12, 2021

- Preservation Content Specification Implementation Guidance
  - Companion to 423-SPEC-001
  - Submitted March 12, 2021

- Atmospheric composition variable standard name recommendations
  - Improve usability, standardization, and machine-readability of ICARTT 2.0
  - Expected early Spring, 2021

How to get involved

- Email us at eso-staff@lists.nasa.gov

- Join us at ESIP or ESDSWG meetings (virtually for now)

- Let us know about best practices, lessons learned, and specifications that are important to your mission, data providers, data consumers, partner organizations.

- Do you wish there were a spec for something but it's not on the list? Let us know.

- Be a reviewer or volunteer to be on a Technical Working Group. Tell us what your areas of interest/expertise are.

- Use what is already on the list of approved documents

- Join the #eosdis-standards channel on EOSDIS Slack

Backup slides

URLs

- ESO History
  - NewDISS Report
    - https://wiki.earthdata.nasa.gov/download/attachments/140808301/NewDISS_Report_V1.pdf?api=v2
  - SEEDS Formulation Team Final Recommendations Report (July 2003)
    - https://wiki.earthdata.nasa.gov/download/attachments/140808301/SEEDS_Final_Recs%20July%202003.pdf?api=v2
  - ESDS SPG Charter
    - https://cdn.earthdata.nasa.gov/conduit/upload/5850/ESDS-RFC-001v6.pdf
  - ESO Announcement email on next slide
- Emerging Standards & Practices
  - STAC
    - https://stacspec.org
  - OGC-API
    - https://ogcapi.ogc.org
  - STARE
    - https://earthdata.nasa.gov/esds/competitive-programs/access/stare
- Upcoming Document Reviews
  - Preservation Content Specification
    - https://earthdata.nasa.gov/esdis/eso/standards-and-references/preservation-content-spec
  - ICARTT 2.0
    - https://earthdata.nasa.gov/esdis/eso/standards-and-references/icartt-file-format

ESO formation announcement - 4/5/2013

Walter, Jeff (GSFC-4230) <jeff.walter@nasa.gov>
[spg] Formation of the ESDIS Standards Office

To: esdswg-announce@lists.nasa.gov <esdswg-announce@lists.nasa.gov>,
spg@lists.nasa.gov <spg@lists.nasa.gov>
Sender: spg-bounces@lists.nasa.gov

2013-04   April 5, 2013 at 7:45 PM
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Hello NASA ESDS community,

The ESDIS Project is pleased to announce the formation of the ESDIS Standards Office.

The ESDIS Standards Office (ESO) will assist the ESDIS Project in formulating the standards policy for NASA ESDS, coordinate standards activities within ESDIS and provide technical expertise to standards related ESDSWG tasks. ESO the lead the ESDIS Standards Interest Group to maintain broad communications among stakeholders about ESDIS standards activities. We expect many members of the former Standards Process Group (SPG) to join the ESDIS Standards Interest Group. ESO will be hosting regular telecons of the ESDIS Standards Interest Group to exchange, provide standards coordination, etc.

The ESO will be initiating Technical Working Groups (TWGs) to review candidate standards using the ESDSWG Standards Review Process that was developed by the SPG. The ESO will be recruiting members for the TWGs from the ESDSWG membership and also from the broader NASA ESD community as appropriate. Specific work performed by the ESDSWG members for the TWGs will be counted towards any ESDSWG work requirement you may have.

The ESDIS Standards Office is staffed by Jeff Walter, Andy Mitchell, Yonsook Enloe, Helen Conover, and Allan Doyle.

We look forward to you joining us in this endeavor.

Jeff

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Publications about ESO

- Behnke, J., Mitchell, A. and Ramapriyan, H., 2019. *NASA's Earth Observing Data and Information System – Near-Term Challenges*. Data Science Journal, 18(1), p.40. http://doi.org/10.5334/dsj-2019-040

- Ramapriyan, H., Lynnes, C., Leonard, P., 2019. *IN21D-0876 - Standards and Best Practices – Two NASA Examples*. Poster, AGU Fall 2019. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/502701

- Enloe, Y., Lynnes, C., Conover, H., Doyle, A., Wei, Y., Scialdone, J., 2019. *IN21D-0875 - NASA ESDIS Standards Office*. Poster, AGU Fall 2019, https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/541261

- Ullman, R. Enloe, Y,. 2011. *NASA's Standards Process Support for New Missions*. AGU Fall Meeting Abstracts. 1591-.

- Ullman R.E., Enloe Y, 2009. *Accelerating Technology Adoption Through Community Endorsement*. In: Di L., Ramapriyan H. (eds) Standard-Based Data and Information Systems for Earth Observation. Lecture Notes in Geoinformation and Cartography. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-88264-0_13

- Ullman, R., Enloe, Y., 2009. *NASA's Standards Process for Earth Science Data Systems (Invited)*. AGU Fall Meeting Abstracts. -1. 03.

- Ullman, R.E., Enloe, Y 2007. *NASA's Earth Science Data Systems Standards Process experiences*. 2007 IEEE International Geoscience and Remote Sensing Symposium, Barcelona, 2007, pp. 4639-4642, https://doi.org/10.1109/IGARSS.2007.4423892

- Ullman, R. Enloe, Y., 2006. *NASA's Earth Science Data Systems Standards Process*. AGU Fall Meeting Abstracts.

- Ullman, R.E., Enloe, Y., 2005. *NASA's earth science data systems standards endorsement process*. 4232- 4235. https://doi.org/10.1109/IGARSS.2005.1525852

- Ullman, R. & McDonald, K., Bedet, J.-J, Conover, H., Doyle, A., Enloe, Y., Evans, J.D., Suresh, R., Yang, J., 2003. *A proposed Strategy for Evolution of ESE Data Systems (SEEDS) standards process*. 663 - 665 vol.1. https://doi.org/10.1109/IGARSS.2003.1293874

- McDonald, K., Di, L., Wharton, S., 2002. *Strategic Evolution of NASA ESE Data Systems (SEEDS)*. IAPRS, Volume XXXIV, Part 2, Commission II, Xi'an, Aug. 20-23, 2002. https://www.isprs.org/proceedings/XXXIV/part2/paper/058_114.pdf

Comments about the process

- Jeff Lee - KBR | ATLAS Science Algorithm Software Development Team Lead
  - "Designing interoperable, standards-compliant, scientific data products is HARD. Science data comes in many forms and figuring out how to make those data available for public use is non-trivial. ICESat-2 products were designed in a period when netCDF-4 was not quite capable of organizing the complex data that ICESat-2 would generate. The ESO and ESDSWG Working Groups were invaluable in helping ICESat-2 design HDF5 products that contain many of the features provided by netCDF. And the transition to a cloud environment for science data storage/retrieval will not mitigate the need for ESO."

- James Gallagher - President, OPeNDAP.org
  - "I thought that while writing the RFC was considerable work, it has been a huge asset and made our work, and the work of other implementers (PyDAP, TDS, ERDAP) possible. Without the specification, DAP2 would never have been developed by other groups. It's hard to overstate how positive that is."

- Hampapuram Ramapriyan - SSAI & ESDIS Project
  - I have worked with ESO on several documents as a result of my involvement in ESDSWG's Data Quality Working Group and the Data Product Developers Guide Working Group. The ESO staff are very helpful in guiding us through the process, which is quite detailed and lengthy. The process, however, results in high quality documents that are useful to the stakeholders for whom the documents are intended. A good thing about the process is that a broad community is involved in reviewing, including people suggested by the authors of the documents and several others chosen by the ESO staff. I like the recent decision to assign DOIs to significant documents published by ESO to make them more easily citable. The published documents, while primarily intended for NASA Earth science activities, will be useful more broadly as evidenced by some informal comments from non-NASA ESIP members.

- Peter Leonard - GSFC and ADNET Systems, Inc.
  - Over the past six years the ESDIS Standards Office (ESO) has helped produce three major documents on which I am a co-author: two dataset interoperability documents and the Data Product Development Guide for Data Producers https://earthdata.nasa.gov/esdis/eso/standards-and-references/data-product-development-guide-for-data-producers. The ESO Staff are very knowledgeable, and they provided assistance to the authors in a professional manner throughout the entire process.

- Oh-ig Kwoun - NASA/JPL and CalTech
  - Barry Weiss developed the NASA-flavor of the ISO metadata design for the science data products from SMAP mission. His design and implementation of the ISO metadata and the processes of coordination between SMAP SDS and DAACs are inherited by SWOT and NISAR SDS teams as the reference design and practices. Owing to his work, both SWOT and NISAR missions saved significant effort in ISO metadata design and were able to jump start their implementation.