



Assessment Information

[CoreTrustSeal Requirements 2017–2019](#)

Repository: Physical Oceanography Distributed Active Archive Center
Website: <https://podaac.jpl.nasa.gov>
Certification Date: 21 June 2019

This repository is owned by: **NASA Jet Propulsion Laboratory**



Physical Oceanography Distributed Active Archive Center

Notes Before Completing the Application

We have read and understood the notes concerning our application submission.

True

Reviewer Entry

Reviewer 1

Comments:

Reviewer 2

Comments:

CORE TRUSTWORTHY DATA REPOSITORIES REQUIREMENTS

Background & General Guidance

Glossary of Terms

BACKGROUND INFORMATION

Context

R0. Please provide context for your repository.

Repository Type. Select all relevant types from:

Domain or subject-based repository, Institutional repository, National repository system; including governmental, Research project repository

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Brief Description of Repository

The Physical Oceanography Distributed Active Archive Center (PO.DAAC) is a project within the National Aeronautics and Space Administration (NASA) Earth Observing System Data and Information System (EOSDIS) program responsible for archiving and distributing remote sensing data for the world's oceans. PO.DAAC data includes satellite measurements of ocean wind and sea level, ocean temperature, salinity and currents, global gravity, and in situ and airborne data from over 20 Earth observing missions. PO.DAAC has over 600 publicly available datasets representing 250TB of data and 15 million files and has served these data to over 60,000 unique users via its tools and services in 2018. The PO.DAAC is located in the NASA Jet Propulsion Laboratory (JPL) in Pasadena, California, USA. See <https://podaac.jpl.nasa.gov/AboutPodaac> for further details.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Brief Description of the Repository's Designated Community.

The PO.DAAC primary customer base is oceanographic and climate research scientists who conduct research on global and regional scales for ocean circulation, sea level rise, air-sea interaction, coastal oceanography and hydrology. The community also includes application users such as decision support and ecological resource managers, engineers and investigators. Commercial users include those in the ocean and weather forecasting and shipping industries, and tourism. PO.DAAC data (and tools and services) are used for academic instruction for students at all levels from high school to the university level. The general public is also a consumer of PO.DAAC data and services.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Level of Curation Performed. Select all relevant types from:

A. Content distributed as deposited, B. Basic curation – e.g. brief checking; addition of basic metadata or documentation, C. Enhanced curation – e.g. conversion to new formats; enhancement of documentation, D. Data-level curation – as in C above; but with additional editing of deposited data for accuracy

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Comments

As one of the NASA EOSDIS data archive centers, the PO.DAAC complies with the guidelines established by the parent organization, the NASA Earth Science Data and Information System (ESDIS) Project, using several processes. For example, the "Requirements for Archiving, Distribution and User Services in EOS Data and Information System (EOSDIS)" provides guidance on some of the official processes. It is available at <https://earthdata.nasa.gov/about/esdis-project/esdis-policy/adurd> . PO.DAAC follows the NASA official curation process and best practices for data ingest, data archive and distribution, user services, and information security. The data management best practices and data lifecycle policy of the PODAAC can be found at: https://podaac.jpl.nasa.gov/PO.DAAC_DataManagementPractices

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Outsource Partners. If applicable, please list them.

None

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

Other Relevant Information.

The PO.DAAC is a part of the network of NASA EOSDIS DAACs, managed by NASA's Earth Science Data and Information System (ESDIS) Project, which is a Network Member of the WDS. As of November 30, 2018, the PO.DAAC has over 600 distinct datasets with a volume of 250TB. From January 1, 2018 to November 30, 2018 it distributed 44 million files to a global user community of over 60,000 users. In 2017, PO.DAAC data were cited in over 120 unique scientific publications or reports. Imagery derived from PO.DAAC data have been used in PO.DAAC announcements, JPL and NASA press releases, and the commercial media.

The PO.DAAC is Type 1 member of the Federation of Earth Science Information Partners (ESIP) since 1999. It is a science team member of the international Group for High Resolution SST (GHRSSST) project. Through the ESDIS project, PO.DAAC also participates in Committee on Earth Observation Satellites (CEOS).

The PO.DAAC also partners with the NASA Ocean Biology Processing Group (OBPG) to produce daily value added MODIS Aqua and Terra, and SNPP VIIRS Level 2 data formatted to the GHRSSST specification.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

ORGANIZATIONAL INFRASTRUCTURE

I. Mission/Scope

R1. The repository has an explicit mission to provide access to and preserve data in its domain.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

As one of the Distributed Active Archive Centers (DAACs) within the Earth Observing System Data and Information System (EOSDIS), the PO.DAAC's mission is to be a custodian of NASA Earth science physical oceanographic data and ensure that data will be easily accessible to users. Acting in concert, the DAACs provide reliable, robust services to users whose needs may cross the traditional boundaries of a science discipline, while supporting the particular needs of users within the discipline communities. (<https://earthdata.nasa.gov/about/daacs>).

Each of the DAACs complies with by the "Requirements for Archiving, Distribution and User Services in EOS Data and Information System (EOSDIS)" available at <https://earthdata.nasa.gov/about/esdis-project/esdis-policy/adurd> . Specific information on the PO.DAAC can also be found at: <https://earthdata.nasa.gov/about/daacs/daac-podaac> .

dasf

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

II. Licenses

R2. The repository maintains all applicable licenses covering data access and use and monitors compliance.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC conforms to NASA's Earth Science Data and Information Policy

(<https://earthdata.nasa.gov/earth-science-data-systems-program/policies/data-information-policy>) and provides free and open access to scientific data. The PO.DAAC works directly with data providers throughout the data curation process to ensure that data contents are documented and preserved with the distribution package and appropriate credit is provided to the authors of the data. The PO.DAAC requests users to include data citations in their publications. General citation instructions can be found at: <https://podaac.jpl.nasa.gov/CitingPODAAC> . Each dataset landing page also contains instructions on how to cite the dataset with its unique DOI.

Reviewer Entry

Reviewer 1

Comments:

Accept.

It may be useful to refer to this data policy within dataset metadata, but I was able to navigate to it through the About Us information of the data portal.

Reviewer 2

Comments:

Accept

III. Continuity of access

R3. The repository has a continuity plan to ensure ongoing access to and preservation of its holdings.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The long-term stability of the data holdings at the PO.DAAC are assured by NASA, our sponsoring agency. NASA has clearly stated that it believes long term stewardship of NASA collected remote sensing and field campaign data is essential to protect the national financial investment in these data, and their scientific value and continuity for future generations. NASA's ESDIS Project, the Network Member of WDS, is responsible for funding and managing all the DAACs. The ESDIS Project is in turn funded by the Earth Science Data System Program at NASA Headquarters. The ESDIS Project is responsible for all data in its collection at all DAACs under NRRS 1441 (NASA Records Retention Schedules).

Each of the DAACs is governed by the "Requirements for Archiving, Distribution and User Services in EOS Data and Information System (EOSDIS)" available at <https://earthdata.nasa.gov/about/esdis-project/esdis-policy/adurd> . This website states: Requirements to archive and distribute the data for a given mission extend as long as required by the ESDIS Project. This duration at the DAAC is dependent on the active use of the data by NASA funded investigators and the scientific community, and the provisions of long term archiving as determined by ESDIS. The ESDIS Project will work with the DAACs to ensure the long-term preservation of the DAAC archive collection.

Reviewer Entry**Reviewer 1**

Comments:

Accept

Reviewer 2

Comments:

Accept

IV. Confidentiality/Ethics

R4. The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.

Compliance Level:

0 – Not applicable

Reviewer Entry

Reviewer 1

Comments:

0 – Not applicable

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

PO.DAAC does not archive any data that requires addressing explicit disclosure risk. All data are available for free and are open to the public. The data archived at the PO.DAAC are satellite, airborne or in situ sensor data containing information about the ocean and hydrology environments. Members of the DAAC staff are well trained to handle such data. Personal/Sensitive information is not published in the PO.DAAC archive system.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

V. Organizational infrastructure

R5. The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC is housed at NASA Jet Propulsion Laboratory in Pasadena, California. The PO.DAAC is funded through an annually renewed contract by the NASA Earth Science Data and Information System (ESDIS) Project. Average spending per year is approximately \$11M. Approximately 25 staff members support the PO.DAAC's activities. The DAAC is sufficiently funded to carry out its mission including support for staffing, IT resources, as well as any necessary training and travel. The PO.DAAC staff includes a manager, a project scientist, a project system engineer, a project data engineer, operations and users services leads and their associated teams comprised of experts in information and data management, software and systems engineers and developers, and user services staff, science experts, and student interns. The staff members are well qualified and have an average of over 10 years' experience in these fields. Many of them are members of the American Geophysical Union, Apache open source software projects, and are active in the Earth Science Information Partners (ESIP) and attend technical and science team meetings regularly. They present papers as well as organize and chair sessions at conferences. They publish papers in refereed journals.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

VI. Expert guidance

R6. The repository adopts mechanism(s) to secure ongoing expert guidance and feedback (either inhouse or external, including scientific guidance, if relevant).

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC has an active external science domain committee, called the User Working Group, which consists of 10 discipline scientists. The User Working Group provides ongoing guidance to the PO.DAAC regarding data holdings, system capabilities, documentation, data formats, and communications procedures which serve the needs of the scientific community. The PO.DAAC has an annual face-to-face meeting and quarterly telecons with the User Working Group.

The PO.DAAC has staff who directly interact with the user community via user email inquiries, forum posts, and on location at science team meetings and conferences. The PO.DAAC is staffed with people skilled in both Earth science and geospatial data, and web services which they use to support users with data discovery, selection, access, usage, and interpretation requests. Users can find PO.DAAC datasets via the search services located on <https://podaac.jpl.nasa.gov> . Users can also provide feedback or request help using the "Feedback" button at <https://earthdata.nasa.gov/> which is the mechanism the NASA ESDIS Project uses to route enquiries to the appropriate DAAC.

The PO.DAAC participates annually in the American Customer Satisfaction Index (ACSI) survey of users of the NASA EOSDIS DAACs. This survey has been conducted annually since 2004 by CFI, an external independent organization. The results from the survey provide a numerical index of customer satisfaction as well as detailed comments and suggestions for improvement of systems and services. These inputs are assessed regularly by the NASA ESDIS Project and the DAACs and changes are implemented as appropriate. In 2018, the PO.DAAC received a higher score compared to previous years and to most other NASA DAACs.

The PO.DAAC regularly partners with other DAACs on data management and data services related activities. The PO.DAAC also participates in expert communities such as the Earth Science Data System Working Groups (ESDSWG) and Earth Science Information Partners (ESIP). The ESDSWG is a NASA activity that focuses on the exploration of new information technologies and services, and evaluates and develops best practices and recommendations to improve the efficiency, productivity and interoperability of NASA's heterogeneous and distributed Earth science data systems. The ESIP is a networked community that brings together science, data and information technology practitioners from over 120 organizations including U.S. federal agencies, universities and commercial entities. Through these partnerships PO.DAAC stays informed about the evolutions in data science and adopts new and latest technology as needed.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

VII. Data integrity and authenticity

R7. The repository guarantees the integrity and authenticity of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The structural integrity of each data granule ingested by the PO.DAAC is guaranteed by employing md5 checksums. Checksums natively produced by the data provider are compared to point of ingest checksums and granules are rejected if they do not match.

New datasets undergo a rigorous internal review before public release. Granules are checked for metadata completeness, data and metadata model structure and integrity, and comparison to previous versions if applicable. Some of these checks are automated, for example, with the PO.DAAC Metadata Compliance Checker (<https://podaac-uat.jpl.nasa.gov/mcc/>), and generic software readers (ftp://podaac.jpl.nasa.gov/common/sw/generic_nc_readers/) while others are made via visual inspections and using web services (OPeNDAP and THREDDS). An internal metadata authoring system ensures that dataset metadata attributes and descriptions are portrayed on public facing dataset landing pages with completeness and consistency with regard to units, vocabularies and presentation. The metadata changes and updates via the authoring tool are logged in a PO.DAAC database (partially a Solr index) that contains all metadata made available on public facing dataset landing pages. Metadata updates are published on dataset landing pages in real time. Provenance of a dataset is tracked through its version metadata attribute and separately a unique PO.DAAC identifier.

The necessary requirements for dataset and granule completeness, and data ingest logistics are captured in Interface Control Documents (ICDs) and Submission Agreements (SAs) that providers and the PO.DAAC must agree to. The PO.DAAC also maintains a web site for metadata and data model best practices (https://podaac.jpl.nasa.gov/PO.DAAC_DataManagementPractices) that the data providers are strongly encouraged to employ. The PO.DAAC collaborates with the data producer to provide the user community with a comprehensive User

Guide for each dataset that describes the dataset properties including its data quality and uncertainty, and retrieval algorithms and other methodology. The PO.DAAC only works with established NASA missions and related Principal Investigators who are made aware early on of the NASA and PO.DAAC data and metadata requirements.

New dataset versions are assigned unique landing pages with newly minted Digital Object Identifiers (DOIs). Typically the version number appears in the directory path on any PO.DAAC data service (e.g., OPeNDAP) so the user is well informed on the version in use. Deprecated dataset versions are retired but the data are not deleted (and retain their DOIs).

Metadata changes and updates are logged in a PO.DAAC database (partially a Solr index) that contains all the metadata made available on public facing web pages (dataset landing pages). Data changes are accounted via version changes (a dataset specific metadata attribute). The provenance of updates to versioning, and new or updated datasets is maintained in the PO.DAAC database. Through a interface to the Solr index all metadata updates are available in public facing websites in real time.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

VIII. Appraisal

R8. The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for data users.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The datasets submitted for archiving and distribution at the PO.DAAC are produced by science teams funded by NASA as a part of satellite or aircraft missions, field experiments or research projects. Datasets are usually assigned for archiving and distribution at the PO.DAAC as a result of interagency or international agreements between NASA and other partners. In all cases, NASA assigns these datasets ("mission directed datasets") to the appropriate DAAC based on the Earth science discipline user community served by the DAAC. Given the rigorous review processes used by NASA in the selection of the science teams, the datasets produced by them are assured to be relevant to the users served by the DAACs.

In some cases, science investigators and principal investigators (PIs) may submit datasets ("PI provided datasets") to the DAAC directly for archiving and distribution. To cover such cases the NASA ESDIS Project has an established procedure for assessment and acceptance of the datasets. The procedure involves common agreement amongst DAAC, its User Working Group, the ESDIS Project and NASA Headquarters. The PO.DAAC is currently developing a web interface to accept and review proposals by science investigators for new PI provided datasets. This capability is expected to be available in late 2019.

The PO.DAAC recommends the use of NASA-approved standard data formats to data providers to ensure data understandability and interoperability (<https://earthdata.nasa.gov/user-resources/standards-and-references>). The PO.DAAC has developed a recommended suite of standards with regards to data and metadata models for earth science data providers that can be found at: https://podaac.jpl.nasa.gov/PO.DAAC_DataManagementPractices . New data providers are strongly encouraged to adhere to these recommendations. In some cases, the PO.DAAC will work with a provider to establish new approaches to support legacy data models such as with the experience of adapting the YAML (a JSON superset) format to encode ASCII results for the GRACE-FO satellite mission.

The PO.DAAC curates metadata for provenance, discovery and usage. PO.DAAC complies with the ESDIS Metadata Requirements - Base Reference for NASA Earth Science Data Products (423-RQMT-003) and submits all metadata to and complies with all requirements of the NASA Common Metadata Repository (CMR) including the UMM metadata models (<https://earthdata.nasa.gov/about/science-system-description/eosdis-components/common-metadata-repository>).

For NASA satellite, airborne and field campaign missions, operational quality review of the data values is generally a requirement of the data producer. For new datasets, the PO.DAAC investigates and documents the data and metadata quality in conjunction with the data provider. This takes the form of initial visual inspections the data, working with the data provider to document the limitations and uncertainty of the data, documenting the metadata completeness via automated tools like the MCC (<https://podaac-uat.jpl.nasa.gov/mcc/>), and improving dataset discoverability and usability via proper metadata including keywords, description and citation markups on the dataset landing pages. The PO.DAAC recommended best practices web site also contains recommendations for data producers on how to encode pixel-by-pixel data quality, uncertainty or usefulness using the Climate and Forecast metadata conventions.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

IX. Documented storage procedures

R9. The repository applies documented processes and procedures in managing archival storage of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC consistently strives to provide data archival and operations in a stable and reliable fashion. While PO.DAAC staff work a typical business day schedule, its systems are operational 24x7 within a monitored machine room with backup power and active systems monitoring. PO.DAAC supports automatic user order fulfillment for all public data sets, and we post notices of our scheduled maintenance at least two business days prior to any planned maintenance on the PO.DAAC Web site and also broadcast the announcement via email to our user community.

PO.DAAC maintains on-site disk backups of all of our archived data using network attached storage (NAS), in addition to remote off-site tape backups of our entire historical data archive. PO.DAAC team annually reviews the data preservation posture by measuring each of our archival strategies against risk of data loss and user impact to primary data system outage. The PO.DAAC uses the NASA "Archiving, Distribution and User Services Requirements Document" (ADURD) and the "ESDIS Data Backup Analysis Report" as a guide to this review and adjusts our archival strategies as needed. (<https://earthdata.nasa.gov/about/esdis-project/esdis-policy/adurd>).

Some specifics on the current logistics of PO.DAAC backup implementation include using a LTO tape library, with tapes stored at an offsite facility 100 km away in a professional earthquake proof room. Tapes are kept at the offsite facility for 3-5 years. If a data restore is needed, the PO.DAAC first looks to a local tape library before a request to the offsite facility

is made.

In the near future, all offsite backups will be to a remote facility 100s of kms from JPL using only NAS, and tapes will not be employed anymore. There will be one full backup plus 3 years incremental snapshots. In this scenario, any data restore will be much faster and the remote backup NAS can also be switched to function as the operational NAS in case there is a disaster in the local area.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

X. Preservation plan

R10. The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC follows the preservation specification document provided by NASA

(<https://earthdata.nasa.gov/user-resources/standards-and-references/preservation-content-spec>). As indicated in that document:

"The data resulting from NASA's missions are a valuable resource that needs to be preserved for the benefit of future generations. In the near-term, as long as the missions' data are being used actively for scientific research, it continues to be important to provide easy access to data and services commensurate with current information technology. For the

longer term, when the research community focus shifts toward new missions and observations, it is essential to preserve the previous mission data and the information needed so that a new user in the future will be able to understand how the data were used for deriving information, knowledge and policy recommendations, and to be able to “repeat the experiment” to ascertain the validity and possible limitations of conclusions reached in the past and to provide confidence in long term trends that depended on data from multiple missions. It is essential for NASA to preserve all the data and associated content beyond the lives of NASA’s missions to meet NASA’s near-term objective of providing access to data and services for active scientific research. Also NASA has to ensure that the data and associated content are preserved for transition to permanent archival agencies. To fulfill this responsibility, identification of the specific content items that need to be preserved from each of NASA’s missions is essential."

Most of the data and associated items held at the PO.DAAC are governed by NASA's Earth Science Data and Information Policy (<https://earthdata.nasa.gov/earth-science-data-systems-program/policies/data-information-policy>). The few exceptions (e.g., documents governed by International Trade and Arms Regulation – ITAR) requiring clearance from NASA for distribution are handled on a case-by-case basis.

The high-level requirements provided by NASA to the data producers include the requirement to transfer data to a designated DAAC according to an agreed upon schedule. The requirement also includes compliance with the NASA Earth Science Data Preservation Content Specification mentioned above. Details of data and metadata standards are worked out between the PO.DAAC and the data producers, and are compatible with those specified at <https://earthdata.nasa.gov/user-resources/standards-and-references#ed-standards> .

NASA's program management, regular reviews and reporting are used to ensure that the specified actions are taken.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

XI. Data quality

R11. The repository has appropriate expertise to address technical data and metadata quality and ensures that sufficient information is available for end users to make quality-related evaluations.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC performs data quality checks as a part of the data stewardship process as previously indicated. The quality checks include:

1. Verify file sizes, checksums and number of files
2. Data set and its contents are clearly described
3. Geospatial and temporal information are complete and described
4. Variables and units follow standards
5. Publication or a user guide describing the data is provided
6. Methodology, calibrations, and algorithms are documented
7. Known issues/limitations are clearly described
8. Statements are properly referenced

PO.DAAC develops or improves existing dataset user guides during curation which contain sections specific to data quality and integrity as reported by the data producer or documented through community feedback or scientific literature. The user guides also include a References and Related Publications section specific to peer-reviewed publications written about the data set. An example user guide can be seen here:

ftp://podaac.jpl.nasa.gov/allData/rapidscat/L2B12/docs/rscat_l2b_user_guide_v1.pdf

In addition, PO.DAAC maintains a listing of peer-reviewed publications from the earth science community describing their research and the use of particular data sets that can be found at the dataset specific landing page.

The PO.DAAC metadata model, used to create and store dataset metadata internally in a PO.DAAC database, enforces minimum metadata requirements and applies validation of valids from the Global Change Master Directory and schema requirements from NASA's Common Metadata Repository (CMR) UMM metadata model.

PO.DAAC staff also participate (and in the past have lead) in the NASA Earth Science Data System Working Groups (ESDSWG) for Data Quality. PO.DAAC has co-authored a set of recommendations and best practices that have been submitted to the ESDIS Standards Office (ESO) for community review in 2018. Two of these have been published on <https://earthdata.nasa.gov/user-resources/standards-and-references/eso-document-list> including "Data Management Plan Template for DAACs" and "Data Quality Working Group Recommendations for the Data Management Plan Template for Data Producers."

As further recommendations become codified, the PO.DAAC will look to these for future best practices in capturing and disseminating data quality information.

PO.DAAC has also collaborated on an earth science data uncertainty white paper to published under the auspices of the ESIP Information Quality Cluster in 2019.

Reviewer Entry

Reviewer 1

Comments:
Accept.

At the next renewal, it would be recommended to give an update on the outcomes of the data quality recommendations that recently were submitted for community review.

Reviewer 2

Comments:
Accept

XII. Workflows

R12. Archiving takes place according to defined workflows from ingest to dissemination.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC ingest, archive and distribution system is built to adhere to the Open Archival Information System (OAIS, see https://en.wikipedia.org/wiki/Open_Archival_Information_System) requirements and design philosophy including employing submission information packages (SIPs) and archival information packages (AIPs) for each granule ingested. Distribution information packages (DIPs) are embedded in the operational metrics collection workflows that the PO.DAAC

maintains as part of the ESDIS metrics capturing activity.

PO.DAAC's archival workflow follows a set of guidelines to govern the end-to-end archive and distribution of our data holdings. This framework provides a formalized process and requirements checklist useful for planning and managing datasets through the various phases of the Dataset Lifecycle. Its purpose is to ensure that PO.DAAC meets the minimum standards and expectations for Quality, Quantity, Continuity, and Latency (QQCL), which are applied consistently for all archived datasets. The flow of the dataset lifecycle as it transitions through various phases, namely identification, preparation, integration, and operations.

The Dataset Identification and Dataset Approval stages of the Dataset Lifecycle correspond directly with the workflow for Dataset Acceptance (see https://podaac.jpl.nasa.gov/PO.DAAC_DataManagementPractices). Dataset Integration begins with a complete harvesting and ingestion of metadata (both granule and collection-level) and concludes with full integration to all compatible access protocols (e.g., FTP, OPeNDAP, THREDDS), tools and services (e.g., Web Portal, Web Services). Once integrated, a review is conducted along with a formalized 50 step checklist to ensure all requirements and expectations are met, and the dataset becomes Fully Operational pending a successful review. Datasets that are Fully Operational come with the applicable levels of service to accommodate a service-oriented data distribution including user support, guide documentation, and accompanying read software. When new versions of an existing dataset become available, the Dataset Lifecycle process is repeated iteratively at the Dataset Approval stage.

Dataset retirement (through a 28 step checklist) is initiated on datasets which are deprecated by newer versions and removed from public visibility with reduced levels of service as determined by the dataset provider; aside from version deprecation, Dataset retirement may also result from a situation in which data may be quarantined due to a proliferation of erroneous data which contaminates the complete data record.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

XIII. Data discovery and identification

R13. The repository enables users to discover the data and refer to them in a persistent way through proper citation.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

All the DAACs within the NASA ESDIS Network provide the metadata for their respective archives to the EOSDIS Common Metadata Repository (CMR), managed by the ESDIS Project. The CMR is a high-performance, high-quality, continuously evolving metadata system that catalogs all data and service metadata records for the EOSDIS system and will be the authoritative management system for all EOSDIS metadata. These metadata records are registered, modified, discovered, and accessed through programmatic interfaces leveraging standard protocols and APIs. (See <https://earthdata.nasa.gov/about/science-system-description/eosdis-components/common-metadata-repository>).

To facilitate users' search for data, the DAACs offer several methods. At the ESDIS Network level, the Earthdata Search provides search, preview, access end-points for all the DAAC holdings. It also serves as a platform to feature planned EOSDIS services as they become available. (See <https://earthdata.nasa.gov/introducing-earthdata-search-beta>). In addition, the search and order tools listed at <https://earthdata.nasa.gov/earth-observation-data/tools>, many of which are DAAC-specific, are available for users with various specialized capabilities. Also, all the DAACs provide landing pages for datasets which have been assigned Digital Object Identifiers (DOIs).

The specific search mechanisms supported by PO.DAAC are listed below:

- Free text keyword search. Each dataset contains a curated list of associated keywords that are indexed in a PO.DAAC search service
- Faceted search. Faceted metadata attributes are presented to the user in a PO.DAAC discovery web site. This allows users to navigate and set "filters" such as spatial and temporal resolution and satellite instrument to constrain the search request.
- Dataset landing page keyword lists. These curated keywords improve discoverability by commercial search services.
- Markup of PO.DAAC dataset landing pages to schema.org recommendations. This implementation improves discoverability by commercial search services.

All the DAACs in the NASA ESDIS Network encourage data citations as indicated at <https://earthdata.nasa.gov/earth-observation-data/data-citations-acknowledgements>. Assignment and registration of DOIs to the datasets archived and distributed by the PO.DAAC are handled by the ESDIS project. Of the datasets held by PO.DAAC, 95% have been assigned DOIs, and it is expected that all datasets will eventually have DOIs. Each dataset

with a DOI also has a landing page that provides the recommended citation format. For example, see https://podaac.jpl.nasa.gov/dataset/QSCAT_LEVEL_2B_OWV_COMP_12 and click on "Citation" tab.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

XIV. Data reuse

R14. The repository enables reuse of the data over time, ensuring that appropriate metadata are available to support the understanding and use of the data.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The PO.DAAC develops collection- and file-level (when appropriate) metadata and supporting documentation for all data sets to enable data discovery, access, and use. This information is developed by a PO.DAAC curation team with domain expertise in measurement techniques and instruments, research applications, user communities, and data formats. The PO.DAAC provides a users' guide for each data set, which includes information on the data structure, algorithm, and processing steps. When available, the user guides also reference peer-reviewed publications outlining the data set production and algorithm. For some NASA satellite mission data, the data production software is available upon request through Delivered Algorithm Packages (DAPs).

The PO.DAAC encourages the use of NASA Earth science-approved, standard data formats to improve usability and

interoperability (<https://earthdata.nasa.gov/user-resources/standards-and-references>). As previously mentioned the PO.DAAC has developed a suite of data and metadata model recommendations that can be found at: https://podaac.jpl.nasa.gov/PO.DAAC_DataManagementPractices

The PO.DAAC keeps abreast of evolving storage formats and protocols through its collaboration and participation in various NASA ESDSWG, the ESDIS ESO office, and community and best practices that emerge in the ESIP and AGU communities.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

TECHNOLOGY

XV. Technical infrastructure

R15. The repository functions on well-supported operating systems and other core infrastructural software and is using hardware and software technologies appropriate to the services it provides to its Designated Community.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:
4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:
4 – The guideline has been fully implemented in the repository

Response:

PO.DAAC operates a state of the art data publication IT infrastructure. PO.DAAC tools and services follow community standards such as OGC, OpenAPI, OPeNDAP, OpenSearch, REST, ISO 19115 etc. Many of these services especially for data access are exposed at the following URL: <https://podaac.jpl.nasa.gov/dataaccess>. Open source and community developed tools and standards are widely adopted at the PO.DAAC (e.g., https://github.com/nasa/podaac_tools_and_services). An example is the Common Mapping Client, the front end that drives the SOTO visualization tool (<https://podaac-tools.jpl.nasa.gov/soto>).

PO.DAAC core hardware and software infrastructure include:

1. Commercial hard drive enclosures configured as a redundant array of disks.
2. Interconnected fiber channel fabric
3. Server and storage system are networked high speed ethernet
4. All hardware is equipped with redundant power supplies (2)
5. On-site diesel generator provides power during extended utility power outage
6. Offsite disaster recovery infrastructure

Infrastructure hardware is reviewed and assessed annually and budgeted through the PO.DAAC's annual work plan process with the NASA ESDIS project. Servers and data storage equipment are replaced on a five to seven year rotation.

Reviewer Entry

Reviewer 1

Comments:

Accept

Reviewer 2

Comments:

Accept

XVI. Security

R16. The technical infrastructure of the repository provides for protection of the facility and its data, products, services, and users.

Compliance Level:

4 – The guideline has been fully implemented in the repository

Reviewer Entry

Reviewer 1

Comments:

4 – The guideline has been fully implemented in the repository

Reviewer 2

Comments:

4 – The guideline has been fully implemented in the repository

Response:

The security of the PO.DAAC systems is maintained by NASA JPL cyber security. They monitor the network and access, and protect the systems. JPL provides enclaves that have firewall and other access restrictions that protect PO.DAAC systems from intrusions and provide a safe operating environment. PO.DAAC is situated at a NASA facility and rigorous monitoring of network traffic is used to ensure safe and secure network operations. The power for the data center is operated with multiple redundancies. Backup and contingency plans have been discussed earlier but in general PO.DAAC has a defined and elaborate contingency plan in place.

In more detail, JPL has two layers of firewall, an external firewall facing the outside world and an internal DMZ area. Every computing resource in JPL must apply for and be approved by JPL security for a Zone Access Request (ZAR) that is used to manage the access controls that determine what network traffic is permitted into, out of and within the JPL networks. JPL IT security also performs IT security scans on all JPL machines (including PO.DAACs) including network, system and application layers almost daily. Any new security problem is flagged in the scan.

Separately, the PO.DAAC system administration team monitors security carefully, subscribes to vendors' security lists, CERN and other security resources to patch its system and applications when any potential problem is discovered. It also has some security monitoring tools to check its own network and systems in realtime.

PO.DAAC machines are physically located in a special data center which has multiple layers of access control. Any person wanting to access certain floors or rooms needs to pass an IT security clearance check including attending class, training and interviews.

Reviewer Entry

Reviewer 1

Comments:
Accept

Reviewer 2

Comments:
Accept

APPLICANT FEEDBACK

Comments/feedback

These requirements are not seen as final, and we value your input to improve the core certification procedure. To this end, please leave any

comments you wish to make on both the quality of the Catalogue and its relevance to your organization, as well as any other related thoughts.

Response:

Reviewer Entry

Reviewer 1

Comments:

Reviewer 2

Comments: