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Appendix B. Metadata Requirements Base Reference for UNIFIED METADATA MODEL - COLLECTION (UMM-C)



National Aeronautics and
Space Administration

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Preface

This document is under ESDIS Project configuration control. Once this document is approved, ESDIS approved changes are handled in accordance with Class I and Class II change control requirements described in the ESDIS Configuration Management Procedures, and changes to this document shall be made by change bars or by complete revision.

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Abstract

This document describes the Unified Metadata Model for Collections (UMM-C) to be used by the National Aeronautics and Space Administration (NASA) Earth Science community. This model takes into account standards and specifications (Directory Interchange Format (DIF), Earth Observing System (EOS) Clearing House (ECHO) 10, International Organization for Standardization (ISO) 19115-2) used by this community. Implementers of Earth Science Data and Information System's (ESDIS) Common Metadata Repository (CMR), its clients, and data providers should reference this document and the Unified Metadata Model (UMM) as a guide while implementing the system, its clients, or generating metadata.

Keywords: UMM-C, Collections, NASA Earthdata Search, Tools, EOSDIS, ESDIS, CMR, GCMD

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B.1 INTRODUCTION

Earth Observing System Data and Information System (EOSDIS) generates, archives, and distributes enormous amounts of Earth Science data via its Distributed Active Archive Centers (DAACs). These data are accessed and employed by a broad user community. It is therefore imperative that reliable, consistent, and high-quality metadata be maintained in order to enable accurate cataloging, discovery, accessibility, and interpretation. To increase the level of quality and consistency among its metadata holdings, EOSDIS has developed a model for various metadata concepts that it archives and maintains. This model aims to document vital elements that may be represented across various metadata formats and standards and unify them through core fields useful for data discovery and service invocations. This unified model, aptly named the Unified Metadata Model (UMM), has been developed as part of the EOSDIS Metadata Architecture Studies (MAS) I and II conducted between 2012 and 2013.

The UMM will be used by the CMR and will drive search and retrieval of metadata cataloged within that system.

This document is intended to serve as a reference profile – a part of the UMM model - for geospatial science metadata for collections. This reference profile is referred to as the UMM-C, where 'C' indicates that this is the collection profile. The UMM-C attempts to unify several metadata specifications (DIF 9, DIF 10, ECHO 10, ISO 19115-2:2009). The profile breaks down collections into elements or classes closely aligned to the ISO 19115-* Geographic Information Metadata schemas. Links to more information about the standards and specifications used in this document can be found in Related Documents section.

B.1.1 Purpose

This document provides information to the NASA Earth Science community. Distribution is unlimited.

B.1.2 Scope

This document describes the UMM Collection (UMM-C) model version 1.16.2

B.1.3 Related Documentation

The latest versions of all documents below should be used. The latest ESDIS Project documents can be obtained from Universal Resource Locator (URL): <https://ops1-cm.ems.eosdis.nasa.gov>. ESDIS documents have a document number starting with either 423 or 505. Other documents are available for reference in the ESDIS project library website at: http://esdisfmp01.gsfc.nasa.gov/esdis_lib/default.php unless indicated otherwise.

B.1.3.1 Applicable Documents

The following documents are referenced within or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document.

N/A	CMR Life Cycle https://wiki.earthdata.nasa.gov/display/CMR/CMR+Documents
N/A	DIF 9 https://gcmd.nasa.gov/Aboutus/xml/dif/dif.xsd https://idn.ceos.org/defaultDif10/index.html
N/A	DIF 10 https://gcmd.gsfc.nasa.gov/Aboutus/xml/dif/dif_v10.2.xsd https://idn.ceos.org/defaultDif10/index.html
N/A	ECHO 10 https://wiki.earthdata.nasa.gov/display/echo/Earth+Observing+System+Clearing+House+-+ECHO https://cdn.earthdata.nasa.gov/echo/
N/A	ISO 19115-2 (MENDS) http://www.iso.org/iso/catalogue_detail.htm?csnumber=39229 https://cdn.earthdata.nasa.gov/iso/

B.1.3.2 Reference Documents

The following documents are not binding on the content but referenced herein and, amplify or clarify the information presented in this document.

N/A	Tag http://en.wikipedia.org/wiki/Tag_%28metadata%29
N/A	XPath XPath is a language for addressing parts of an XML document, designed for use with XSLT.
N/A	MENDS More information on the Base Metadata Requirements established by the MENDS group: https://wiki.earthdata.nasa.gov/display/NASAISO/NASA+Base+Metadata+Requirements

B.1.4 Impact

This document outlines a profile intended to be backward compatible with existing NASA Earth Science metadata implementations. It will impact providers from NASA DAAC[s], CMR client developers, metadata catalog developers, and users.

B.1.5 Copyright Notice

The contents of this document are not protected by copyright in the United States and may be used without obtaining permission from NASA.

B.1.6 Feedback

Questions, comments and recommendations concerning this model should be directed to support@earthdata.nasa.gov

B.1.7 Document Conventions

Each section of this document describes an element of the model and can include the following components:

- **Element Name:** Specifies the element name.
- **Element Specification:** Provides the sub-elements, cardinality of the sub-elements within (), any valid values within <>, applicable comments and notes within {}, and any other major factors that make up the element.
- **Description:** Provides background information on the purpose of the element and its intended use. Furthermore, any information about the element's current usage, recommendations for usage, or unresolved issues is also documented here.
- **Cardinality:** Indicates the expectation of counts for this element, summarized in Table 1:
- **Tags:** Provides specific, related categorical values associated with this element, which are defined in Appendix A Tags Glossary.
- **Analysis:** Provides additional information to provide clarity.
- **Sample Mapping/Mapping:** Gives an XPath mapping for this element in DIF 9, DIF 10, ECHO 10, and ISO 19115-2 (MENDS) XML representations. This can be considered as the "crosswalk" for this element. For links to more information on XPaths please see the introduction's reference documents section.
- **Examples:** XML snippets from cross-walked data formats documenting sample values for the element.

With the exception of Element Name each of the element's sections are that are included are listed in bold to make it easier for the reader to distinguish between the element's section headings and the descriptions.

Table B-1 below shows values and descriptions of numbers of elements.

Table B-1. Cardinality

Value	Description
1	Exactly one of this element is required
0..N	This element is optional; up to and including N number of this element may be present
0..*	Optionally, many of this element may be present
1..*	At least one of this element is required, many may be present

The [R] after an element name indicates that the element is required.

B.1.8 Metadata Validation and Quality Assurance/Quality Control

All metadata entering the CMR goes through the validation process flow as shown in Figure B-1 to ensure metadata quality requirements are met. All records undergo CMR validation before entering the system. The process of Quality Assurance/Quality Control (QA/QC) is slightly different for NASA and non-NASA data providers. Non-NASA providers include interagency and international data providers and are referred to as the International Directory Network (IDN).

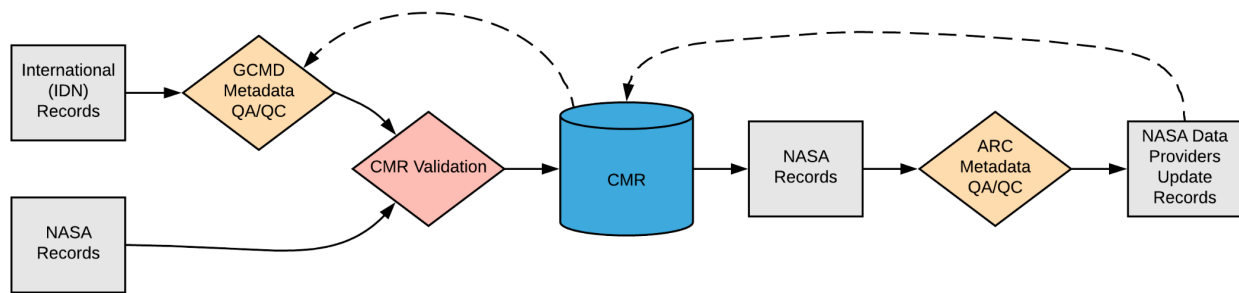


Figure B-1. Validation Process Flow

The Analysis and Review of CMR (ARC) metadata team is part of the validation process. They periodically review the metadata and provide reports back to the NASA data providers to give them guidance on improving their metadata. In their reports each metadata is given a color coded status with words. The definition of the status and color follows:

- Red
 - Highest Priority
 - An element is categorized as highest priority when the data in the metadata is wrong or it is missing and it is required.
- Yellow
 - Medium Priority
 - An element is categorized as medium priority when recommended but it is missing, a different value should be used, or more detailed data is warranted.
- Blue
 - Low Priority
 - An element is categorized as low priority when no data is provided in the metadata and it is not necessary, but it would be nice for the end user to have.
- Green
 - If no value is provided, return is "np"
 - If a value is provided, return is "OK"
 - The metadata looks good and there are no recommend changes

B.2 COLLECTION METADATA CONCEPTUAL MODEL

As shown in Figure B-2, the model has been organized into seven subsections that group related model elements. Each of these subsections and its constituent elements is documented individually.

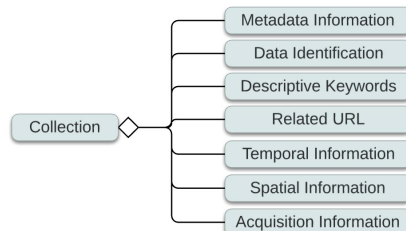


Figure B-2. Overall Collection Model Organization

B.2.1 Metadata Information

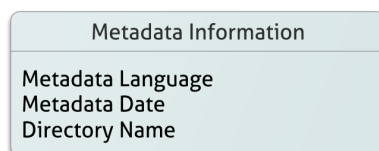


Figure B-3. Metadata Information

B.2.1.1 Metadata Language

Element Specification

MetadataLanguage

Description

The Metadata Language element specifies the language used in the metadata record.

Best Practices

While not required, it is recommended that an ISO 639-2 code be used to populate the Metadata Language field (http://www.loc.gov/standards/iso639-2/php/code_list.php). If a language is not supplied - English, the default language, will be assumed.

Examples:

"eng" ← Example using the ISO 639-2 code for English

"French" ← Example where the ISO 639-2 code is not used

"chi (B)" ← Example using the ISO 639-2 code for Chinese (See <http://www.loc.gov/standards/iso639-2/faq.html#3> for an explanation why "(B)" is included in the code)

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - None
- CMR Validation

- None
- ARC Validation Report
 - Marked as high priority
 - The metadata language provided does not reflect the language used in the metadata.
 - Marked as low priority
 - No metadata language is provided when the metadata language is a language other than English (the assumed default language).
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags*Controlled Vocabulary, Faceted, Recommended***Mapping**

ISO 19115-2:

/gmi:MI_Metadata/gmd:language/gco:CharacterString
with/gmi:MI_Metadata/gmd:MD_CharacterSetCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCode" codeListValue="utf8"**Examples**

ISO 19115-2:

```
<gmd:language>
  <gco:CharacterString>eng</gco:CharacterString>
</gmd:language>
<gmd:MD_CharacterSetCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCode" codeListValue="utf8">utf8</gmd:MD_CharacterSetCode>
</gmd:characterSet>
```

B.2.1.2 MetaBata Date

Element Specification

MetadataDate/Date (1)

MetadataDate/Type (1) <"CREATE", "UPDATE", "DELETE", "REVIEW">

Description

There are three types of dates used in the UMM profiles:

- Dates that concern the metadata record - called Metadata Dates in this document.

- Dates that concern the resource itself (collections, etc.) - called Data Dates in this document.
- Dates that describe the time period in which the data set was acquired - called Temporal Extent in this document.

Of these three date types this element is comprised of dates for when the metadata was created, last revised, planned for future review, or planned for deletion. All of the dates use the ISO 8601 date and time conventions. For dates related to the actual data or resource, the element Data Date should be used. For dates that describe the acquisition period the Temporal Extent element should be used.

Best Practices

Each Metadata Date is accompanied by a Type. The Type must be selected from a controlled vocabulary list. There are four options available for Type:

- CREATE: The date the metadata was created. This should be the date the metadata was published in the database/ entered into the data archive system.
- UPDATE: The date the metadata was last updated.
- REVIEW: The date of a planned future review of the metadata.
- DELETE: The date the metadata record will be deleted.

Providing a Metadata Date is optional. Multiple Metadata Dates are allowed, however, the same date type should not be repeated more than once in the same record (for example, a CREATE and an UPDATE time can be provided, but two CREATE times cannot be provided in the same record). All dates should comply with the ISO 8601 Standard (<https://www.w3.org/TR/NOTE-datetime>).

Examples:

Type = CREATE Date: 2010-02-01

Type = UPDATE Date: 2018-02-01

Type = REVIEW Date: 2019-02-01

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the date is accurate for the dataset.
 - Automated Review
 - Check that the field has been populated.
 - Checks for correct format.
 - Check that the field length is not greater than 1,000 characters.
- CMR Validation
 - Make sure the value in date is a date.
- ARC Validation Report
 - Marked as high priority
 - The MetadataDate/Type does not match one of the date type enumeration values (CREATE, UPDATE, REVIEW, DELETE).

- The MetadataDate/Date provided does comply with the ISO 8601 Standard (<https://www.w3.org/TR/NOTE-datetime>.
 - Marked as medium priority
 - A REVIEW or DELETE date is in the past.
 - The CREATE or UPDATE date is in the future.
 - A translation error between a native metadata format (ISO, DIF 10, ECHO 10) and UMM is present for the date and/or the date type.
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Recommended***Mapping**

DIF 9:

/DIF/DIF_Creation_Date

/DIF/Last_DIF_Revision_Date

/DIF/Future_DIF_Review_Date

DIF 10:

DIF/Metadata_Dates/Metadata_Creation

DIF/Metadata_Dates/Metadata_Last_Revision

DIF/Metadata_Dates/Metadata_Future_Review

DIF/Metadata_Dates/Metadata_Delete

ECHO 10:

/Collection/RevisionDate

ISO 19115-2:

/gmi:MI_Metadata/datestamp - This element can be populated, but not used by the UMM. This element does not contain a date type and therefore it is not known what date is represented by this element.

```
/gmi:MI_Metadata/gmd:metadataExtensionInfo/gmd:MD_MetadataExtensionInformation/gmd:extendedElementInformation/gmd:MD_ExtendedElementInformation/gmd:name/gco:CharacterString=<Metadata Create Date, Metadata Update Date, Metadata Future Review Date, Metadata Delete Date>
```

with

```
.../gmd:definition/gco:CharacterString=<Create Date, Update Date, Future Review Date, Delete Date>
```

```
.../gmd:dataType/gmd:MD_DatatypeCode codeList="" codeListValue="" = Date
```

```
.../gmd:domainValue/gco:CharacterString= {the actual date}
```

Examples

DIF 9:

```
<DIF_Creation_Date>2002-06-25</DIF_Creation_Date>
<Last_DIF_Revision_Date>2015-12-02</Last_DIF_Revision_Date>
<Future_DIF_Review_Date>2005-04-27</Future_DIF_Review_Date>
```

DIF 10:

```
<Metadata_Dates>
  <Metadata_Creation>2007-02-26</Metadata_Creation>
  <Metadata_Last_Revision>2015-06-11</Metadata_Last_Revision>
  <Metadata_Future_Review>2017-05-01</Metadata_Future_Review>
...
</Metadata_Dates>
```

ECHO 10 Collection:

```
<RevisionDate>2008-12-02T00:00:00.000Z</RevisionDate>
```

ISO 19115-2:

```
<gmd:dateStamp>
  <gco:DateTime>2008-12-02T00:00:00Z</gco:DateTime>
</gmd:dateStamp>
...
<gmd:date>
  <gmd:CI_Date>
    <gmd:date>
      <gco:DateTime>2008-12-02T00:00:00.000Z</gco:DateTime>
    </gmd:date>
    <gmd:dateType>
      <gmd:CI_DateTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_DateType
Code codeListValue="revision">revision</gmd:CI_DateTypeCode>
      </gmd:dateType>
    </gmd:CI_Date>
  </gmd:date>
  <gmd:date>
    <gmd:CI_Date>
      <gmd:date>
        <gco:DateTime>2008-12-02T00:00:00.000Z</gco:DateTime>
      </gmd:date>
      <gmd:dateType>
        <gmd:CI_DateTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_DateType
Code" codeListValue="creation">creation</gmd:CI_DateTypeCode>
        </gmd:dateType>
      </gmd:CI_Date>
```


</gmd:date>

B.2.1.3 Directory Name

Element Specification

DirectoryName

Description

Formerly called Internal Directory Name (IDN) Node (IDN_Node). This element has been used historically by the Global Change Master Directory (GCMD) internally to identify association, responsibility and/or ownership of the dataset, service or supplemental information. This element uses controlled vocabulary through the GCMD keyword management system and the valid values can be found online at:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/idnnode?format=csv. The use of this element is discouraged as it will be deprecated sometime in the future.

Note: This field only occurs in the DIF. When a DIF record is retrieved in the ECHO10 or ISO 19115 formats, this element will not be translated.

Best Practices

DirectoryName controlled vocabulary:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/idnnode?format=csv

Examples:

DirectoryName: "AMD/AU"

DirectoryName: "SOOS"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 1,030 characters.
 - Check that the field value does not match the Entry ID.
- CMR Validation
 - Make sure the value in date is a date.
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all.
 - The element is included but is empty.
 - The value in the element is identical to the Entry Title.
 - The value in the element is identical to the DOI.
 - The value in the element is incorrect for the dataset.
 - No recommended changes

- The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Controlled Vocabulary, Search API***Mapping**

DIF 9:

/DIF/IDN_Node

DIF 10:

/DIF/IDN_Node

Examples

DIF 9, DIF 10:

`<IDN_Node uuid="edff0791-121c-40aa-adf2-33feb2bc30e5">` `<Short_Name>CEOS</Short_Name>``</IDN_Node>``<IDN_Node uuid="b131a9e2-e994-41e2-9f61-afcf215f6c39">` `<Short_Name>GERMANY/GFZ</Short_Name>``</IDN_Node>`

B.2.2 Data Identification

Data Identification
ShortName [R]
Version [R]
Entry Title [R]
DOI [R]
AssociatedDOIs
Abstract [R]
Purpose
Data Language
Data Dates
Data Center [R]
DataContact
Collection Data Type
Processing Level [R]
Collection Citation
Collection Progress [R]
Quality
Use Constraints
Access Constraints
Archive And Distribution Information
Direct Distribution Information
Metadata Association
Publication Reference

Figure B-4. Data Identification

B.2.2.1 ShortName [R]

Element Specification

ShortName (1)

Description

This element describes the collection short name. The short name and version id combination must be unique per provider. The short name should not be the same as the Digital Object Identifier (DOI).

Best Practices

The Short Name is an abbreviated or shortened name used to identify a dataset. The Short Name, in combination with the Version Id, uniquely describe a metadata record in the CMR per data provider. While the Short Name can be used as a unique identifier for a dataset, it should never be the same as the dataset DOI.

Examples:

"AIRIBQAP"

"gpmrgachiphx"

"FIFE_RAIN_30M_2"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 85 characters.
 - Check that the field value does not match the Entry Title.
- CMR Validation
 - This element is required
 - Must contain at least 1 character and be no longer than 85 characters in length
 - The ShortName together with the Version must be unique per data provider
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all.
 - The element is included but is empty.
 - The value in the element is identical to the Entry Title.
 - The value in the element is identical to the DOI.
 - The value in the element is incorrect for the dataset.
 - No Recommended Changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

1

Tags*Required, Free Text Search, Parameter Search***Mapping**

DIF 9:

/DIF/Entry_ID

DIF 10:

/DIF/Short_Name

ECHO 10 Collection:

/Collection/ShortName

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:code/gco:CharacterString
and

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.shortname

and

```
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:description/gco:CharacterString = Short Name
```

(CMR read only) If the gmd:code/gco:CharacterString doesn't exist look at gmd:code/gmd:Anchor

Examples

DIF 9:

```
<Entry_ID>GLCF_GLC_1km</Entry_ID>
```

DIF 10:

```
<Entry_ID>
  <Short_Name>MYBARS</Short_Name>
  <Version>5</Version>
</Entry_ID>
```

ECHO 10 Collection:

```
<Collection>
  <ShortName>CIESIN_CHRR_NDH_CYCLONE_HFD</ShortName>
  ...
</Collection>
```

ISO 19115-2:

```
<gmi:MI_Metadata>
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      <gmd:citation>
        <gmd:CI_Citation>
          <gmd:identifier>
            <gmd:MD_Identifier>
              <gmd:code>
                <gco:CharacterString>CIESIN_CHRR_NDH_CYCLONE_HFD</gco:CharacterString>
                </gmd:code>
                <gmd:codeSpace>
                  <gco:CharacterString>gov.nasa.esdis.umm.shortname</gco:CharacterString>
                </gmd:codeSpace>
                <gmd:description>
                  <gco:CharacterString>Short Name</gco:CharacterString>
                </gmd:description>
              </gmd:MD_Identifier>
            </gmd:identifier>
          <gmd:title>
            <gco:CharacterString>CIESIN_CHRR_NDH_CYCLONE_HFD &gt; Global
            Cyclone Hazard Frequency and Distribution</gco:CharacterString>
```

```

    </gmd:title>
    <gmd:edition>
      <gco:CharacterString>1.0</gco:CharacterString>
    </gmd:edition>
    </gmd:CI_Citation>
  </gmd:citation>
</gmd:MD_DataIdentification>
</gmd:identificationInfo>
</gmi:MI_Metadata>

```

B.2.2.2 Version [R]

Element Specification

Version (1)

Description

The Version element will indicate the version associated with the collection. The short name and version ID combination must be unique per provider.

Best Practices

The version should be consistent throughout the metadata record. The version in the metadata should be identical to the version specified on the dataset landing page and in dataset documentation. For example, if the dataset landing page specifies the dataset as version 1.1, then the version number in the metadata should also be 1.1 (e.g. not 1.10). If the version in the title is specified as 3.4.2004 then the version in the metadata should also be 3.4.2004 (e.g. not 03.04.2004).

Examples:

"2.0"

"1"

"007"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the version value is appropriate for the dataset.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 80 characters.
- CMR Validation
 - This element is required
 - Must contain at least 1 character and be no longer than 80 characters in length
 - The ShortName together with the Version must be unique per data provider
- ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when:

- The element is not included at all.
- The element is included but is empty.
- The version is incorrect for the associated data.
- No Recommended Changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

1

Tags*Required, Free Text Search, Parameter Search, Normalize***Mapping**

DIF 9:

/DIF/Data_Set_Citation/Version

DIF 10:

/DIF/Entry_ID/Version

ECHO 10 Collection:

/Collection/VersionId

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:edition

Examples

DIF 9:

<Data_Set_Citation>

...

<Version>1.0</Version>

<Online_Resource>http://glcf.umd.edu/data/landcover/</Online_Resource>

</Data_Set_Citation>

DIF 10:

<Entry_ID>

<Short_Name>MYBARS</Short_Name>

<Version>5</Version>

</Entry_ID>

ECHO 10 Collection:

<Collection>

<ShortName>CIESIN_CHRR_NDH_CYCLONE_HFD</ShortName>

<VersionId>1.0</VersionId>

...

</Collection>

ISO 19115-2:

```

<gmi:MI_Metadata>
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      <gmd:citation>
        <gmd:CI_Citation>
          <gmd:identifier>
            <gmd:MD_Identifier>
              <gmd:code>
                <gco:CharacterString>CIESIN_CHRR_NDH_CYCLONE_HFD</gco:CharacterString>
              </gmd:code>
              <gmd:codeSpace>
                <gco:CharacterString>gov.nasa.esdis.umm.shortname</gco:CharacterString>
              </gmd:codeSpace>
              <gmd:description>
                <gco:CharacterString>Short Name</gco:CharacterString>
              </gmd:description>
            </gmd:MD_Identifier>
          </gmd:identifier>
        <gmd:title>
          <gco:CharacterString>CIESIN_CHRR_NDH_CYCLONE_HFD &> Global Cyclone
          Hazard Frequency and Distribution</gco:CharacterString>
        </gmd:title>
        <gmd:edition>
          <gco:CharacterString>1.0</gco:CharacterString>
        </gmd:edition>
      </gmd:CI_Citation>
    </gmd:citation>
  </gmd:MD_DataIdentification>
</gmd:identificationInfo>
</gmi:MI_Metadata>

```

B.2.2.3 Entry Title [R]

Element Specification

EntryTitle

Description

The Entry Title element states the title of the dataset.

Best Practices

The Entry Title should be a descriptive, formal title of the dataset. The Entry Title should not be the same as the Short Name element. It is recommended that the Entry Title follow a mixed case capitalization scheme and that the use of special characters (such as underscores) and acronyms be kept to a minimum, if possible. In order to make titles descriptive, important elements about the data may be included, such as: parameters measured, geographic location, instrument, project, temporal coverage, etc.

Examples:

"The San Joaquin Valley Air Quality Study (SJAQS) Atmospheric Signatures, Predictions, and Experiments (AUSPEX) Database"

"Aquarius Official Release Level 3 Sea Surface Salinity Smoothed Standard Mapped Image Monthly Data V4.0"

"The Next Generation Weather Radar (NEXRAD) Level II, III, and IV Data Products"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 1,030 characters.
 - Check that the field value does not match the Entry ID.
- CMR Validation
 - This element is required
 - Must contain at least 1 character and be no longer than 1,030 characters in length
 - The Entry Title must be unique per data provider
- ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when:
 - The element is not included at all.
 - The element is included but is empty.
 - The value in the element is identical to the Short Name.
 - The value in the element is in an abbreviated format (similar, but not necessarily identical to, the short name).
 - The value in the element contains a spelling error.
 - The value in the element includes incorrect information about the dataset.
 - No Recommended Changes
 - The element is provided, and is a formal title for the dataset (i.e. it is not the same as the short name and is free of grammatical and content errors).

Cardinality

1

Tags

Required, Free Text Search, Search API, Normalize

Mapping

DIF 9:

/DIF/Entry_Title

DIF 10:

/DIF/Entry_Title

ECHO 10:

/Collection/DataSetId

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:title/gco:CharacterString

Examples

DIF 9:

<Entry_Title>1-km Water Fraction From National Topographic Data Base Maps, Canada</Entry_Title>

DIF 10:

<Entry_Title>Aerosol Ratio Small MODIS L2 (AQUA Browse Product)</Entry_Title>

ECHO 10 Collection:

<Collection>

...

<DataSetId>Aquarius L3 Gridded 1-Degree Daily Soil Moisture V004</DataSetId>

...

</Collection>

ISO 19115-2:

<gmd:identificationInfo>

<gmd:MD_DataIdentification>

<gmd:citation>

<gmd:CI_Citation>

<gmd:title>

<gco:CharacterString>Aquarius L3 Gridded 1-Degree Daily Soil Moisture

V004</gco:CharacterString>

</gmd:title>

...

</gmd:CI_Citation>

</gmd:citation>

...

</gmd:MD_DataIdentification>

</gmd:identificationInfo>

B.2.2.4 DOI [R]

Element Specification

Choice Of 1

DOI/DOI (1)

DOI/Authority (0..1)

or

DOI/MissingReason (1) <Not Applicable, Unknown>

DOI/Explanation (0..1)

Description

This element stores the DOI (Digital Object Identifier) that identifies the collection. Note: The values should start with the directory indicator which in ESDIS' case is 10. If the DOI was registered through ESDIS, the beginning of the string should be 10.5067. The DOI URL is not stored here; it should be stored as a RelatedURL. The DOI organization that is responsible for creating the DOI is described in the Authority element. For ESDIS records the value of <https://doi.org/> should be used. While this element is not required, NASA metadata providers are strongly encouraged to include DOI and DOI Authority for their collections. For those that want to specify that a DOI is not applicable for their record use the second option.

Best Practices

For the DOI concept, there are two options for providing information. These options are:

DOI/DOI: The DOI (Digital Object Identifier) that identifies the collection.

DOI/Authority: The DOI organization that is responsible for creating the DOI
or

DOI/MissingReason: This element stores the fact that a DOI is not applicable for a record.

DOI/Explanation: This element describes the reason the DOI is not applicable.

For DOI/DOI and DOI/Authority

DOI/DOI:

- When providing information in the DOI/DOI field, only the DOI string should be provided. The string value should begin with the directory indicator.
- The DOI URL should not be stored in the DOI element but should instead be provided as a RelatedURL.
- For ESDIS providers specifically:
 - The directory indicator for ESDIS is "10." Therefore, if the DOI was registered through ESDIS, the beginning of the DOI string should be "10.5067".
 - A list of DOIs registered through ESDIS can be found here:
<https://wiki.earthdata.nasa.gov/display/DOIsforEOSDIS/EOSDIS+DOIs+Status+and+Listing>
 - More details on the ESDIS DOI process can be found here:
<https://wiki.earthdata.nasa.gov/display/DOIsforEOSDIS/ESDIS+DOI+Process>

- DOI is a required metadata element for ESDIS providers. While the majority of ESDIS datasets will have a DOI, there are certain cases where having a DOI is not appropriate. These cases include near real time datasets and datasets that will soon be replaced by a new version. Please see the DOI/MissingReason and DOI/Explanation section for more information.

DOI/Authority:

- For ESDIS providers specifically:
 - The DOI/Authority element value should be "https://doi.org/"

Examples:

DOI/DOI: "10.5067/ISS/CATS/L2O_N-M7.1-V2-01_05KMPRO"

DOI/Authority: "https://doi.org/"

DOI/DOI: "10.5067/MEASURES/GWELD/GWELDYR.003"

DOI/Authority: "https://doi.org/"

For DOI/MissingReason and DOI/Explanation

DOI/MissingReason:

- This element should only be used for specific cases where assigning a DOI to a dataset is not appropriate. These cases include near real time datasets, provisional datasets and datasets that will soon be replaced by a new version.
 - This element is controlled by the enumeration values "Not Applicable, Unknown"

DOI/Explanation:

- This element should be used to describe why a dataset was not assigned a DOI.

Examples:

DOI/MissingReason: "Not Applicable"

DOI/Explanation: "The collection is near real time and only exists for a couple of days, therefore, the collection was not assigned a DOI."

DOI/MissingReason: "Not Applicable"

DOI/Explanation: "A new version of this dataset will be released in a month (May 2018). This version will be removed from CMR and the new version will be assigned a DOI."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Verify that the DOI resolves to the appropriate web page.
 - Automated Review
 - Check that the field length is not greater than 1,024 characters.
 - Check that the DOI is resolvable.
 - Check that the DOI syntax is valid.
- CMR Validation

- The DOI must start with two digits followed by a period (.) followed by 4 digits followed by an optional period with optional digits. After the digits the DOI value must be followed by a slash (/) followed by alphanumeric characters.
- The DOI must be at least 1 character and at most 1024 characters in length.
- ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when:
 - The element is not included at all.
 - The element is included but is empty.
 - The dataset has a DOI but the metadata indicates that it does not.
 - The incorrect DOI is listed for the dataset.
 - The DOI listed leads to a broken link.
 - The DOI is provided in the incorrect format (e.g. as a URL rather than just the DOI string).
 - The DOI/Explanation includes spelling or grammatical errors.
 - Marked as medium priority
 - The DOI/MissingReason option is used but no DOI/Explanation is provided.
 - Marked as low priority
 - A DOI is provided but the DOI/Authority element is not provided.
 - No Recommended Changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

1

Tags*Free Text Search, Parameter Search***Mapping**

DIF 9:

`/DIF/Data_Set_Citation/Dataset_DOI`

DIF 10:

`/DIF/DataSet_Citation/Persistent_Identifier/Identifier where type=DOI`

ECHO 10 Collection:

`/Collection/OnlineResources/OnlineResource/URL where Type includes DOI in its value.`

ISO 19115-2:

```

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/
gmd:identifier/gmd:MD_Identifier/gmd:code/gco:CharacterString

```

```

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.doi
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/
gmd:identifier/gmd:MD_Identifier/gmd:description/gco:CharacterString = DOI

```

or

UMM DOI/MissingReason <=>

```

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:code nilReason="inapplicable"
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.doi
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:description/gco:CharacterString contains DOI
UMM DOI/Explanation <=>
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:description/gco:CharacterString contains
Explanation: <Explanation>

```

Examples

DIF 9:

```

<Data_Set_Citation>
...
  <Dataset_DOI>10.7927/H4SQ8XB1</Dataset_DOI>
</Data_Set_Citation>

```

DIF 10:

```

<Dataset_Citation>
  <Dataset_Creator>SEDAC</Dataset_Creator>
  <Dataset_Title>Global Cyclone Hazard Frequency and Distribution</Dataset_Title>
  ...
  <Persistent_Identifier>
    <Type>DOI</Type>
    <Identifier>10.7927/H4SQ8XB1</Identifier>
  </Persistent_Identifier>
  <Online_Resource>http://dx.doi.org/10.7927/H4SQ8XB1</Online_Resource>
</Dataset_Citation>

```

ECHO 10 Collection:

```

<DOI>10.7927/H4SQ8XB1</DOI>
...
<OnlineResources>
  <OnlineResource>

```

```

    <URL>http://dx.doi.org/10.7927/H4SQ8XB1</URL>
    <Description>data set DOI URL and homepage</Description>
    <Type>DOI URL</Type>
  </OnlineResource>
</OnlineResources>

```

ISO 19115-2:

```

<gmi:MI_Metadata>
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      <gmd:citation>
        <gmd:CI_Citation>
nbs;      <gmd:identifier>
          <gmd:MD_Identifier>
            <gmd:code>
              <gco:CharacterString>10.7927/H4SQ8XB1</gco:CharacterString>
            </gmd:code>
            <gmd:codeSpace>
              <gco:CharacterString>gov.nasa.esdis.umm.doi</gco:CharacterString>
            </gmd:codeSpace>
            <gmd:description>
              <gco:CharacterString>DOI</gco:CharacterString>
            </gmd:description>
          </gmd:MD_Identifier>
        </gmd:identifier>
        ....
      </gmd:CI_Citation>
    </gmd:citation>
  </gmd:MD_DataIdentification>
</gmd:identificationInfo>
</gmi:MI_Metadata>
or
<gmi:MI_Metadata>
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      <gmd:citation>
        <gmd:CI_Citation>
          <gmd:identifier>
            <gmd:MD_Identifier>
              <gmd:code nilReason="inapplicable"/>
            <gmd:codeSpace>
              <gco:CharacterString>gov.nasa.esdis.umm.doi</gco:CharacterString>
            </gmd:codeSpace>
            <gmd:description>

```

```

    <gco:CharacterString>DOI Explanation: The collection is a near real time
collection that does not have a DOI because the collection only exists for a couple of
days.</gco:CharacterString>
    </gmd:description>
    </gmd:MD_Identifier>
</gmd:identifier>
    ....
    </gmd:CI_Citation>
</gmd:citation>
    </gmd:MD_DataIdentification>
</gmd:identificationInfo>
</gmi:MI_Metadata>

```

B.2.2.5 AssociatedDOIs

Element Specification

AssociatedDOIs (0..1)
AssociatedDOIs/Title (0..1)
AssociatedDOIs/Authority (0..1)
AssociatedDOIs/DOI (1)

Description

This element stores Data Set DOIs that are related to the data set collection being described in the UMM-C record. The Title field will assist client users by providing context for the AssociatedDOIs.

Note: The values should start with the directory indicator which in ESDIS' case is 10. If the DOI was registered through ESDIS, the beginning of the string should be 10.5067. The DOI URL is not stored here; it should be stored as a RelatedURL. The DOI organization that is responsible for creating the DOI is described in the Authority element. For ESDIS records the value of <https://doi.org/> should be used. While this element is not required, NASA metadata providers are strongly encouraged to include DOI and DOI Authority for their collections.

Best Practices

For the Associated DOIs concept, there are three options for providing information. These options are:

Title: A brief description of the resource providing context for the DOI.
DOI: The DOI (Digital Object Identifier) that identifies the collection.
Authority: The DOI organization that is responsible for creating the DOI

For Title, DOI, Authority

DOI:

- When providing information in the DOI/DOI field, only the DOI string should be provided. The string value should begin with the directory indicator.

- The DOI URL should not be stored in the DOI element but should instead be provided as a RelatedURL.
- For ESDIS providers specifically:
 - The directory indicator for ESDIS is "10." Therefore, if the DOI was registered through ESDIS, the beginning of the DOI string should be "10.5067".
 - A list of DOIs registered through ESDIS can be found here:
<https://wiki.earthdata.nasa.gov/display/DOIsforEOSDIS/EOSDIS+DOIs+Status+and+Listing>
 - More details on the ESDIS DOI process can be found here:
<https://wiki.earthdata.nasa.gov/display/DOIsforEOSDIS/ESDIS+DOI+Process>
 - DOI is a required metadata element for ESDIS providers. While the majority of ESDIS datasets will have a DOI, there are certain cases where having a DOI is not appropriate. These cases include near real time datasets and datasets that will soon be replaced by a new version. Please see the DOI/MissingReason and DOI/Explanation section for more information.

DOI/Authority:

- For ESDIS providers specifically:
 - The DOI/Authority element value should be "https://doi.org/"

Examples:

Title: Landsat-derived Sprint and Autumn Phenology,Eastern US - Canadian Forests, 1984-2013

DOI: "10.3334/ORNLDAAC/1570"

Authority: "https://doi.org/"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Verify that the DOI resolves to the appropriate web page.
 - Automated Review
 - Check that the field length is not greater than 1,024 characters.
 - Check that the DOI is resolvable.
 - Check that the DOI syntax is valid.
- CMR Validation
 - The DOI must start with two digits followed by a period (.) followed by 4 digits followed by an optional period with optional digits. After the digits the DOI value must be followed by a slash (/) followed by alphanumeric characters.
 - The DOI must be at least 1 character and at most 1024 characters in length.
- ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when:
 - The element is not included at all.
 - The element is included but is empty.
 - The dataset has a DOI but the metadata indicates that it does not.
 - The incorrect DOI is listed for the dataset.

- The DOI listed leads to a broken link.
 - The DOI is provided in the incorrect format (e.g. as a URL rather than just the DOI string).
 - The DOI/Explanation includes spelling or grammatical errors.
- Marked as medium priority
 - The DOI/MissingReason option is used but no DOI/Explanation is provided.
- Marked as low priority
 - A DOI is provided but the DOI/Authority element is not provided.
- No Recommended Changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

1

Tags*Free Text Search, Parameter Search***Mapping**

DIF 10:

Associated_DOIs/DOI

ECHO 10 Collection:

AssociatedDOIs/AssociatedDOI/DOI

ISO 19115-2:

```
"/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:aggregationInfo/gmd:MD_AggregateInformation/gmd:aggregateDataSetIdentifier/gmd:MD_Identifier [=>
[=> /gmd:code/gco:CharacterString = <Associated DOI>
and
[=> gmd:codeSpace/gco:CharacterString = gov.nasa.esdis.umm.associateddoi
and
[=> gmd:description/gco:CharacterString contains associated doi
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:aggregationInfo/gmd:MD_AggregateInformation/gmd:associationType/gmd:DS_AssociationTypeCode
codeListValue=""associatedDOIs"
```

Examples

DIF 10:

<Associated_DOIs>

<DOI>10.5067/GPM/GMICONSTXT/DAY/05</DOI>

```
<Title>GPM constellation multi-imager hourly 0.25 degree gridded precipitation V05
(GPM_3GIDEGPM_DAY) at GES DISC</Title>
```

```

<Authority>https://doi.org/</Authority>
</Associated_DOIs>
<Associated_DOIs>
<DOI>10.5067/GPM/PRTMI/TRMM/3B-MONTH/06</DOI>
<Title>GPM PR and TMI on TRMM (Combined Precipitation) L3 1 month 0.25x0.25 degree
V06 (GPM_3CMB_TRMM) at GES DISC</Title>
<Authority>https://doi.org/</Authority>
</Associated_DOIs>

```

ECHO 10 Collection:

```

<AssociatedDOIs>
<AssociatedDOI>
<DOI>10.5067/GPM/GMICONSTXT/DAY/05</DOI>
<Title>GPM constellation multi-imager hourly 0.25 degree gridded precipitation V05
(GPM_3GIDEGPM_DAY) at GES DISC</Title>
<Authority>https://doi.org/</Authority>
</AssociatedDOI>
<AssociatedDOI>
<DOI>10.5067/GPM/PRTMI/TRMM/3B-MONTH/06</DOI>
<Title>GPM PR and TMI on TRMM (Combined Precipitation) L3 1 month 0.25x0.25 degree
V06 (GPM_3CMB_TRMM) at GES DISC</Title>
<Authority>https://doi.org/</Authority>
</AssociatedDOI>
</AssociatedDOIs>

```

ISO 19115-2:

```

<gmd:MD_Identifier>
  <gmd:authority>
    <gmd:CI_Citation>
      <gmd:title gco:nilReason="inapplicable"></gmd:title>
      <gmd:date gco:nilReason="inapplicable"></gmd:date>
      <gmd:citedResponsibleParty>
        <gmd:CI_ResponsibleParty>
          <gmd:organisationName>
            <gco:CharacterString>https://doi.org/</gco:CharacterString>
          </gmd:organisationName>
          <gmd:role>
            <gmd:CI_RoleCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
codeListValue="authority">authority</gmd:CI_RoleCode>
          </gmd:role>
        </gmd:CI_ResponsibleParty>
      </gmd:citedResponsibleParty>
    </gmd:CI_Citation>
  </gmd:authority>

```

```

    <gmd:code>
<gco:CharacterString>10.5067/GPM/GMICONSTXT/DAY/05</gco:CharacterString>
    </gmd:code>
    <gmd:codeSpace>

<gco:CharacterString>gov.nasa.esdis.umm.associateddoi</gco:CharacterString>
    </gmd:codeSpace>
    <gmd:description>
      <gco:CharacterString>Associated DOI</gco:CharacterString>
    </gmd:description>
  </gmd:MD_Identifier>

```

UMM-JSON:

```

,
"AssociatedDOIs": [
{
"DOI": "10.5067/GPM/GMICONSTXT/DAY/05",
"Title": "GPM constellation multi-imager hourly 0.25 degree gridded precipitation V05
(GPM_3GIDEGPM_DAY) at GES DISC",
"Authority": "https://doi.org/"
},
{
"DOI": "10.5067/GPM/PRTMI/TRMM/3B-MONTH/06",
"Title": "GPM PR and TMI on TRMM (Combined Precipitation) L3 1 month 0.25x0.25 degree
V06 (GPM_3CMB_TRMM) at GES DISC",
"Authority": "https://doi.org/"
}
],

```

B.2.2.6 Abstract [R]

Element Specification

Abstract

Description

Abstract provides a brief description of the resource the metadata represents. This element allows markdown-formatted text and line breaks within the text are preserved. Additional information on markdown can be found at <http://en.wikipedia.org/wiki/Markdown>.

Best Practices

The abstract should summarize the dataset and mimic a journal abstract that is useful to the science community but also approachable for a first time user of the data. The following information should be included (when applicable):

- The temporal range of the dataset
- The names of platforms, instruments, and/or methods used to collect data

- The spatial coverage of the data (including any gaps in coverage)
- A brief explanation of processing applied to the data
- The format the data is provided in and whether proprietary software is required to use it
- Units the data is provided in
- Spatial and temporal resolution of the data
- Similarities and differences of these data to other closely related datasets
- The purpose and/or intended use of the data (especially if the <Purpose> element is not populated)
- If the data were collected as part of a campaign, a brief description of the campaign and how the dataset fits into the picture of the campaign
- Any other pertinent information a user might find helpful

In addition, the abstract should utilize a standard mixed case capitalization scheme. All acronyms should be defined. All sentences should be complete sentences and proper grammar should be used.

Examples:

"The GPM Ground Validation Iowa X-band Polarimetric Mobile Doppler Weather Radars IFloodS dataset was gathered during the IFloodS campaign from April to June 2013 throughout central and northeastern Iowa. The Iowa Flood Studies (IFloodS) was a ground measurement campaign that took place throughout Iowa from May 1 to June 15, 2013. The main goal of IFloodS was to evaluate how well the GPM satellite rainfall data can be used for flood forecasting. Four X-band Polarimetric (XPOL) Mobile Doppler Weather Radars were used to collect high-resolution observations of precipitation. The data consists of reflectivity, Doppler velocity, spectrum width, differential reflectivity, differential phase, copolar correlation coefficient, and sound-to-noise ratios. These data are available in netCDF, and browse image files are available in .png format."

"This dataset, LBA-ECO LC-39 MODIS Active Fire and Frequency Data for South America: 2000-2007, provides active fire locations and estimates of annual fire frequencies for South America from 2000-2007. Data from the MODERate Resolution Imaging Spectroradiometer (MODIS) sensors aboard the Terra (2000-2007) and Aqua (2003-2007) satellite platforms were analyzed to determine spatial and temporal patterns in satellite fire detections. The analysis considered a high-confidence subset of all MODIS fire detections to reduce the influence of false fire detections over small forest clearings in Amazonia (Schroeder et al., 2008). The number of unique days on which the active fire detections were recorded within a 1 km radius was estimated from the subset of active fire detections and the ArcGIS neighborhood variety algorithm. There are 14 data files with this dataset: 7 GeoTIFF (.tif) files of fire frequency at MODIS 250 m resolution, where each grid cell value represents the number of days in that year on which active fires were detected, and 7 shape files of active fire locations for the years 2001-2007."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that there is at least a brief summary of the data.
 - Confirm that other URLs link to the appropriate web pages.
 - Identify errors, discrepancies or omissions.

- Proof all content for conciseness and readability.
- Automated Review
 - Check that the field length is not greater than 40,000 characters.
 - Check that the field length is at least 50 characters.
 - Check that the field has been populated.
 - Check for potential broken links.
- CMR Validation
 - Must contain at least 1 character and be no longer than 4000 characters in length
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all.
 - The element is included but is empty.
 - The abstract contains a spelling or grammatical error.
 - The abstract is a copy of the short name or dataset title.
 - The abstract is comprised of a single incomplete sentence.
 - The information provided in the abstract is inaccurate.
 - The information provided in the abstract is unclear or difficult to understand.
 - A broken link is contained in the abstract.
 - The abstract provided is identical to that of another collection.
 - Marked as medium priority
 - An acronym needs to be defined in the abstract.
 - Information that would make the abstract more robust is missing from the abstract.
 - Marked as low priority
 - A link needs to be updated from 'http' to 'https' in the abstract.
 - The title of the dataset is not included in the first sentence of the abstract.
 - No Recommended Changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

1

Tags

Required, Free Text Search, Markdown Support

Mapping

DIF 9:

/DIF/Summary/Abstract

DIF 10:

/DIF/Summary/Abstract

ECHO 10 Collection:

/Collection/Description

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:abstract/gco:CharacterString

Examples

DIF 9:

<Summary>

<Abstract>The Lambert Glacier Basin (LGB) series of five oversnow traverses were conducted from 1989-95. Ten metre depth (10 m) firn temperatures, as a proxy indicator of annual mean surface temperature at a site, were recorded approximately every 30 km along the 2014 km main traverse route from LGB00 (68.6543 S, 61.1201 E) near Mawson Station, to LGB72 (69.9209 S, 76.4933 E) near Davis Station.

10 m depth firn temperatures were recorded manually in field notebooks and the data transferred to spreadsheet files (MS Excel).

Summary data (30 km spatial resolution) can be obtained from CRC Research Note No.09 & Surface Mass Balance and Snow Surface Properties from the Lambert Glacier Basin Traverses 1990-94&.

This work was completed as part of ASAC projects 3 and 2216.

Some of this data have been stored in a very old format. The majority of files have been updated to current formats, but some files (kaleidograph files in particular) were not able to be modified due to a lack of appropriate software. However, these files are simply figures, and can be regenerated from the raw data (also provided).

The fields in this dataset are:

Latitude

Longitude

Height

Cane

Distance

Elevation

Density

Mass Accumulation

Year

Delta Oxygen-18

Grain Size

Ice Crusts

Depth Hoar</Abstract>

</Summary>

DIF 10:

<Summary>

<Abstract>The Atmospheric Infrared Sounder (AIRS) is a grating spectrometer (R = 1200) aboard the second Earth Observing System (EOS) polar-orbiting platform, EOS Aqua. In combination with the Advanced Microwave Sounding Unit (AMSU) and the Humidity Sounder for Brazil (HSB), AIRS constitutes an innovative atmospheric sounding group of visible,

infrared, and microwave sensors. The AIRS Carbon Dioxide (CO₂) Standard Retrieval Product consists of retrieved estimates of CO₂, plus estimates of the errors associated with the retrieval. In contrast to AIRX2RET, the horizontal resolution of this standard product is about 110 km (1x1 degree). An AIRS granule has been set as 6 minutes of data, 15 footprints cross track by 22 lines along track.

</Summary>

ECHO 10 Collection:

<Description>

The AMSR-E/Aqua Level-3 daily Snow Water Equivalent (SWE) product includes global SWE on Northern and Southern Hemisphere 25 km EASE-Grids, generated by the GSFC algorithm using Level-2A TBs.

</Description>

ISO 19115-2:

<gmd:abstract>

<gco:CharacterString>The AMSR-E/Aqua Level-3 daily Snow Water Equivalent (SWE) product

includes global SWE on Northern and Southern Hemisphere 25 km EASE-Grids, generated by the GSFC algorithm using Level-2A TBs. Version Description: Transitional snow water equivalent (SWE) corrects for forest attenuation using forest fraction from MODIS 1 km IGBP Classes and forest density from MODIS 500 m UMD Vegetation

Continuous

Field; snow density climatology is used to convert snow depth to SWE.

</gmd:abstract>

B.2.2.7 Purpose

Element Specification

Purpose

Description

The Purpose element contains suggested usage for the data and/or a description for why the resource exists. Any limitations on the resource (including, but not limited to, special restrictions, legal prerequisites, and terms and conditions) should be placed into the Use Constraints element and not into the Purpose element.

Best Practices

The Purpose element is optional. It can be leveraged to communicate to a user specific the broad applications the data is designed to be used for, and/or why the data were generated.

Examples:

"To assess species composition, abundance, distribution and biomass of zooplankton within the Bering and Chukchi Seas , 1985-1989."

"To provide VIIRS 375m resolution active fire locations in Near Real-Time in easy to use formats."

"To serve a wide user community by providing composite Landsat images and raw data for urban areas that can be used in interdisciplinary studies of remote sensing and the environment."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the purpose description is appropriate for the dataset.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 1000 characters.
- CMR Validation
 - If this element is used it must contain at least 1 character and be no longer than 10000 characters in length
- ARC Validation Report
 - Marked as high priority
 - The purpose contains spelling or grammatical errors
 - The purpose is incorrect for the data (for example, a copy + paste error could result in the purpose for a different dataset to appear in this field)
 - A broken URL is provided in the purpose element
 - Marked as medium priority
 - The information provided in the purpose element is better suited for a different metadata field (i.e. incorrect usage of the purpose field)
 - Marked as low priority
 - A link provided in the purpose element needs to be updated from 'http' to 'https'
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags

Free Text Search, Recommended, Markdown Support

Mapping

DIF 9:

/DIF/Summary/Purpose

DIF 10:

/DIF/Summary/Purpose

ECHO 10 Collection:

/Collection/SuggestedUsage

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:purpose/gco:CharacterString

Examples

DIF 9:

<Summary>

...

<Purpose>To assess species composition, abundance, distribution and biomass of zooplankton within the Bering and Chukchi Seas , 1985-1989</Purpose>

</Summary>

DIF 10:

<Summary>

...

<Purpose>To provide VIIRS 375m active fire locations in Near Real-Time in easy to use formats.</Purpose>

</Summary>

ECHO 10 Collection:

<SuggestedUsage>To serve a wide user community by providing composite Landsat images and raw data for urban areas that can be used in interdisciplinary studies of remote sensing and the environment.</SuggestedUsage>

ISO 19115-2:

<gmd:purpose>

<gco:CharacterString>To serve a wide user community by providing composite Landsat images and raw data for urban areas that can be used in interdisciplinary studies of remote sensing and the environment.</gco:CharacterString>

</gmd:purpose>

B.2.2.8 Data Language

Element Specification

Language

Description

The Data Language element describes the language used in the preparation, storage, and description of the collection. It is the language of the collection data itself. It does not refer to the language used in the metadata record (although this may be the same language). Please refer to the Metadata Language wiki page on how to specify the language used in the metadata.

Best Practices

While not required, it is recommended that an ISO 639-2 code be used to populate the Data Language field (http://www.loc.gov/standards/iso639-2/php/code_list.php). If a language is not supplied - English, the default language, will be assumed.

Examples:

"eng" ← Example using the ISO 639-2 code for English

"French" ← Example where the ISO 639-2 code is not used

"chi (B)" ← Example using the ISO 639-2 code for Chinese (See this FAQ for an explanation why "(B)" is included in the code) <http://www.loc.gov/standards/iso639-2/faq.html#3>

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field value matches the enumeration value.
(English;Afrikaans;Arabic;Bosnian;Bulgarian;Chinese;Croatian;Czech;Danish;Dutch;Estonian;Finnish;French;German;Hebrew;Hungarian;Indonesian;Italian;Japanese;Korean;Latvian;Lithuanian;Norwegian;Polish;Portuguese;Romanian;Russian;Slovak;Spanish;Ukrainian;Vietnamese)
- CMR Validation
 - This element is currently not validated.
- ARC Validation Report
 - Marked as high priority
 - The data language(s) provided are incorrect for the dataset.
 - Marked as medium priority
 - Not applicable
 - Marked as low priority
 - No data language is provided when the data language is a language other than English (the assumed default language).
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags

Recommended

Mapping

DIF 9:

/DIF/Data_Set_Language

DIF 10:

/DIF/Dataset_Language

ISO 19115-2:

```

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/
gmd:language/gco:CharacterString
with
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:MD_CharacterSetC
ode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_Charact
erSetCode" codeListValue="utf8"

```

Examples

DIF 9:

```
<Data_Set_Language>English</Data_Set_Language>
```

DIF 10:

```
<Dataset_Language>English</Dataset_Language>
```

ISO 19115-2:

```

<gmd:language>
  <gco:CharacterString>eng</gco:CharacterString>
</gmd:language>
<gmd:MD_CharacterSetCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_Charact
erSetCode" codeListValue="utf8">utf8</gmd:MD_CharacterSetCode>
</gmd:characterSet>

```

B.2.2.9 Data Dates**Element Specification**

DataDate/Date (1)

DataDate/Type (1) <CREATE, UPDATE, DELETE, REVIEW>

Description

There are three types of dates used in the UMM profiles:

- Dates that concern the metadata record - called Metadata Dates in this document.
- Dates that concern the resource itself (collections, granules, services, etc.) - called Data Dates in this document.
- Dates that describe the time period in which the data set was acquired - called Temporal Extent in this document.

Of these three date types this element is comprised of dates for when the *data or resource* itself changed in some way. It does not include the first or third bullets that describe Metadata Dates or Temporal Extent. This element is made of two sub-elements, type and date. The type describes what the date represents: a future review, when the resource was created, last updated, or planned for deletion. The date describes when the resource had an action performed on it or when an action on it will occur as described by the type element.

Best Practices

Each Data Date is accompanied by a Type. The Type must be selected from a controlled vocabulary list. There are four options available for Type:

- CREATE: The date the resource was created. This should be the date the dataset was published in the database/ entered into the data archive system.
- UPDATE: The date the resource was last updated. This includes any changes made to the data itself, such as a change in processing or a change in the file naming convention.
- REVIEW: The date of a planned future review of the resource.
- DELETE: The date the resource will be deleted.

Providing a Data Date is optional. Multiple Data Dates are allowed, however, the same date type should not be repeated more than once in the same record (for example, a CREATE and an UPDATE time can be provided, but two CREATE times cannot be provided in the same record). All dates should comply with the ISO 8601 Standard.

Examples:

Type = CREATE Date: 2010-02-01

Type = UPDATE Date: 2018-02-01

Type = REVIEW Date: 2019-02-01

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the date is accurate for the dataset.
 - Automated Review
 - Check that the field has been populated.
 - Check that the date format is correct.
 - Check that the field length is not greater than 1,000 characters.
- CMR Validation
 - The CMR makes sure the date values are in the correct order and range where CREATE date needs to be earlier or equal to the UPDATE date and both dates need to be in the past. The REVIEW date needs to be before the DELETE date and both dates need to be in the future.
 - The Date needs to comply with the ISO 8601 Standard.
- ARC Validation Report
 - Marked as high priority
 - The DataDate/Type does not match one of the date type enumeration values (CREATE, UPDATE, REVIEW, DELETE).
 - The DataDate/Date provided does not comply with the ISO 8601 Standard.
 - Marked as medium priority
 - A REVIEW or DELETE date is in the past.
 - The CREATE or UPDATE date is in the future.
 - A translation error between a native metadata format (ISO, DIF 10, ECHO 10) and UMM is present for the date and/or the date type.
 - Marked as low priority
 - n/a
 - No recommended changes

- The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Recommended***Mapping**

DIF 10:

/DIF/Metadata_Dates/Data_Creation
 /DIF/Metadata_Dates/Data_Last_Revision
 /DIF/Metadata_Dates/Data_Future_Review
 /DIF/Metadata_Dates/Data_Delete

ECHO 10 Collection:

/Collection/InsertTime
 /Collection/LastUpdate
 /Collection/DeleteTime

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:date/gco:DateTime
 with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_DateTypeCode codeListValue varies.

Examples

DIF 10:

```
<Metadata_Dates>
...
  <Data_Creation>2015-01-01</Data_Creation>
  <Data_Last_Revision>2015-01-01</Data_Last_Revision>
  <Data_Future_Review>2026-05-12</Data_Future_Review>
</Metadata_Dates>
```

ECHO 10 Collection:

```
<InsertTime>2008-12-02T00:00:00.000Z</InsertTime>
<LastUpdate>2008-12-02T00:00:00.000Z</LastUpdate>
```

ISO 19115-2:

```
<gmd:date>
<gmd:CI_Date>
  <gmd:date>
    <gco:DateTime>2008-06-03T00:00:00.000Z</gco:DateTime>
```

```

</gmd:date>
<gmd:dateType>
  <gmd:CI_DateTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_DateType
Code" codeListValue="revision">revision</gmd:CI_DateTypeCode>
  </gmd:dateType>
</gmd:CI_Date>
</gmd:date>
<gmd:date>
<gmd:CI_Date>
  <gmd:date>
    <gco:DateTime>2005-06-01T00:00:00.000Z</gco:DateTime>
  </gmd:date>
  <gmd:dateType>
    <gmd:CI_DateTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_DateType
Code" codeListValue="creation">creation</gmd:CI_DateTypeCode>
  </gmd:dateType>
</gmd:CI_Date>
</gmd:date>

```

B.2.2.10 DataCenter [R]

Element Specification

DataCenter (1..*)

DataCenter/Roles (1..*) <ARCHIVER, DISTRIBUTOR, ORIGINATOR, PROCESSOR>

DataCenter/ShortName (1)

DataCenter/LongName (0..1)

DataCenter/Uuid (0..1)

DataCenter/ContactInformation (0..1)

DataCenter/ContactInformation/RelatedURL (0..*)

DataCenter/ContactInformation/ServiceHours (0..1)

DataCenter/ContactInformation/ContactInstructions (0..1)

DataCenter/ContactInformation/ContactMechanism (0..*)

DataCenter/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>

DataCenter/ContactInformation/ContactMechanism/Value (1)

DataCenter/ContactInformation/Address (0..*)

DataCenter/ContactInformation/Address/StreetAddresses (0..*)

DataCenter/ContactInformation/Address/City (0..1)

DataCenter/ContactInformation/Address/StateProvince (0..1)

DataCenter/ContactInformation/Address/PostalCode (0..1)

DataCenter/ContactInformation/Address/Country (0..1)

CHOICE OF:

DataCenter/ContactPerson (0..*)

DataCenter/ContactPerson/Roles (1..*) <DATA CENTER CONTACT, TECHNICAL CONTACT, SCIENCE CONTACT, INVESTIGATOR, METADATA AUTHOR, USER SERVICES, SCIENCE SOFTWARE DEVELOPMENT>
DataCenter/ContactPerson/NonDataCenterAffiliation (0..1)
DataCenter/ContactPerson/FirstName (0..1)
DataCenter/ContactPerson/MiddleName (0..1)
DataCenter/ContactPerson/LastName (1)
DataCenter/ContactPerson/Uuid (0..1)
DataCenter/ContactPerson/ContactInformation (0..1)
DataCenter/ContactPerson/ContactInformation/RelatedURL (0..*)
DataCenter/ContactPerson/ContactInformation/ServiceHours (0..1)
DataCenter/ContactPerson/ContactInformation/ContactInstructions (0..1)
DataCenter/ContactPerson/ContactInformation/ContactMechanism (0..*)
DataCenter/ContactPerson/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>
DataCenter/ContactPerson/ContactInformation/ContactMechanism/Value (1)
DataCenter/ContactPerson/ContactInformation/Address (0..*)
DataCenter/ContactPerson/ContactInformation/Address/StreetAddresses (0..*)
DataCenter/ContactPerson/ContactInformation/Address/City (0..1)
DataCenter/ContactPerson/ContactInformation/Address/StateProvince (0..1)
DataCenter/ContactPerson/ContactInformation/Address/PostalCode (0..1)
DataCenter/ContactPerson/ContactInformation/Address/Country (0..1)

OR

DataCenter/ContactGroup (0..*)
DataCenter/ContactGroup/Roles (1..*) <DATA CENTER CONTACT, TECHNICAL CONTACT, SCIENCE CONTACT, INVESTIGATOR, METADATA AUTHOR, USER SERVICES, SCIENCE SOFTWARE DEVELOPMENT>
DataCenter/ContactGroup/NonDataCenterAffiliation (0..1)
DataCenter/ContactGroup/GroupName (1)
DataCenter/ContactGroup/Uuid (0..1)
DataCenter/ContactGroup/ContactInformation (0..1)
DataCenter/ContactGroup/ContactInformation/RelatedURL (0..*)
DataCenter/ContactGroup/ContactInformation/ServiceHours (0..1)
DataCenter/ContactGroup/ContactInformation/ContactInstructions (0..1)
DataCenter/ContactGroup/ContactInformation/ContactMechanism (0..*)
DataCenter/ContactGroup/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>
DataCenter/ContactGroup/ContactInformation/ContactMechanism/Value (1)
DataCenter/ContactGroup/ContactInformation/Address (0..*)
DataCenter/ContactGroup/ContactInformation/Address/StreetAddresses (0..*)
DataCenter/ContactGroup/ContactInformation/Address/City (0..1)
DataCenter/ContactGroup/ContactInformation/Address/StateProvince (0..1)

DataCenter/ContactGroup/ContactInformation/Address/PostalCode (0..1)

DataCenter/ContactGroup/ContactInformation/Address/Country (0..1)

Description

The Data Center metadata element is used to identify and provide contact information for the organization responsible for originating, processing, archiving, and/or distributing the dataset being described in the metadata.

Contact information for an individual or a group affiliated with the data center can also be provided. Information about an individual should be provided in the DataCenter/ContactPerson sub-fields. Information about a group should be provided in the DataCenter/ContactGroup sub-fields.

There are 5 options for providing contact information in the UMM:

1. Data Center
2. Data Center/Contact Person
3. Data Center/Contact Group
4. Contact Person
5. Contact Group

Details for each of these options are provided on a separate wiki page. This wiki page describes details for option 1 (Data Center).

Best Practices

Each Data Center listed in the metadata must be affiliated with a Role. Providing a Role for the Data Center is required and must be selected from a controlled vocabulary list. There are four options for Role:

- **ARCHIVER:** the organization responsible for storing the data. This role should be selected when listing the name of a NASA Distributed Active Archive Center (DAAC).
- **DISTRIBUTOR:** the organization responsible for distributing the data. The archiver and distributor will often be the same organization. In this case, both 'ARCHIVER' and 'DISTRIBUTOR' can be specified for the same data center.
- **ORIGINATOR:** the organization responsible for producing the data.
- **PROCESSOR:** the organization responsible for processing the data. Not all data is necessarily processed. Examples of processing include: converting raw data into level 1 data; re-gridding or re-projecting data to make a higher level product; combining multiple data products to derive a model output.

The same data center may be responsible for multiple roles. In this case, multiple roles may be assigned to the same data center.

Other Data Center metadata fields include:

Short Name: The name of the Data Center (abbreviated version). Providing a Data Center Short Name is required. The Data Center Short Name must be selected from a controlled vocabulary maintained in the Keyword Management System (KMS). A list of valid Data Center keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/providers?format=csv Note that the Short Name should be selected from the "Short_Name" column in the keyword list.

Long Name: The name of the Data Center. Providing a Data Center Long Name is optional, however, it is recommended that a long name be provided if one exists in the keyword list since short names are often comprised of acronyms. A list of valid Data Center keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/providers?format=csv Note that the Long Name should be selected from the "Long_Name" column in the keyword list.

Uuid: The uuid is the unique identifier associated with the Data Center name in the controlled vocabulary keyword list. Providing the uuid is completely optional. The uuid can be found in the Data Centers keyword list in the "UUID" column.

Contact Information: Any relevant contact information for the data center can be provided in the Contact Information fields. Providing contact information is optional, however, it is recommended that at least one piece of contact information (such as a link, email or phone number) be provided. Some examples of contact information include: phone number, email, fax, related links, service hours, and contact instructions. See the element specification table below for full details.

Example:

Role: ARCHIVER, DISTRIBUTOR

ShortName: NASA/MSFC/GHRC

LongName: Global Hydrology Resource Center, Marshall Space Flight Center, NASA

ContactInformation/RelatedURL/Url: <https://ghrc.nsstc.nasa.gov/home/>

ContactInformation/RelatedURLs/UrlContentType: DataCenterURL

ContactInformation/RelatedURLs/Type: HOME PAGE

ContactInformation/RelatedURLs/Description: The Global Hydrology Resource Center (GHRC) website's home page

ContactInformation/ServiceHours: 8 AM to 5 PM Central Time

ContactInformation/ContactMechanism/Type: Email

ContactInformation/ContactMechanism/Value: support-ghrc@earthdata.nasa.gov

ContactInformation/ContactMechanism/Type: Phone

ContactInformation/ContactMechanism/Value: 256-961-7932

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Confirm that the URL link to the appropriate web page.
 - Automated Review

-
- Check that the field length is not greater than 160 characters (Dataset_ID).
 - Check that the field length is not greater than 1,024 characters (Hours_of_Service).
 - Check that the field length is not greater than 2,048 characters (Instructions).
 - Check that the field length is not greater than 2,048 characters (Organization_URL).
 - Check that the field has been populated.
 - Check that the field value is not a duplicate.
 - Check that the field value (Role) matches the enumeration value (DISTRIBUTOR, ORIGINATOR, ARCHIVER, PROCESSOR).
 - Check for potential broken links.
 - Check that the URL is formatted correctly.
- CMR Validation
 - N/A
 - ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when:
 - No Data Center information is provided.
 - No Data Center Short Name is provided.
 - No Data Center Role.
 - No Data Center URL is provided.
 - The Data Center URL provided is broken.
 - The Data Center URL provided is incorrect/unrelated to the data center.
 - The URL Content Type does not match the enumeration value "DataCenterURL."
 - The URL Type provided does not match the keyword value "HOME PAGE."
 - The Data Center Short Name and/or Long Name does not align with the KMS.
 - The Short Name and/or Long Name does not exist in the KMS.
 - The Short Name and/or Long Name is placed in the incorrect position of the hierarchy (e.g. DOC/NOAA/OOE should not be provided in the Long Name field, because it is categorized as a Short Name in the KMS).
 - There is an invalid Short Name/ Long Name relationship (e.g. Short Name: DOC/NOAA/OOE, Long Name: Energy Team, U.S. Geological Survey, U.S. Department of the Interior, is not a valid combination in the KMS).
 - The UUID provided is incorrect for the Data Center.
 - The Data Center provided is incorrect for the dataset.
 - The Data Center Role provided does not align with the UMM-Common enumeration values (DISTRIBUTOR, ORIGINATOR, ARCHIVER, PROCESSOR).

- The Contact Mechanism Type does not align with the UMM-Common enumeration values (Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other).
- The Contact Information provided is incorrect.
- Marked as medium priority
 - The Data Center Related URL 'Description' element is left blank. It is highly recommended that a description be provided for each URL.
 - The Data Center Related URL provided in the metadata redirects - it is recommended that the most current link always be provided.
 - A recommendation is made to change a valid Data Center keyword for purposes of consistency with other similar metadata records.
 - No Data Center Long Name is provided when a long name exists in the KMS.
 - The information provided in the Data Center elements is better suited for the DataCenter/ContactGroup or DataCenter/ContactPerson metadata elements.
- Marked as low priority
 - The Data Center Related URL is provided via http when https is available.
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

1..*

Tags

Required, Free Text Search, Parameter Search

Analysis

The Metadata Management Tool (MMT) collection forms are organized based on the current UMM-C/UMM-Common metadata model. During MMT alpha and beta testing, some metadata providers indicated that they were confused by the Organization, Personnel and Party elements on the MMT collection record forms. Issues and areas of confusion included:

- Roles:
 - pick lists include roles that apply to organizations and roles that apply to individuals.
 - role values are not the same for DIF and for ECHO.
 - current collection records in CMR have non-standardized values for roles (including different variations of the same word (ARCHIVER, archive, archive data center), different words for the same concept (PRODUCER, PROCESSOR).
 - ECHO 10 records have Organization role built into field names (Processing Center, Archive Center) rather than as field values.
 - EDSC shows Processing Center and Archiving Center on Collection Information panel, but these are blank for DIF collections.

- Contact Types:
 - contact type lists associated with organizations and personnel are not standardized.
 - contact type lists associated with organizations and personnel do not include 'modern' values.

Based on that feedback, we revisited the metadata model for these field groupings, giving consideration to how the metadata model can best reflect the physical model of organizations responsible for earth science datasets and people or groups who can be contacted with questions about those datasets. Based on this additional analysis, we are now recommending a collection metadata model which moves away from the Organization, Responsibility, and Party concepts, and moves back to the Data Center concept that better reflects the physical model of NASA DAACs and makes translation between GCMD collection record values and UMM-C values more straightforward and intuitive.

In addition, we are recommending changing the current UMM-C Personnel element to DataContact. The re-naming of this element emphasizes the function of a contact person, and the corresponding new role assigned to a DataContact better addresses whom to contact for answers to different types of dataset questions (e.g., TECHNICAL CONTACT, SCIENCE CONTACT, USER SERVICES, etc.)

A DataContact may be associated with a DataCenter, as described in this element, or may be independent of a DataCenter, as described in the DataContact element.

Mapping

DIF 9:

/DIF/Data_Center

DIF 10:

/DIF/Organization

ECHO 10 Collection:

/Collection/ProcessingCenter

/Collection/ArchiveCenter

/Collection/Contacts/Contact

ISO 19115-2:

/gmi:MI_Metadata/gmd:contact/gmd:CI_ResponsibleParty

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:CI_Citation/gmd:citedResponsibleParty/gmd:CI_ResponsibleParty/

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:pointOfContact/gmd:CI_ResponsibleParty/

or

/gmi:MI_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor/gmd:MD_Distributor/gmd:distributorContact/gmd:CI_ResponsibleParty/
or
/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmd:LI_ProcessStep/gmd:processor

Examples

DIF 9:

```
<Data_Center>
  <Data_Center_Name uuid="09fc17b0-6aa2-47a2-87e4-dd005c4d52ab">
    <Short_Name>DE/GFZ/ISDC</Short_Name>
    <Long_Name>Information System and Data Center, GeoForschungszentrum Potsdam,
Germany</Long_Name>
  </Data_Center_Name>
  <Data_Center_URL>http://isdc.gfz-potsdam.de/</Data_Center_URL>
  <Data_Set_ID>doi:10.1594/GFZ/ISDC/CHAMP/CH-OG-1-GPS-10S</Data_Set_ID>
  <Personnel>
    <Role>DATA CENTER CONTACT</Role>
    <First_Name>BERND</First_Name>
    <Last_Name>RITSCHHEL</Last_Name>
    <Email>rit@gfz-potsdam.de</Email>
    <Phone>+49-331-288-1685</Phone>
    <Fax>+49-331-288-1703</Fax>
    <Contact_Address>
      <Address>GeoForschungszentrum Potsdam</Address>
      <Address>Daten- und Rechenzentrum</Address>
      <Address>Telegrafenberg A3</Address>
      <City>Potsdam</City>
      <Postal_Code>14473</Postal_Code>
      <Country>GERMANY</Country>
    </Contact_Address>
  </Personnel>
</Data_Center>
```

DIF 10:

```
<Organization>
  <Organization_Type>ARCHIVER</Organization_Type>
  <Organization_Name>
    <Short_Name>ASDC</Short_Name>
    <Long_Name>Atmospheric Science Data Center</Long_Name>
  </Organization_Name>
  <Organization_URL>http://eosweb.larc.nasa.gov</Organization_URL>
  <Personnel>
    <Role>DATA CENTER CONTACT</Role>
    <Contact_Person>
```

```

<First_Name>ASDC</First_Name>
<Last_Name>USER SERVICES</Last_Name>
<Address>
  <Street_Address>NASA Langley Atmospheric Science Data Center</Street_Address>
  <Street_Address>User and Data Services</Street_Address>
  <Street_Address>NASA Langley Research Center</Street_Address>
  <Street_Address>Mail Stop 157D</Street_Address>
  <City>Hampton</City>
  <State_Province>VA</State_Province>
  <Postal_Code>23681-2199</Postal_Code>
  <Country>USA</Country>
</Address>
<Phone>
  <Number>757-864-8656</Number>
  <Type>Telephone</Type>
</Phone>
<Email>support-asdc@earthdata.nasa.gov</Email>
</Contact_Person>
</Personnel>
</Organization>

```

ECHO 10 Collection:

```

<ProcessingCenter>SEDAC</ProcessingCenter>
<ArchiveCenter>SEDAC</ArchiveCenter>

```

```

<Contacts>
  <Contact>
    <Role>Archive</Role>
    <HoursOfService>9:00 A.M. to 5:00 P.M., Monday to Friday</HoursOfService>
    <OrganizationName>Socioeconomic Data and Applications Center
(SEDAC)</OrganizationName>
    <OrganizationAddresses>
      <Address>
        <StreetAddress>CIESIN, Columbia University, 61 Route 9W, P.O. Box
1000</StreetAddress>
        <City>Palisades</City>
        <StateProvince>NY</StateProvince>
        <PostalCode>10964</PostalCode>
        <Country>USA</Country>
      </Address>
    </OrganizationAddresses>
    <OrganizationPhones>
      <Phone>
        <Number>+1 845-365-8920</Number>
        <Type>Telephone</Type>
      </Phone>

```

```

    <Phone>
      <Number>+1 845-365-8922</Number>
      <Type>Fax</Type>
    </Phone>
  </OrganizationPhones>
  <OrganizationEmails>
    <Email>ciesin.info@ciesin.columbia.edu</Email>
  </OrganizationEmails>
  <ContactPersons>
    <ContactPerson>
      <FirstName>SEDAC</FirstName>
      <MiddleName>User</MiddleName>
      <LastName>Services</LastName>
    </ContactPerson>
  </ContactPersons>
</Contact>
</Contacts>

```

ISO 19115-2:

```

<gmd:CI_ResponsibleParty>
  <gmd:organisationName>
    <gco:CharacterString>SEDAC</gco:CharacterString>
  </gmd:organisationName>
  <gmd:role>
    <gmd:CI_RoleCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_RoleCod
e"
      codeListValue="pointOfContact">pointOfContact</gmd:CI_RoleCode>
    </gmd:role>
  <gmd:CI_ResponsibleParty>
    <gmd:individualName>
      <gco:CharacterString>SEDAC User Services</gco:CharacterString>
    </gmd:individualName>
    <gmd:organisationName>
      <gco:CharacterString>Socioeconomic Data and Applications Center
(SEDAC)</gco:CharacterString>
    </gmd:organisationName>
    <gmd:positionName gco:nilReason="missing"/>
    <gmd:contactInfo>
      <gmd:CI_Contact>
        <gmd:phone>
          <gmd:CI_Telephone>
            <gmd:voice>
              <gco:CharacterString>+1 845-365-8920</gco:CharacterString>
            </gmd:voice>
          </gmd:voice>
        </gmd:voice>
      </gmd:CI_Contact>
    </gmd:phone>
  </gmd:CI_Contact>

```



```

        <gco:CharacterString>+1 845-365-8922</gco:CharacterString>
      </gmd:voice>
    </gmd:CI_Telephone>
  </gmd:phone>
  <gmd:address>
    <gmd:CI_Address>
      <gmd:deliveryPoint>
        <gco:CharacterString>CIESIN, Columbia University, 61 Route 9W, P.O.
Box 1000</gco:CharacterString>
      </gmd:deliveryPoint>
      <gmd:city>
        <gco:CharacterString>Palisades</gco:CharacterString>
      </gmd:city>
      <gmd:administrativeArea>
        <gco:CharacterString>NY</gco:CharacterString>
      </gmd:administrativeArea>
      <gmd:postalCode>
        <gco:CharacterString>10964</gco:CharacterString>
      </gmd:postalCode>
      <gmd:country>
        <gco:CharacterString>USA</gco:CharacterString>
      </gmd:country>
    </gmd:electronicMailAddress>

<gco:CharacterString>ciesin.info@ciesin.columbia.edu</gco:CharacterString>
  </gmd:electronicMailAddress>
  </gmd:CI_Address>
</gmd:address>
  <gmd:hoursOfService>
    <gco:CharacterString>9:00 A.M. to 5:00 P.M., Monday to
Friday</gco:CharacterString>
  </gmd:hoursOfService>
  <gmd:contactInstructions gco:nilReason="missing"/>
</gmd:CI_Contact>
</gmd:contactInfo>
  <gmd:role>
    <gmd:CI_RoleCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_RoleCod
e"
      codeListValue="distributor">distributor</gmd:CI_RoleCode>
    </gmd:role>
  </gmd:CI_ResponsibleParty>

```

B.2.2.11 DataContact

DataContact is a parent element to the ContactPerson and the ContactGroup elements. Its purpose is to hold shared elements that its children will use. The DataContact element must exist

with at least 1 of its children; it cannot exist on its own. Below is a diagram showing the relationships between the classes and their elements. The ContactPerson and the ContactGroup elements are described in detail in their respective sub-sections.

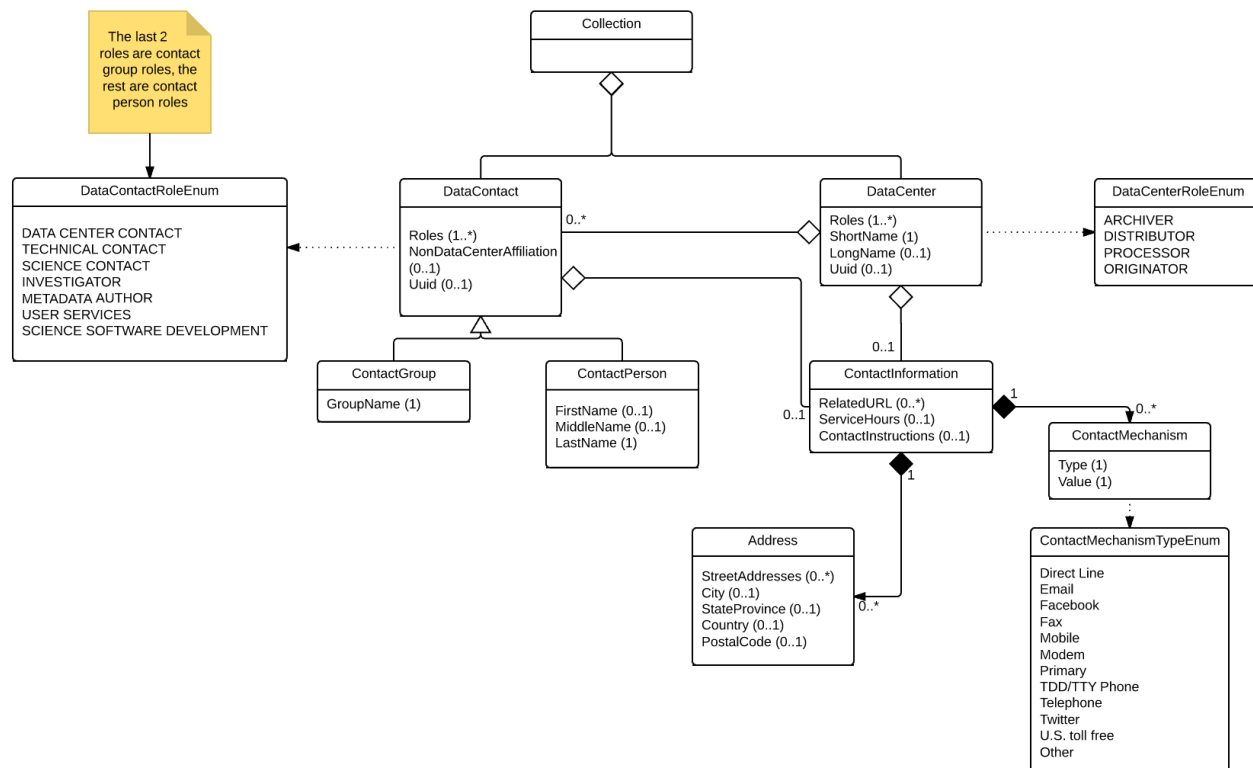


Figure B-5. Data Contact

Description:

This element includes metadata that describes who to contact to get information about the dataset. There may be zero to many contacts. A data contact can be either a ContactPerson or a ContactGroup. As stated in the DataCenter analysis section the old UMM Personnel element was changed to the DataContact element group including its children of ContactPerson and ContactGroup. The DataContact element only holds shared sub-elements for its children elements and cannot be used on its own. Either ContactPerson or ContactGroup must be used. This change emphasizes the contact function and expertise of the person or group described. The corresponding new role assigned to DataContact gives a dataset user better information on whom to contact for answers to different types of dataset questions (e.g., TECHNICAL CONTACT, SCIENCE CONTACT, USER SERVICES, etc.). A DataContact may be independent of a DataCenter. In that case, the NonDataCenterAffiliation field may be used to indicate the independent affiliation of the DataContact contact person or group.

B.2.2.11.1 ContactPerson

Element Specification

ContactPerson (0..*)

ContactPerson/Roles (1..*) <Data Center Contact, Technical Contact, Science Contact, Investigator, Metadata Author>
ContactPerson/NonDataCenterAffiliation (0..1)
ContactPerson/FirstName (0..1)
ContactPerson/MiddleName (0..1)
ContactPerson/LastName (1)
ContactPerson/Uuid (0..1)
ContactPerson/ContactInformation (0..1)
ContactPerson/ContactInformation/RelatedURL (0..*)
ContactPerson/ContactInformation/ServiceHours (0..1)
ContactPerson/ContactInformation/ContactInstructions (0..1)
ContactPerson/ContactInformation/ContactMechanism (0..*)
ContactPerson/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>
ContactPerson/ContactInformation/ContactMechanism/Value (1)
ContactPerson/ContactInformation/Address (0..*)
ContactPerson/ContactInformation/Address/StreetAddresses (0..*)
ContactPerson/ContactInformation/Address/City (0..1)
ContactPerson/ContactInformation/Address/StateProvince (0..1)
ContactPerson/ContactInformation/Address/PostalCode (0..1)
ContactPerson/ContactInformation/Address/Country (0..1)

Description

The Contact Person metadata element is used to provide contact information for an individual associated with the dataset.

There are 5 options for providing contact information in the UMM:

1. Data Center
2. Data Center/ Contact Person
3. Data Center/ Contact Group
4. Contact Person
5. Contact Group

Details for each of these options are provided on a separate wiki page. This wiki page describes details for option 4 (Contact Person).

Note that the Contact Person element can also be nested under the Data Center element. As a rule of thumb, if an individual is affiliated with a Data Center, then it is recommended that their contact info be provided under DataCenter/ContactPerson. If the individual is not affiliated with a particular Data Center, then their contact information can be provided here.

Best Practices

Each Contact Person listed in the metadata must be affiliated with a Role. Providing a Role for the Contact Person is required and must be selected from a controlled vocabulary list. Multiple Roles may be assigned to the same person, if necessary. There are seven options for Role:

- **DATA CENTER CONTACT:** an individual affiliated with the dataset. If the individual is affiliated with a Data Center, then it is recommended that their contact information be provided under `DataCenter/ContactPerson`.
- **TECHNICAL CONTACT:** an individual with technical (expert) knowledge about the data product.
- **SCIENCE CONTACT:** an individual with technical (expert) knowledge about the science principals involved in deriving the data product.
- **INVESTIGATOR:** a person involved in the creation of the data product. For instance, this might be the principal investigator (PI) or co-PI of the project responsible for creating the data product.
- **METADATA AUTHOR:** a person responsible for creating and/or maintaining the collection level and/or granule level metadata records associated with the data product.
- **USER SERVICES:** an individual representative of the user services office at the organization responsible for archiving, distributing, originating or processing the data. If the individual is affiliated with a Data Center, then it is recommended that their contact information be provided under `DataCenter/ContactPerson`.
- **SCIENCE SOFTWARE DEVELOPMENT:** a person with knowledge of software specifically developed for the data product.

Other Contact Person metadata fields include:

Non Data Center Affiliation: This field can be used to specify the name of the organization the Contact Person is affiliated with. Providing a Non Data Center Affiliation is optional, however, it is recommended that this information be provided.

First Name: The first name of the contact person. Providing a first name is optional.

Middle Name: The middle name of the contact person. Providing a middle name is optional.

Last Name: The last name of the contact person. *Providing a last name is required.*

Contact Information: Any relevant contact information for the contact person. Providing contact information is optional, however, it is recommended that at least one piece of contact information (such as a link, email or phone number) be provided. Some examples of contact information include: phone number, email, fax, related links, service hours, and contact instructions. See the element specification table below for full details.

Examples:

Role: TECHNICAL CONTACT

Non Data Center Affiliation: University of Alabama in Huntsville Earth System Science Center

FirstName: Bob

LastName: Smith

ContactInformation/ContactMechanism/Type: Email

ContactInformation/ContactMechanism/Value: email@email.com

Role: TECHNICAL CONTACT

Non Data Center Affiliation: UMD Laser Remote Sensing Laboratory

FirstName: J.

LastName: Blair

ContactInformation/ContactMechanism/Type: Email

ContactInformation/ContactMechanism/Value: email@email.com

ContactInformation/ContactMechanism/Type: Telephone
ContactInformation/ContactMechanism/Value: 301-444-4444
ContactInformation/ContactMechanism/Type: Fax
ContactInformation/ContactMechanism/Value: 301-555-5555
ContactInformation/Address/StreetAddresses: Laser Remote Sensing Laboratory, Code 694
ContactInformation/Address/StreetAddresses: NASA Goddard Space Flight Center
ContactInformation/Address/City: Greenbelt
ContactInformation/Address/StateProvince: MD
ContactInformation/Address/Country: USA
ContactInformation/Address/PostalCode: 20771

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field length is not greater than 255 characters (Personnel/Contact_Person/Last_Name).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Group/Address/Street_Address).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Person/Address/City).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Group/Address/State_Province).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Person/Address/Country).
 - Check that the field length is not greater than 20 characters (Personnel/Contact_Person/Address/Postal_Code).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Person/Email).
 - Check that the field has been populated.
 - Check that the field value is not a duplicate.
 - Check that the field value (Phone Type) matches the enumeration value (Direct Line;Primary;Telephone;Fax;Mobile;Modem;TDD/TTY Phone;U.S. toll free;Other).
 - Check that the field value (Personnel Role) matches the enumeration value (DATA CENTER CONTACT).
 - Check for potential broken links.
 - Check that the URL is formatted correctly.
 - Check that the email address is formatted correctly.
 - Check that the phone number is formatted correctly.
 - Check that the field length is not greater than 1,024 characters (Hours_of_Service).
 - Check that the field length is not greater than 2,048 characters (Instructions).

- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when:
 - The Contact Person Related URL provided is broken.
 - The URL Content Type does not match the enumeration value "DataContactURL."
 - The URL Type provided does not match the keyword value "HOME PAGE."
 - The Contact Person Role provided does not align with the UMM-Common enumeration values (Data Center Contact, Technical Contact, Science Contact, Investigator, Metadata Author, User Services, Science Software Development).
 - The Contact Mechanism Type does not align with the UMM-Common enumeration values (Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other).
 - The Contact Information provided is incorrect.
 - Marked as medium priority
 - This element is categorized as medium priority when:
 - The Contact Person Related URL 'Description' element is left blank. It is highly recommended that a description be provided for each URL.
 - The Contact Person Related URL provided in the metadata redirects—it is recommended that the most current link always be provided.
 - The information provided in the Contact Person elements is better suited for the Data Center, Data Center/Contact Person, Data Center/Contact Group or Contact Group metadata elements.
 - Marked as low priority
 - This element is categorized as low priority when: The Contact Person Related URL is provided via http when https is available.
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Tags

Recommended

Mapping

DIF 9:

/DIF/Personnel

DIF 10:

/DIF/Personnel

ECHO 10 Collection:

/Collection/Contacts/Contact

ISO 19115-2:

/gmi:MI_Metadata/gmd:contact/gmd:CI_ResponsibleParty

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:CI_Citation/gmd:citedResponsibleParty/gmd:CI_ResponsibleParty/

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:pointOfContact/gmd:CI_ResponsibleParty/

Examples

DIF 9:

<DIF>

<Personnel>

<Role>TECHNICAL CONTACT</Role>

<Last_Name>SEDAC USER SERVICES</Last_Name>

<Email>ciesin.info@ciesin.columbia.edu</Email>

<Phone>+1 845-365-8920</Phone>

<Fax>+1 845-365-8922</Fax>

<Contact_Address>

<Address>61 Route 9W, P.O. Box 1000</Address>

<City>Palisades</City>

<Province_or_State>NY</Province_or_State>

<Postal_Code>10964</Postal_Code>

<Country>USA</Country>

</Contact_Address>

</Personnel>

<Personnel>

<Role>DIF AUTHOR</Role>

<Last_Name>CIESIN METADATA ADMINISTRATION</Last_Name>

<Email>metadata@ciesin.columbia.edu</Email>

<Phone>+1 845-365-8988</Phone>

<Fax>+1 845-365-8922</Fax>

<Contact_Address>

<Address>61 Route 9W, P.O. Box 1000</Address>

<City>Palisades</City>

<Province_or_State>New York</Province_or_State>

<Postal_Code>10964</Postal_Code>

<Country>USA</Country>

</Contact_Address>

</Personnel>

</DIF>

DIF 10:

<Personnel>

<Role>DIF AUTHOR</Role>

```

<Contact_Person>
  <Last_Name>CIESIN METADATA ADMINISTRATION</Last_Name>
  <Email>metadata@ciesin.columbia.edu</Email>
  <Phone>+1 845-365-8988</Phone>
  <Fax>+1 845-365-8922</Fax>
  <Address>
    <Street_Address>61 Route 9W, P.O. Box 1000</Street_Address>
    <City>Palisades</City>
    <State_Province>New York</State_Province>
    <Postal_Code>10964</Postal_Code>
    <Country>USA</Country>
  </Address>
</Contact_Person>
</Personnel>
</DIF>

```

ECHO 10 Collection:

```

<Contacts>
  <Contact>
    <Role>INVESTIGATOR</Role>
    <OrganizationEmails>
      <Email>someone@larc.nasa.gov</Email>
    </OrganizationEmails>
    <ContactPersons>
      <ContactPerson>
        <FirstName>some</FirstName>
        <MiddleName>P.</MiddleName>
        <LastName>one</LastName>
      </ContactPerson>
    </ContactPersons>
  </Contact>

```

ISO 19115-2:

```

<gmd:citedResponsibleParty>
  <gmd:CI_ResponsibleParty>
    <gmd:individualName>
      <gco:CharacterString>Some P. One</gco:CharacterString>
    </gmd:individualName>
    <gmd:organisationName gco:nilReason="missing"/>
    <gmd:positionName gco:nilReason="missing"/>
    <gmd:contactInfo>
      <gmd:CI_Contact>
        <gmd:phone>
          <gmd:CI_Telephone/>
        </gmd:phone>
        <gmd:address>

```



```

    <gmd:CI_Address>
      <gmd:deliveryPoint gco:nilReason="missing"/>
      <gmd:city gco:nilReason="missing"/>
      <gmd:administrativeArea gco:nilReason="missing"/>
      <gmd:postalCode gco:nilReason="missing"/>
      <gmd:country gco:nilReason="missing"/>
      <gmd:electronicMailAddress>
        <gco:CharacterString>some.p.one@larc.nasa.gov</gco:CharacterString>
      </gmd:electronicMailAddress>
    </gmd:CI_Address>
  </gmd:address>
  <gmd:hoursOfService gco:nilReason="missing"/>
  <gmd:contactInstructions gco:nilReason="missing"/>
</gmd:CI_Contact>
</gmd:contactInfo>
<gmd:role>
  <gmd:CI_RoleCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_RoleCod
e"
  </gmd:CI_RoleCode>
  </gmd:role>
</gmd:CI_ResponsibleParty>
</gmd:citedResponsibleParty>

```

B.2.2.11.2 ContactGroup

Element Specification

ContactGroup (0..*)

ContactGroup/Roles (1..*) <User Services, Science Software Development>

ContactGroup/NonDataCenterAffiliation (0..1)

ContactGroup/GroupName (1)

ContactGroup/Uuid (0..1)

ContactGroup/ContactInformation (0..1)

ContactGroup/ContactInformation/RelatedURL (0..*)

ContactGroup/ContactInformation/ServiceHours (0..1)

ContactGroup/ContactInformation/ContactInstructions (0..1)

ContactGroup/ContactInformation/ContactMechanism (0..*)

ContactGroup/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>

ContactGroup/ContactInformation/ContactMechanism/Value (1)

ContactGroup/ContactInformation/Address (0..*)

ContactGroup/ContactInformation/Address/StreetAddresses (0..*)

ContactGroup/ContactInformation/Address/City (0..1)

ContactGroup/ContactInformation/Address/StateProvince (0..1)

ContactGroup/ContactInformation/Address/PostalCode (0..1)

ContactGroup/ContactInformation/Address/Country (0..1)

Description

The Contact Group metadata element is used to provide contact information for a group associated with the dataset.

There are 5 options for providing contact information in the UMM:

1. Data Center
2. Data Center/Contact Person
3. Data Center/Contact Group
4. Contact Person
5. Contact Group
6. Details for each of these options are provided on a separate wiki page. This wiki page describes details for option 5 (Contact Group).

Note that the Contact Group element can also be nested under the Data Center element. As a rule of thumb, if an group is affiliated with a Data Center, then it is recommended that their contact info be provided under DataCenter/ContactGroup. If the group is not affiliated with a particular Data Center, then their contact information can be provided here.

Best Practices

Each Contact Group listed in the metadata must be affiliated with a Role. Providing a Role for the Contact Group is required and must be selected from a controlled vocabulary list. Multiple Roles may be assigned to the same group, if necessary. There are seven options for Role:

- **DATA CENTER CONTACT:** a group affiliated with the dataset. If the group is affiliated with a Data Center, then it is recommended that their contact information be provided under DataCenter/ContactGroup.
- **TECHNICAL CONTACT:** a group with technical (expert) knowledge about the data product.
- **SCIENCE CONTACT:** a group with technical (expert) knowledge about the science principles involved in deriving the data product.
- **INVESTIGATOR:** a group involved in the creation of the data product. For instance, this might be the principal investigator (PI) or co-PI of the project responsible for creating the data product.
- **METADATA AUTHOR:** a group responsible for creating and/or maintaining the collection level and/or granule level metadata record(s) associated with the data product.
- **USER SERVICES:** the user services office at the organization responsible for archiving, distributing, originating or processing the data. If the group is affiliated with a Data Center, then it is recommended that their contact information be provided under DataCenter/ContactGroup.
- **SCIENCE SOFTWARE DEVELOPMENT:** a group with knowledge of software(s) specifically developed for the data product.

Other Contact Group metadata fields include:

Non Data Center Affiliation: This field can be used to specify the name of the organization the Contact Group is affiliated with. Providing a Non Data Center Affiliation is optional, however, is it recommended that this information be provided.

Group Name: The name of the group. *Providing a group name is required.*

UUID: A Level 3 UUID of the data contact, (see wiki link http://en.wikipedia.org/wiki/Universally_unique_identifier#Version_4_.28random.29).

Contact Information: Any relevant contact information for the group. Providing contact information is optional, however, it is recommended that at least one piece of contact information (such as a link, email or phone number) be provided. Some examples of contact information include: phone number, email, fax, related links, service hours, and contact instructions. See the element specification table below for full details.

Examples:

Role: SCIENCE CONTACT

Non Data Center Affiliation: University of Central Florida Department of Biology

GroupName: Marine Turtle Research Group

ContactInformation/ContactMechanism/Type: Email

ContactInformation/ContactMechanism/Value: savetheseaturtles@email.com

ContactInformation/RelatedURLs/Url:

<https://sciences.ucf.edu/biology/marineturtleresearchgroup/>

ContactInformation/RelatedURLs/UrlContentType: DataContactURL

ContactInformation/ContactMechanism/Type: HOME PAGE

/ContactInformation/RelatedURLs/Description: The Marine Turtle Research Group website home page

Role: TECHNICAL CONTACT

Non Data Center Affiliation: Boston University

GroupName: Antarctic Research Group

ContactInformation/ContactMechanism/Type: Telephone

ContactInformation/ContactMechanism/Value: 999-888-7777

ContactInformation/ContactMechanism/Type: Email

ContactInformation/ContactMechanism/Value: earth@bu.edu

ContactInformation/Address/StreetAddresses: Boston University, Department of Earth & Environment

ContactInformation/Address/StreetAddresses : 675 Commonwealth Avenue

ContactInformation/Address/City: Boston

ContactInformation/Address/StateProvince: MA

ContactInformation/Address/PostalCode: 02215

ContactInformation/Address/Country: USA

Element Specification

DataCenter (1..*)

DataCenter/Roles (1..*) <ARCHIVER, DISTRIBUTOR, ORIGINATOR, PROCESSOR>

DataCenter/ShortName (1)

DataCenter/LongName (0..1)

DataCenter/Uuid (0..1)

DataCenter/ContactInformation (0..1)

DataCenter/ContactInformation/RelatedURL (0..*)
DataCenter/ContactInformation/ServiceHours (0..1)
DataCenter/ContactInformation/ContactInstructions (0..1)
DataCenter/ContactInformation/ContactMechanism (0..*)
DataCenter/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>
DataCenter/ContactInformation/ContactMechanism/Value (1)
DataCenter/ContactInformation/Address (0..*)
DataCenter/ContactInformation/Address/StreetAddresses (0..*)
DataCenter/ContactInformation/Address/City (0..1)
DataCenter/ContactInformation/Address/StateProvince (0..1)
DataCenter/ContactInformation/Address/PostalCode (0..1)
DataCenter/ContactInformation/Address/Country (0..1)

CHOICE OF:

DataCenter/ContactPerson (0..*)
DataCenter/ContactPerson/Roles (1..*) <DATA CENTER CONTACT, TECHNICAL CONTACT, SCIENCE CONTACT, INVESTIGATOR, METADATA AUTHOR, USER SERVICES, SCIENCE SOFTWARE DEVELOPMENT>
DataCenter/ContactPerson/NonDataCenterAffiliation (0..1)
DataCenter/ContactPerson/FirstName (0..1)
DataCenter/ContactPerson/MiddleName (0..1)
DataCenter/ContactPerson/LastName (1)
DataCenter/ContactPerson/Uuid (0..1)
DataCenter/ContactPerson/ContactInformation (0..1)
DataCenter/ContactPerson/ContactInformation/RelatedURL (0..*)
DataCenter/ContactPerson/ContactInformation/ServiceHours (0..1)
DataCenter/ContactPerson/ContactInformation/ContactInstructions (0..1)
DataCenter/ContactPerson/ContactInformation/ContactMechanism (0..*)
DataCenter/ContactPerson/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>
DataCenter/ContactPerson/ContactInformation/ContactMechanism/Value (1)
DataCenter/ContactPerson/ContactInformation/Address (0..*)
DataCenter/ContactPerson/ContactInformation/Address/StreetAddresses (0..*)
DataCenter/ContactPerson/ContactInformation/Address/City (0..1)
DataCenter/ContactPerson/ContactInformation/Address/StateProvince (0..1)
DataCenter/ContactPerson/ContactInformation/Address/PostalCode (0..1)
DataCenter/ContactPerson/ContactInformation/Address/Country (0..1)

OR

DataCenter/ContactGroup (0..*)

DataCenter/ContactGroup/Roles (1..*) <DATA CENTER CONTACT, TECHNICAL CONTACT, SCIENCE CONTACT, INVESTIGATOR, METADATA AUTHOR, USER SERVICES, SCIENCE SOFTWARE DEVELOPMENT>
 DataCenter/ContactGroup/NonDataCenterAffiliation (0..1)
 DataCenter/ContactGroup/GroupName (1)
 DataCenter/ContactGroup/Uuid (0..1)
 DataCenter/ContactGroup/ContactInformation (0..1)
 DataCenter/ContactGroup/ContactInformation/RelatedURL (0..*)
 DataCenter/ContactGroup/ContactInformation/ServiceHours (0..1)
 DataCenter/ContactGroup/ContactInformation/ContactInstructions (0..1)
 DataCenter/ContactGroup/ContactInformation/ContactMechanism (0..*)
 DataCenter/ContactGroup/ContactInformation/ContactMechanism/Type (1) <Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other>
 DataCenter/ContactGroup/ContactInformation/ContactMechanism/Value (1)
 DataCenter/ContactGroup/ContactInformation/Address (0..*)
 DataCenter/ContactGroup/ContactInformation/Address/StreetAddresses (0..*)
 DataCenter/ContactGroup/ContactInformation/Address/City (0..1)
 DataCenter/ContactGroup/ContactInformation/Address/StateProvince (0..1)
 DataCenter/ContactGroup/ContactInformation/Address/PostalCode (0..1)
 DataCenter/ContactGroup/ContactInformation/Address/Country (0..1)

Description

The Data Center metadata element is used to identify and provide contact information for the organization responsible for originating, processing, archiving, and/or distributing the dataset being described in the metadata.

Contact information for an individual or a group affiliated with the data center can also be provided. Information about an individual should be provided in the DataCenter/ContactPerson sub-fields. Information about a group should be provided in the DataCenter/ContactGroup sub-fields.

There are 5 options for providing contact information in the UMM:

- Data Center
- Data Center/Contact Person
- Data Center/Contact Group
- Contact Person
- Contact Group

Details for each of these options are provided on a separate wiki page. This wiki page describes details for option 1 (Data Center).

Best Practices

Each Data Center listed in the metadata must be affiliated with a Role. Providing a Role for the Data Center is required and must be selected from a controlled vocabulary list. There are four options for Role:

- ARCHIVER: the organization responsible for storing the data. This role should be selected when listing the name of a NASA Distributed Active Archive Center (DAAC).
- DISTRIBUTOR: the organization responsible for distributing the data. The archiver and distributor will often be the same organization. In this case, both 'ARCHIVER' and 'DISTRIBUTOR' can be specified for the same data center.
- ORIGINATOR: the organization responsible for producing the data.
- PROCESSOR: the organization responsible for processing the data. Not all data is necessarily processed. Examples of processing include: converting raw data into level 1 data; re-gridding or re-projecting data to make a higher level product; combining multiple data products to derive a model output.

The same data center may be responsible for multiple roles. In this case, multiple roles may be assigned to the same data center.

Other Data Center metadata fields include:

Short Name: The name of the Data Center (abbreviated version). Providing a Data Center Short Name is required. The Data Center Short Name must be selected from a controlled vocabulary maintained in the Keyword Management System (KMS). A list of valid Data Center keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/providers?format=csv Note that the Short Name should be selected from the "Short_Name" column in the keyword list.

Long Name: The name of the Data Center. Providing a Data Center Long Name is optional, however, it is recommended that a long name be provided if one exists in the keyword list since short names are often comprised of acronyms. A list of valid Data Center keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/providers?format=csv Note that the Long Name should be selected from the "Long_Name" column in the keyword list.

Uuid: The uuid is the unique identifier associated with the Data Center name in the controlled vocabulary keyword list. Providing the uuid is completely optional. The uuid can be found in the Data Centers keyword list in the "UUID" column.

Contact Information: Any relevant contact information for the data center can be provided in the Contact Information fields. Providing contact information is optional, however, it is recommended that at least one piece of contact information (such as a link, email or phone number) be provided. Some examples of contact information include: phone number, email, fax, related links, service hours, and contact instructions. See the element specification table below for full details.

Example:

Role: ARCHIVER, DISTRIBUTOR

ShortName: NASA/MSFC/GHRC

LongName: Global Hydrology Resource Center, Marshall Space Flight Center, NASA

ContactInformation/RelatedURL/Url: <https://ghrc.nsstc.nasa.gov/home/>

ContactInformation/RelatedURLs/UrlContentType: DataCenterURL
ContactInformation/RelatedURLs/Type: HOME PAGE
ContactInformation/RelatedURLs/Description: The Global Hydrology Resource Center (GHRC) website's home page
ContactInformation/ServiceHours: 8 AM to 5 PM Central Time
ContactInformation/ContactMechanism/Type: Email
ContactInformation/ContactMechanism/Value: support-ghrc@earthdata.nasa.gov
ContactInformation/ContactMechanism/Type: Phone
ContactInformation/ContactMechanism/Value: 256-961-7932

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field length is not greater than 255 characters (Personnel/Contact_Group/Name).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Group/Address/Street_Address).
 - Check that the field length is not greater than 100 characters (Personnel/Content_Group/Address/City).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Group/Address/State_Province).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Group/Address/Country).
 - Check that the field length is not greater than 20 characters (Personnel/Contact_Group/Address/Postal_Code).
 - Check that the field length is not greater than 100 characters (Personnel/Contact_Group/Email).
 - Check that the field has been populated.
 - Check that the field value is not a duplicate.
 - Check that the field value (Phone Type) matches the enumeration value (Direct Line;Primary;Telephone;Fax;Mobile;Modem;TDD/TTY Phone;U.S. toll free;Other).
 - Check that the field value (Personnel Role) matches the enumeration value (DATA CENTER CONTACT).
 - Check for potential broken links.
 - Check that the URL is formatted correctly.
 - Check that the email address is formatted correctly.
 - Check that the phone number is formatted correctly.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - This element is categorized as highest priority when
 - The Contact Group Related URL provided is broken.

- The URL Content Type does not match the enumeration value "DataContactURL."
 - The URL Type provided does not match the keyword value "HOME PAGE."
 - The Contact Group Role provided does not align with the UMM-Common enumeration values (Data Center Contact, Technical Contact, Science Contact, Investigator, Metadata Author, User Services, Science Software Development).
 - The Contact Mechanism Type does not align with the UMM-Common enumeration values (Direct Line, Email, Facebook, Fax, Mobile, Modem, Primary, TDD/TTY Phone, Telephone, Twitter, U.S. toll free, Other).
 - The Contact Information provided is incorrect.
- Marked as medium priority
 - The Contact Group Related URL 'Description' element is left blank. It is highly recommended that a description be provided for each URL.
 - The Contact Group Related URL provided in the metadata redirects—it is recommended that the most current link always be provided.
 - The information provided in the Contact Group elements is better suited for the Data Center or Data Center/Contact Person metadata elements.
 - Marked as low priority
 - The Contact Group Related URL 'Description' element is left blank. It is highly recommended that a description be provided for each URL.
 - The Contact Group Related URL provided in the metadata redirects—it is recommended that the most current link always be provided.
 - The information provided in the Contact Group elements is better suited for the Data Center or Data Center/Contact Person metadata elements.
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Tags*Recommended***Mapping**

DIF 10:

/DIF/Personnel under Contact_Group

ISO 19115-2:

/gmi:MI_Metadata/gmd:contact/gmd:CI_ResponsibleParty

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:CI_Citation/gmd:citedResponsibleParty/gmd:CI_ResponsibleParty/

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:pointOfContact/gmd:CI_ResponsibleParty/

Examples

DIF 10:

```

<DIF>
  <Personnel>
    <Role>TECHNICAL CONTACT</Role>
    <Contact_Group>
      <Name>SEDAC USER SERVICES</Name>
      <Email>ciesin.info@ciesin.columbia.edu</Email>
      <Phone>+1 845-365-8920</Phone>
      <Fax>+1 845-365-8922</Fax>
      <Address>
        <Street_Address>61 Route 9W, P.O. Box 1000</Street_Address>
        <City>Palisades</City>
        <State_Province>NY</State_Province>
        <Postal_Code>10964</Postal_Code>
        <Country>USA</Country>
      </Address>
    </Contact_Group>
  </Personnel>
</DIF>

```

ISO 19115-2:

```

<gmd:CI_ResponsibleParty>
  <gmd:organisationName>
    <gco:CharacterString>SEDAC</gco:CharacterString>
  </gmd:organisationName>
  <gmd:role>
    <gmd:CI_RoleCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_RoleCode"
    codeListValue="pointOfContact">pointOfContact</gmd:CI_RoleCode>
  </gmd:role>
</gmd:CI_ResponsibleParty>

```

B.2.2.12 Collection Data Type**Element Specification**

CollectionDataType <NEAR_REAL_TIME, SCIENCE_QUALITY, OTHER>

Description

The Collection Data Type element is used to identify the collection as a science quality collection or as a non-science-quality collection such as a Near Real Time collection.

Best Practices

If a collection does not contain this field, it will be assumed to be of science-quality.

The Type must be selected from a controlled vocabulary list. There are three options available for Type:

SCIENCE_QUALITY: Most data products that are permanently archived should be of science quality. Science quality means the data is in a state where it is trustworthy enough for use in scientific analyses (given known limitations of the data).

NEAR_REAL_TIME: Data from the source that are available for use within a time that is short in comparison to important time scales in the phenomena being studied. For EOSDIS, near real time data is not considered science quality and is not retained by EOSDIS once the SCIENCE_QUALITY product is archived.

OTHER: Any data and data products that are not SCIENCE_QUALITY and do not fall under NEAR_REAL_TIME holdings.

Examples:

CollectionDataType: NEAR_REAL_TIME

CollectionDataType: SCIENCE_QUALITY

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field value matches the enumeration value (SCIENCE_QUALITY; NEAR_REAL_TIME; OTHER).
- CMR Validation
 - If this element is included in the record then one of the enumeration values must be used.
- ARC Validation Report
 - Marked as high priority
 - The Collection Data Type is not a valid value (SCIENCE_QUALITY, NEAR_REAL_TIME, OTHER)
 - The Collection Data Type provided is incorrect
 - Marked as medium priority
 - N/A
 - Marked as low priority
 - n/a
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags

Recommended, Controlled Vocabulary, Free Text Search, Search API

Mapping

DIF 9:

/DIF/Extended_Metadata.Metadata.Name='CollectionDataType'

DIF 10:

/DIF/Collection_Data_Type

ECHO 10 Collection:

/Collection/CollectionDataType

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:code/gco:CharacterString

and

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =

gov.nasa.esdis.umm.collectiondatatype

and

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:description/gco:CharacterString = Collection Data Type

Examples

DIF 9:

<Extended_Metadata>

...

<Metadata>

<Group>ECHO</Group>

<Name>CollectionDataType</Name>

<Value>NEAR_REAL_TIME</Value>

</Metadata>

...

</Extended_Metadata>

DIF 10:

<Collection_Data_Type>SCIENCE_QUALITY</Collection_Data_Type>

ECHO 10:

<CollectionDataType>NEAR_REAL_TIME</CollectionDataType>

ISO 19115-2:

...

<gmd:identifier>

<gmd:MD_Identifier>

```

<gmd:code>
  <gco:CharacterString>SCIENCE_QUALITY</gco:CharacterString>
</gmd:code>
<gmd:codeSpace>
  <gco:CharacterString>gov.nasa.esdis.umm.collectiondatatype</gco:CharacterString>
</gmd:codeSpace>
<gmd:description>
  <gco:CharacterString>Collection Data Type</gco:CharacterString>
</gmd:description>
</gmd:MD_Identifier>
</gmd:identifier>

```

...

B.2.2.13 Processing Level [R]

Element Specification

ProcessingLevel/ID (1)

ProcessingLevel/Description (0..1)

Description

An identifier indicating the level at which the data in the collection are processed, ranging from level 0 (raw instrument data at full resolution) to level 4 (model output or analysis results).

Best Practices

It is recommended that the processing level align with the EOSDIS data processing levels if at all possible. The EOSDIS data processing levels are: 0, 1A, 1B, 2, 3, 4. Please see the EOSDIS Data Processing Levels policy page for a more detailed description of each of the processing levels. It is recommended that processing levels be assigned in a consistent manner for all datasets from a data provider. A processing level Id is required.

EOSDIS data processing levels: <https://earthdata.nasa.gov/collaborate/open-data-services-and-software/data-information-policy/data-levels>

EOSDIS Data Processing Levels policy page: <https://earthdata.nasa.gov/collaborate/open-data-services-and-software/data-information-policy/data-levels>

The processing level description is an optional field used to provide details on the processing level. Ideally the description should be a brief summary which aids the user in understanding the degree to which the source data has been processed. The level of detail provided in the description may vary. The description may range from very generic (e.g. "Model derived") to more specific (e.g. "Radiometrically calibrated and orthorectified using ground control points and SRTM digital elevation model (DEM) data to correct for relief displacement. Data is provided in digital numbers.")

Examples:

Id: "4"

Description: "This data product is model derived."

Id: "1B"

Description: "Radiometrically calibrated and orthorectified using ground control points and SRTM digital elevation model (DEM) data to correct for relief displacement. Data has been converted from digital numbers to top of atmosphere (TOA) reflectance."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value.
 - Check that the field length for 'ProcessingLevel/Id' is not greater than 80 characters.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - The processing level Id is not included at all.
 - The processing level Id is included but is empty.
 - The processing level for an EOSDIS dataset does not match an EOSDIS processing level.
 - Note: if a justification is provided for why the EOSDIS dataset cannot be assigned an EOSDIS processing level, the recommendation will be changed to yellow upon the second iteration of review.
 - The processing level provided is incorrect for the dataset.
 - The processing level description contains a spelling or grammatical error.
 - The processing level description incorrectly describes the processing level provided.
 - Marked as medium priority
 - A non-EOSDIS dataset, being re-distributed via EOSDIS, does not match an EOSDIS processing level.
 - A recommendation is made to improve the syntax of the processing level description.
 - Marked as low priority
 - A recommendation is made to update the processing level description to match a recommended processing level Id change.
 - The processing level description provided is vague to the point where it does not help discern between the assigned processing level and another processing level.
 - The first letter of the processing level description is not capitalized.
 - A recommendation is made to update a link in the processing level description from 'http' to 'https'.
 - A miscellaneous inconsistency is noted in the processing level description.
 - No processing level description is provided.

- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

1

Tags*Required, Controlled Vocabulary, Search API, Faceted***Mapping**

DIF 9:

/DIF/Extended_Metadata.Metadata.Name='ProcessingLevelId'

/DIF/Extended_Metadata.Metadata.Name='ProcessingLevelDescription'

DIF 10:

/DIF/Product_Level_Id

ECHO 10 Collection:

/Collection/ProcessingLevelId

/Collection/ProcessingLevelDescription

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:processingLevel/gmd:MD_Identifier/gmd:code/gco:CharacterString

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:processingLevel/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString = gov.nasa.esdis.umm.processinglevelid

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:processingLevel/gmd:MD_Identifier/gmd:description/gco:CharacterString

and

/gmi:MI_Metadata/gmd:contentInfo/gmd:MD_ImageDescription/gmd:processingLevelCode/gmd:MD_Identifier/gmd:code/gco:CharacterString

/gmi:MI_Metadata/gmd:contentInfo/gmd:MD_ImageDescription/gmd:processingLevelCode/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString = gov.nasa.esdis.umm.processinglevelid

/gmi:MI_Metadata/gmd:contentInfo/gmd:MD_ImageDescription/gmd:processingLevelCode/gmd:MD_Identifier/gmd:description/gco:CharacterString

Examples

DIF 9:

<Extended_Metadata>

...

<Metadata>

<Group>CMR</Group>

<Name>ProcessingLevelId</Name>

<Value>3</Value>

</Metadata>

```

<Metadata>
  <Group>CMR</Group>
  <Name>ProcessingLevelDescription</Name>
  <Value>Sensor Measurements</Value>
</Metadata>

```

...

```

</Extended_Metadata>

```

DIF 10:

```

<Product_Level_Id>2</Product_Level_Id>

```

ECHO 10:

```

<ProcessingLevelId>3</ProcessingLevelId>
<ProcessingLevelDescription>Data or retrieved environmental variables that have been spatially
and/or temporally resampled (i.e., derived from Level 1 or Level 2 data products). Such
resampling may include averaging and compositing</ProcessingLevelDescription>

```

ISO 19115-2:

```

<gmd:identificationInfo>
  <gmd:MD_DataIdentification>
    ...
    <gmd:processingLevel>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>3</gco:CharacterString>
        </gmd:code>
        <gmd:codeSpace>
          <gco:CharacterString>gov.nasa.esdis.umm.processinglevelid</gco:CharacterString>
        </gmd:codeSpace>
        <gmd:description>
          <gco:CharacterString>Data or retrieved environmental variables that have been
spatially and/or temporally resampled (i.e., derived from Level 1 or Level 2 data products). Such
resampling may include averaging and compositing</gco:CharacterString>
        </gmd:description>
      </gmd:MD_Identifier>
    </gmd:processingLevel>
  </gmd:MD_DataIdentification>
</gmd:identificationInfo>
<gmd:contentInfo>
  <gmd:MD_ImageDescription>
    ...
    <gmd:processingLevelCode>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>3</gco:CharacterString>
        </gmd:code>

```

```

    <gmd:codeSpace>
      <gco:CharacterString>gov.nasa.esdis.umm.processinglevelid</gco:CharacterString>
    </gmd:codeSpace>
    <gmd:description>
      <gco:CharacterString>Data or retrieved environmental variables that have been
      spatially and/or temporally resampled (i.e., derived from Level 1 or Level 2 data products). Such
      resampling may include averaging and compositing</gco:CharacterString>
    </gmd:description>
  </gmd:MD_Identifier>
</gmd:processingLevelCode>
</gmd:MD_ImageDescription>
</gmd:contentInfo>

```

B.2.2.14 Collection Citation

Element Specification

CollectionCitation/Creators (0..1)
 CollectionCitation/Editors (0..1)
 CollectionCitation/Title (0..1)
 CollectionCitation/SeriesName (0..1)
 CollectionCitation/ReleaseDate (0..1)
 CollectionCitation/ReleasePlace (0..1)
 CollectionCitation/Publisher (0..1)
 CollectionCitation/Version (0..1)
 CollectionCitation/IssueIdentification (0..1)
 CollectionCitation/DataPresentationForm (0..1)
 CollectionCitation/OtherCitationDetails (0..1)
 CollectionCitation/OnlineResource (0..1)
 CollectionCitation/OnlineResource/Linkage (1)
 CollectionCitation/OnlineResource/Protocol (0..1)
 CollectionCitation/OnlineResource/ApplicationProfile (0..1)
 CollectionCitation/OnlineResource/Name (0..1)
 CollectionCitation/OnlineResource/Description (0..1)
 CollectionCitation/OnlineResource/Function (0..1)
 CollectionCitation/OnlineResource/MimeType (0..1) {Look at RelatedURL MimeType values}

Description

The Collection Citation element provides the information required to properly cite a collection in professional scientific literature. This information is for citing the collection itself, and is not designed for bibliographic references related to the collection. Any references related to the collection should be provided in the Publication Reference element.

Best Practices

While Collection Citation is not required, it is highly recommended that it be provided so that the dataset may be appropriately cited. The dataset citation should also be provided on the collection's dataset landing page.

There are seventeen sub-elements that comprise Collection Citation:

Creators: The name of the organization(s) or individual(s) with primary intellectual responsibility for the collection's development.

Editors: The individual(s) responsible for changing the data in the collection.

Title: The title of the collection; this should be the same as the collection Entry Title.

Series Name: The name of the data series, or aggregate data of which the data is a part.

Release Date: The date when the collection was made available for release.

Release Place: The name of the city (and state or province and country if needed) where the collection was made available for release.

Publisher: The name of the individual or organization that made the collection available for release.

Version: The version of the collection. This should be the same value as provided in the Version element.

Issue Identification: The volume or issue number of the publication (if applicable).

Data Presentation Form: The mode in which the data are represented, e.g. atlas, image, profile, text, etc.

OnlineResource/Linkage: The URL of the website related to the online resource. For Collection Citation, this URL should link to the dataset landing page. If the collection has a DOI, then it is recommended that the DOI URL be provided here.

OnlineResource/Protocol: The protocol of the linkage for the online resource (e.g. https, svn, ftp, etc.). Providing a Protocol is optional.

OnlineResource/ApplicationProfile: The Application Profile holds the name of the application that can service the data. For example if the URL points to a word document, then the Application Profile is MS-Word. Providing an Application Profile is optional.

OnlineResource/Name: A name for the link to the collection. Providing Name is optional.

OnlineResource/Description: A brief description of the link to the collection. Providing a Description is optional.

OnlineResource/Function: The function of the online resource. This field originated from the ISO metadata standard where the valid values are: download, information, offlineAccess, order, and search. Providing a Function is optional.

OnlineResource/MimeType: MIME stands for "Multipurpose Internet Mail Extensions". Mime types are used to identify the nature and format of files provided on the Internet, and are typically used by internet browsers in order to determine how to properly process or display a document or file. Providing the Mime Type element in the metadata helps ensure that the URL contents will be properly displayed on the Web. Providing a Mime Type is optional. Mime Type is a controlled vocabulary field and should be chosen from the GCMD mime type keyword list. https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/MimeType?format=csv

Other Citation Details: Additional free-text information about the collection citation.

Examples:

CollectionCitations/Creator: "Global Modeling and Assimilation Office (GMAO)"
 CollectionCitations/ReleasePlace: "Greenbelt, MD, USA"
 CollectionCitations/Title: "tavgU_3d_udt_Cp: MERRA 3D IAU Tendency, Wind Components, Diurnal V5.2.0"
 CollectionCitations/SeriesName: "MATUCPUDT"
 CollectionCitations/Version: "5.2.0"
 CollectionCitation/OnlineResource/Linkage:
 "https://disc.gsfc.nasa.gov/datacollection/MATUCPUDT_5.2.0.html"
 CollectionCitation/OnlineResource/Publisher: "Goddard Earth Sciences Data and Information Services Center (GES DISC)"
 CollectionCitation/OnlineResource/ReleaseDate: "2008-07-23T00:00:00.000Z"
 CollectionCitation/OnlineResource/DataPresentationForm: "Digital Science Data"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Checks that Dataset_Release_Date is properly formatted.
 - Checks that URLs are properly formatted and operational.
 - Checks that field lengths do not exceed maximum characters allowed.
 - Checks that Persistent_Identifier/Type keyword is valid.
- CMR Validation
 - Automated Review
 - Checks that field lengths do not exceed maximum characters allowed.
 - Checks that Mime Type keyword is valid.
- ARC Validation Report
 - Marked as high priority
 - The information provided is for a resource other than the dataset.
 - Information provided in any of the Collection Citation sub-elements is incorrect for the dataset.
 - The Collection Citation linkage is a broken URL.
 - The incorrect DOI is provided for the dataset.
 - Marked as medium priority

- A recommendation is made to add an important sub-element to the Collection Citation.
 - Marked as low priority
 - A recommendation is made to update the Collection Citation linkage from http to https.
 - The Publication Reference linkage description contains grammatical errors.
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Recommended, Free Text Search***Sample Mapping**

DIF 9:

/DIF/Data_Set_Citation/

DIF 10:

/DIF/Dataset_Citation/

ECHO 10 Collection:

/Collection/CitationForExternalPublication

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation

Examples

DIF 9:

```

<Data_Set_Citation>
  <Dataset_Creator>Fastook, J. L.</Dataset_Creator>
  <Dataset_Title>Amundsen Sea Sector Data Set</Dataset_Title>
  <Dataset_Series_Name>NSIDC-0312</Dataset_Series_Name>
  <Dataset_Release_Date>2007-01-01</Dataset_Release_Date>
  <Dataset_Release_Place>Boulder, Colorado USA</Dataset_Release_Place>
  <Dataset_Publisher>NSIDC: National Snow and Ice Data Center</Dataset_Publisher>
  <Version>1</Version>
  <Dataset_DOI>doi:10.7265/N5J9649Q</Dataset_DOI>
  <Online_Resource>http://nsidc.org/data/NSIDC-0312</Online_Resource>
</Data_Set_Citation>

```

DIF 10:

```

<Dataset_Citation>
  <Dataset_Creator>AIRS Science Team/Joao Teixeira</Dataset_Creator>
  <Dataset_Title>AIRS/Aqua L2 CO2 in the free troposphere (AIRS+AMSU)
V005</Dataset_Title>
  <Dataset_Series_Name>AIRX2STC</Dataset_Series_Name>
  <Dataset_Release_Date>2010-01-01</Dataset_Release_Date>
  <Dataset_Release_Place>Greenbelt, MD, USA</Dataset_Release_Place>
  <Dataset_Publisher>Goddard Earth Sciences Data and Information Services Center (GES
DISC)</Dataset_Publisher>
  <Version>005</Version>
  <Data_Presentation_Form>Digital Science Data</Data_Presentation_Form>
  <Persistent_Identifier>
    <Type>DOI</Type>
    <Identifier>10.5067/AQUA/AIRS/DATA218</Identifier>
  </Persistent_Identifier>

<Online_Resource>http://disc.gsfc.nasa.gov/datacollection/AIRX2STC_005.html</Online_Resource>
</Dataset_Citation>

```

ECHO 10 Collection:

```

<CitationForExternalPublication>Wood, E. F. 1994. 15 Minute Stream Flow Data: USGS
(FIFE). Data set. Available on-line [http://www.daac.ornl.gov] from Oak Ridge National
Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. Also published in
D. E. Strebel, D. R. Landis, K. F. Huemmrich, and B. W. Meeson (eds.), Collected Data of the
First ISLSCP Field Experiment, Vol. 1: Surface Observations and Non-Image Data Sets. CD-
ROM. National Aeronautics and Space Administration, Goddard Space Flight Center,
Greenbelt, Maryland, U.S.A. (available from http://www.daac.ornl.gov).
doi:10.3334/ORNLDAAC/1</CitationForExternalPublication>

```

ISO 19115-2:

```

<gmd:citation>
  <gmd:CI_Citation>
    <gmd:title>
      <gco:CharacterString>CIESIN_CHRR_NDH_CYCLONE_HFD &gt; Global
Cyclone Hazard Frequency and Distribution</gco:CharacterString>
    </gmd:title>
    <gmd:date>
      ...
    </gmd:date>
    <gmd:edition>
      ...
    </gmd:edition>
    <gmd:identifier>
      ...
    </gmd:identifier>
  </gmd:CI_Citation>
</gmd:citation>

```

```

    <gmd:otherCitationDetails>
      <gco:CharacterString>Center for Hazards and Risk Research - CHRR - Columbia
      University, Center for International Earth Science Information Network - CIESIN - Columbia
      University, International Bank for Reconstruction and Development - The World Bank, and
      United Nations Environment Programme Global Resource Information Database Geneva -
      UNEP GRID-Geneva. 2005. Global Cyclone Hazard Frequency and Distribution. Palisades,
      NY:NASA Socioeconomic Data and Applications Center (SEDAC).
      http://dx.doi.org/10.7927/H4CZ353K</gco:CharacterString>
    </gmd:otherCitationDetails>
  </gmd:CI_Citation>
</gmd:citation>

```

B.2.2.15 Collection Progress [R]

Element Specification

CollectionProgress <PLANNED, ACTIVE, COMPLETE, NOT APPLICABLE, NOT PROVIDED>

Description

The Collection Progress element describes the production status of the dataset. The Collection Progress element leverages a controlled vocabulary to ensure consistency across CMR. There are five possible choices for describing the status of the dataset:

PLANNED refers to datasets to be collected in the future and are thus unavailable at the present time. Examples include:

- The Hydro spacecraft has not been launched, but information on planned datasets may be available.

ACTIVE refers to datasets currently in production or data that is continuously being collected or updated. Examples include:

- Data from an instrument that continually makes observations such as the AIRS instrument on Aqua or MODIS on Terra.
- Datasets where one version of a dataset is continuously and regularly updated such as CERES EBAF-TOA Ed2.8 (doi: 10.5067/TERRA+AQUA/CERES/EBAF-SURFACE_L3B004.0)

COMPLETE refers to datasets in which no updates or further data collection will be made. Examples include:

- Data collection from the Lightning Imaging Sensor (LIS) has been completed due to the end of the TRMM mission.
- Completion of a legacy version of a product where no further updates will be made such as with CERES EBAF-TOA Ed2.7.

DEPRECATED Deprecated products have been retired but are still discoverable for historical purposes.

NOT APPLICABLE should only be used if this element is not applicable to the collection, such as a calibration collection.

Best Practices

For continuous datasets:

If data collection is ongoing and the Collection Progress element is set to “ACTIVE”, the following actions are recommended:

- The ‘Ends at Present Flag’ element should be set to “true.”
- If the temporal extent of the collection is expressed as a range date time, then it is not necessary to populate the “Ending Date Time” element in the metadata.
 - For additional information see the Temporal Extent wiki page

Setting the ‘Ends at Present Flag’ element to “true” tells the CMR that the ending time for the collection is present day, and thus eliminates the need to specify the ending date time of the collection. This also eliminates the need to update the ending date time in the metadata each time new data gets added to the collection.

For completed datasets:

If data collection is complete and the collection progress is set to “COMPLETE”, the following actions are recommended:

- The ‘Ends at Present Flag’ element should be set to “false”. Alternatively, the ‘Ends at Present Flag’ element may be completely removed from the metadata since it is an optional element.
- If the temporal extent of the collection is expressed as a range date time, then the “Ending Date Time” element must be provided in the metadata.
 - For additional information see the Temporal Extent wiki page

Setting the ‘Ends at Present Flag’ element to “false” tells the CMR that the ending time for the collection is in the past. If the temporal extent of the collection is expressed as a range date time, then the “Ending Date Time” element should specify the ending date and time of the last available granule in the collection.

For disparate datasets:

For some datasets, there may be gaps in data collection. For example, there may be a flight campaign dataset where data is only collected in May and September of each year. If there are future plans to add data to the collection, then it is okay to set the Collection Progress to “ACTIVE”. In this scenario, opposite to the best practices specified for continuous datasets above, it is recommended that the ‘Ends At Present Flag’ be set to “false” and that an Ending Date time be provided. This would require that the Ending Date Time be updated each time new data gets added to the collection (e.g. in May and September). This practice most accurately conveys the temporal coverage of a dataset to a user.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review

- Check that the field has been populated.
- Check that the field value is valid.
- CMR Validation
 - Automated Review
 - Check that the field has been populated.
 - Check that the field value is valid.
- ARC Validation Report
 - Marked as high priority
 - Collection Progress is not provided at all.
 - Collection Progress tags are present but the field is left blank.
 - An invalid value is provided for Collection Progress. Valid values include: PLANNED, ACTIVE, COMPLETE, NOT APPLICABLE
 - The Collection Progress appears to be out of sync with data collection. For example:
 - Data collection stopped in the distant past but progress is listed as 'ACTIVE' - as a rule of thumb, this applies when the last available granule has an ending date time of 1+ years in the past.
 - Collection Progress is listed as 'PLANNED' but data is actively being collected.
 - Data collection is ongoing but the element lists the progress as 'COMPLETE'
 - Marked as medium priority
 - The Collection Progress appears to be out of sync with data collection. For example:
 - The ending date time of the latest granule in the collection is in the past, however the Collection Progress is 'ACTIVE' - this will be marked yellow when the latest granule in the collection is less than 1 year from the present day, and the collection is part of a field or flight campaign which may still be ongoing (this could result in gaps in the data). The DAAC should confirm whether data collection is still ongoing for the field/flight campaign or whether the collection is complete.
 - Marked as low priority
 - N/A
 - No recommended changes
 - The element is provided, a correct valid value is used, and the valid value matches the status of the dataset.

Cardinality

1

Tags*Required, Controlled Vocabulary, Faceted, Normalize***Mapping**

DIF 9:

/DIF/Data_Set_Progress

DIF 10:

/DIF/Dataset_Progress

ECHO 10 Collection:

/Collection/CollectionState

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:status/gmd:MD_ProgressCode

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:status/gmd:MD_ProgressCode/@codeListValue

Examples

DIF 9:

<Data_Set_Progress>COMPLETE</Data_Set_Progress>

DIF 10:

<Dataset_Progress>ACTIVE</Dataset_Progress>

ECHO 10:

<CollectionState>COMPLETE</CollectionState>

ISO 19115-2:

<gmd:MD_DataIdentification>

...

<gmd:status>

<gmd:MD_ProgressCode

codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_ProgressCode" codeListValue="completed">completed</gmd:MD_ProgressCode>

</gmd:status>

...

</gmd:MD_DataIdentification>

B.2.2.16 Quality

Element Specification

Quality

Description

This element permits the author to provide the following information about a resource (collection, etc.) described in the metadata: 1) Quality of the resource, and 2) any quality assurance procedures followed in producing the resource. Examples of appropriate element information include: A) succinct description; B) indicators of resource quality or quality flags - both validated, invalidated, or unvalidated; C) recognized or potential problems with quality; D) established quality control mechanisms; and E) established quantitative quality measurements.

Best Practices

This field may be used to describe any indications of quality of the data. Examples of appropriate element information include: a) a succinct description of the quality of data in the collection; b) quality assurance procedures followed in producing the data in the collection; c) indicators of collection quality or quality flags - both validated or invalidated; d) recognized or potential problems with quality; e) established quality control mechanisms; and 6) established quantitative quality measurements. The Quality element is optional.

Examples:

Quality: "Users are advised that ASTER SWIR data acquired from late April 2008 to the present exhibit anomalous saturation of values and anomalous striping. This effect is also present for some prior acquisition periods. Please refer to the ASTER SWIR User Advisory Document (https://lpdaac.usgs.gov/sites/default/files/public/aster/docs/ASTER_SWIR_User_Advisory_July%2018_08.pdf) for more details."

Quality: "This data has been in extensive use in weather forecasting and atmospheric chemistry research for many years, and has thus been subject to independent review by many scientific experts."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the quality description is appropriate for the dataset.
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check for potential broken links.
 - Check that the field length is not greater than 12,000 characters.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - The Quality description contains a spelling or grammatical error.
 - The element is being used incorrectly (i.e. for a purpose other than describing data quality).
 - A broken URL is provided in the Quality element.
 - Marked as medium priority
 - A recommendation is made to change the syntax or content provided the Quality element to improve readability.
 - Marked as low priority
 - A URL provided in the Quality element is a re-direct link (this includes re-directs from http to https).
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags*Normalize, Markdown Support***Mapping**

DIF 9:

/DIF/Quality

DIF 10:

/DIF/Quality

ISO 19115-2:

/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/gmd:DQ_QuantitativeAttributeAccuracy/gmd:evaluationMethodDescription/gco:CharacterString

Examples

DIF 9:

<Quality>The dates provided in temporal coverage are approximate only. Years are correct. See the referenced paper for full details on steps taken to ensure quality of data.

To assess extraction efficiency for a range of sediment types, four marine sediments were analysed in detail. Two international certified reference materials (CRMs) and two well-characterised Antarctic sediments were chosen to compare and contrast moderately to strongly contaminated samples (based on total metal digest), with clean samples of similar matrices. One CRM was an uncontaminated continental shelf mud (MESS-2), and the other a contaminated harbour mud (PACS-2) (NRCC, 2002). The two Antarctic sediments were collected as part of a regional hierarchical survey (Stark et al., 2003). One Antarctic sample was from an area of known metal pollution in Brown Bay (BB), which is adjacent to the 'Old' Casey Station waste disposal site (Snape et al., 2001; Stark et al., 2003). The second Antarctic sample was from a non-impacted control site from O'Brien Bay (OBB), 3 km south of Casey Station and the disposal site (Fig. 1). The Antarctic samples, OBB and BB, have similar matrices, proportions of mud (less than 63 microns; 19% and 22% respectively) and total organic carbon contents (1.9% and 2.3% respectively). Both MESS and PACS are sieved, homogenised and dried CRMs that have been ground to ~50 microns (NRCC, 2002). In contrast, OBB and BB were only sieved to less than 2 mm, thereby removing only the very largest particles (less than or equal to 3%). The Antarctic samples were collected using acid-washed PVC coring tubes. The samples were kept frozen at -20 degrees C until wet-sieved with a small amount of clean filtered (0.45 microns cellulose nitrate) O'Brien Bay seawater through 2 mm nylon mesh held in a plastic sieve unit. The sediments were then oven-dried to constant weight at 103 degrees C (Loring and Rantala 1992), and stored in Nalgene HDPE bottles until analysis.</Quality>

DIF 10:

<Quality>Nucleic extraction blanks were carried out through amplification steps and sequence analysis quality control measures were followed on data analyzed. Oceanographic instruments were calibrated at SeaBird before the cruise and sample blanks were periodically run for chlorophyll and nutrient analyses.</Quality>

ISO 19115-2:

```

<gmd:dataQualityInfo>
  <gmd:DQ_DataQuality>
    <gmd:scope>
      <gmd:DQ_Scope>
        <gmd:level>
          <gmd:MD_ScopeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_ScopeC
ode"
          codeListValue="series">series</gmd:MD_ScopeCode>
        </gmd:level>
      </gmd:DQ_Scope>
    </gmd:scope>
    <gmd:report>
      <gmd:DQ_AccuracyOfATimeMeasurement>
        <gmd:measureIdentification>
          <gmd:MD_Identifier>
            <gmd:code>
              <gco:CharacterString>PrecisionOfSeconds</gco:CharacterString>
            </gmd:code>
          </gmd:MD_Identifier>
        </gmd:measureIdentification>
        <gmd:result>
          <gmd:DQ_QuantitativeResult>
            <gmd:valueUnit/>
            <gmd:value>
              <gco:Record xsi:type="gco:Real_PropertyType">
                <gco:Real>1</gco:Real>
              </gco:Record>
            </gmd:value>
          </gmd:DQ_QuantitativeResult>
        </gmd:result>
      </gmd:DQ_AccuracyOfATimeMeasurement>
    </gmd:report>
    <gmd:lineage>
      <gmd:LI_Lineage>
        <gmd:processStep>
          <gmi:LE_ProcessStep>
            <gmd:description gco:nilReason="unknown"/>
            <gmd:processor>
              <gmd:CI_ResponsibleParty>
                <gmd:organisationName>
                  <gco:CharacterString>SEDAC</gco:CharacterString>
                </gmd:organisationName>
                <gmd:role>

```

```

        <gmd:CI_RoleCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#CI_RoleCod
e"
        codeListValue="processor">processor</gmd:CI_RoleCode>
        </gmd:role>
        </gmd:CI_ResponsibleParty>
        </gmd:processor>
        </gmi:LE_ProcessStep>
        </gmd:processStep>
        </gmd:LI_Lineage>
        </gmd:lineage>
        </gmd:DQ_DataQuality>
</gmd:dataQualityInfo>

```

B.2.2.17 Use Constraints

Element Specification

UseConstraints/Description (0..1)

{Choice of 0 or 1}

1) UseConstraints/LicenseURL/Linkage (1)

UseConstraints/LicenseURL/Protocol (0..1)

UseConstraints/LicenseURL/ApplicationProfile (0..1)

UseConstraints/LicenseURL/Name (0..1)

UseConstraints/LicenseURL/Description (0..1)

UseConstraints/LicenseURL/Function (0..1)

UseConstraints/LicenseURL/MimeType (0..1)

2) UseConstraintsLicenseText

Description

The UseConstraints element is designed to protect privacy and/or intellectual property by allowing the author to specify how the collection may or may not be used after access is granted. This includes any special restrictions, legal prerequisites, terms and conditions, and/or limitations on using the item. Providers may request acknowledgement of the item from users and claim no responsibility for quality and completeness. UseConstraints describes how the item may be used once access has been granted; and is distinct from AccessConstraints, which refers to any constraints in accessing the item. A data provider may also add a license URL or license text, but not both to the collection if the license exists. For NASA collections every collection should have a license URL or text.

Best Practices

There are two main uses for the Use Constraints elements. The first is to describe any specific purposes the data should not be used for. This information should be provided in the UseConstraints/Description field. The second is to provide license information about the data set. License information should be provided in either the UseConstraints/LicenseText or the UseConstraints/LicenseURL element.

Use Constraints/ Description

UseConstraints/Description is a free text field which should include information on any special restrictions, limitations, or terms and conditions for using the data. This should go beyond the terms laid out in the license. For example, a data set may be free and open to the public to use based on the license, but due to the quality of the data there may be limitations on the type of applications it should be used for. These types of special limitations should be stated in the description field. Providing a License Description is optional.

Examples:

"Due to a sensor anomaly, data collected between October 4, 2007 and October 10, 2007 should not be used to conduct scientific research."

"Validation studies have shown significant error values in data collected over desert land cover types. Therefore, it is recommended that this data not be used to conduct analysis over areas of land containing desert"

License URL and License Text

License information can be provided directly in the metadata record, or as a URL that links to a web page which holds the license text. It is highly recommended that a License URL be provided if possible. With a License URL, the metadata remains unaffected by changes made to the license. Providing license information is required for all NASA EOSDIS data sets. License information can be provided in the License Text field OR as a License URL (you cannot provide both).

License URL: The License URL field can be used to link to a web page which describes the license terms for the data set. Providing license information is required for all NASA data sets. Use of the License URL field is strongly recommended. There are several sub-elements for License URL:

License URL/Linkage: The link to the license should be provided in this field. If providing a License URL, the Linkage element is required.

License URL/Protocol: The protocol is used to identify mechanisms/conventions for communication between different network devices (e.g. https, svn, ftp, etc.). Providing a protocol is optional.

License URL/Application Profile: The name of the application that can service the data. For example, if the URL points to a word document, then the application profile is MS-Word. If the URL points to a website, the application profile could be the name of a web browser (e.g. Chrome, Internet Explorer, etc.). Providing an application profile is optional.

License URL/Name: A name that identifies the URL, such as "License URL". Providing a name is completely optional.

License URL/Description: A description of the URL being provided. Providing a URL description is recommended but not required.

License URL/Function: "The function of the online resource. In ISO where this class originated the valid values are: download, information, offlineAccess, order, and search." Providing a function is optional.

License URL/Mime Type: MIME stands for "Multipurpose Internet Mail Extensions." Mime types are used to identify the nature and format of files provided on the Internet, and are typically used by internet browsers in order to determine how to properly process or display a document or file. Providing the Mime Type element in the metadata helps ensure that the URL contents will be properly displayed on the Web. Providing a Mime Type for License URL is optional. Mime Type is a controlled vocabulary field and should be chosen from the GCMD Mime Type keyword list.

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/MimeType?format=csv

Examples:

Linkage: <https://opendatacommons.org/licenses/odbl/1.0/>

Protocol: https

Name: License URL

Description: Link to the full legal text for the Open Data Commons Open Database License (ODbL) version 1.0

MimeType: text/html

Linkage: <https://opendatacommons.org/licenses/pddl/1.0/>

Description: Link to the full legal text of the license applied to this data set

MimeType: text/html

License Text: Use the License Text field to provide the license terms for the data set. The license text should be provided in full. A summary or plain english version of the license text does not count as the actual license text. As shown in the example below, license text is often lengthy and providing the full license text in the metadata should be avoided if possible. Use of the License Text field should be reserved for cases where it is not possible to provide a License URL.

Examples: <https://wiki.earthdata.nasa.gov/display/CMR/Use+Constraints#UseConstraints-LicenseURL&LicenseText>

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that there is at least a brief summary of the use constraints.
 - Confirm that any URLs link to the appropriate web pages.
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check that the field length is not greater than 12,000 characters.
 - Check for potential broken links.
- CMR Validation
 - N/A

- ARC Validation Report
 - Marked as high priority
 - License information is missing for a NASA dataset (License is required for NASA datasets)
 - The License URL is a broken link
 - The Use Constraints/Description or the License Text includes spelling or grammatical errors
 - The license provided is incorrect for the dataset
 - Marked as medium priority
 - The License Text option is provided when a URL is available
 - Marked as low priority
 - The License URL provided is a re-direct link
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags*Recommended, Free Text Search, Markdown Support***Mapping**

DIF 9:

/DIF/Use_Constraints

DIF 10:

/DIF/Use_Constraints

ISO 19115-2:

/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:useLimitation/gco:CharacterString

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:useConstraints/gmd:MD_RestrictionCode

codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode" codeListValue="otherRestrictions" element value=otherRestrictions
with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:otherConstraints/gco:CharacterString = License URL: <URL>

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:otherConstraints/gco:CharacterString = License Text: <text>

Examples

DIF 9:

<Use_Constraints>This data set conforms to the PICCCBY Attribution License
(<http://creativecommons.org/licenses/by/3.0/>).

Please follow instructions listed in the citation reference provided at http://data.aad.gov.au/aadc/metadata/citation.cfm?entry_id=ASAC_2201_HCL_0.5 when using these data.</Use_Constraints>

DIF 10:

<Use_Constraints>The distribution of this data set is funded by NASA's Earth Science Enterprise (ESE). The data are not copyrighted; however, we request that when you publish data or results using these data, please acknowledge as follows:

The data used in this study were acquired as part of the Tropical Rainfall Measuring Mission (TRMM). The algorithms were developed by the TRMM Science Team. The data were processed by the TRMM Science Data and Information System (TSDIS) and the TRMM Office; they are archived and distributed by the Goddard Earth Sciences Data and Information Services Center. TRMM is an international project jointly sponsored by the Japan National Space Development Agency (NASDA) and the U.S. National Aeronautics and Space Administration (NASA) Office of Earth Sciences.

Please send a copy of your publication to Help Desk, Goddard Earth Sciences Data and Information Services Center, Code 610.2, NASA GSFC, Greenbelt, MD 20771 or email the reference of your publication to gsfc-help-disc@lists.nasa.gov.</Use_Constraints>

ISO 19115-2:

```
<gmi:MI_Metadata>
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      <gmd:resourceConstraints>
        <gmd:MD_LegalConstraints>
          <gmd:useLimitation>
            <gco:CharacterString>This product must not be used for the purposes of
determining water quality.</gco:CharacterString>
          </gmd:useLimitation>
          <gmd:useConstraints>
            <gmd:MD_RestrictionCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_Restrict
ionCode" codeListValue="otherRestrictions">otherRestrictions</gmd:MD_RestrictionCode>
            </gmd:useConstraints>
            <gmd:otherConstraints>
              <gco:CharacterString>LicenseText: Sample license text so that the review has an
idea of what to put here: Apache License Version 2.0, January 2004
http://www.apache.org/licenses/ TERMS AND CONDITIONS FOR USE, REPRODUCTION,
AND DISTRIBUTION 1. Definitions. License shall mean the terms and conditions for use,
reproduction, and distribution as defined by Sections 1 through 9 of this document.
...</gco:CharacterString>
            </gmd:otherConstraints>
          </gmd:MD_LegalConstraints>
        </gmd:resourceConstraints>
```



```

    </gmd:MD_DataIdentification>
  </gmd:identificationInfo>
</gmi:MI_Metadata>

```

B.2.2.18 Access Constraints

Element Specification

AccessConstraints/Description (1)

AccessConstraints/Value (0..1)

Description

The Description sub-element allows the author to provide information concerning accessing constraints. This includes any special restrictions, legal prerequisites, limitations and/or warnings on obtaining the data. Examples of values include: Public, In-house, Limited, and None. The Value sub-element is used for special access control list (ACL) rules (http://en.wikipedia.org/wiki/Access_control_list) - for example, to hide metadata when it isn't ready for public consumption. Providers use the AccessConstraint/Value element to specify various restriction levels with ACLs. For example: A provider might specify a service Level ACL that hides all items (collections for this example) with a value element set to "15.0". There is no controlled mapping for what the values represent.

Best Practices

There are two sub-elements that comprise Access Constraints: Description and Value.

- **Description:** The Description sub-element allows the author to provide information concerning access constraints. This includes any special restrictions, legal prerequisites, limitations and/or warnings on obtaining the data. Examples of values include: Public, In-house, Limited, and None.
- **Value:** Providers have the option to use the AccessConstraint/Value element to specify various restriction levels with access control lists (ACLs). The provider is responsible for defining their own ACL rules (http://en.wikipedia.org/wiki/Access_control_list). For example, a provider might specify a service level ACL that hides all items (collections for this example) with a value element set to '15.0' in order to hide metadata when it isn't ready for public consumption. There is no controlled mapping for what the values represent.

Examples:

AccessConstraints/Description: None

AccessConstraints/Value: 15

AccessConstraints/Description: Limited

AccessConstraints/Value: 4

AccessConstraints/Description: This product has full public access.

AccessConstraints/Value: 0

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Confirm that the URLs link to the appropriate web pages.
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check that the field length is not greater than 4,000 characters.
 - Check for potential broken links.
- CMR Validation
 - If this element is used it the description sub element is required
 - The description must have at least 1 character and be no longer than 4000 characters in length
- ARC Validation Report
 - Marked as high priority
 - The information provided is not related to the element.
 - The access constraints described are inaccurate for the dataset.
 - The access constraints description includes spelling or grammatical errors.
 - Marked as medium priority
 - N/A
 - Marked as low priority
 - N/A
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.
- ARC Automated Checks
 - Description
 - If no value is provided, return is: "np."
 - Otherwise, return is "OK."
 - Value
 - If no value is provided, return is: "np."
 - Otherwise, return is "OK."

Cardinality

0..1

Tags*Recommended***Mapping**

DIF 9:

/DIF/Access_Constraints

/DIF/Extended_Metadata/Metadata

DIF 10:

/DIF/Access_Constraints

/DIF/Extended_Metadata/Metadata

ECHO 10 Collection:

/Collection/RestrictionComment

/Collection/RestrictionFlag

ECHO 10 Granule:

/Granule/RestrictionComment

/Granule/RestrictionFlag

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:useLimitation/gco:CharacterString (prefix: 'Restriction Comment:')

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:otherConstraints/gco:CharacterString (prefix: 'Restriction Flag:')

Examples

DIF 9:

<Access_Constraints>None</Access_Constraints>

<Extended_Metadata>

<Metadata>

<Group>gov.nasa.earthdata.cmr</Group>

<Name>Restriction</Name>

<Value>[0 or 1+]</Value>

</Metadata>

</Extended_Metadata>

DIF 10:

<Access_Constraints>None. The paper is open access.</Access_Constraints>

<Extended_Metadata>

<Metadata>

<Group>gov.nasa.earthdata.cmr</Group>

<Name>Restriction</Name>

<Value>[0 or 1+]</Value>

</Metadata>

</Extended_Metadata>

ECHO 10 Collection:

<RestrictionFlag>0</RestrictionFlag>

<RestrictionComment>None</RestrictionComment>

ECHO 10 Granule:

<RestrictionFlag>0</RestrictionFlag>

```
<RestrictionComment>
  This product has full public access
</RestrictionComment>
```

ISO 19115-2

```
<gmd:resourceConstraints>
  <gmd:MD_LegalConstraints>
    <gmd:useLimitation>
      <gco:CharacterString>Restriction Comment: There are no fees for training, materials,
rubrics, and assessments. Each
participant must complete the online form to access materials.</gco:CharacterString>
    </gmd:useLimitation>
    <gmd:otherConstraints>
      <gco:CharacterString>Restriction Flag:0</gco:CharacterString>
    </gmd:otherConstraints>
  </gmd:MD_LegalConstraints>
</gmd:resourceConstraints>
```

B.2.2.19 Archive And Distribution Information

Element Specification

ArchiveAndDistributionInformation/FileArchiveInformation (0..*)

ArchiveAndDistributionInformation/FileArchiveInformation/Format (0..1) <ASCII, BINARY, GRIB, BUFR, HDF4, HDF5, HDF-EOS4, HDF-EOS5, JPEG, PNG, TIFF, GeoTIFF, KML>

ArchiveAndDistributionInformation/FileArchiveInformation/FormatType (0..1) <Native, Supported>

ArchiveAndDistributionInformation/FileArchiveInformation/FormatDescription (0..1)

ArchiveAndDistributionInformation/FileArchiveInformation/AverageFileSize (0..1, 1 If TotalCollectionFileSizeBeginDate is used)

ArchiveAndDistributionInformation/FileArchiveInformation/AverageFileSizeUnit (0..1, 1 if AverageFileSize is used)

Choice of 0..1

1) ArchiveAndDistributionInformation/FileArchiveInformation/TotalCollectionsFileSize (0..1)

ArchiveAndDistributionInformation/FileArchiveInformation/TotalCollectionFileSizeUnit (0..1, 1 If TotalCollectionsFileSize is used)

2)

ArchiveAndDistributionInformation/FileArchiveInformation/TotalCollectionFileSizeBeginDate (0..1)

ArchiveAndDistributionInformation/FileArchiveInformation/Description (0..1)

ArchiveAndDistributionInformation/FileDistributionInformation (0..*)

ArchiveAndDistributionInformation/FileDistributionInformation/Format (1) <ASCII, BINARY, GRIB, BUFR, HDF4, HDF5, HDF-EOS4, HDF-EOS5, JPEG, PNG, TIFF, GeoTIFF, KML>

ArchiveAndDistributionInformation/FileDistributionInformation/FormatType (0..1) <Native, Supported>

ArchiveAndDistributionInformation/FileDistributionInformation/FormatDescription (0..1)

ArchiveAndDistributionInformation/FileDistributionInformation/Media (0..*)

ArchiveAndDistributionInformation/FileDistributionInformation/AverageFileSize (0..1, 1 If TotalCollectionFileSizeBeginDate is used)
 ArchiveAndDistributionInformation/FileDistributionInformation/AverageFileSizeUnit (0..1, 1 if AverageFileSize is used)
 Choice of 0..1
 1) ArchiveAndDistributionInformation/FileDistributionInformation/TotalCollectionsFileSize (0..1)
 ArchiveAndDistributionInformation/FileDistributionInformation/TotalCollectionFileSizeUnit (0..1, 1 If TotalCollectionsFileSize is used)
 2)
 ArchiveAndDistributionInformation/FileDistributionInformation/TotalCollectionFileSizeBeginDate (0..1)
 ArchiveAndDistributionInformation/FileDistributionInformation/Description (0..1)
 ArchiveAndDistributionInformation/FileDistributionInformation/Fees (0..1)

Description

The archive and distribution information main element allows data providers to provide users information of what is available for downloading when they are initially looking at a collection. The end users get information such as the average downloadable file size, format, mime type, checksum, an estimate of the collection's entire downloadable file size, etc.

Best Practices

There are multiple sub-elements that comprise Archive and Distribution Information for Collections:

Format: Defines a single format for an archival artifact (e.g., binary, jpeg, HDF5, HDF-EOS5, GeoTIFF). It is strongly recommended that the format be selected from the GCMD Granule Data Format vocabulary list in order to ensure consistent use of data formats across the CMR.

Format Type: Allows the provider to define if the archival artifact's format is in its native format or another supported format

Format Description: Allows the data provider to provide added information about the provided Format.

Average File Size: An approximate average of the size of the the archivable item, which gives users an idea of the magnitude of each archivable file

Average File Size Unit: Unit of measure for the average file size (e.g., KB, MB, TB)

Total Collection File Size: An approximate total size of the archivable items, which gives users an idea of the magnitude of all the archivable files combined

Total Collection File Size Unit: Unit of measure for the total collection file size (e.g., KB, MB, TB)

Total Collection File Size Begin Date: The date that data collection began for the collection, which should be in the following format: yyyy-MM-ddTHH:mm:ssZ

Description: Enables the provider to provide more information about the archivable item

Media: Defines how the distributable material can be obtained by an end user (e.g., CD-ROM, hard drives, online, etc.)

Fees: Provide the price an end user will need to pay in order to obtain the distributable material. Each of these elements are available under 'FileArchiveInformation' and 'FileDistributionInformation'. FileArchiveInformation describes the data in its archived format. FileDistributionInformation describes the data as distributed by a data provider; it can be the original format in which the data are archived, or can be used to specify when the data is distributed in a format other than its original format.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Distribution_Format - Check that the field length is not greater than 80 characters.
 - Distribution_Size - Check that the field length is not greater than 80 characters.
 - Distribution_Media - Check that the field length is not greater than 500 characters.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - No data format is provided
 - The data format provided is incorrect
 - Marked as medium priority
 - The data format provided is correct, but could be more specific
 - E.g. Providing 'NetCDF' when the format should be 'NetCDF-4'
 - E.g. Providing 'ASCII' when the data format should be 'CSV'
 - Marked as low priority
 - The data format provided is correct, however, it does not exactly match its entry in the GCMD Granule Data Format vocabulary list.
 - E.g. providing 'netcdf4' versus 'NetCDF-4'
 - E.g. providing 'geo-tiff' versus 'GeoTIFF'
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags*Recommended***Mapping**

DIF 9:

/DIF/Use_Constraints

DIF 10:

/DIF/Use_Constraints

ISO 19115-2:

/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd:MD_LegalConstraints/gmd:useLimitation/gco:CharacterString

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints

/gmd:MD_LegalConstraints/gmd:useConstraints/gmd:MD_RestrictionCode

codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_RestrictionCode" codeListValue="otherRestrictions" element value=otherRestrictions

with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints

/gmd:MD_LegalConstraints/gmd:otherConstraints/gco:CharacterString = License URL: <URL>

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints

/gmd:MD_LegalConstraints/gmd:otherConstraints/gco:CharacterString = License Text: <text>

Examples

DIF 9:

<Use_Constraints>This data set conforms to the PICCCBY Attribution License
(<http://creativecommons.org/licenses/by/3.0/>).

Please follow instructions listed in the citation reference provided at

http://data.aad.gov.au/aadc/metadata/citation.cfm?entry_id=ASAC_2201_HCL_0.5 when using
these data.</Use_Constraints>

DIF 10:

<Use_Constraints>The distribution of this data set is funded by NASA's Earth Science
Enterprise (ESE). The data are not copyrighted; however, we request that when you publish data
or results using these data, please acknowledge as follows:

The data used in this study were acquired as part of the Tropical Rainfall Measuring Mission (TRMM). The algorithms were developed by the TRMM Science Team. The data were processed by the TRMM Science Data and Information System (TSDIS) and the TRMM Office; they are archived and distributed by the Goddard Earth Sciences Data and Information Services Center. TRMM is an international project jointly sponsored by the Japan National Space Development Agency (NASDA) and the U.S. National Aeronautics and Space Administration (NASA) Office of Earth Sciences.

Please send a copy of your publication to Help Desk, Goddard Earth Sciences Data and Information Services Center, Code 610.2, NASA GSFC, Greenbelt, MD 20771 or email the reference of your publication to gsfc-help-disc@lists.nasa.gov.

ISO 19115-2:

```

<gmi:MI_Metadata>
  <gmd:identificationInfo>
    <gmd:MD_DataIdentification>
      <gmd:resourceConstraints>
        <gmd:MD_LegalConstraints>
          <gmd:useLimitation>
            <gco:CharacterString>This product must not be used for the purposes of
determining water quality.</gco:CharacterString>
          </gmd:useLimitation>
          <gmd:useConstraints>
            <gmd:MD_RestrictionCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_Restrict
ionCode" codeListValue="otherRestrictions">otherRestrictions</gmd:MD_RestrictionCode>
            </gmd:useConstraints>
            <gmd:otherConstraints>
              <gco:CharacterString>LicenseText: Sample license text so that the review has an
idea of what to put here: Apache License Version 2.0, January 2004
http://www.apache.org/licenses/ TERMS AND CONDITIONS FOR USE, REPRODUCTION,
AND DISTRIBUTION 1. Definitions. License shall mean the terms and conditions for use,
reproduction, and distribution as defined by Sections 1 through 9 of this document.
...</gco:CharacterString>
            </gmd:otherConstraints>
          </gmd:MD_LegalConstraints>
        <gmd:resourceConstraints>
          </gmd:MD_DataIdentification>
        </gmd:identificationInfo>
      </gmi:MI_Metadata>

```

B.2.2.20 Direct Distribution Information

Element Specification

DirectDistributionInformation/Region (1)
 DirectDistributionInformation/S3BucketAndObjectPrefixNames (0..*)
 DirectDistributionInformation/S3CredentialsAPIEndpoint (1)
 DirectDistributionInformation/S3CredentialsAPIDocumentationURL (1)

Description

This element allows end users to get direct access to data products that are stored in the Amazon Web Service (AWS) s3 buckets. The sub elements include s3 credentials end point, a documentation URL, as well as bucket prefix names, and an AWS region.

Best Practices

Direct Distribution Information is an optional element. It stores information that allows an end user to retrieve the individual data files from an AWS s3 bucket.

There are four sub-elements that comprise Direct Distribution Information:

Region: Defines the possible values for the AWS US Regions where the data product resides.

S3BucketAndObjectPrefixNames: Defines the possible values for the AWS s3 bucket and/or object prefix names.

S3CredentialsAPIEndpoint: Defines the URL of the API for credentials.

S3CredentialsAPIDocumentationURL: Defines the URL where the credential API documentation is stored.

Examples:

Region: "us-east-2"

S3BucketAndObjectPrefixNames: "4"

S3CredentialsAPIEndpoint: "https://someurl.org/credential/api/url"

S3CredentialsAPIDocumentationURL: "https://someurl.org/credential/api/documentation."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
- CMR Validation
 - Check the Region field to make sure it matches the valid values.
 - Check that the S3BucketAndObjectPrefixNames field length is greater than 0 and not greater than 1,024 characters, and if used that there is at least one value in the array.
 - Check that the S3CredentialsAPIEndpoint, and S3CredentialsAPIDocumentationURL field lengths are not greater than 1,024 characters, not less than 1 character, and that the values are valid URIs.
- ARC Validation Report
 - Not yet assessed as this is a new set of fields.

Cardinality

0..1

Tags

Controlled Vocabulary

Mapping

DIF 10:

/DIF/DirectDistributionInformation/Region

/DIF/DirectDistributionInformation/S3BucketAndObjectPrefixName

/DIF/DirectDistributionInformation/S3CredentialsAPIEndpoint

/DIF/DirectDistributionInformation/S3CredentialsAPIDocumentationURL

ECHO 10 Collection:

/Collection/DirectDistributionInformation/Region
 /Collection/DirectDistributionInformation/S3BucketAndObjectPrefixName
 /Collection/DirectDistributionInformation/S3CredentialsAPIEndpoint
 /Collection/DirectDistributionInformation/S3CredentialsAPIDocumentationURL

ISO 19115-2:

/gmi:MI_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor
 xlink:href="DirectDistributionInformation"/gmd:MD_Distributor/gmd:distributionOrderProcess/
 gmd:MD_StandardOrderProcess/gmd:orderingInstructions/gmd:CharacterString = Region:
 <region such as us-east-2>

/gmi:MI_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor
 xlink:href="DirectDistributionInformation"/gmd:MD_Distributor/gmd:distributionOrderProcess/
 gmd:MD_StandardOrderProcess/gmd:orderingInstructions/gmd:CharacterString =
 S3BucketAndObjectPrefixNames: <such as BucketPrefix1 BucketPrefix2 >

/gmi:MI_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor
 xlink:href="DirectDistributionInformation"/gmd:MD_Distributor/gmd:distributorTransferOption
 s
 xlink:href="DirectDistributionInformation_S3CredentialsAPIEndpoint"/gmd:MD_DigitalTransf
 erOptions/gmd:onLine/gmd:CI_OnlineResource/gmd:linkage/gmd:URL

/gmi:MI_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor
 xlink:href="DirectDistributionInformation"/gmd:MD_Distributor/gmd:distributorTransferOption
 s
 xlink:href="DirectDistributionInformation_S3CredentialsAPIDocumentationURL"/gmd:MD_Di
 gitalTransferOptions/gmd:onLine/gmd:CI_OnlineResource/gmd:linkage/gmd:URL

Examples

DIF 10:

<DIF>

<DirectDistributionInformation>

<Region>us-east-2</Region>

<S3BucketAndObjectPrefixName>TestBucketOrObjectPrefix</S3BucketAndObjectPrefixName
 >

<S3CredentialsAPIEndpoint>https://DAACCredentialEndpoint.org</S3CredentialsAPIEndpoint
 >

<S3CredentialsAPIDocumentationURL>https://DAACCredentialDocumentation.org</S3Creden
 tialsAPIDocumentationURL>

</DirectDistributionInformation>

</DIF>

ECHO 10 Collection:

```

<Collection>
  <DirectDistributionInformation>
    <Region>us-east-2</Region>

  <S3BucketAndObjectPrefixName>TestBucketOrObjectPrefix</S3BucketAndObjectPrefixName
  >

  <S3CredentialsAPIEndpoint>https://DAACCredentialEndpoint.org</S3CredentialsAPIEndpoint
  >

  <S3CredentialsAPIDocumentationURL>https://DAACCredentialDocumentation.org</S3Creden
  tialsAPIDocumentationURL>
  </DirectDistributionInformation>
</Collection>

```

ISO 19115-2:

```

<gmd:distributionInfo>
  <gmd:MD_Distribution>
    ...
    <gmd:distributor xlink:href="DirectDistributionInformation">
      <gmd:MD_Distributor>
        <gmd:distributorContact gco:nilReason="inapplicable"/>
        <gmd:distributionOrderProcess>
          <gmd:MD_StandardOrderProcess>
            <gmd:orderingInstructions>
              <gco:CharacterString>Region: us-east-2 S3BucketAndObjectPrefixNames:
TestBucketOrObjectPrefix</gco:CharacterString>
            </gmd:orderingInstructions>
          </gmd:MD_StandardOrderProcess>
        </gmd:distributionOrderProcess>
      <gmd:distributorTransferOptions
xlink:href="DirectDistributionInformation_S3CredentialsAPIEndpoint">
        <gmd:MD_DigitalTransferOptions>
          <gmd:onLine>
            <gmd:CI_OnlineResource>
              <gmd:linkage>
                <gmd:URL>https://DAACCredentialEndpoint.org</gmd:URL>
              </gmd:linkage>
              <gmd:description>
                <gco:CharacterString>The S3 credentials API
endpoint.</gco:CharacterString>
              </gmd:description>
            </gmd:CI_OnlineResource>
          </gmd:onLine>
        </gmd:MD_DigitalTransferOptions>
      </gmd:distributorTransferOptions>

```

```

    <gmd:distributorTransferOptions
xlink:href="DirectDistributionInformation_S3CredentialsAPIDocumentationURL">
      <gmd:MD_DigitalTransferOptions>
        <gmd:onLine>
          <gmd:CI_OnlineResource>
            <gmd:linkage>
              <gmd:URL>https://DAACCredentialDocumentation.org</gmd:URL>
            </gmd:linkage>
            <gmd:description>
              <gco:CharacterString>The S3 credentials API Documentation
URL.</gco:CharacterString>
            </gmd:description>
          </gmd:CI_OnlineResource>
        </gmd:onLine>
      </gmd:MD_DigitalTransferOptions>
    </gmd:distributorTransferOptions>
  </gmd:MD_Distributor>
</gmd:distributor>
...
<gmd:MD_Distribution>
<gmd:distributionInfo>

```

B.2.2.21 Metadata Association

Element Specification

MetadataAssociation/EntryId (1)

MetadataAssociation/Type (0..1) <"SCIENCE ASSOCIATED", "DEPENDENT", "INPUT", "PARENT", "CHILD", "RELATED", "LARGER CITATION WORKS">

MetadataAssociation/Description (0..1)

MetadataAssociation/Version (0..1)

Description

The Metadata Association element is used to identify other metadata resources that are dependent on or related to the data described by the metadata. Such metadata resources may include (but are not limited to): services, other collections, visualizations, variables, granules, documents, etc.

Best Practices

Metadata Association is an optional element. It can be used to identify resources stored in different metadata records that are related to the data, and can also be used to define relationships between collections. For instance, a metadata association can be used to identify a parent metadata record if it exists. This usage should be reserved for instances where a group of metadata records are subsets that can be better represented by one parent metadata record, which describes the entire set. In some instances, a 'child' metadata record may point to more than one 'parent'.

The association must be made to another collection level metadata record (via the Entry Id sub-element, which should contain the related collection's Short Name) and then the Type and

Description fields can be used to further explain the relationship (whether it be to the collection itself, or to a component provided in the other collection's metadata such as a service, document, visualization, etc.).

There are four sub-elements that comprise Metadata Association:

Entry ID: The Short Name of the target metadata record that is associated with the collection record. The Entry ID is required and should point to another collection level metadata record that includes the related information.

Version: The version of the target metadata record that is associated with the collection record. Providing a version is optional, but is recommended if the associated collection has multiple available versions.

Type: The type of association between the collection metadata record and the target metadata record. Providing a Type is optional, but recommended. This is a controlled vocabulary field and must be select from the following options:

- **SCIENCE ASSOCIATED:** There is an associated science resource (such as a document or data) in the target metadata record.
- **DEPENDENT:** The collection is somehow dependent on the target record.
- **INPUT:** The target record is an input to the collection. For example, the target record could be a lower level data product that was input to an algorithm & processed to create the collection.
- **PARENT:** The target record is a parent of the collection. This means the collection is a subset or 'child' of a larger parent collection.
- **CHILD:** The target record is a child of the collection. This means the collection is a parent record with a number of associated 'child' records.
- **RELATED:** The target record is somehow related to the collection.
- **LARGER CITATION WORKS:** There is a document cited in the target record that is related to the collection.

Description: Free-text description of the association between the collection and the target metadata record. Providing a description is optional, but can be important for identifying a specific related resource such as a document, citation or piece of data in the target metadata record (recommended for SCIENCE ASSOCIATED, DEPENDENT, INPUT, RELATED and LARGER CITATION WORKS association types).

Examples:

EntryId: "AST_L1A"

Version: "4"

Type: "INPUT"

Description: "Raw sensor counts that were converted to radiometric values found in this collection."

EntryId: "Polarimetric_CT_1602"

Version: "1"

Type: "RELATED"

Description: "This related dataset contains forest vertical structure and associated uncertainty products over the same study area derived by applying multi-baseline Polarimetric

Interferometric Synthetic Aperture Radar (PolInSAR) and Polarimetric Coherence Tomographic SAR (PCT or PC-TomoSAR)."

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check the Type field to make sure it matches a Type keyword in the enumeration list.
 - Check that the Description field length is not greater than 4,000 characters
 - Check that the Short_Name, Version, and Type field lengths are not greater than 80 characters
- CMR Validation
 - Check the Type field to make sure it matches a Type keyword in the enumeration list.
 - Check that the Description field length is not greater than 4,000 characters
 - Check that the Short_Name, Version, and Type field lengths are not greater than 80 characters
- ARC Validation Report
 - Marked as high priority
 - A Metadata Association is provided but the Entry Id is missing (Entry Id is required)
 - An incorrect enumeration value is provided for the MetadataAssociation/Type field
 - The MetadataAssociation/Description includes spelling errors
 - Marked as medium priority
 - The Metadata Association points to an outdated collection (i.e. a collection that no longer exists)
 - Marked as low priority
 - Suggestions are made to change the information provided in the Metadata Association for clarity
 - Suggestions are made to provide additional information in the Metadata Association for clarity
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags

Controlled Vocabulary, Validated Relationship

Mapping

DIF 9:
/DIF/Parent_DIF

DIF 10:
/DIF/Parent_DIF
/DIF/MetadataAssociation/

ECHO 10 Collection:
/Collection/CollectionAssociations/CollectionAssociation/

ISO 19115-2:
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:aggregationInfo/gmd:MD_AggregateInformation/gmd:aggregateDataSetName/gmd:CI_Citation

Metadata Associations:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:aggregationInfo/gmd:MD_AggregateInformation/gmd:associationType/gmd:DS_AssociationTypeCode
codeListValue="Science Associated"

Parent Associations:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:aggregationInfo/gmd:MD_AggregateInformation/gmd:associationType/gmd:DS_AssociationTypeCode
codeListValue="largerWorkCitation"

Examples

DIF 9:
<Parent_DIF>CNDP-ESP_IPY_POL2006-11139-C02-01CGL_ESASSI</Parent_DIF>

DIF 10:
<Parent_DIF>CNDP-ESP_IPY_POL2006-11139-C02-01CGL_ESASSI</Parent_DIF>

<DIF>
 <MetadataAssociation>
 <EntryId>CIESIN_SEDAC_E,NTRI_TEXTS_COL</EntryId>
 <Type>Science Associated</Type>
 <Description>Some description of the association</Description>
 </MetadataAssociation>
</DIF>

ECHO 10 Collection:

Parent Association:

<CollectionAssociation>
 <ShortName>g3atb</ShortName>
 <VersionId>4</VersionId>
 <CollectionType>Parent Association</CollectionType>
 <CollectionUse>This is the SAGE III Level 1B solar transmission file containing 85 profiles from zero to 100 km in 0.5 km intervals that are used in inversion algorithms to extract the measured species associated with the transmission wavelengths.</CollectionUse>

</CollectionAssociation>

Metadata Association:

```
<CollectionAssociation>
  <ShortName>g3arepqa</ShortName>
  <VersionId>4</VersionId>
  <CollectionType>Science Associated</CollectionType>
  <CollectionUse>The weekly quality assurance report containing information that might be
  useful in gaining insight into the quality of these data.</CollectionUse>
</CollectionAssociation>
```

ISO 19115-2:

Parent Association:

```
<gmd:aggregationInfo>
  <gmd:MD_AggregateInformation>
    <gmd:aggregateDataSetName>
      <gmd:CI_Citation>
        <gmd:title>
          <gco:CharacterString>g3atb</gco:CharacterString>
        </gmd:title>
        <gmd:date gco:nilReason="unknown"/>
        <gmd:edition>
          <gco:CharacterString>4</gco:CharacterString>
        </gmd:edition>
        <gmd:otherCitationDetails>
          <gco:CharacterString>This is the SAGE III Level 1B solar transmission file containing
          85 profiles from zero to 100 km in 0.5 km intervals that are used in inversion algorithms to
          extract the measured species associated with the transmission
          wavelengths.</gco:CharacterString>
        </gmd:otherCitationDetails>
      </gmd:CI_Citation>
    </gmd:aggregateDataSetName>
    <gmd:aggregateDataSetIdentifier>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>g3atb</gco:CharacterString>
        </gmd:code>
      </gmd:MD_Identifier>
    </gmd:aggregateDataSetIdentifier>
    <gmd:associationType>
      <gmd:DS_AssociationTypeCode
      codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodellists.xml#DS_Associat
      ionTypeCode"
      codeListValue="largerWorkCitation">largerWorkCitation</gmd:DS_AssociationTypeCode>
    </gmd:associationType>
  </gmd:MD_AggregateInformation>
```

```
</gmd:aggregationInfo>
```

Metadata Association:

```
<gmd:aggregationInfo>
  <gmd:MD_AggregateInformation>
    <gmd:aggregateDataSetName>
      <gmd:CI_Citation>
        <gmd:title>
          <gco:CharacterString>g3atb</gco:CharacterString>
        </gmd:title>
        <gmd:date gco:nilReason="unknown"/>
        <gmd:edition>
          <gco:CharacterString>4</gco:CharacterString>
        </gmd:edition>
        <gmd:otherCitationDetails>
          <gco:CharacterString>This is the SAGE III Level 1B solar transmission file containing
85 profiles from zero to 100 km in 0.5 km intervals that are used in inversion algorithms to
extract the measured species associated with the transmission
wavelengths.</gco:CharacterString>
        </gmd:otherCitationDetails>
      </gmd:CI_Citation>
    </gmd:aggregateDataSetName>
    <gmd:aggregateDataSetIdentifier>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>g3atb</gco:CharacterString>
        </gmd:code>
      </gmd:MD_Identifier>
    </gmd:aggregateDataSetIdentifier>
    <gmd:associationType>
      <gmd:DS_AssociationTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodellists.xml#DS_Associat
ionTypeCode" codeListValue="Science Associated">Science
Associated</gmd:DS_AssociationTypeCode>
    </gmd:associationType>
  </gmd:MD_AggregateInformation>
</gmd:aggregationInfo>
```

B.2.2.22 Publication Reference

Element Specification

PublicationReference/Authors(0..1)
PublicationReference/PublicationDate (0..1)
PublicationReference/Title (0..1)
PublicationReference/Series (0..1)
PublicationReference/Edition (0..1)
PublicationReference/Volume (0..1)

PublicationReference/Issue (0..1)
PublicationReference/ReportNumber (0..1)
PublicationReference/PublicationPlace (0..1)
PublicationReference/Publisher (0..1)
PublicationReference/Pages (0..1)
PublicationReference/ISBN (0..1)
PublicationReference/DOI (0..1)
PublicationReference/OnlineResource (0..1)
PublicationReference/OnlineResource/Linkage (1)
PublicationReference/OnlineResource/Protocol (0..1)
PublicationReference/OnlineResource/ApplicationProfile (0..1)
PublicationReference/OnlineResource/Name (0..1)
PublicationReference/OnlineResource/Description (0..1)
PublicationReference/OnlineResource/Function (0..1)
PublicationReference/OnlineResource/MimeType (0..1) {Look at RelatedURL MimeType values}
PublicationReference/OtherReferenceDetails (0..1)

Description

The Publication Reference element describes key bibliographic citations pertaining to the collection. Note that the citation for the collection itself should NOT provided here. The citation for the collection should be provided in the Collection Citation element.

Best Practices

The Publication Reference element can be used to cite any literature (such as journal articles) that are related to the collection. Providing a Publication Reference is optional.

There are twenty-one sub-elements that comprise Publication Reference:

Authors: The author(s) of the publication. This is a free text field so the name(s) may be formatted in any way.

PublicationDate: The date of publication.

Title: The title of the publication.

Publisher: The publisher of the publication.

Series: If the publication is part of a series, then the name of the series should be provided here. For journal articles, the name of the journal may also be provided here.

Edition: The edition of the publication. Edition typically refers to revisions of the original publication.

Volume: The publication volume number.

Issue: The issue number of the publication. Issues are typically part of a larger volume.

ReportNumber: The report number of the publication.

Pages: The publication pages that are relevant.

PublicationPlace: The place of publication.

DOI: The Digital Object Identifier (DOI) of the publication. Note that this should just be the DOI string and not the DOI URL (e.g. 10.1002/ece3.4075 vs <https://doi.org/10.1002/ece3.4075>)

DOI Authority: The DOI organization that is responsible for creating the DOI is described in the Authority element.

ISBN: The ISBN of the publication.

OnlineResource/Linkage: The URL of the publication if it is available online. If the resource has a DOI, then it is recommended that the DOI URL be provided here. Providing a link is optional, but encouraged.

OnlineResource/Protocol: The protocol of the link to the publication (e.g. https, svn, ftp, etc.). Providing a Protocol is optional.

OnlineResource/ApplicationProfile: The Application Profile holds the name of the application that can service the data. For example if the URL points to a word document, then the Application Profile is MS-Word. Providing an Application Profile is optional.

OnlineResource/Name: A name for the link to the publication. Providing Name is optional.

OnlineResource/Description: A brief description of the link to the publication. Providing a Description is optional.

OnlineResource/Function: The function of the online resource. This field originated from the ISO metadata standard where the valid values are: download, information, offlineAccess, order, and search. Providing a Function is optional.

OnlineResource/MimeType: MIME stands for "Multipurpose Internet Mail Extensions". Mime types are used to identify the nature and format of files provided on the Internet, and are typically used by internet browsers in order to determine how to properly process or display a document or file. Providing the Mime Type element in the metadata helps ensure that the URL contents will be properly displayed on the Web. Providing a Mime Type is optional. Mime Type is a controlled vocabulary field and should be chosen from the GCMD mime type keyword list. https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/MimeType?format=csv

OtherReferenceDetails: Additional free-text information about the publication.

Examples:

Example 1

Authors: "Bloom, S., L. Takacs, A. DaSilva, and D. Ledvina"

PublicationDate: "1996-01-01T00:00:00.000Z"

Title: "Data assimilation using incremental analysis updates"

Series: "Monthly Weather Review"

Edition: "104606"

Volume: "19"

Issue: "124"

Pages: "1256-1271"

DOI: "10.1177/1094342005056120"

Example 2

Authors: "Blair, J. B., D. L. Rabine., and M. A. Hofton."

PublicationDate: "1999"

Title: "The Laser Vegetation Imaging Sensor: A Medium-Altitude, Digitisation-Only, Airborne Laser Altimeter for Mapping Vegetation and Topography"

Publisher: " ISPRS Journal of Photogrammetry and Remote Sensing"

Volume: "54"

Pages: "115-122"

DOI/DOI: "10.1016/S0924-2716(99)00002-7"

DOI/Authority: "https://doi.org"

OnlineResource/Linkage: "https://doi.org/10.1016/S0924-2716(99)00002-7"

OnlineResource/Description: Access the article online.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Checks that URLs are properly formatted and operational.
 - Checks that field lengths do not exceed maximum characters allowed.
 - Checks that Persistent_Identifier/Type keyword is valid.
- CMR Validation
 - Automated Review
 - Checks that field lengths do not exceed maximum characters allowed.
 - Checks that Mime Type keyword is valid.
- ARC Validation Report
 - Marked as high priority
 - The Publication Reference linkage is a broken URL.
 - The incorrect DOI is provided for the publication.
 - Marked as medium priority
 - A recommendation is made to update information provided in the Publication Reference that is outdated or inaccurate.
 - Marked as low priority

- A recommendation is made to add an important sub-element to the Publication Reference.
- A recommendation is made to update the Publication Reference linkage from http to https.
- The Publication Reference linkage description contains grammatical errors.
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Free Text Search, Normalize***Mapping**

DIF 9:

/DIF/Reference/

DIF 10:

/DIF/Reference/

ISO 19115-2:

/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:aggregationInfo/gmd:MD_AggregateInformation/gmd:aggregateDataSetName/gmd:CI_Citation

Examples

DIF 9:

<Reference>

<Author>International Union for the Conservation of Nature and Natural Resources -

IUCN</Author>

<Publication_Date>2012</Publication_Date>

<Title>Environmental Treaty Status Data Set, 2012 Release</Title>

<Publication_Place>Palisades, NY</Publication_Place>

<Publisher>NASA Socioeconomic Data and Applications Center (SEDAC)</Publisher>

<DOI><http://dx.doi.org/10.7927/H4DZ067Z></DOI>

</Reference>

DIF 10:

<Reference>

<Author>International Union for the Conservation of Nature and Natural Resources -

IUCN</Author>

<Publication_Date>2012</Publication_Date>

<Title>Environmental Treaty Status Data Set, 2012 Release</Title>

<Publication_Place>Palisades, NY</Publication_Place>

```

    <Publisher>NASA Socioeconomic Data and Applications Center (SEDAC)</Publisher>
    <DOI>http://dx.doi.org/10.7927/H4DZ067Z</DOI>
  </Reference>

```

ISO 19115-2:

```

<gmd:aggregateDataSetName>
  <gmd:CI_Citation>
    <gmd:title>
      <gco:CharacterString>
        Unique data repository facilitates ocean color satellite validation
      </gco:CharacterString>
    </gmd:title>
    <gmd:date>
      <gmd:CI_Date>
        <gmd:date>
          <gco>Date>2003</gco>Date>
        </gmd:date>
        <gmd:dateType>
          <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#CI_DateTypeCo
de" codeListValue="publication">publication</gmd:CI_DateTypeCode>
          </gmd:dateType>
        </gmd:CI_Date>
      </gmd:date>
      <gmd:citedResponsibleParty>
        <gmd:CI_ResponsibleParty>
          ...
        </gmd:CI_ResponsibleParty>
      </gmd:citedResponsibleParty>
      <gmd:series>
        <gmd:CI_Series>
          <gmd:name>
            <gco:CharacterString>EOS Trans</gco:CharacterString>
          </gmd:name>
          <gmd:issueIdentification>
            <gco:CharacterString>38</gco:CharacterString>
          </gmd:issueIdentification>
        </gmd:CI_Series>
      </gmd:series>
      <gmd:otherCitationDetails>
        <gco:CharacterString>337</gco:CharacterString>
      </gmd:otherCitationDetails>
    </gmd:CI_Citation>
  </gmd:aggregateDataSetName>

```

B.2.3 Descriptive Keywords

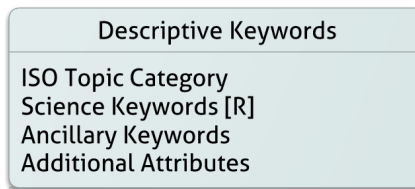


Figure B-6. Descriptive Keywords

B.2.3.1 ISO Topic Category

Element Specification

ISOTopicCategory

Description

The ISO Topic Category element identifies the topic category (or categories) from the EN ISO 19115 Topic Category Code List that pertain to a collection. The ISO Topic Category is a high-level thematic classification to assist in the grouping of and search for available collections. To see the the topic category definitions please see

http://wiki.esipfed.org/index.php/ISO_19115_and_19115-2_CodeList_Dictionaries and look for MD_TopicCategoryCode.



Figure B-7. Source: EN ISO 19115-1:2014 Geographic Information – Metadata – Part 1: Fundamentals MD_TopicCategoryCode List

Best Practices

Since the CMR validates ISO topic categories using the Keyword Management System (KMS), the KMS ISO Topic Category values should be used. The complete list of the ISO 19115 Topic

Category keywords in the KMS can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/isotopiccategory?format=csv.

Providing an ISO Topic Category keyword is optional. The field may be repeated so multiple ISO Topic Category keywords may be provided if applicable. The spacing and case of the terms are controlled, and therefore should exactly match the terms as they appear in the KMS.

Examples:

"SOCIETY"

"PLANNING CADASTRE"

"CLIMATOLOGY/METEOROLOGY/ATMOSPHERE"

Note: If using the Metadata Management Tool (MMT) to curate your collections, this field is auto-populated (using a mapping) at ingest based on the Science Keywords selected.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.
 - Verify that the keywords are consistent and suitable for the data.
 - Automated Review
 - Check that the field is populated with a valid value from KMS.
- CMR Validation
 - All ISO topic categories must be valid according to the keyword management system. An error is returned if the Cmr-Validate-Keywords HTTP header is set to true.
- ARC Validation Report
 - Marked as high priority
 - The ISO Topic Category keyword does not exactly match a valid value:
http://wiki.esipfed.org/index.php/ISO_Topic_Categories
 - Marked as medium priority
 - The ISO Topic Category keyword is not appropriate for the dataset.
 - Marked as low priority
 - N/A
 - No Recommended Changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags

Recommended

Mapping

DIF 9:

/DIF/ISO_Topic_Category

DIF 10:

/DIF/ISO_Topic_Category

ISO 19115-2:

/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:topicCategory/gmd:MD_TopicCategoryCode

Examples

DIF 9:

<ISO_Topic_Category uuid="d9cd5b7e-e9e7-4746-bbc8-bc69f7b606c7">GEOSCIENTIFIC INFORMATION</ISO_Topic_Category>

<ISO_Topic_Category uuid="0353d44f-2fc2-44df-9143-b1a3b86d5aa1">INLAND WATERS</ISO_Topic_Category>

DIF 10:

<ISO_Topic_Category uuid="1ebf71bd-d007-42f8-8f9b-8c44a6b65a28">CLIMATOLOGY/METEOROLOGY/ATMOSPHERE</ISO_Topic_Category>

ISO 19115-2:

<gmd:topicCategory>

 <gmd:MD_TopicCategoryCode>geoscientificInformation</gmd:MD_TopicCategoryCode>

 <gmd:MD_TopicCategoryCode>inlandWaters</gmd:MD_TopicCategoryCode>

</gmd:topicCategory>

B.2.3.2 Science Keywords [R]

Element Specification

ScienceKeywords/Category (1)

ScienceKeywords/Topic (1)

ScienceKeywords/Term (1)

ScienceKeywords/VariableLevel1 (0..1)

ScienceKeywords/VariableLevel2 (0..1)

ScienceKeywords/VariableLevel3 (0..1)

ScienceKeywords/DetailedVariable (0..1)

Description

The Science Keywords element allows relevant Earth science keywords to be associated with a dataset to better enable data search and discovery. The Science Keywords are chosen from a controlled keyword hierarchy maintained in the Keyword Management System (KMS). A list of valid Science Keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords?format=csv

Best Practices

Science keywords are important for the precise search and retrieval of data, and should accurately represent the dataset being described. As a rule of thumb, science keywords should represent the scientific parameters being provided in the data as well as any broader conceptual terms that may aid in describing the data. At a minimum, one science keyword hierarchy must be

provided, and this hierarchy must go down to the 'Term' level of detail. The 'Detailed Variable' element is the only science keyword element that is not controlled by the KMS. The 'Detailed Variable' keyword should only be used if there is a very specific parameter provided in the data which is not adequately described by keywords in the KMS. If a particular science keyword is missing from the KMS, it is possible to put in a request to have it added. The KMS is managed by the Global Change Master Directory (GCMD) and new keyword requests may be made through the GCMD Keywords Community Forum.

<https://earthdata.nasa.gov/gcmd-forum>. All positions in the science keyword hierarchy must be populated until the desired level of detail is reached. Skipping or leaving blank a position in the keyword hierarchy will render the keyword invalid. The only exception to this is the 'Detailed Variable' element; a Detailed Variable keyword may be provided as long as it is preceded by the required Category, Topic and Term keywords. Science keywords are not case sensitive.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.
 - Verify that existing facets and other controlled keyword values are consistent and suitable for the data.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value from KMS.
 - Check that the field value is not a duplicate.
 - Check that the 'Detailed_Variable' field length is not greater than 80 characters.
- CMR Validation
 - This element is required and at least 1 science keyword must exist.
 - For every science keyword the sub elements of Category, Topic, and Term must exist.
 - All science keyword sub elements except for DetailedVariable must be valid according to the keyword management system. Currently the CMR issues a warning if this constraint is violated.
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all.
 - The element is included but is empty.
 - The science keyword does not align with the KMS.
 - The science keyword does not exist in KMS.
 - A keyword(s) is missing from the hierarchy.
 - A keyword(s) is placed in the incorrect position of the hierarchy (e.g. a Variable Level 2 keyword is placed in the Variable Level 1 field).
 - The science keyword is not appropriate for the dataset.
 - Marked as medium priority

- A recommendation is made to add a relevant science keyword to the metadata.
 - A recommendation is made to add to an existing keyword in the metadata (i.e. i.e. to extend a keyword hierarchy down to a more detailed keyword).
- Marked as low priority
 - N/A
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

1..*

Tags*Required, Controlled Vocabulary, Faceted, Search API, Free Text Search***Mapping**

DIF 9:

/DIF/Parameters/

DIF 10:

/DIF/Science_Keywords/

ECHO 10 Collection:

/Collection/ScienceKeywords/ScienceKeyword/

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString
with
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gmd:type/MD_KeywordTypeCode[@codeListValue="the me"]

Examples

DIF 9:

```
<Parameters>
  <Category>EARTH SCIENCE</Category>
  <Topic>BIOSPHERE</Topic>
  <Term>ECOLOGICAL DYNAMICS</Term>
  <Variable_Level_1>ECOTOXICOLOGY</Variable_Level_1>
  <Variable_Level_2>SPECIES BIOACCUMULATION</Variable_Level_2>
</Parameters>
```

DIF 10:

<Science_Keywords>

```

<Category>EARTH SCIENCE</Category>
<Topic>ATMOSPHERE</Topic>
<Term>ATMOSPHERIC CHEMISTRY</Term>
<Variable_Level_1>CARBON AND HYDROCARBON
COMPOUNDS</Variable_Level_1>
<Variable_Level_2>CARBON DIOXIDE</Variable_Level_2>
</Science_Keywords>

```

ECHO 10 Collection:

```

<ScienceKeywords>
<ScienceKeyword>
<CategoryKeyword>EARTH SCIENCE</CategoryKeyword>
<TopicKeyword>HYDROSPHERE</TopicKeyword>
<TermKeyword>SURFACE WATER</TermKeyword>
<VariableLevel1Keyword>
<Value>DISCHARGE/FLOW</Value>
</VariableLevel1Keyword>
</ScienceKeyword>
<ScienceKeyword>
<CategoryKeyword>EARTH SCIENCE</CategoryKeyword>
<TopicKeyword>HYDROSPHERE</TopicKeyword>
<TermKeyword>SURFACE WATER</TermKeyword>
<VariableLevel1Keyword>
<Value>STAGE HEIGHT</Value>
</VariableLevel1Keyword>
</ScienceKeyword>
</ScienceKeywords>

```

ISO 19115-2:

```

<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword>
      <gco:CharacterString>EARTH SCIENCE&gt;HYDROSPHERE&gt;SURFACE
WATER&gt;DISCHARGE/FLOW&gt;NONE&gt;NONE&gt;NONE</gco:CharacterString>
    </gmd:keyword>
    <gmd:keyword>
      <gco:CharacterString>EARTH SCIENCE&gt;HYDROSPHERE&gt;SURFACE
WATER&gt;STAGE HEIGHT&gt;NONE&gt;NONE&gt;NONE</gco:CharacterString>
    </gmd:keyword>
    <gmd:type>
      <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodetlists.xml#MD_KeywordT
ypeCode" codeListValue="theme">theme</gmd:MD_KeywordTypeCode>
    </gmd:type>
    <gmd:thesaurusName>
      <gmd:CI_Citation>

```

```
<gmd:title>
  <gco:CharacterString>NASA/GCMD Science Keywords</gco:CharacterString>
</gmd:title>
...
</gmd:CI_Citation>
</gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>
```

B.2.3.3 Ancillary Keywords

Element Specification

AncillaryKeywords

Description

The Ancillary Keywords element allows metadata authors to provide words or phrases beyond the controlled Science Keyword vocabulary, to further describe the the collection.

Best Practices

The Ancillary Keywords element is optional, and is an uncontrolled free-text field. It can be leveraged to provide any additional keywords needed to describe the collection in addition to the Science Keywords (which must be selected from a controlled vocabulary list). This can be useful for providing tags needed for other applications or for providing niche keywords which may not fit in the current scope of the controlled science keyword vocabulary. Ancillary keywords are indexed for search using the CMR API, however, they do not appear as faceted keywords in the Earthdata Search Client user interface.

Examples:

"Hurricane Katrina"

"Mineral Resources"

"BEDI"

"Modified SAVI"

"Discrete-Band Normalized Difference Water Index"

"Principal Component Analysis"

"Hydrology"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the purpose description is appropriate for the dataset.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 1000 characters.
- CMR Validation

- If this element is used it must contain at least 1 character and be no longer than 255 characters in length
- ARC Validation Report
 - Marked as high priority
 - The ancillary keyword contains a spelling error.
 - The element is being used incorrectly.
 - Marked as medium priority
 - A recommendation is made to change an existing keyword.
 - The ancillary keyword is unnecessarily long.
 - The keyword doesn't seem appropriate or in any way related to the dataset.
 - Marked as low priority
 - Not Applicable
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags

Free Text Search, Search API

Mapping

DIF 9:

/DIF/Keyword

DIF 10:

/DIF/Ancillary_Keyword

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString

Examples

DIF 9:

```
<Keyword>ANTARCTICA</Keyword>
<Keyword>ORGANOCHLORINES</Keyword>
<Keyword>SEABIRDS</Keyword>
<Keyword>fulmar</Keyword>
<Keyword>Adelie penguin</Keyword>
<Keyword>prenoi</Keyword>
<Keyword>polychlorinated biphenyls</Keyword>
<Keyword>hexachlorobenzene</Keyword>
<Keyword>dieldrin</Keyword>
<Keyword>PCB</Keyword>
<Keyword>HCB</Keyword>
```

```

<Keyword>DDE</Keyword>
<Keyword>Pygoscelis adeliae</Keyword>
<Keyword>Fulmarus glacialis</Keyword>
<Keyword>morphometrics</Keyword>

```

DIF 10

```

<Ancillary_Keyword>RADIANCE</Ancillary_Keyword>
<Ancillary_Keyword>INFRARED</Ancillary_Keyword>
<Ancillary_Keyword>CALIBRATED</Ancillary_Keyword>
<Ancillary_Keyword>GEOLOCATED</Ancillary_Keyword>
<Ancillary_Keyword>EOSDIS</Ancillary_Keyword>

```

ISO 19115-2

```

<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword>
      <gco:CharacterString>RADIANCE</gco:CharacterString>
    </gmd:keyword>
    <gmd:keyword>
      <gco:CharacterString>INFRARED</gco:CharacterString>
    </gmd:keyword>
    <gmd:keyword>
      <gco:CharacterString>CALIBRATED</gco:CharacterString>
    </gmd:keyword>
    ...
  </gmd:MD_Keywords>
</gmd:descriptiveKeywords>

```

B.2.3.4 Additional Attributes

Element Specification

```

AdditionalAttribute/Name(1)
AdditionalAttribute/Type(0..1)
AdditionalAttribute/Identifier(0..1)
AdditionalAttribute/DataType;(1) <STRING, FLOAT, INT, BOOLEAN, DATE, TIME,
DATETIME, DATE_STRING, TIME_STRING, DATETIME_STRING>
AdditionalAttribute/Description(1)
AdditionalAttribute/MeasurementResolution(0..1)
AdditionalAttribute/RangeBegin(0..1)
AdditionalAttribute/RangeEnd(0..1)
AdditionalAttribute/UnitsOfMeasure(0..1)
AdditionalAttribute/ValueAccuracy(0..1)
AdditionalAttribute/ValueAccuracyExplanation(0..1)
AdditionalAttribute/Value(0..1)
AdditionalAttribute/Group(0..1)
AdditionalAttribute/UpdateDate(0..1)

```

Description

This entity stores the data's distinctive attributes (i.e. attributes used to describe the unique characteristics of the resource which extend beyond those defined in this mapping). AdditionalAttributes describe the data represented in each granule within a collection. These values are important search criteria for the granules. Example attributes include values for cloud cover, MODIS Tile grid coordinates, and elevation information. All additional attribute definitions are included in the collection metadata. A collection may also specify a value, to be understood as the value for all granules. Granules reference defined additional attributes and supply a value that is associated to that granule. Granules may not define a new additional attribute that is not defined by the collection.

Best Practices

The Additional Attributes metadata concept can be used to describe unique characteristics of a dataset beyond what is covered in the existing metadata model. For example: cloud cover, tile number, or acquisition mode could be provided as additional attributes, since there are no existing metadata fields for these particular characteristics in the Unified Metadata Model (UMM). All Additional Attributes must be defined in the collection level metadata and should also be provided in the granule level metadata. If an additional attribute in the granule level metadata has not been defined in the parent collection, then validation errors may occur.

There are twelve sub-elements that comprise Additional Attributes:

- **Name:** The name/label for the additional attribute. Providing a name is required.
- **Description:** A free-text description of the additional attribute. Providing a description is required.
- **Value:** The value of the additional attribute. Provide the value in the collection level record if it is the same for all granules in the collection. If the value of the additional attribute differs by granule, then leave value field blank at the collection level (see below for examples).
- **DataType:** The data type of the additional attribute value. Providing a data type is required. This is a controlled vocabulary field in UMM-Common with the following options: STRING, FLOAT, INT, BOOLEAN, DATE, TIME, DATETIME, DATE_STRING, TIME_STRING, DATETIME_STRING
- **Measurement Resolution:** The smallest unit increment to which the additional attribute value is measured. Providing a measurement resolution is optional.
- **Parameter Range Begin:** The minimum value of the additional attribute over the whole collection. This only applies to attributes that are continuous in nature. Providing a parameter range begin is optional.
- **Parameter Range End:** The maximum value of the additional attribute over the whole collection. This only applies to attributes that are continuous in nature. Providing a parameter range begin is optional.
- **Parameter Units Of Measure:** The standard unit of measurement for the additional attribute. For example: meters, hertz. Providing a parameter unit of measure is optional, but is highly recommended if the additional attribute value has an associated unit. Use of SI Base Units are recommended: <https://physics.nist.gov/cuu/Units/units.h>

- **Parameter Value Accuracy:** An estimate of the accuracy of the values of the additional attribute. The accuracy must be specified as a percentage or the unit with which the parameter is measured. Providing a parameter value accuracy is optional.
- **Value Accuracy Explanation:** Describes the method used for determining the parameter value accuracy. Providing a value accuracy explanation is optional.
- **Group:** Identifies a namespace for the additional attribute name. Providing a group is optional.
- **Update Date:** The date this additional attribute information was updated. Providing an update date is optional.

The Additional Attribute Value might be the same for all data in a collection, or it may vary. This results in 2 possible scenarios:

Scenario 1

The Additional Attribute value is the same for all data in the collection. In this case, the additional attribute "Value" field should be populated in the collection level metadata. Populating the "Value" field at the collection level indicates that the value is the same for all granules in the collection. For example, if cloud cover is the same (let's say 50%) for the entire dataset, the metadata would look like this:

Example 1: Additional Attribute that is the same for all granules in a dataset. Note that the value field is populated at the collection level and that the value remains the same at the granule level.

Collection Level Metadata	Granule Level Metadata file 1	Granule Level Metadata file 2
"AdditionalAttributes": [{ "Name": "Cloud Cover", >Description": "Percent cloud cover", "Value": "50", "DataType": "INT", "ParameterUnitsOfMeasure": "Percent" }],	"AdditionalAttributes": [{ "Name": "Cloud Cover", "Value": "50" }],	"AdditionalAttributes": [{ "Name": "Cloud Cover", "Value": "50" }],

Scenario 2

The Additional Attribute value varies across the collection. In this case, the additional attribute "Value" field should be left blank in the collection level metadata. Excluding the "Value" field at the collection level indicates that the value changes from granule to granule, and that the granule level metadata should be referenced to determine the value of the attribute for that particular data file. For example, if cloud cover varies across the dataset, the metadata would look like this:

Example 2: Additional Attribute that varies from granule to granule. Note that the value field is not provided at the collection level and that the value is different for each of the granules.

Collection Level Metadata	Granule Level Metadata file 1	Granule Level Metadata file 2

```
"AdditionalAttributes": [{
  "Name": "Cloud Cover",
  "Description": "Percent cloud cover",
  "DataType": "INT",
  "ParameterUnitsOfMeasure":
  "Percent"
},
  {
    "Name": "Cloud Cover",
    "Value": "30"
  },
  {
    "Name": "Cloud Cover",
    "Value": "73"
  }
},
```

Examples:/p>

Name: "Polarization"

Description: "Transmit and receive polarization specification for the SAR file"

Value: "HV"

Data Type: "STRING"

Name: "Band Center Frequency"

Description: "Central transmission frequency of the instrument"

Data Type: "FLOAT"

ParameterUnitsOfMeasure: "GHz"

Name: "MODIS SIN TILE HORIZ"

Description: "The horizontal tile number of the MODIS sinusoidal tile grid"

Type: "INT"

ParameterRangeBegin: "0"

ParameterRangeEnd: "35"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Checks that the field length is not greater than that established in the schema for each "Additional Attribute" sub-group.
 - Checks "DIF/Additional_Attributes/DataType" for enumerations; "STRING", "FLOAT", "INT", "BOOLEAN", "DATE", "TIME", "DATETIME", "DATE_STRING", "TIME_STRING", "DATETIME_STRING".
- CMR Validation
 - Checks to determine if string falls within maximum field lengths.
- ARC Validation Report
 - Marked as high priority
 - Any additional attribute sub-element contains a spelling or grammatical error
 - An incorrect or invalid data type is provided
 - An additional attribute is provided at the granule level that is not defined at the collection level
 - Marked as medium priority

- A recommendation is made to improve the readability and/or consistency
- Marked as low priority
 - The additional attribute contains a URL which needs to be updated from http to https
 - Any other miscellaneous suggestions (minor in nature)
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Free Text Search, Search API, Validated Relationship, Recommended***Mapping**

DIF 9:

/DIF/ExtendedMetadata/Metadata/

DIF 10:

/DIF/Additional_Attributes/

ECHO 10 Collection:

/Collection/AdditionalAttributes/AdditionalAttribute/

ECHO 10 Granule:

/Granule/AdditionalAttributes/AdditionalAttribute/

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString

or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier

or

/gmi:MI_Metadata/gmd:contentInfo/gmd:MD_CoverageDescription/gmd:dimension/gmd:MD_Band/gmd:otherProperty/gco:Record/eos:AdditionalAttributes/eos:AdditionalAttribute

or

/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/gmd:DQ_QuantitativeAttributeAccuracy/gmd:result/gmd:DQ_QuantitativeResult/gmd:value/gco:Record/eos:AdditionalAttributes/eos:AdditionalAttribute

or

/gmi:MI_Metadata/gmi:acquisitionInformation/gmi:MI_AcquisitionInformation/gmi:instrument/eos:EOS_Instrument/eos:otherProperty/gco:Record/eos:AdditionalAttributes/eos:AdditionalAttribute

or

/gmi:MI_Metadata/gmi:acquisitionInformation/gmi:MI_AcquisitionInformation/gmi:platform/eos:EOS_Platform/eos:otherProperty/gco:Record/eos:AdditionalAttributes/eos:AdditionalAttribute

Examples

DIF 9:

```
<Extended_Metadata>
...
  <Metadata>
    <Group>EMS</Group>
    <Name>EMS_Product</Name>
    <Value>MOD09Q1N</Value>
  </Metadata>
</Extended_Metadata>
```

DIF 10:

```
<Additional_Attributes>
  <Name>SuccessCloudPhaseRtrPct_IR</Name>
  <DataType>FLOAT</DataType>
  <Description>None</Description>
</Additional_Attributes>
```

ECHO 10 Collection:

```
<AdditionalAttribute>
  <Name>SuccessCloudPhaseRtrPct_IR</Name>
  <DataType>FLOAT</DataType>
  <Description>None</Description>
</AdditionalAttribute>
```

ECHO 10 Granule:

```
<AdditionalAttributes>
  <AdditionalAttribute>
    <Name>AIRSAR_FLIGHT_LINE</Name>
    <Values>
      <Value>mammoth_138.90021</Value>
    </Values>
  </AdditionalAttribute>
</AdditionalAttributes>
```

ISO 19115-2

```
<eos:AdditionalAttribute>
  <eos:reference>
    <eos:EOS_AdditionalAttributeDescription>
      <eos:type>
        <eos:EOS_AdditionalAttributeTypeCode
codeList=https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#EOS_Additio
```

```

nalAttributeTypeCode"
codeListValue="contentInformation">contentInformation</eos:EOS_AdditionalAttributeTypeC
ode>
  </eos:type>
  <eos:name>
    <gco:CharacterString>SuccessCloudPhaseRtrPct_IR</gco:CharacterString>
  </eos:name>
  <eos:description>
    <gco:CharacterString>None</gco:CharacterString>
  </eos:description>
  <eos:dataType>
    <eos:EOS_AdditionalAttributeDataTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#EOS_Additio
nalAttributeDataTypeCode"
codeListValue="FLOAT">FLOAT</eos:EOS_AdditionalAttributeDataTypeCode>
    </eos:dataType>
  </eos:EOS_AdditionalAttributeDescription>
</eos:reference>
</eos:AdditionalAttribute>

```

B.2.4 Related URL

Element Specification

RelatedURL (0..*)

RelatedURL/URL (1)

RelatedURL/Description (0..1)

RelatedURL/URLContentType (1) <CollectionURL, PublicationURL, DataCenterURL, DistributionURL, DataContactURL, VisualizationURL>

RelatedURL/Type (1) {Valid values shown below}

RelatedURL/Subtype (0..1) {Valid values shown below}

RelatedURL/GetData (0..1)

RelatedURL/GetData/Format (1) {Values should match KMS controlled vocabulary: granule data format}

RelatedURL/GetData/MimeType (0..1) {Valid values shown below}

RelatedURL/GetData/Size (1)

RelatedURL/GetData/Unit (1) <KB, MB, GB, TB, PB>

RelatedURL/GetData/Fees (0..1)

RelatedURL/GetData/Checksum (0..1)

RelatedURL/GetService (0..1)

RelatedURL/GetService/Format (0..1) <ascii, binary, GRIB, BUFR, HDF4, HDF5, HDF-EOS4, HDF-EOS5, jpeg, png, tiff, geotiff, kml, Not provided>

RelatedURL/GetService/MimeType (1) {Valid values shown below}

RelatedURL/GetService/Protocol (1) <ESI, FTP, FTPS, HTTP, HTTPS, OPeNDAP, WCS, WMS, Not provided>

RelatedURL/GetService/FullName (1)

RelatedURL/GetService/DataID (1)

RelatedURL/GetService/DataType (1)

RelatedURL/GetService/URI (0..*)

Valid Values for

- URLContentType
 - Type
 - Subtype

- DistributionURL
 - DOWNLOAD SOFTWARE
 - MOBILE APP
 - GET DATA
 - APPEARS DATA COLLECTION BUNDLE
 - DATA TREE
 - DATACAST URL
 - DIRECT DOWNLOAD
 - Earthdata Search
 - EOSDIS DATA POOL
 - GIOVANNI
 - GoLIVE Portal
 - IceBridge Portal
 - LAADS
 - LANCE
 - MIRADOR
 - MODAPS
 - NOAA CLASS
 - NOMADS
 - Order
 - PORTAL
 - Subscribe
 - USGS EARTH EXPLORER
 - VERTEX
 - VIRTUAL COLLECTION
 - GOTO WEB TOOL
 - LIVE ACCESS SERVER (LAS)

- CollectionURL
 - DATA SET LANDING PAGE
 - EXTENDED METADATA
 - PROFESSIONAL HOME PAGE
 - PROJECT HOME PAGE

- PublicationURL
 - VIEW RELATED INFORMATION
 - ALGORITHM DOCUMENTATION
 - ALGORITHM THEORETICAL BASIS DOCUMENT (ATBD)
 - ANOMALIES
 - CASE STUDY
 - DATA CITATION POLICY
 - DATA QUALITY
 - DATA RECIPE
 - DELIVERABLES CHECKLIST
 - GENERAL DOCUMENTATION
 - HOW-TO
 - IMPORTANT NOTICE
 - INSTRUMENT/SENSOR CALIBRATION DOCUMENTATION
 - MICRO ARTICLE
 - PI DOCUMENTATION
 - PROCESSING HISTORY
 - PRODUCT HISTORY
 - PRODUCT QUALITY ASSESSMENT
 - PRODUCT USAGE
 - PRODUCTION HISTORY
 - PUBLICATIONS
 - READ-ME

- MAP VIEWER
 - SIMPLE SUBSET WIZARD (SSW)
 - SUBSETTER
- USE SERVICE API
 - GRADS DATA SERVER (GDS)
 - MAP SERVICE
 - OPENDAP DATA
 - OpenSearch
 - SERVICE CHAINING
 - TABULAR DATA STREAM (TDS)
 - THREDDS DATA
 - WEB COVERAGE SERVICE (WCS)
 - WEB FEATURE SERVICE (WFS)
 - WEB MAP SERVICE (WMS)
 - WEB MAP TILE SERVICE (WMTS)
- VisualizationURL
 - GET RELATED VISUALIZATION
 - WORLDVIEW
 - GIOVANNI
 - MAP
- REQUIREMENTS AND DESIGN
- SCIENCE DATA PRODUCT SOFTWARE DOCUMENTATION
- SCIENCE DATA PRODUCT VALIDATION
- USER FEEDBACK PAGE
- USER'S GUIDE
- DataCenterURL
 - HOME PAGE
 -
- DataContactURL
 - HOME PAGE
 -

Valid values for RelatedURL/GetService/MimeType:

- application/json
- application/xml
- application/x-netcdf
- application/gml+xml
- application/vnd.google-earth.kml+xml
- image/gif
- image/tiff
- image/bmp
- text/csv
- text/xml
- application/pdf
- application/x-hdf
- application/xhdf5
- application/octet-stream
- application/vnd.google-earth.kmz
- image/jpeg
- image/png
- image/vnd.collada+xml
- text/html
- text/plain

Description

This element describes any resource-related URLs that include project home pages, resource information pages, services, related data, archives/servers, metadata extensions, direct links to online software packages, web mapping services, links to images, documents, or other data. When filling out this element URLContentType and Type are required - Description and Subtype are optional. If the URLContentType is "DistributionURL" and the Type is "GET DATA", "DOWNLOAD SOFTWARE", or "GOTO WEB TOOL", then the RelatedURL/GetData sub-elements are also filled out. For the RelatedURL/GetData/Format sub-element, a list of valid values can be found at:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/granuledataformat?format=csv.

If the URLContentType is "DistributionURL" and the Type is "USE SERVICE API", then the RelatedURL/GetService sub-elements are also filled out.

- RelatedURL - contains URLs to data or services (e.g. Distribution URLs).
- GetData - information about the data (e.g. format, size, units, fees, checksum).
- GetService - contains Universal Resource Identifiers (URI)s to data via services and information about the data and service (e.g. mime type, protocol, name, data IDs, data type).

Some use Examples:

I have a DAAC Home page that I would like to put into the metadata:

RelatedURL/URL = <http://www.daachomepage.gov>

RelatedURL/Description = The DAAC home page

RelatedURL/URLContentType = DataCenterURL

RelatedURL/Type = HOME PAGE

RelatedURL/Subtype =

I have a file that I can distribute to whomever is interested:

RelatedURL/URL = <http://www.daachomepage.gov/path/downloadable.doc>

RelatedURL/Description = some downloadable resource

RelatedURL/URLContentType = DistributionURL

RelatedURL/Type = GET DATA

RelatedURL/Subtype = DATA TREE

RelatedURL/GetData/Format = application/msword

RelatedURL/GetData/Size = 40

RelatedURL/GetData/Unit = MB

RelatedURL/GetData/Fees = 0

RelatedURL/GetData/Checksum = f5d30a4f2

Best Practices

The Related URLs metadata element allows for the linkage of a metadata record to external resources or locations on the web. When used properly, this element allows users to quickly and easily access data, as well as access relevant services and information about the data. Related URLs at the collection level should point to:

- A data access location
- A landing page for the associated dataset

- Any relevant services provided for the data (if applicable) such as: Web Map Services (WMS), OPeNDAP, THREDDS, Web Map Tile Services (WMTS), Web Coverage Services (WCS), etc.
- A user's guide and/or comparable documentation which provides important information about how to use the data
- The project home page
- Relevant software packages
- Relevant online data tools
- Relevant PI documentation
- Read-Me files
- Data citation policies
- Algorithm Theoretical Basis Document (ATBD)
- OpenSearch Description Document (OSDD) links
- Any other documentation directly related to the dataset (examples include: data recipes, micro articles, product quality assessment documentation, important announcements, documentation on dataset anomalies, etc.)

There are two special sub-sections within Related URLs. These include the GET DATA and the USE SERVICE API sub-elements. A separate wiki page with full details has been developed for each of these sub-sections:

Related URLs (GET DATA)

Related URLs (USE SERVICE API)

The details on this wiki page are for general Related URL guidance and do not include any of the GET DATA or USE SERVICE API sub-elements.

Several of the elements within the Related URLs section of the metadata serve to properly identify the purpose of the link. These identifying elements include:

URL Content Type: The URL Content Type is a keyword which, at a high level, describes the content of a link. This is a controlled vocabulary field maintained as an enumeration list within the UMM-Common schema with the following options: "CollectionURL", "PublicationURL", "DataCenterURL", "DistributionURL", "DataContactURL", "VisualizationURL". The URL Content Type helps specify how the URL will be displayed in the Earthdata Search Client.

URL Type: The URL Type is a keyword which specifies the content of a link. URL Type keywords are maintained in the Keyword Management System (KMS). A list of valid URL Type keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/rucontenttype?format=csv Note that the keyword list does not include the upper level URL Content Type keywords (specified above & maintained in the UMM schema). Please see the diagram below for details on the relationship between URL Content Type keywords and URL Type keywords.

URL Subtype: The URL Subtype is a keyword which further specifies the content of a link. Together, the URL Type and Subtype keywords create a keyword hierarchy which is used to identify the URL. Providing a Subtype is optional, but should be used when applicable. The URL Subtype keywords are maintained in the Keyword Management System (KMS). A list of valid URL Subtype keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/rucontenttype?format=csv

Description: While not required, it is highly recommended that a description be provided for each URL provided in the metadata. The description should be kept brief and explain where the link navigates and the type of information it contains. Descriptions should be unique to the link. While descriptions can be repeated for the same type of URL across different metadata records, it is generally advised that the same description not be repeated within the same metadata record. I.e. the description should be used to further differentiate two URLs with the same URL Type and Subtype.

Examples:

URL: https://daac.ornl.gov/ACTAMERICA/guides/ACTAMERICA-PICARRO_Ground.html

URL Content Type: PublicationURL

URL Type: VIEW RELATED INFORMATION

URL Subtype: USER'S GUIDE

Description: The guide document contains detailed information about the dataset.

URL: <https://ghrc.nsstc.nasa.gov/home/micro-articles/lake-effect-snow>

URL Content Type: PublicationURL

URL Type: VIEW RELATED INFORMATION

URL Subtype: MICRO ARTICLE

Description: Learn about how AMSR-2 data can be used to study lake effect snow in this micro article.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Confirm that the URLs link to the appropriate web pages.
 - Automated Review
 - Check that the field has been populated.
 - Check that the URL_Content_Type field is populated with a valid value from KMS.
 - Check for potential broken links.
 - Check that the URL is formatted correctly.
 - Check that the field length of Description is not greater than 12,000 characters.
 - Check that the field length of URL is not greater than 1,024 characters.
- CMR Validation
 - Checks to see that the URL value is a syntactically valid URL.
 - Checks to see if a description is present
 - Validates that the RelatedUrl/Type and Subtype values correspond to the correct value in the URLContentType element.
 - Validates that the object types of GET DATA and GET SERVICE are only used with Distribution URLs.
- ARC Validation Report
 - Marked as high priority
 - No Related URLs are provided.

- No data access URL is provided. For further details on data access URLs please see the Related URLs (GET DATA) wiki page.
- There is a service available for a collection, but no service URL is provided. For further details on service URLs please see the Related URLs (USE SERVICE API) wiki page.
- The URL provided is broken.
- The URL provided is incorrect/ unrelated to the associated dataset.
- The URL Type or Subtype provided does not accurately describe the link (i.e. the link is mislabeled).
- The URL Type or Subtype provided does not align with the KMS.
 - The Type or Subtype does not exist in the KMS.
 - The Type or Subtype is placed in the incorrect position of the hierarchy (e.g. GET DATA should not be provided in the Subtype field, because it is categorized as a Type keyword in the KMS).
 - There is an invalid Type/Subtype relationship (e.g. Type: GET DATA, Subtype: USER'S GUIDE, is not a valid combination in the KMS).
- The URL links to an FTP server (this only applies to NASA EOSDIS metadata).
- Marked as medium priority
 - A URL is provided, but the 'Description' element is left blank. It is highly recommended that a description be provided for each URL.
 - If a recommendation is made to add a new URL to the metadata, there will be accompanying yellow recommendations to add the appropriate URLContentType/URLType/Subtype/Description elements.
 - Note: These recommendations are blue at the granule level, since the schema does not require Related URLs at the granule level
 - A recommendation is made to change a valid URL Type or Subtype keyword for purposes of consistency with other similar metadata records.
- Marked as low priority
 - The 'Description' element is identical for multiple URLs.
 - A URL is provided via http when https is available.
 - The URL provided in the metadata redirects --- it is recommended that the most current link always be provided.
 - A noted exception to this is DOI URLs (e.g. <https://doi.org/10.3334/ORNLDAAAC/1416>) since these will always re-direct.
 - If a URL with Type "USE SERVICE API" is present, but no mime type is provided, a blue recommendation will be made to add a mime type for the service URL.
 - If a recommendation is made to add a new "USE SERVICE API" URL to the metadata, there will be an accompanying blue recommendation to add a mime type for the service URL.
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags*Recommended***Mapping**

DIF 9:

/DIF/Related_URL

/DIF/Multimedia_Sample

/DIF/Distribution

DIF 10:

/DIF/Related_URL

/DIF/Multimedia_Sample

/DIF/Distribution

ECHO 10 Collection:

/Collection/OnlineAccessURLs/OnlineAccessURL

/Collection/AssociatedBrowseImageUrls

/Collection/OnlineResources

/Collection/Price

/Collection/DataFormat

ISO 19115-2:

/gmi:MI_Metadata/gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor/gmd:MD_Distributor/gmd:distributorTransferOptions/gmd:MD_DigitalTransferOptions/gmd:onlineResource

and/or

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:graphicOverview/gmd:MD_BrowseGraphic/gmd:fileName/gmx:FileName src=

Examples

DIF 9:

<Related_URL>

<URL_Content_Type uuid="6e72d128-7d28-4bd0-bac0-8c5ffd8b31f1">

<Type>VIEW PROJECT HOME PAGE</Type>

</URL_Content_Type>

<URL>http://www.waisdivide.unh.edu/</URL>

</Related_URL>

<Related_URL>

<URL_Content_Type uuid="5ec1bb9d-0efc-4099-9b31-ec791bbd8145">

<Type>VIEW RELATED INFORMATION</Type>

</URL_Content_Type>

<URL>http://www.homepage.montana.edu/~lkbonney/</URL>

```

    <Description>
      Website for the Priscu Research Group
    </Description>
  </Related_URL>

<Multimedia_Sample>
  <URL>http://www.waisdivide.unh.edu/images/sitemap1_large.jpg</URL>/p>
</Multimedia_Sample>

DIF 10:
  <Multimedia_Sample>

<URL>http://disc.gsfc.nasa.gov/AIRS/images/G1932015.04.19all1CBrightnessTemperature_K
_at10.9microns_map.png</URL>
  <Format>PNG</Format>
  <Caption>The BT derived from an AIRS Level 1C granule for a channel at 10.9
microns.</Caption>
  <Description>Sample image of an AIRICRAD channel converted to brighness
temperature</Description>
</Multimedia_Sample>

  <Related_URL>
    <URL_Content_Type>
      <Type>GET DATA</Type>
      <Subtype>DATA TREE</Subtype>
    </URL_Content_Type>

<URL>http://airs11.gesdisc.eosdis.nasa.gov/data/Aqua_AIRS_Level1/AIRICRAD.006/</URL>
  <Description>Access the data via HTTP.</Description>
</Related_URL>
<Related_URL>
  <URL_Content_Type>
    <Type>GET DATA</Type>
    <Subtype>MIRADOR</Subtype>
  </URL_Content_Type>
  <URL>http://mirador.gsfc.nasa.gov/cgi-
bin/mirador/homepageAlt.pl?keyword=AIRICRAD</URL>
  <Description>Mirador is a data search interface that allows searching, browsing, and
retrieving of Earth science data archived at NASA GES DISC.</Description>
</Related_URL>
<Related_URL>
  <URL_Content_Type>
    <Type>GET DATA</Type>
  </URL_Content_Type>

<URL>http://airs11.gesdisc.eosdis.nasa.gov/opendap/Aqua_AIRS_Level1/AIRICRAD.006/cont

```

```

nts.html</URL>
  <Description>Access the data via the OPeNDAP protocol.</Description>
</Related_URL>
...
<Related_URL>
  <URL_Content_Type>
    <Type>GET DATA</Type>
    <Subtype>EARTHDATA SEARCH</Subtype>
  </URL_Content_Type>
  <URL>https://search.earthdata.nasa.gov/search?q=AIRICRAD+006</URL>
  <Description>Use the Earthdata Search Client (EDSC) to find and retrieve data sets across
multiple data centers.</Description>
</Related_URL>
...

ECHO 10 Collection:
<OnlineAccessURLs>
  <OnlineAccessURL>
    <URL>http://sedac.ciesin.columbia.edu/data/set/ulandsat-cities-from-space/data-
download</URL>
    <URLDescription>data download page</URLDescription>
  </OnlineAccessURL>
</OnlineAccessURLs>
<OnlineResources>
  <OnlineResource>
    <URL>http://dx.doi.org/10.7927/H4SQ8XB1</URL>
    <Description>data set DOI and homepage</Description>
    <Type>DOI URL</Type>
  </OnlineResource>
</OnlineResources>

<AssociatedBrowseImageUrls>
  <ProviderBrowseUrl>
    <URL>http://sedac.ciesin.columbia.edu/data/set/ulandsat-cities-from-space/maps</URL>
  </ProviderBrowseUrl>
</AssociatedBrowseImageUrls>

ISO 19115-2:
<gmd:onLine>
  <gmd:CI_OnlineResource>
    <gmd:linkage>
      <gmd:URL>http://sedac.ciesin.columbia.edu/data/set/ulandsat-cities-from-space/data-
download</gmd:URL>
    </gmd:linkage>
    <gmd:applicationProfile gco:nilReason="missing"/>
    <gmd:description>

```

```

    <gco:CharacterString>data download page</gco:CharacterString>
  </gmd:description>
  <gmd:function>
    <gmd:CI_OnLineFunctionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_OnLineFunc
tionCode" codeListValue="download">download</gmd:CI_OnLineFunctionCode>
    </gmd:function>
  </gmd:CI_OnlineResource>
</gmd:onLine>
<gmd:onLine>
  <gmd:CI_OnlineResource>
    <gmd:linkage>
      <gmd:URL>http://dx.doi.org/10.7927/H4SQ8XB1</gmd:URL>
    </gmd:linkage>
    <gmd:applicationProfile gco:nilReason="missing"/>
    <gmd:name>
      <gco:CharacterString>DOI URL</gco:CharacterString>
    </gmd:name>
    <gmd:description>
      <gco:CharacterString>data set DOI and homepage</gco:CharacterString>
    </gmd:description>
    <gmd:function>
      <gmd:CI_OnLineFunctionCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#CI_OnLineFunc
tionCode" codeListValue=""/>
    </gmd:function>
  </gmd:CI_OnlineResource>
</gmd:onLine>
...
<gmd:graphicOverview>
  <gmd:MD_BrowseGraphic>
    <gmd:fileName>
      <gmx:FileName src="http://sedac.ciesin.columbia.edu/data/set/ulandsat-cities-from-
space/maps"/>
    </gmd:fileName>
    <gmd:fileDescription>
      <gco:CharacterString>File Size:</gco:CharacterString>
    </gmd:fileDescription>
    <gmd:fileType gco:nilReason="missing"/>
  </gmd:MD_BrowseGraphic>

```

B.2.5 Temporal Information

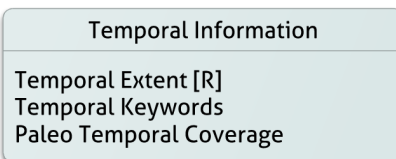


Figure B-8. Temporal Information

B.2.5.1 Temporal Extent [R]

Element Specification

TemporalExtent/PrecisionOfSeconds (0..1)

TemporalExtent/EndsAtPresentFlag (0..1)

{Choice of 1}

1) TemporalExtent/RangeDateTime (0..*)

 TemporalExtent/RangeDateTime/BeginningDateTime (1)

 TemporalExtent/RangeDateTime/EndingDateTime (0..1)

2) TemporalExtent/SingleDateTime (0..*)

3) TemporalExtent/PeriodicDateTime (1..*)

 TemporalExtent/PeriodicDateTime/Name (1)

 TemporalExtent/PeriodicDateTime/StartDate (1)

 TemporalExtent/PeriodicDateTime/EndDate (1)

 TemporalExtent/PeriodicDateTime/DurationUnit (1)

 TemporalExtent/PeriodicDateTime/DurationValue (1)

 TemporalExtent/PeriodicDateTime/PeriodCycleDurationUnit (1)

 TemporalExtent/PeriodicDateTime/PeriodCycleDurationValue (1)

Description

This element contains sub-elements, which describe the time period in which the data set was acquired or when the measurements occurred for a specific collection. This extent can be represented in a variety of ways: RangeDateTime, SingleDateTime, or PeriodicDateTime. The dates use the ISO 8601 format.

Best Practices

Dates provided in CMR metadata should comply with the ISO 8601 Standard, which is an International Standard for the representation of dates and times.

There are three options in the UMM for describing the temporal extent of data: Single Date Time, Range Date Time and Periodic Date Time.

Using different temporal extent representations between collection and granule level metadata are allowed, as long as it makes logical sense. For example, Single Date Time could be used to describe temporal coverage at the granule level, whereas a Range Date Time may be used to describe temporal coverage at the collection level. It is important that the temporal extent at the collection level be in sync with the temporal extent provided in associated granule level metadata files.

Single Date Time:

The Single Date Time element should be used if data were captured instantaneously (i.e. a single time stamp sufficiently describes the temporal extent of the data). For example, if a data file contains an image that was taken by a camera, the time stamp associated with the time the image was taken would be listed as the Single Date Time in the granule level metadata. Single Date Time may also be used in the collection level metadata if appropriate. If the exact time of data capture is known, it is strongly recommended that the time be included in the Single Date Time. If the exact time of data collection is unknown, it is okay to just provide a date. Multiple Single Date Times may be provided if necessary (cardinality 0..*).

Examples:

SingleDateTime: 2018-11-11T14:53:32Z

SingleDateTime: 2017-04-14T05:26:22Z

Range Date Time:

The Range Date Time element should be used when a continuous time range is appropriate to describe the temporal extent of data. Range Date Time is composed of two sub-elements: Beginning Date Time and Ending Date Time, which describe the start and end time of a data file or a collection.

For completed datasets:

- It is *required* that an Ending Date Time be provided. The 'EndingDateTime' element should specify the ending date and time of the last available granule in the collection. In addition:
 - The 'Ends at Present Flag' element should be set to "false." Setting the 'Ends at Present Flag' element to "false" tells the CMR that the ending time for the collection is in the past. Note: Ends at Present Flag is an optional element.
 - The Collection Progress element should be set to "COMPLETE"

If data collection is ongoing,

- An Ending Date Time *does not* need to be provided. Even if the future end date of the collection is known, this future date should not be provided in the metadata as the Ending Date Time, since data for these future dates do not yet exist. In addition:
 - The 'Ends at Present Flag' element should be set to "true." Setting the 'Ends at Present Flag' element to "true" tells the CMR that the ending time for the collection is present day, and thus eliminates the need to specify the Ending Date Time of the collection. This also eliminates the need to update the Ending Date Time in the metadata each time new data gets added to the collection.
 - The Collection Progress element should be set to "ACTIVE"

Multiple RangeDateTimes may be provided if necessary (cardinality 0..*). It is recommended that multiple RangeDateTimes be used if there is a significant temporal gap present in the data. Generally, the Ending Date Time provided should not be in the future, with the exception of data that has an actual future time stamp (e.g. modeled/ forecasted data that includes future projections).

Examples:

A satellite collected data from May 1, 2004 to February 10, 2008. A data product derived from this satellite provides monthly global averages of surface temperature. A monthly global

average for February 2008 was not included in the dataset since only 10 days of data were available in February.

RangeDateTime for the first granule in the collection:
BeginningDateTime: 2004-05-01T00:00:00Z
EndingDateTime: 2008-01-31T23:59:59Z

RangeDateTime for the first granule in the collection:
BeginningDateTime: 2004-05-01T00:00:00Z
EndingDateTime: 2004-05-31T23:59:59Z

Radar measurements were taken from a plane. One flight occurred each day from August 20, 2018 to August 31, 2018.

RangeDateTime for the collection:
BeginningDateTime: 2018-08-20T12:34:00Z
EndingDateTime: 2018-08-31T10:01:02Z

RangeDateTime for the first granule in the collection:
BeginningDateTime: 2018-08-20T12:34:00Z
EndingDateTime: 2018-08-20T16:50:52Z

RangeDateTime for the last granule in the collection:
BeginningDateTime: 2018-08-31T06:18:21Z
EndingDateTime: 2018-08-31T10:01:02Z

Periodic Date Time:

For data that is collected in regular reoccurring intervals, the temporal extent can be described as a Periodic Date Time. Periodic Date Time is described via the below sub-elements. If Periodic Date Time is provided, *all sub-elements are required*:

Name: The name given to the recurring time period.

StartDate: The date (day and time) of the first occurrence of this regularly occurring period. This is when data collections begins for the entire collection. This also identifies the day of the month and time of the day when data collection starts for each reoccurring cycle.

EndDate: The date (day and time) of the last occurrence of this regularly occurring period. This is when data collection ends for the entire collection.

DurationUnit: The unit for the regularly reoccurring data collection period. In combination with DurationValue, this describes the length of time that data gets collected. This value must be selected from a controlled vocabulary list maintained in the UMM-Common schema. Options include: DAY, MONTH, YEAR

DurationValue: The number of DurationUnits comprising the regularly reoccurring data collection period. Together, DurationValue and DurationUnit describe the length of time that data gets collected.

PeriodCycleDurationUnit: The duration unit of one full cycle. The full cycle includes both the active data collection period as well as an inactive period. This value must be selected from a

controlled vocabulary list maintained in the UMM-Common schema. Options include: DAY, MONTH, YEAR

PeriodCycleDurationValue: The number of CycleDurationUnits comprising one full cycle. Together, CycleDurationValue and CycleDurationUnit describe the length of a full cycle which includes both the active data collection period as well as an inactive period.

Examples:

Data for a field campaign are collected in December, January and February of each year. Data collection started in December 2013 and ended in February 2017.

Name: Winter_FieldCampaign
StartDate: 2013-12-01T00:00:00Z
EndDate: 2017-02-28T23:59:59Z
DurationUnit: MONTH
DurationValue: 3
PeriodCycleDurationUnit: YEAR
PeriodCycleDurationValue: 1

A sensor collected data every morning from 5 AM to 6 AM UTC.

Name: AM_Sensor_Daily
StartDate: 2000-04-01T05:00:00Z
EndDate: 2010-09-04T06:00:00Z
DurationUnit: DAY
DurationValue: 0.0417
PeriodCycleDurationUnit: DAY
PeriodCycleDurationValue: 1

For paleoclimate or geologic data, temporal coverage can be described via the Paleo Temporal Coverage elements. Paleo Temporal Coverage should be used to describe time frames earlier than 0001-01-01 (yyyy-mm-dd). Please see the Paleo Temporal Coverage wiki page for details.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field has been populated.
 - Check that at least of the fields (Range_DateTime; Single_DateTime; Periodic_DateTime; or Paleo_DateTime) has been populated.
 - Check that the field is populated with a valid value from KMS (Chronostratigraphic_Unit).
 - Check that the field values matches the enumeration values.
 - Check that the field length is not greater than 80 characters (Date_Type).
 - Check that the field length is not greater than 30 characters (Periodic_DateTime/Name).
 - Check that the field length is not greater than 80 characters (Temporal_Range_Type).

- Check that the field length is not greater than 80 characters (Temporal_Resolution/Unit).
- Check that the field length is not greater than 80 characters (Time_Type).
- Check that the date format is correct.
- CMR Validation
 - Dates must comply with the ISO 8601 Standard.
 - For a RangeDateTime:
 - The BeginningDateTime must be earlier or equal to the EndingDateTime.
 - The BeginningDateTime must be in the past.
 - If the EndingDateTime is set it must also be in the past.
 - If the EndingDateTime is set the EndsAtPresentFlag must not be set.
 - For a SingleDateTime the SingleDateTime must be in the past.
 - For any granules that are ingested for the collection, the granules temporal extent must exist within the collection's temporal extent.
- ARC Validation Report
 - Marked as high priority
 - Temporal Extent is not provided at all
 - A Temporal Extent element is included but no dates are provided. Either a SingleDateTime, RangeDateTime, or PeriodicDateTime must be provided in the metadata.
 - The date provided does not comply with the ISO 8601 Standard
 - The valid value in the element appears to be out of sync with data collection. Examples include:
 - Data collection has ended but no ending date has been provided.
 - An ending date has been provided for data that is still being actively collected.
 - Dates and/or times do not align with time stamps provided in the actual data.
 - The 'Ends at Present Flag' element is set to 'True' when data collection has ended.
 - The 'Ends at Present Flag' element is set to 'False' (i.e. data collection has ended) but no ending date has been provided.
 - The beginning and/or ending date time provided in the collection level metadata is out of sync with the dates provided in the granule level metadata.
 - This is flagged as red if the discrepancy is greater than or equal to than 1 day. (E.g. The EndingDateTime of the last granule in a collection is 2003-03-03T06:33:00Z but the EndingDateTime of the collection level metadata is 2003-03-01T06:33:00Z, two days before the last granule was collected).
 - Marked as medium priority
 - The beginning and/or ending date time provided in the collection level metadata is out of sync with the dates provided in the granule level metadata.

ECHO 10 Collection:

/Collection/Temporal/TimeType
 /Collection/Temporal/DateType
 /Collection/Temporal/TemporalRangeType
 /Collection/Temporal/PrecisionOfSeconds
 /Collection/Temporal/EndsAtPresentFlag
 {Choice of one}
 1) /Collection/Temporal/RangeDateTime
 2) /Collection/Temporal/SingleDateTime
 3) /Collection/Temporal/PeriodicDateTime

ISO 19115-2:

/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/gmd:DQ_AccuracyOf
 aTimeMeasurement/gmd:measureIdentification/gmd:MD_Identifier/gmd:code/gco:CharacterSt
 ring PrecisionOfSeconds

/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:report/gmd:DQ_AccuracyOf
 aTimeMeasurement/gmd:result/gmd:DQ_QuantitativeResult/gmd:value/gco:Record
 xsi:type="gco:Real_PropertyType"/gco:Real - PrecisionOfSeconds Value

1)/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_E
 xtent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent/gml:TimePeriod/gml:beginPo
 sition

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Ext
 ent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent/gml:TimePeriod/gml:endPositi
 on

2)/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_E
 xtent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent/gml:TimeInstant/gml:timePos
 ition

Examples**DIF 9:**

```

<Temporal_Coverage>
  <Start_Date>2005-10-29</Start_Date>
  <Stop_Date>2005-11-21</Stop_Date>
</Temporal_Coverage>
  
```

DIF 10:

```

<Temporal_Coverage>
  <Time_Type>UTC</Time_Type>
  <Date_Type>Gregorian</Date_Type>
  <Temporal_Range_Type>Continuous Range</Temporal_Range_Type>
  <Precision_Of_Seconds>1</Precision_Of_Seconds>
  <Range_DateTime>
  
```

```

    <Beginning_Date_Time>2002-05-04T00:00:00.000Z</Beginning_Date_Time>
  </Range_DateTime>
</Temporal_Coverage>

```

ECHO 10 Collection:

```

<Temporal>
  <TimeType>Universal Time</TimeType>
  <DateType>Eastern Daylight</DateType>
  <TemporalRangeType>Long Range</TemporalRangeType>
  <PrecisionOfSeconds>1</PrecisionOfSeconds>
  <EndsAtPresentFlag>true</EndsAtPresentFlag>
  <RangeDateTime>
    <BeginningDateTime>1990-01-01T00:00:00Z</BeginningDateTime>
    <EndingDateTime>2003-12-31T00:00:00Z</EndingDateTime>
  </RangeDateTime>
</Temporal>

```

ISO 19115-2:

```

  <gmd:extent>
    <gmd:EX_Extent id="boundingExtent">
      <gmd:description>
        <gco:CharacterString>SpatialCoverageType=Horizontal,
SpatialInfoCoverageType=Horizontal,
SpatialGranuleSpatialRepresentation=CARTESIAN</gco:CharacterString>
      </gmd:description>
      <!-- Bounding Rectangle -->
      <gmd:geographicElement>
        <gmd:EX_GeographicBoundingBox>
          <gmd:westBoundLongitude>
            <gco:Decimal>-180</gco:Decimal>
          </gmd:westBoundLongitude>
          <gmd:eastBoundLongitude>
            <gco:Decimal>180</gco:Decimal>
          </gmd:eastBoundLongitude>
          <gmd:southBoundLatitude>
            <gco:Decimal>-55</gco:Decimal>
          </gmd:southBoundLatitude>
          <gmd:northBoundLatitude>
            <gco:Decimal>90</gco:Decimal>
          </gmd:northBoundLatitude>
        </gmd:EX_GeographicBoundingBox>
      </gmd:geographicElement>
      <gmd:temporalElement>
        <!-- RangeDateTime -->
        <gmd:EX_TemporalExtent id="boundingTemporalExtent">
          <gmd:extent>

```

```

        <gml:TimePeriod gml:id="w16aac43c11">
          <gml:beginPosition frame="Eastern Daylight">1990-01-
01T00:00:00Z</gml:beginPosition>
          <gml:endPosition frame="Eastern Daylight" indeterminatePosition="now"/>
        </gml:TimePeriod>
      </gmd:extent>
    </gmd:EX_TemporalExtent>
  </gmd:temporalElement>
</gmd:EX_Extent>
</gmd:extent>

<gmd:dataQualityInfo>
  <gmd:DQ_DataQuality>
    <gmd:scope>
      <gmd:DQ_Scope>
        <gmd:level>
          <gmd:MD_ScopeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml#MD_ScopeCode
"
          codeListValue="series">series</gmd:MD_ScopeCode>
        </gmd:level>
      </gmd:DQ_Scope>
    </gmd:scope>
    <gmd:report>
      <gmd:DQ_AccuracyOfATimeMeasurement>
        <gmd:measureIdentification>
          <gmd:MD_Identifier>
            <gmd:code>
              <gco:CharacterString>PrecisionOfSeconds</gco:CharacterString>
            </gmd:code>
          </gmd:MD_Identifier>
        </gmd:measureIdentification>
        <gmd:result>
          <gmd:DQ_QuantitativeResult>
            <gmd:valueUnit/>
            <gmd:value>
              <gco:Record xsi:type="gco:Real_PropertyType">
                <gco:Real>1</gco:Real>
              </gco:Record>
            </gmd:value>
          </gmd:DQ_QuantitativeResult>
        </gmd:result>
      </gmd:DQ_AccuracyOfATimeMeasurement>
    </gmd:report>
  </gmd:DQ_DataQuality>
</gmd:dataQualityInfo>

```


B.2.5.2 Temporal Keywords

Element Specification

TemporalKeyword

Description

The temporal keyword element specifies a word or phrase which serves to summarize the temporal characteristics of a dataset.

Best Practices

Temporal Keywords is an optional element. There is not a controlled vocabulary for temporal keywords. If this element is utilized it is recommended that a consistent naming convention be developed for related records or for records from the same data center.

Examples:

TemporalKeywords: "Weekly"

TemporalKeywords: "Subannual"

TemporalKeywords: "Annual Climatology"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.
 - Verify that existing facets and other controlled keyword values are consistent and suitable for the data.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value from KMS.
 - Check that the field value is not a duplicate.
 - Check that the 'Detailed_Variable' field length is not greater than 80 characters.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - The Temporal Keyword is not appropriate for the dataset.
 - Marked as medium priority
 - A recommendation is made to change a Temporal Keyword to be more accurate or more consistent with related collections.
 - Marked as low priority
 - The element is included but is empty (i.e. empty temporal keywords tags are provided in the metadata record).
 - A recommendation is made to add a relevant Temporal Keyword to the metadata.
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

- ARC Automated Checks
 - If no value is provided, return is "np"
 - If a value is provided, return is "OK"

Cardinality

0..*

Tags*Free Text Search, Search API, Recommended, Normalize***Sample Mappings**

DIF 9:

/DIF/Data_Resolution/Temporal_Resolution

/DIF/Data_Resolution/Temporal_Resolution_Range

DIF 10:

/DIF/TemporalCoverage/TemporalInfo/Ancillary_Temporal_Keyword(the first TemporalCoverage element will be used.)

ECHO 10 Collection:

/Collection/TemporalKeywords/Keyword

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString
with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gmd:type/MD_KeywordTypeCode[@codeListValue="temporal"]

Examples

DIF 9:

<Data_Resolution>

...

<Temporal_Resolution>15-sec sample rate, standard geodetic GPS
resolution</Temporal_Resolution><Temporal_Resolution_Range uuid="48ff676f-836c-4cff-bc88-4c4cc06b2e1b">1 second -
< 1 minute</Temporal_Resolution_Range>

</Data_Resolution>

DIF 10:

<Temporal_Info>

<Ancillary_Temporal_Keyword>Ancillary_Temporal_Keyword0</Ancillary_Temporal_Keyword>

```
<Ancillary_Temporal_Keyword>Ancillary_Temporal_Keyword1</Ancillary_Temporal_Keyword>
</Temporal_Info>
```

ECHO 10:

```
<TemporalKeywords>
  <Keyword>DAILY</Keyword>
</TemporalKeywords>
```

ISO 19115-2:

```
<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword>
      <gco:CharacterString>DAILY</gco:CharacterString>
    </gmd:keyword>
    <gmd:type>
      <gmd:MD_KeywordTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodetlists.xml#MD_KeywordT
ypeCode" codeListValue="temporal">temporal</gmd:MD_KeywordTypeCode>
    </gmd:type>
    <gmd:thesaurusName gco:nilReason="unknown"/>
  </gmd:MD_Keywords>
</gmd:descriptiveKeywords>
```

B.2.5.3 Paleo Temporal Coverage

Element Specification

PaleoTemporalCoverage/StartDate (0..1)

PaleoTemporalCoverage/EndDate (0..1)

PaleoTemporalCoverage/ChronostratigraphicUnit (0..*)

PaleoTemporalCoverage/ChronostratigraphicUnit/Eon (1)

PaleoTemporalCoverage/ChronostratigraphicUnit/Era (0..1)

PaleoTemporalCoverage/ChronostratigraphicUnit/Period (0..1)

PaleoTemporalCoverage/ChronostratigraphicUnit/Epoch (0..1)

PaleoTemporalCoverage/ChronostratigraphicUnit/Stage (0..1)

PaleoTemporalCoverage/ChronostratigraphicUnit/Detailed_Classification (0..1)

Description

The Paleo Temporal Coverage element defines the time period for geologic and/or paleoclimate data. The element is predominantly used for data samples that originated prior to 01-01-0001.

The valid values can be found at:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/chronounits?format=csv.

Best Practices

Paleo Temporal Coverage tags identify time periods where geologic and paleoclimate data collection occurred. The time period tags can be used to identify the start and end dates for data

collection. There is also the option to provide the names of the eon, era, period, epoch and stage associated with the data collection. It is suggested that Paleo Temporal Coverage tags are as specific as possible to aid in data discovery. The names of eons, eras, periods, epochs and stages must be selected from a controlled vocabulary list managed by the Keyword Management System (KMS). Because the tags are KMS controlled, if a specific tag is not already included in the KMS, a request to have it added can be made through the GCMD Keywords Community Forum. <https://earthdata.nasa.gov/gcmd-forum>

Examples:

PaleoTemporalCoverage/StartDate: "560 ka"

PaleoTemporalCoverage/EndDate: "60 ka"

PaleoTemporalCoverage/ChronostratigraphicUnit/Eon: "PHANEROZOIC"

PaleoTemporalCoverage/ChronostratigraphicUnit/Era: "CENOZOIC"

PaleoTemporalCoverage/ChronostratigraphicUnit/Period: "QUATERNARY"

PaleoTemporalCoverage/ChronostratigraphicUnit/Epoch: "PLEISTOCENE"

PaleoTemporalCoverage/ChronostratigraphicUnit/Stage: "LATE"

PaleoTemporalCoverage/StartDate: "175 myr"

PaleoTemporalCoverage/EndDate: "160 myr"

PaleoTemporalCoverage/ChronostratigraphicUnit/Eon: "PHANEROZOIC"

PaleoTemporalCoverage/ChronostratigraphicUnit/Era: "MESOZOIC"

PaleoTemporalCoverage/ChronostratigraphicUnit/Period: "JURASSIC"

PaleoTemporalCoverage/StartDate: "100 ka"

PaleoTemporalCoverage/EndDate: "20 ka"

PaleoTemporalCoverage/ChronostratigraphicUnit/Eon: "PHANEROZOIC"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Not Applicable
- CMR Validation
 - XML Schema Validation Only
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all (for relevant collections).
 - The element is provided but it is not applicable for the dataset (i.e. data were collected after 0001-01-01)
 - The paleo temporal coverage term does not align with the KMS.
 - The paleo temporal coverage term does not exist in KMS.
 - A term(s) is missing from the hierarchy.
 - A term(s) is placed in the incorrect position of the hierarchy (e.g. an Eon term is placed in the Epoch field).

- The paleo temporal coverage term is not appropriate for the dataset.
- Marked as medium priority
 - A recommendation is made to add a relevant paleo temporal coverage term to the metadata.
 - A recommendation is made to add to an existing term in the metadata (i.e. to extend a keyword hierarchy down to a more detailed keyword).
- Marked as low priority
 - A recommendation is made to add to an existing term in the metadata (i.e. to extend a keyword hierarchy down to a more detailed keyword).
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags*Controlled Vocabulary, Free Text Search, Search API***Mappings**

DIF 9:

/DIF/Paleo_Temporal_Coverage

DIF 10:

/DIF/Temporal_Coverage/Paleo_DateTime

ISO 19115-2:

To Be Determined

Examples

DIF 9:

```

<Paleo_Temporal_Coverage>
<Paleo_Start_Date>560 ka</Paleo_Start_Date>
<Paleo_Stop_Date>60 ka</Paleo_Stop_Date>
  <Chronostratigraphic_Unit uuid="e000088a-8252-4603-ba55-38189c45612c">
    <Eon>PHANEROZOIC</Eon>
    <Era>CENOZOIC</Era>
    <Period>QUATERNARY</Period>
    <Epoch>HOLOCENE</Epoch>
  </Chronostratigraphic_Unit>
  <Chronostratigraphic_Unit uuid="a686e751-3639-4cd0-840b-c8ad25c441c1">
    <Eon>PHANEROZOIC</Eon>
    <Era>CENOZOIC</Era>
    <Period>QUATERNARY</Period>
    <Epoch>PLEISTOCENE</Epoch>
  </Chronostratigraphic_Unit>

```

```

<Chronostratigraphic_Unit uuid="c7e7fb38-44ef-4c5b-aa1d-b3f8cf89d838">
  <Eon>PHANEROZOIC</Eon>
  <Era>CENOZOIC</Era>
  <Period>QUATERNARY</Period>
</Chronostratigraphic_Unit>
</Paleo_Temporal_Coverage>

```

DIF 10:

```

<Temporal_Coverage>
  <Paleo_DateTime>
    <Paleo_Start_Date>31ka</Paleo_Start_Date>
    <Paleo_Stop_Date>40ka</Paleo_Stop_Date>
  </Paleo_DateTime>
</Temporal_Coverage>

```

B.2.6 Spatial Information

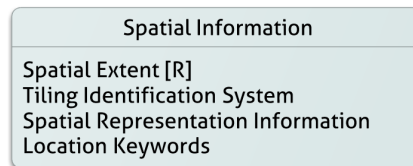


Figure B-9. Spatial Information

B.2.6.1 Spatial Extent [R]

Element Specification

SpatialExtent/SpatialCoverageType (0..1) <HORIZONTAL, VERTICAL, ORBITAL, HORIZONTAL_VERTICAL, ORBITAL_VERTICAL>

SpatialExtent/HorizontalSpatialDomain (0..1)

SpatialExtent/HorizontalSpatialDomain/ZoneIdentifier (0..1)

SpatialExtent/HorizontalSpatialDomain/Geometry (1)

SpatialExtent/HorizontalSpatialDomain/Geometry/CoordinateSystem (1) <CARTESIAN, GEODETIC>

{choice of 1..*}

1)SpatialExtent/HorizontalSpatialDomain/Geometry/Points

2)SpatialExtent/HorizontalSpatialDomain/Geometry/BoundingRectangles

3)SpatialExtent/HorizontalSpatialDomain/Geometry/GPolygons

4)SpatialExtent/HorizontalSpatialDomain/Geometry/Lines

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem (0..1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/Description (0..1)

{choice of 1}

1)SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/GeodeticModel (1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/GeodeticModel/HorizontalDatumName (0..1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/GeodeticModel/EllipsoidName (0..1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/GeodeticModel/SemiMajorAxis (0..1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/GeodeticModel/DenominatorOfFlatteningRatio (0..1)

2)SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution (0..1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/VariesResolution (0..1) <Varies>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/PointResolution (0..1) <Point>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedResolutions (0, 1..*)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedResolutions/XDimension (0..1; 1 If YDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedResolutions/YDimension (0..1; 1 If XDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedResolutions/Unit (1) <Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, Not provided>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedResolutions/ViewingAngleType (0..1) <At Nadir, Scan Extremes>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedResolutions/ScanDirection (0..1) <Along Track, Cross Track>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions (0, 1..*)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions/MinimumXDimension (0..1; 1 If MinimumYDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolu

tion/NonGriddedRangeResolutions/MinimumYDimension (0..1; 1 If MinimumXDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions/MaximumXDimension (0..1; 1 If MaximumYDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions/MaximumYDimension (0..1; 1 If MaximumXDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions/Unit (1) <Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, Not provided>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions/ViewingAngleType (0..1) <At Nadir, Scan Extremes>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/NonGriddedRangeResolutions/ScanDirection (0..1) <Along Track, Cross Track>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedResolutions/XDimension (0..1; 1 If YDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedResolutions/YDimension (0..1; 1 If XDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedResolutions/Unit (1) <Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, Not provided>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedRangeResolutions//MinimumXDimension (0..1; 1 If MinimumYDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedRangeResolutions/MinimumYDimension (0..1; 1 If MinimumXDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedRangeResolutions/MaximumXDimension (0..1; 1 If MaximumYDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedRangeResolutions/MaximumYDimension (0..1; 1 If MaximumXDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GriddedRangeResolutions/Unit (1) <Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, Not provided>

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GenericResolutions/XDimension (0..1; 1 If YDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GenericResolutions/YDimension (0..1; 1 If XDimension is not present)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/HorizontalDataResolution/GenericResolutions/Unit (1) <Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, Not provided>

3)SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/LocalCoordinateSystem (1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/LocalCoordinateSystem/GeoReferenceInformation (0..1)

SpatialExtent/HorizontalSpatialDomain/ResolutionAndCoordinateSystem/LocalCoordinateSystem/Description (0..1)

SpatialExtent/VerticalSpatialDomain (0..*)

SpatialExtent/VerticalSpatialDomain/Type (1) <Atmosphere Layer, Maximum Altitude, Maximum Depth, Minimum Altitude, Minimum Depth>

SpatialExtent/VerticalSpatialDomain/Value (1)

SpatialExtent/VerticalSpatialDomain/Unit (1)

SpatialExtent/OrbitParameters (0..1)

SpatialExtent/OrbitParameters/SwathWidth (1)

SpatialExtent/OrbitParameters/Period (1)

SpatialExtent/OrbitParameters/InclinationAngle (1)

SpatialExtent/OrbitParameters/NumberOfOrbits (1)

SpatialExtent/OrbitParameters/StartCircularLatitude (0..1)

SpatialExtent/GranuleSpatialRepresentation (1) <CARTESIAN, GEODETIC, ORBIT, NO_SPATIAL>

Description

The Spatial Extent element describes the geographic coverage of the data. For data collections, the spatial extent describes the area of the Earth that the collection covers. For specific files or granules, the spatial extent describes the area covered by that individual file.

The Spatial Extent element may also be used to describe vertical coverage of the data and orbital parameters where appropriate.

The Spatial Extent's coordinate system and resolution is also included under this main element. The horizontal spatial domain includes the geographic coverage of the data plus its coordinate

system and the geographic coverage's resolution. This information provides the reference frame from which horizontal and vertical spatial domains are measured. The horizontal reference frame includes fields for Geodetic Model, Horizontal Data Resolution, and Local Coordinates. The geographic coverage's resolution is defined as the smallest horizontal distance between successive elements of data in a dataset. This is synonymous with terms such as ground sample distance, sample spacing and pixel size. It is to be noted that the horizontal data resolution could be different in the two horizontal dimensions. Also, it is different from the spatial resolution of an instrument, which is the minimum distance between points that an instrument can see as distinct.

Best Practices

In the CMR, there is the option to describe the horizontal, vertical, and orbital spatial coverage of a dataset along with its coordinate system and resolution. The type of spatial coverage being described in the metadata is identified via the 'Spatial Coverage Type' metadata element. There are five different controlled vocabulary options for 'Spatial Coverage Type'. These include:

- Horizontal
- Vertical
- Orbital
- Horizontal and Vertical
- Orbital and Vertical

Each spatial extent type requires different information. The information needed for each type is summarized below:

Horizontal:

Horizontal spatial extent refers to data covering the surface of the Earth. For horizontal spatial extent, a coordinate system must be specified with the choice of either a Cartesian or Geodetic coordinate system:

SpatialExtent/HorizontalSpatialDomain/Geometry/CoordinateSystem:

Choice of:

- CARTESIAN
- GEODETIC

Please see the Coordinate Systems section of the CMR Data Partner User Guide for instructions on how to assign the appropriate coordinate system.

<https://wiki.earthdata.nasa.gov/display/CMR/CMR+Data+Partner+User+Guide>

Furthermore, there are four different options for describing horizontal spatial coverage. Only one of these options may be selected, however, the selected option may be repeated as many times as necessary (e.g. you can't provide a bounding rectangle and a point, but you can provide multiple bounding rectangles). The four options are:

Point

- A point location defined by a latitude and longitude coordinate. Multiple points may be provided if necessary.

Bounding Rectangle

- A rectangle defined by a north latitude coordinate, south latitude coordinate, east longitude coordinate, and west longitude coordinate. The north bounding latitude may not exceed 90 degrees, the south bounding coordinate may not be less than -90 degrees, the west bounding coordinate may not be less than -180 degrees, and the east bounding coordinate may not exceed 180 degrees.

GPolygon

- A polygon defined by latitude/longitude point pairs. The more points are provided, the more detailed the polygon will be. Exclusion zones within the polygon can also be identified. Please see the CMR Data Partner User Guide for more details.
<https://wiki.earthdata.nasa.gov/display/CMR/CMR+Data+Partner+User+Guide>

Line

- A width-less line defined by latitude/longitude point pairs. Multiple points may be provided to express a complex line. Please see the CMR Data Partner User Guide for more details.
<https://wiki.earthdata.nasa.gov/display/CMR/CMR+Data+Partner+User+Guide>

Horizontal Resolution and Coordinate System:

The following sub-elements can be used to describe Horizontal Resolution and Coordinate System.

There are 3 categories for Horizontal Resolution and Coordinate System Data Resolution including:

Geodetic Model:

Geodetic Model is used to describe data that has been georeferenced to a datum, which is a well defined ellipsoidal/spherical representation of the Earth. There are many different standard datums. Knowing which datum the data is encoded in is extremely useful for manipulating the data using GIS software. Sub-elements under Geodetic Model are summarized below:

- Horizontal Datum Name: The name of the datum the data are encoded in. Also commonly referred to as a geodetic datum. A geodetic datum is a more localized/specialized version of a simple Ellipsoid model of the Earth (see below). It is recommended that EPSG Datum names be used.
- Denominator Of Flattening Ratio: The ratio of the Ellipsoid's major axis to the difference between the major and the minor axis. Also referred to as the Inverse Flattening ratio. The smaller the ratio, the 'flatter' or more oval-like the Ellipsoid's shape will be. The units of the Inverse Flattening ratio are also defined by the Ellipsoid standard.
- Semi Major Axis: The radius of the major axis of the Ellipsoid. The length and units of the Semi Major Axis should be defined in the Ellipsoid standard.
- Ellipsoid Name: An elliptical or spherical shape representing the Earth. An Ellipsoid's shape can be defined by a major axis (longer axis) and a minor axis (shorter axis). There are standard names for different Ellipsoids - it is recommended that EPSG Ellipsoid names be used.

Horizontal Data Resolution:

Data that has been georeferenced to a geodetic datum can have resolution information. There are three basic types of spatial coverages: Point Data, Non Gridded Data, and Gridded Data.

Depending on which type different set of data is useful to describe the data sets resolution. These are summarized below:

- **Varies Resolution:** The only valid value for this enumeration is **Varies**. The data product's resolution information is varied and not described in the data set's metadata record. For more information the data set's landing pages should be visited.
- **Point Resolution:** The only valid value for this enumeration is **Point**. The data product's spatial extent is a point and therefore there is no resolution information to describe.
- **Non Gridded Resolutions:** The data product's spatial extent is not gridded and the following set of sub elements apply:
 - **XDimension:** The resolution value on an X axis on a plane - On the Earth this is normally the Longitudinal axis.
 - **YDimension:** The resolution value on a Y axis on a plane - On the Earth this is normally the Latitudinal axis.
 - **Unit:** The unit of measure for the X and Y dimensions. The valid values are controlled and they include: Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, and Not provided.
 - **ViewingAngleType:** Describes the sensors angle when the measurements are taken. The valid values are controlled and they include: At Nadir and Scan Extremes.
 - **ScanDirection:** Describes the direction that is scanned by the sensor. The valid values are controlled and they include: Along Track and Cross Track.
- **Non Gridded Range Resolutions:** Resolution ranges are necessary for data that is collected by aircraft and other such vessels. The following set of sub elements apply to describing the data product's resolution:
 - **MinimumXDimension:** The minimum resolution value on an X axis on a plane - On the Earth this is normally the Longitudinal axis.
 - **MinimumYDimension:** The minimum resolution value on a Y axis on a plane - On the Earth this is normally the Latitudinal axis.
 - **MaximumXDimension:** The maximum resolution value on an X axis on a plane - On the Earth this is normally the Longitudinal axis.
 - **MaximumYDimension:** The maximum resolution value on a Y axis on a plane - On the Earth this is normally the Latitudinal axis.
 - **Unit:** The unit of measure for the X and Y dimensions. The valid values are controlled and they include: Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, and Not provided.
 - **ViewingAngleType:** Describes the sensors angle when the measurements are taken. The valid values are controlled and they include: At Nadir and Scan Extremes.
 - **ScanDirection:** Describes the direction that is scanned by the sensor. The valid values are controlled and they include: Along Track and Cross Track.
- **Gridded Resolutions:** The data product's spatial extent is gridded and the following set of sub elements apply:

- XDimension: The resolution value on an X axis on a plane - On the Earth this is normally the Longitudinal axis.
- YDimension: The resolution value on a Y axis on a plane - On the Earth this is normally the Latitudinal axis.
- Unit: The unit of measure for the X and Y dimensions. The valid values are controlled and they include: Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, and Not provided.
- Gridded Range Resolutions: ranges are necessary for data that is collected by aircraft and other such vessels. The following set of sub elements apply to describing the data product's resolution:
 - MinimumXDimension: The minimum resolution value on an X axis on a plane - On the Earth this is normally the Longitudinal axis.
 - MinimumYDimension: The minimum resolution value on a Y axis on a plane - On the Earth this is normally the Latitudinal axis.
 - MaximumXDimension: The maximum resolution value on an X axis on a plane - On the Earth this is normally the Longitudinal axis.
 - MaximumYDimension: The maximum resolution value on a Y axis on a plane - On the Earth this is normally the Latitudinal axis.
 - Unit: The unit of measure for the X and Y dimensions. The valid values are controlled and they include: Decimal Degrees, Kilometers, Meters, Statue Miles, Nautical Miles, and Not provided.
- Generic Resolutions: This value should not be used by a CMR metadata provider. It is a necessary value that is used by the CMR when translating from supported metadata specifications when the horizontal resolution processing level cannot be determined or is not provided. When this value is used the same sub elements will be used as if the value was Gridded.

Local Coordinate System:

Data collected over small or localized areas may be georeferenced to a custom or highly specialized reference system. In order to accurately compare the local data to other data, the local coordinates must be converted to a standard reference system such as one of the EPSG geodetic datums. The Local Coordinate System fields provide information about the local coordinate system. Sub-elements under Local Coordinate System are summarized below:

- Geo Reference Information: Information on how the local system were registered to a standard reference system (e.g. control points, satellite ephemeral data, and inertial navigation data). In some cases, the user may be responsible for georeferencing the data.
- Description: A description of the Local Coordinate System and georeference information.

A Description sub element is included in the ResolutionAndCoordinateSystem element that allows a CMR data provider to explain to a user the data products horizontal coordinate system and resolution.

Providing the horizontal coverage's resolution and coordinate system data is optional, but encouraged and is used to provide horizontal and/or vertical coordinate system information.

Vertical:

Vertical spatial domain can be used to describe the coverage of data with a vertical component. The type of vertical coverage being described in the metadata is identified via the 'Vertical Spatial Domain/Type' metadata element. There are five different controlled vocabulary options for 'Vertical Spatial Domain/Type' in UMM-Common. These include:

SpatialExtent/VerticalSpatialDomain/Type:

Choice of:

- Atmosphere Layer
- Maximum Altitude
- Minimum Altitude
- Maximum Depth
- Minimum Depth

Once a Type is selected, an accompanying value in the SpatialExtent/VerticalSpatialDomain/Value field must also be provided. For example, if "Maximum Altitude" was selected as the Type, the corresponding Value could be "50 KM."

Orbital:

When data is collected via a satellite, the Orbit Parameters metadata elements may be used to describe the spatial coverage. Please see the CMR Data Partner User Guide for additional details on how Orbit Parameters are used by the backtrack search algorithm for conducting spatial searches. Orbit Parameters includes the following sub-elements:

Swath Width: The width of the strip of the Earth's surface from which geospatial data are collected by a satellite, in kilometers. Only a number should be provided since the unit of kilometers is implied. If providing orbit parameters, Swath Width is required.

Period: The time it takes a satellite to complete one complete orbit around the Earth, in decimal minutes. Only a number should be provided since the unit of decimal minutes is implied. If providing orbit parameters, Period is required.

Inclination Angle: The angle between the equatorial plane of the Earth and the orbital plane of a satellite, in degrees. Only a number should be provided since the unit of degrees is implied. If providing orbit parameters, Inclination Angle is required.

Number of Orbits: "Indicates the number of orbits."

Start Circular Latitude: "The latitude start of the orbit relative to the equator. This is used by the backtrack search algorithm to treat the orbit as if it starts from the specified latitude. This is optional and will default to 0 if not specified."

Furthermore, the Granule Spatial Representation element is a required element. This element identifies how the spatial extent is expressed in the granule metadata associated with a collection. The spatial representation used in the collection metadata can be different than what is used in the granule metadata. Granule Spatial Representation is a controlled vocabulary field in the UMM-Common schema and includes the following options:

- CARTESIAN
- GEODETIC
- ORBIT
- NO_SPATIAL

The granule spatial representation selected at the collection level must be utilized by the granules. Please see the Collection & Granule Spatial Relationships section of the CMR Data Partner User Guide for additional details.

<https://wiki.earthdata.nasa.gov/display/CMR/CMR+Data+Partner+User+Guide>

The spatial extent of the granules should always fall within the spatial extent specified in the collection level metadata (and vice versa). It is the responsibility of the metadata author to ensure that collection-granule spatial relationships are compatible.

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field value is valid.
 - Check that the field values matches the enumeration values.
 - Check that the spatial coverage ranges are correct.
 - Check that the field length is not greater than 255 characters (Ellipsoid_Name).
 - Check that the field length is not greater than 80 characters (Horizontal_Datum_Name).
 - Check that the field length is not greater than 80 characters (Geographic_Coordinate_Units).
 - Check that the field length is not greater than 2,048 characters (Local_Coordinate_System/Description).
 - Check that the field length is not greater than 2,048 characters (Local_Coordinate_System/GeoReference_Information).
 - Check that the field length is not greater than 255 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/Grid_Coordinate_System_Name).
 - Check that the field length is not greater than 2,048 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/Local_Planar_Coordinate_System/GeoReference_Information).
 - Check that the field length is not greater than 2,048 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/LocalPlanar_Coordinate_System/Description).
 - Check that the field length is not greater than 80 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/Map_Projection/Map_Projection_Name).
 - Check that the field length is not greater than 255 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/Map_Projection/Map_Projection_Pointer).
 - Check that the field length is not greater than 80 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/Planar_Coordinate_Information).

- Check that the field length is not greater than 20 characters (Planar_Coordinate_System/Planar_Coordinate_Information/Distance_And_Bearing_Representation/Bearing_Reference_Direction).
- Check that the field length is not greater than 2,048 characters (Planar_Coordinate_System/Planar_Coordinate_Information/Distance_And_Bearing_Representation/Bearing_Reference_Meridian).
- Check that the field length is not greater than 255 characters (Planar_Coordinate_System/Planar_Coordinate_Information/Distance_And_Bearing_Representation/Bearing_Units).
- Check that the field length is not greater than 80 characters (Planar_Coordinate_System/Planar_Coordinate_Information/Encoding_Method).
- Check that the field length is not greater than 80 characters (Horizontal_Coordinate_System/Planar_Coordinate_System/Planar_Coordinate_System_Id).
- Check that the field length is not greater than 80 characters (TwoD_Coordinate_System/TwoDCoordinateSystem/TwoD_Coordinate_System_Name).
- Check that the field length is not greater than 80 characters Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/Altitude_System_Definition/Datum_Name).
- Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/Altitude_System_Definition/Distance_Units).
- Check that the field length is not greater than 2,048 characters (Vertical_Coordinate_System/Altitude_System_Definition/Encoding_Method).
- Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/Altitude_System_Definition/Resolutions).
- Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/Depth_System_Definition).
- Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/Depth_System_Definition/Datum_Name).
- Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/Depth_System_Definition/Distance_Units).
- Check that the field length is not greater than 2,048 characters (Vertical_Coordinate_System/Depth_System_Definition/Encoding_Method).
- Check that the field length is not greater than 80 characters (Vertical_Coordinate_System/DepthSystemDefinition/Resolution).
- Check that the field length is not greater than 80 characters (Vertical_Spatial_Info/VerticalSpatialInfo/Type).
- Check that the field length is not greater than 80 characters (Vertical_Spatial_Info/VerticalSpatialInfo/Value).

- Check that the field length is not greater than 80 characters (Zone_Identifier).
- CMR Validation
 - This element is required and must exist.
 - General validation rules for cartesian coordinates
 - Any single spatial area may not cross the International Date Line or Poles.
 - Two vertices will be connected with a straight line.
 - General validation rules for geodetic coordinates
 - The implemented Geodetic model uses the great circle distance to connect two vertices for constructing a polygon area or line. If there is not enough density (that is, the number of points) for a set of vertices, then the line or the polygon area might be misinterpreted or the metadata might be considered invalid.
 - Any single spatial area may cross the International Date Line and/or Poles
 - Any single spatial area may not cover more than one half of the earth.
 - General collection level rules
 - Each collection may specify only one coordinate system for its spatial coverage.
 - Each collection's coordinate system is independent of all other collections.
 - Each collection's coordinate system is independent of its granule spatial representation — i.e., a collection's spatial extent may be expressed in the Cartesian geometry, but have all of its granules specify their spatial extents in the Geodetic geometry.
 - A collection specifies its granules' spatial representation, which cannot be overridden by a granule. This element is called GranuleSpatialRepresentation.
 - A collection with an orbital granule spatial representation must specify exact orbit parameters in order to facilitate granule discovery via spatial constraints.
 - Ingest for a metadata record will fail if any spatial metadata input is invalid with respect to the associate rules of the utilized coordinate system.
 - For any granules that are ingested for the collection, the granules spatial extent must exist within the collection's spatial extent.
 - The sub element GranuleSpatialRepresentation is required and so it must exist and must be filled in with one of the following enumerations: CARTESIAN, GEODETIC, ORBIT, or NO_SPATIAL. If the collection has granules associated with it the GranuleSpatialRepresentation cannot be changed.If SpatialCoverageType exists, it must be populated with one of the following enumerations: HORIZONTAL, VERTICAL, ORBITAL, HORIZONTAL_VERTICAL, ORBITAL_VERTICAL
 - Under HorizontalSpatialDomain
 - the geometry sub element must exist
 - if populated, the zone identifier must have at least 1 character and no more than 80 characters in length
 - In geometry

- The coordinate system sub element must exist and be populated with one of the following enumerations: CARTESIAN or GEODETIC.
- At least one of the geometry types (points, bounding rectangles, gpolygons, or lines) must exist.
- For Point and Bounding Rectangle types all sub elements are required.
- For GPolygon types
 - The Boundary sub element must exist and at least 4 points must be present in the boundary
 - A polygon's vertices must be stored in order of vertex connection.
 - Provide the vertices in clockwise order. (If using ISO 19115-2 MENDS, the expected order is counter-clockwise and the CMR will convert the order to clockwise as it translates the record to UMM).
 - No consecutive vertices may have the same latitude and longitude, that is, no repeating points.
 - Polygonal lines may not cross each other within the polygon.
 - The first point and last point must be the same.
 - No polygon should cover more than half the Earth in the Geodetic coordinate system.
 - If the ExclusiveZone is used the Boundary sub element must exist.
- For Lines
 - At least 2 Points must exist
 - A line may not have consecutive vertices with the same latitude and longitude (duplicate points).
 - A line must be less than one half the circumference of the Earth in the Geodetic coordinate system.
- Under VerticalSpatialDomain
 - All sub elements must exist
 - The type sub element must be populated with the following enumeration values: Atmosphere Layer, Maximum Altitude, Maximum Depth, Minimum Altitude, Minimum Depth.
- If the OrbitParameters sub element exists all of its sub elements except for the StartCircularLatitude sub element must exist.
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all.
 - The element is included but is empty.
 - Marked as medium priority
 - N/A
 - Marked as low priority

- N/A
- No recommended changes
 - The element is provided, a correct valid value is used, and the valid value matches the status of the dataset.

Cardinality

1

Tags*Required, Search API, Validated Relationship***Mapping**

DIF 10:

/DIF/Spatial_Coverage/Spatial_Coverage_Type
 /DIF/Spatial_Coverage/Granule_Spatial_Representation
 /DIF/Spatial_Coverage/Zone_Identifier
 /DIF/Spatial_Coverage/Geometry/Coordinate_System
 {Choice of 1}
 1)/DIF/Spatial_Coverage/Geometry/Bounding_Rectangle
 2)/DIF/Spatial_Coverage/Geometry/Point
 3)/DIF/Spatial_Coverage/Geometry/Line
 4)/DIF/Spatial_Coverage/Geometry/Polygon
 /DIF/Spatial_Coverage/Orbit_Parameters/Swath_Width
 /DIF/Spatial_Coverage/Orbit_Parameters/Period
 /DIF/Spatial_Coverage/Orbit_Parameters/Inclination_Angle
 /DIF/Spatial_Coverage/Orbit_Parameters/Number_Of_Orbits
 /DIF/Spatial_Coverage/Orbit_Parameters/Start_Circular_Latitude
 /DIF/Spatial_Coverage/Vertical_Spatial_Info/Type
 /DIF/Spatial_Coverage/Vertical_Spatial_Info/Value
 /DIF/Spatial_Coverage/Minimum_Altitude
 /DIF/Spatial_Coverage/Maximum_Altitude
 /DIF/Spatial_Coverage/Altitude_Unit
 /DIF/Spatial_Coverage/Minimum_Depth
 /DIF/Spatial_Coverage/Maximum_Depth
 /DIF/Spatial_Coverage/Depth_Unit
 /DIF/Spatial_Coverage/Spatial_Info/Spatial_Coverage_Type
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geodetic_Model
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geodetic_Model/Horizontal
 _DatumName
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geodetic_Model/Ellipsoid_
 Name
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geodetic_Model/Semi_Maj
 or_Axis
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geodetic_Model/Denomina
 tor_Of_Flattening_Ratio

/DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geographic_Coordinate_System/GeographicCoordinateUnits
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geographic_Coordinate_System/LatitudeResolution
 /DIF/Spatial_Coverage/Spatial_Info/Horizontal_Coordinate_System/Geographic_Coordinate_System/LongitudeResolution
 /DIF/Data_Resolution/Latitude_Resolution
 /DIF/Data_Resolution/Longitude_Resolution

ECHO 10 Collection:

/Collection/Spatial/SpatialCoverageType
 /Collection/Spatial/HorizontalSpatialDomain
 /Collection/Spatial/HorizontalSpatialDomain/ZoneIdentifier
 /Collection/Spatial/HorizontalSpatialDomain/Geometry/CoordinateSystem
 {Choice of 1..*}
 1) /Collection/Spatial/HorizontalSpatialDomain/Geometry/Point
 2) /Collection/Spatial/HorizontalSpatialDomain/Geometry/BoundingRectangle
 3) /Collection/Spatial/HorizontalSpatialDomain/Geometry/GPolygon
 4) /Collection/Spatial/HorizontalSpatialDomain/Geometry/Line
 /Collection/Spatial/VerticalSpatialDomain
 /Collection/Spatial/VerticalSpatialDomain/Type
 /Collection/Spatial/VerticalSpatialDomain/Value
 /Collection/Spatial/OrbitParameters/SwathWidth
 /Collection/Spatial/OrbitParameters/Period
 /Collection/Spatial/OrbitParameters/InclinationAngle
 /Collection/Spatial/OrbitParameters/NumberOfOrbits
 /Collection/Spatial/OrbitParameters/StartCircularLatitude
 /Collection/Spatial/GranuleSpatialRepresentation
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeodeticModel/HorizontalDatumName
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeodeticModel/EllipsoidName
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeodeticModel/SemiMajorAxis
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeodeticModel/DenominatorOfFlatteningRatio
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeographicCoordinateSystem/GeographicCoordinateUnits
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeographicCoordinateSystem/LatitudeResolution
 /Collection/SpatialInfo/HorizontalCoordinateSystem/GeographicCoordinateSystem/LongitudeResolution
 /Collection/SpatialInfo/HorizontalCoordinateSystem/LocalCoordinateSystem/
 /Collection/SpatialInfo/HorizontalCoordinateSystem/LocalCoordinateSystem

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent [=>

with gmd:EX_Extent attribute id="boundingExtent" - Create a new gmd:extent - do not share with TilingInformationSystem

```
[=>/gmd:description/gco:CharacterString SpatialCoverageType=
[=>/gmd:geographicElement/gmd:EX_GeographicDescription
id="ZoneIdentifier"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString
g
with
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString = gov.nasa.esdis.umm.zoneidentifier
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString = ZoneIdentifier
[=>/gmd:description/gco:CharacterString CoordinateSystem=
[=>/gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:Point/gml:pos
srsName="http://www.opengis.net/def/crs/EPSSG/4326" srsDimension="2">Latitude + " " +
Longitude
[=>/gmd:geographicElement/gmd:EX_GeographicBoundingBox [==>
[==>/gmd:westBoundLongitude/gco:Decimal
[==>/gmd:northBoundLongitude/gco:Decimal
[==>/gmd:eastBoundLongitude/gco:Decimal
[==>/gmd:southBoundLongitude/gco:Decimal
[=>/gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:Polygon
srsName="http://www.opengis.net/def/crs/EPSSG/9825" [==>
(Boundary)
[==>/gml:exterior/gml:LinearRing/gml:posList {latitude first then longitude for every point - no
commas just spaces. ex: -10 -10 -10 10 10 10 10 -10 -10 -10
(Exclusions)
[==>/gml:interior/gml:LinearRing/gml:posList {latitude first then longitude for every point - no
commas just spaces. ex: -10 -10 -10 10 10 10 -10 -10 -10
[=>/gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/gml:LineString/gml:pos
List srsName="http://www.opengis.net/def/crs/EPSSG/4326" srsDimension="2">lat-1 long-1 lat-
2 long-2 etc.</gml:posList>
[=>/gmd:geographicElement/gmd:EX_GeographicDescription
id="VerticalSpatialDomainN"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:Char
acterString = Type: {Type} Value: {Value} Unit: {Unit}
with
[=>/gmd:geographicElement/gmd:EX_GeographicDescription
id="VerticalSpatialDomainN"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString = gov.nasa.esdis.umm.verticalspatialdomain
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription id="VerticalSpatialDomainN"
/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
VerticalSpatialDomain
Where VerticalSpatialDomainN = VerticalSpatialDomain0, VerticalSpatialDomain1, ...
VerticalSpatailDomainN.
```

[=>/gmd:geographicElement/gmd:EX_GeographicDescription
id="OrbitParameters"/gmd:geographicIdentifier/gmd:MD_Identifier[==>
[==>/gmd:description/gco:CharacterString = OrbitParameters
and
[==>/gmd:codeSpace/gco:CharacterString = gov.nasa.esdis.umm.orbitparameters
[==>/gmd:code/gco:CharacterString = SwathWidth: {value}, Period: {value}, InclinationAngle:
{value}, NumberOfOrbits: {value}, StartCircularLatitude: {value}

[=>/gmd:description/gco:CharacterString SpatialGranuleSpatialRepresentation=
(CMR read only) If the above path does not exist then look here:
[=>/gmd:geographicElement/gmd:EX_GeographicDescription
id="GranuleSpatialRepresentation"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco
:CharacterString

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_description"/gmd:geographicIdentifier/gmd:MD_I
dentifier/gmd:code/gco:CharacterString = Description: description
with
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:M
D_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_description
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:M
D_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_Description

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_geodeticmodel"/gmd:geographicIdentifier/gmd:M
D_Identifier/gmd:code/gco:CharacterString = HorizontalDatumName: datum name
Ellipsoidname: ellipsoid name SemiMajorAxis: number DenominatorOfFlatteningRatio: number
with
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:M
D_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_geodeticmodel
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:M
D_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_GeodeticModel

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_horizontaldataresolutionsN"/gmd:geographicIdent
ifier/gmd:MD_Identifier/gmd:code/gco:CharacterString =
HorizontalResolutionProcessingLevelEnum: Point or Varies
where N is a number 0,1,2...N
with
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:M

D_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_horizontaldataresolutions
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_HorizontalDataResolutions

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_horizontaldataresolutionsN"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString =
HorizontalResolutionProcessingLevelEnum: Non Gridded XDimension: number YDimension: number Unit: value ViewingAngleType: value ScanDirection: value
where N is a number 0,1,2...N

with

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_horizontaldataresolutions
and

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_HorizontalDataResolutions

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_horizontaldataresolutionsN"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString =
HorizontalResolutionProcessingLevelEnum: Non Gridded Range MinimumXDimension: number MinimumYDimension: number MaximumXDimension: number MaximumYDimension: number Unit: value ViewingAngleType: value ScanDirection: value
where N is a number 0,1,2...N

with

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_horizontaldataresolutions
and

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_HorizontalDataResolutions

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_horizontaldataresolutionsN"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString =
HorizontalResolutionProcessingLevelEnum: Gridded or Not provided XDimension: number YDimension: number Unit: value
where N is a number 0,1,2...N

with

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_HorizontalDataResolutions

D_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_horizontaldataresolutions
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_HorizontalDataResolutions

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_horizontaldataresolutionsN"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString =
HorizontalResolutionProcessingLevelEnum: Gridded Range MinimumXDimension: number
MinimumYDimension: number MaximumXDimension: number MaximumYDimension: number
Unit: value

where N is a number 0,1,2...N
with

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_horizontaldataresolutions
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_HorizontalDataResolutions

[=> /gmd:geographicElement/gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_localcoordinatesystem"/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString = GeoReferenceInformation: value
Description: value

with

[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:codeSpace/gco:CharacterString =
gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_localcoordinatesystem
and
[=>/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString =
HorizontalResolutionAndCoordinateSystem_LocalCoordinateSystem

Examples

DIF 10:

```
<Spatial_Coverage>
  <Spatial_Coverage_Type>Horizontal</Spatial_Coverage_Type>
  <Geometry>
    <Coordinate_System>CARTESIAN</Coordinate_System>
    <Bounding_Rectangle>
      <Southernmost_Latitude>20</Southernmost_Latitude>
      <Northernmost_Latitude>53</Northernmost_Latitude>
      <Westernmost_Longitude>-130</Westernmost_longitude>
```



```

    <Easternmost_Longitude>-60</Easternmost_Longitude>
  </Bounding_Rectangle>
</Geometry>
<Granule_Spatial_Representation>CARTESIAN</Granule_Spatial_Representation>
</Spatial_Coverage>
...
<Spatial_Info>
  <Spatial_Coverage_Type>Horizontal</Spatial_Coverage_Type>
  <Horizontal_Coordinate_System>
    <Geodetic_Model>
      <Horizontal_DatumName>North American Datum 1983</Horizontal_DatumName>
      <Ellipsoid_Name>GRS 1980</Ellipsoid_Name>
      <Semi_Major_Axis>6378137</Semi_Major_Axis>
      <Denominator_Of_Flattening_Ratio>298.257222101</Denominator_Of_Flattening_Ratio>
    </Geodetic_Model>
    <Geographic_Coordinate_System>
      <GeographicCoordinateUnits>Decimal Degrees</GeographicCoordinateUnits>
      <LatitudeResolution>0.5</LatitudeResolution>
      <LongitudeResolution>0.5</LongitudeResolution>
    </Geographic_Coordinate_System>
  </Horizontal_Coordinate_System>
</Spatial_Info> <Spatial_Coverage>
...
<Data_Resolution>
  <Latitude_Resolution>50 km</Latitude_Resolution>
  <Longitude_Resolution>50 km</Longitude_Resolution>
  <Horizontal_Resolution_Range>50 km - < 100 km or approximately .5 degree - < 1
degree</Horizontal_Resolution_Range>
</Data_Resolution> ...

```

ECHO 10 Collection:

```

<SpatialInfo>
  <SpatialCoverageType>HORIZONTAL</SpatialCoverageType>
  <HorizontalCoordinateSystem>
    <GeodeticModel>
      <HorizontalDatumName>North American Datum 1983</HorizontalDatumName>
      <EllipsoidName>GRS 1980</EllipsoidName>
      <SemiMajorAxis>6378137</SemiMajorAxis>
      <DenominatorOfFlatteningRatio>298.257222101</DenominatorOfFlatteningRatio>
    </GeodeticModel>
    <GeographicCoordinateSystem>
      <GeographicCoordinateUnits>Decimal Degrees</GeographicCoordinateUnits>
      <LatitudeResolution>0.5</LatitudeResolution>
      <LongitudeResolution>0.5</LongitudeResolution>
    </GeographicCoordinateSystem>
  </HorizontalCoordinateSystem>

```

```

...
</SpatialInfo>
...
<Spatial>
  <SpatialCoverageType>Horizontal</SpatialCoverageType>
  <HorizontalSpatialDomain>
    <Geometry>
      <CoordinateSystem>CARTESIAN</CoordinateSystem>
      <BoundingRectangle>
        <WestBoundingCoordinate>-130</WestBoundingCoordinate>
        <NorthBoundingCoordinate>53</NorthBoundingCoordinate>
        <EastBoundingCoordinate>-60</EastBoundingCoordinate>
        <SouthBoundingCoordinate>20</SouthBoundingCoordinate>
      </BoundingRectangle>
    </Geometry>
  </HorizontalSpatialDomain>
  <GranuleSpatialRepresentation>CARTESIAN</GranuleSpatialRepresentation>

```

ISO 19115-2:

```

<gmd:spatialRepresentationInfo>
  <gmd:MD_GridSpatialRepresentation>
    <gmd:numberOfDimensions>
      <gco:Integer>2</gco:Integer>
    </gmd:numberOfDimensions>
    <gmd:axisDimensionProperties
xlink:href="#horizontalresolutionandcoordinatesystem_geographiccoordinatesystems0">
      <gmd:MD_Dimension>
        <gmd:dimensionName>
          <gmd:MD_DimensionNameTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodellists.xml#MD_Dimens
ionNameTypeCode" codeListValue="column">column</gmd:MD_DimensionNameTypeCode>
          </gmd:dimensionName>
          <gmd:dimensionSize/>
          <gmd:resolution>
            <gco:Measure uom="DecimalDegrees">0.01</gco:Measure>
          </gmd:resolution>
        </gmd:MD_Dimension>
      </gmd:axisDimensionProperties>
    </gmd:axisDimensionProperties
xlink:href="#horizontalresolutionandcoordinatesystem_geographiccoordinatesystems0">
      <gmd:MD_Dimension>
        <gmd:dimensionName>
          <gmd:MD_DimensionNameTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodellists.xml#MD_Dimens
ionNameTypeCode" codeListValue="row">row</gmd:MD_DimensionNameTypeCode>
          </gmd:dimensionName>

```

```

    <gmd:dimensionSize/>
    <gmd:resolution>
      <gco:Measure uom="DecimalDegrees">0.01</gco:Measure>
    </gmd:resolution>
  </gmd:MD_Dimension>
</gmd:axisDimensionProperties>
<gmd:cellGeometry/>
<gmd:transformationParameterAvailability/>
</gmd:MD_GridSpatialRepresentation>
</gmd:spatialRepresentationInfo>
...
<gmd:extent>
  <gmd:EX_Extent id="boundingExtent">
    <gmd:description>
      <gco:CharacterString>SpatialCoverageType=Horizontal,
SpatialGranuleSpatialRepresentation=CARTESIAN</gco:CharacterString>
    </gmd:description>
    <!-- Bounding Rectangle--><gmd:geographicElement>
      <gmd:EX_GeographicBoundingBox>
        <gmd:westBoundLongitude>
          <gco:Decimal>-130</gco:Decimal>
        </gmd:westBoundLongitude>
        <gmd:eastBoundLongitude>
          <gco:Decimal>-60</gco:Decimal>
        </gmd:eastBoundLongitude>
        <gmd:southBoundLatitude>
          <gco:Decimal>20</gco:Decimal>
        </gmd:southBoundLatitude>
        <gmd:northBoundLatitude>
          <gco:Decimal>53</gco:Decimal>
        </gmd:northBoundLatitude>
      </gmd:EX_GeographicBoundingBox>
    </gmd:geographicElement>
    <gmd:geographicElement>
      <gmd:EX_GeographicDescription id="horizontalresolutionandcoordinatesystem">
        <gmd:geographicIdentifier>
          <gmd:MD_Identifier>
            <gmd:code>
              <gco:CharacterString>Description: 3 of the 10 pixels are averaged at 64 samples
per second this gives a horizontal resolution of 1.5 km at the tangent point
location.</gco:CharacterString>
            </gmd:code>
            <gmd:codeSpace>

<gco:CharacterString>gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem</gco:Chara
cterString>

```

```

    </gmd:codeSpace>
    <gmd:description>

<gco:CharacterString>HorizontalResolutionAndCoordinateSystem</gco:CharacterString>
    </gmd:description>
    </gmd:MD_Identifier>
    </gmd:geographicIdentifier>
    </gmd:EX_GeographicDescription>
</gmd:geographicElement>
<gmd:geographicElement>
    <gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_geodeticmodel">
    <gmd:geographicIdentifier>
    <gmd:MD_Identifier>
    <gmd:code>
    <gco:CharacterString>EllipsoidName: World Geodetic System of 1984
(WGS84) SemiMajorAxis: 6378140.0 DenominatorOfFlatteningRatio:
298.257</gco:CharacterString>
    </gmd:code>
    <gmd:codeSpace>

<gco:CharacterString>gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_geodeticm
odel</gco:CharacterString>
    </gmd:codeSpace>
    <gmd:description>

<gco:CharacterString>HorizontalResolutionAndCoordinateSystem_GeodeticModel</gco:Chara
cterString>
    </gmd:description>
    </gmd:MD_Identifier>
    </gmd:geographicIdentifier>
    </gmd:EX_GeographicDescription>
</gmd:geographicElement>
<gmd:geographicElement>
    <gmd:EX_GeographicDescription
id="horizontalresolutionandcoordinatesystem_horizontaldataresolutions0">
    <gmd:geographicIdentifier> <gmd:MD_Identifier>
    <gmd:code>
    <gco:CharacterString>GeographicCoordinateUnits: Decimal Degrees
LatitudeResolution: 0.01 LongitudeResolution: 0.01</gco:CharacterString>
    </gmd:code>
    <gmd:codeSpace>

<gco:CharacterString>gov.nasa.esdis.umm.horizontalresolutionandcoordinatesystem_Geographi
cCoordinateSystems</gco:CharacterString>
    </gmd:codeSpace>

```

```

    <gmd:description>
<gco:CharacterString>HorizontalResolutionAndCoordinateSystem_GeographicCoordinateSystem</gco:CharacterString>
    </gmd:description>
    </gmd:MD_Identifier>
    </gmd:geographicIdentifier>
    </gmd:EX_GeographicDescription>
</gmd:geographicElement>
    <gmd:temporalElement><!--RangeDateTime--><gmd:EX_TemporalExtent
id="boundingTemporalExtent">
    <gmd:extent>
    <gml:TimePeriod gml:id="w16aac14a">
    <gml:beginPosition>1995-01-01T00:00:00.000Z</gml:beginPosition>
    <gml:endPosition/>
    </gml:TimePeriod>
    </gmd:extent>
    </gmd:EX_TemporalExtent>
    </gmd:temporalElement>
    </gmd:EX_Extent>
</gmd:extent>

```

B.2.6.2 Tiling Identification System

Element Specification

TilingIdentificationSystem/TilingIdentificationSystemName (1) <CALIPSO, MISR, MODIS Tile EASE, MODIS Tile SIN, WELD Alaska Tile, WELD CONUS Tile, WRS-1, WRS-2, Military Grid Reference System>

TilingIdentificationSystem/Coordinate1 (1)

TilingIdentificationSystem/Coordinate1/MinimumValue (1)

TilingIdentificationSystem/Coordinate1/MaximumValue (0..1)

TilingIdentificationSystem/Coordinate2 (1)

TilingIdentificationSystem/Coordinate2/MinimumValue (1)

TilingIdentificationSystem/Coordinate2/MaximumValue (0..1)

Description

The Tiling Identification System element defines a named two-dimensional tiling system related to the collection.

Best Practices

A tiling identification system is a defined 2-D grid which covers the surface of the Earth. An example of a tiling identification system is the Worldwide Reference System (WRS) where the surface of the Earth is split into numbered paths and rows. The WRS-2 system is used to catalog Landsat data and is a popular way to search for Landsat data. Another example are the various MODIS grids, such as the MODIS Sinusoidal Tile Grid system which divides the Earth into 595 10 x 10 degree tiles.

There are five sub-elements used to specify a tiling identification system. If provided, all of the sub-fields are required:

Tiling Identification System Name: This field identifies the name of the tiling identification system. The name must be selected from a controlled enumeration list which includes the following values: CALIPSO, MISR, MODIS Tile EASE, MODIS Tile SIN, WELD Alaska Tile, WELD CONUS Tile, WRS-1, WRS-2

Coordinate 1/ Minimum Value: Identifies the minimum value for one dimension (e.g. horizontal) of the two dimensional tiling system.

Coordinate 1/ Maximum Value: Identifies the maximum value for one dimension (e.g. horizontal) of the two dimensional tiling system.

Coordinate 2/ Minimum Value: Identifies the minimum value for the other dimension (e.g. vertical) of the two dimensional tiling system.

Coordinate 2/ Maximum Value: Identifies the maximum value for the other dimension (e.g. vertical) of the two dimensional tiling system.

Examples:

TilingIdentificationSystemName: MISR

Coordinate1/MinimumValue: 1

Coordinate2/MaximumValue: 233

Coordinate2/MinimumValue: 1

Coordinate2/MaximumValue: 80

TilingIdentificationSystemName: MODIS Tile SIN

Coordinate1/MinimumValue: 0

Coordinate2/MaximumValue: 35

Coordinate2/MinimumValue: 0

Coordinate2/MaximumValue: 17

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Check that the purpose description is appropriate for the dataset.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field length is not greater than 1000 characters.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - The tiling identification system name does not match an enumeration value (CALIPSO, MISR, MODIS Tile EASE, MODIS Tile SIN, WELD Alaska Tile, WELD CONUS Tile, WRS-1, WRS-2).
 - The tiling identification system provided is incorrect for the dataset.
 - Marked as medium priority

- The tiling identification system name does not match an enumeration value when the metadata format is anything other than UMM-JSON (this field is not controlled in other metadata dialects).
 - Marked as low priority
 - A recommendation is made to add a tiling identification system to the metadata when appropriate.
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Mapping

DIF 10:

/DIF/Spatial_Coverage/Spatial_Info/TwoD_Coordinate_System

ECHO 10 Collection:

/Collection/TwoDCoordinateSystems/TwoDCoordinateSystem

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:code/gco:CharacterString

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:geographicElement/gmd:EX_GeographicDescription/gmd:geographicIdentifier/gmd:MD_Identifier/gmd:description/gco:CharacterString

Examples

DIF 10:

<Spatial_Coverage>

...

<Spatial_Info>

<Spatial_Coverage_Type>Horizontal</Spatial_Coverage_Type>

<TwoD_Coordinate_System>

<TwoD_Coordinate_System_Name>MISR</TwoD_Coordinate_System_Name>

<Coordinate1>

<Minimum_Value>1</Minimum_Value>

<Maximum_Value>233</Maximum_Value>

</Coordinate1>

<Coordinate2>

<Minimum_Value>1</Minimum_Value>

<Maximum_Value>180</Maximum_Value>

</Coordinate2>

</TwoD_Coordinate_System>

```
</Spatial_Info>
</Spatial_Coverage>
```

ECHO 10 Collection:

```
<TwoDCoordinateSystems>
  <TwoDCoordinateSystem>
    <TwoDCoordinateSystemName>CALIPSO</TwoDCoordinateSystemName>
    <Coordinate1>
      <MinimumValue>1</MinimumValue>
      <MaximumValue>75000</MaximumValue>
    </Coordinate1>
    <Coordinate2>
      <MinimumValue>1</MinimumValue>
      <MaximumValue>233</MaximumValue>
    </Coordinate2>
  </TwoDCoordinateSystem>
</TwoDCoordinateSystems>
```

ECHO 10 Granule:

```
<TwoDCoordinateSystem>
  <StartCoordinate1>116</StartCoordinate1>
  <StartCoordinate2>24</StartCoordinate2>
  <EndCoordinate2>167</EndCoordinate2>
  <TwoDCoordinateSystemName>MISR</TwoDCoordinateSystemName>
```

ISO 19115-2:

```
<gmd:geographicElement>
  <gmd:EX_GeographicDescription>
    <gmd:geographicIdentifier>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>o1,75000p1,233</gco:CharacterString>
        </gmd:code>
        <gmd:description>
          <gco:CharacterString>CALIPSO</gco:CharacterString>
        </gmd:description>
      </gmd:MD_Identifier>
    </gmd:geographicIdentifier>
  </gmd:EX_GeographicDescription>
</gmd:geographicElement>
```

-Granule

```
<gmd:geographicElement>
  <gmd:EX_GeographicDescription>
    <gmd:geographicIdentifier>
      <gmd:MD_Identifier>
```



```

    <gmd:code>
      <gco:CharacterString>p116b24-167</gco:CharacterString>
    </gmd:code>
    <gmd:description>
      <gco:CharacterString>MISR</gco:CharacterString>
    </gmd:description>
  </gmd:MD_Identifier>
</gmd:geographicIdentifier>
</gmd:EX_GeographicDescription>
</gmd:geographicElement>

```

B.2.6.3 Spatial Representation Information

Element Specification

SpatialRepresentationInfo/SpatialCoverageType (1) <HORIZONTAL, VERTICAL, ORBITAL, HORIZONTAL_VERTICAL, ORBITAL_VERTICAL>

SpatialRepresentationInfo/VerticalCoordinateSystem (0..1)

SpatialRepresentationInfo/VerticalCoordinateSystem/AltitudeSystemDefinition (0..1)

SpatialRepresentationInfo/VerticalCoordinateSystem/AltitudeSystemDefinition/DatumName (0..1)

SpatialRepresentationInfo/VerticalCoordinateSystem/AltitudeSystemDefinition/DistanceUnits (0..1) <HectoPascals, Kilometers, Millibars>

SpatialRepresentationInfo/VerticalCoordinateSystem/AltitudeSystemDefinition/Resolutions (0..*)

SpatialRepresentationInfo/VerticalCoordinateSystem/DepthSystemDefinition (0..1)

SpatialRepresentationInfo/VerticalCoordinateSystem/DepthSystemDefinition/DatumName (0..1)

SpatialRepresentationInfo/VerticalCoordinateSystem/DepthSystemDefinition/DistanceUnits (0..1) <Fathoms, Feet, HectoPascals, Meters, Millibars>

SpatialRepresentationInfo/VerticalCoordinateSystem/DepthSystemDefinition/Resolutions (0..*)

Description

The Spatial Information element stores information about the reference frame from which horizontal and vertical spatial domains are measured. The horizontal reference frame includes fields for Geodetic Model, Geographic Coordinates, and Local Coordinates. The Vertical reference frame includes fields for altitudes (elevations) and depths.

Best Practices

Providing Spatial Information is optional, but encouraged. This element can be used to provide horizontal and/or vertical coordinate system information.

The Spatial Coverage Type field is required for Spatial Information.

- Spatial Coverage Type: Denotes the type of spatial coverage of the collection. While this field is not currently controlled, recommend providing one of the spatial coverage type enumeration values: HORIZONTAL, VERTICAL, ORBITAL, HORIZONTAL_VERTICAL, ORBITAL_VERTICAL

Vertical Spatial Information

The following sub-elements can be used to describe Vertical Coordinate Systems.

There are 2 categories for Vertical Coordinate Systems including:

(1) Altitude System Definition

Altitude System Definition should be used to describe data with a vertical component that is above-ground. Sub-elements under Altitude System Definition are summarized below:

- Datum Name: The name of the vertical datum the data is encoded in. Vertical datums define a level reference surface from which vertical measurements are compared. There are many standard vertical datums. If a standard vertical datum is used, it is recommended that the EPSG vertical datum name be provided.
- Resolutions: The minimum distance possible between two adjacent values, expressed in distance units of measure for the collection.
- Distance Units: The units in which altitude measurements are recorded. This field is controlled and must be selected from one of the following values: HectoPascals, Kilometers, Millibars

(2) Depth System Definition

Depth System Definition should be used to describe data with a vertical component that is below-ground. Sub-elements under Depth System Definition are summarized below:

- Datum Name: The name of the vertical datum the data is encoded in. Vertical datums define a level reference surface from which vertical measurements are compared. There are many standard vertical datums. If a standard vertical datum is used, it is recommended that the EPSG vertical datum name be provided.
- Resolutions: The minimum distance possible between two adjacent values, expressed in distance units of measure for the collection.
- Distance Units: The units in which depth measurements are recorded. This field is controlled and must be selected from one of the following values: Fathoms, Feet, HectoPascals, Meters, Millibars

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Proof all content for conciseness and readability.
 - Automated Review
 - Check that the field values matches the enumeration values.
- CMR Validation
 - N/A
- ARC Validation Report
 - Marked as high priority
 - Spatial Information is provided but the required 'Spatial Information Type' field is not included.

- An invalid value is provided for 'Distance Units'. 'DistanceUnits' must be selected from an enumeration list.
 - An invalid value is provided for 'GeographicCoordinateUnits'. 'GeographicCoordinateUnits' must be selected from an enumeration list.
 - The information provided is incorrect for the dataset.
- Marked as medium priority
 - N/A
- Marked as low priority
 - A recommendation is made to add the Horizontal Datum Name in the metadata.
 - A recommendation is made to provide any additional information to existing Spatial Information provided in the metadata.
- No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..1

Tags*Recommended***Mappings**

DIF 10:

/DIF/Data_Resolution/
/DIF/Spatial_Coverage/Spatial_Info/

ECHO 10 Collection:

/Collection/SpatialInfo/

ISO 19115-2:

/gmi:MI_Metadata/gmd:spatialRepresentationInfo/gmd:MD_Georeferenceable/gmd:numberOfDimensions/gco:Integer
/gmi:MI_Metadata/gmd:spatialRepresentationInfo/gmd:MD_Georeferenceable/gmd:axisDimensionProperties/gmd:MD_Dimension/gmd:dimensionName/gmd:MD_DimensionNameTypeCode codeListValue="column"
/gmi:MI_Metadata/gmd:spatialRepresentationInfo/gmd:MD_Georeferenceable/gmd:axisDimensionProperties/gmd:MD_Dimension/gmd:resolution/gco:Measure uom="Decimal%20Degrees"
/gmi:MI_Metadata/gmd:spatialRepresentationInfo/gmd:MD_Georeferenceable/gmd:axisDimensionProperties/gmd:MD_Dimension/gmd:dimensionName/gmd:MD_DimensionNameTypeCode codeListValue="row"
/gmi:MI_Metadata/gmd:spatialRepresentationInfo/gmd:MD_Georeferenceable/gmd:axisDimensionProperties/gmd:MD_Dimension/gmd:dimensionName/gmd:MD_DimensionNameTypeCode codeListValue="vertical"

Examples

DIF 9:

```
<Data_Resolution>
  <Vertical_Resolution>.1 m</Vertical_Resolution>
  <Vertical_Resolution_Range uuid="08e4b31c-0be3-49cd-9374-caac345e7402">&lt; 1
meter</Vertical_Resolution_Range>
</Data_Resolution>
```

DIF 10:

```
<Spatial_Coverage>
...
  <Spatial_Info>
    <Spatial_Coverage_Type>Horizontal</Spatial_Coverage_Type>
...
  </Spatial_Info>
</Spatial_Coverage>
```

ECHO 10:

```
<SpatialInfo>
  <SpatialCoverageType>HORIZ&amp;VERT</SpatialCoverageType>
  <VerticalCoordinateSystem>
    <AltitudeSystemDefinition>
      <DatumName>Not Applicable</DatumName>
      <DistanceUnits>kilometers</DistanceUnits>
      <EncodingMethod>Implicit coordinate</EncodingMethod>
      <Resolutions>
        <Resolution>0.5</Resolution>
      </Resolutions>
    </AltitudeSystemDefinition>
  </VerticalCoordinateSystem>
</SpatialInfo>
```

ISO 19115-2:

```
<gmd:spatialRepresentationInfo>
  <gmd:MD_Georeferenceable>
    <gmd:numberOfDimensions>
      <gco:Integer>1</gco:Integer>
    </gmd:numberOfDimensions>
    <gmd:axisDimensionProperties>
      <gmd:MD_Dimension>
        <gmd:dimensionName>
          <gmd:MD_DimensionNameTypeCode
codeList="http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmxCo
delists.xml#MD_DimensionNameTypeCode"
codeListValue="vertical">vertical</gmd:MD_DimensionNameTypeCode>
        </gmd:dimensionName>
        <gmd:dimensionSize gco:nilReason="unknown"/>
      </gmd:MD_Dimension>
    </gmd:axisDimensionProperties>
  </gmd:MD_Georeferenceable>
</gmd:spatialRepresentationInfo>
```

```

    <gmd:resolution>
      <gco:Measure uom="kilometers">0.5</gco:Measure>
    </gmd:resolution>
  </gmd:MD_Dimension>
</gmd:axisDimensionProperties>
<gmd:cellGeometry/>
<gmd:transformationParameterAvailability/>
<gmd:controlPointAvailability/>
<gmd:orientationParameterAvailability/>
<gmd:georeferencedParameters/>
</gmd:MD_Georeferenceable>
</gmd:spatialRepresentationInfo>

```

B.2.6.4 Location Keywords

Element Specification

LocationKeywords

LocationKeywords/Category (1)

LocationKeywords/Type (0..1)

LocationKeywords/Subregion1 (0..1)

LocationKeywords/Subregion2 (0..1)

LocationKeywords/Subregion3 (0..1)

LocationKeywords/DetailedLocation (0..1)

Description

This element specifies the name of a place on the Earth, within Earth's atmosphere, within Earth's magnetic field, or regions of the Sun. All of the sub-elements except for DetailedVariable are controlled and use the GCMD Location Keyword vocabulary. The vocabulary is managed by the Keyword Management System (KMS) and it can be found at this location:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/locations?format=csv. The DetailedVariable is an uncontrolled free text element that allows the metadata author to include another location keyword to more fully describe the data.

When translating from specifications that use a single keyword such as ECHO 10, the value of the keyword is looked up in the KMS. The highest level hierarchy found that matches the value will be used to fill in the UMM hierarchy. For example there is an ECHO 10 collection record that contains:

```

<SpatialKeywords>
...
  <Keyword>Australia</Keyword>
...
</SpatialKeywords>

```

The keyword of Australia is looked up using the data of the KMS system. As of 10/13/2016 the top three values exist in the KMS that contain the keyword Australia plus I have added the last one for the purpose of this example:

```
"CONTINENT","AUSTRALIA/NEW ZEALAND","","","","02156a5c-5ea1-43e3-acf1-
a89e99027555"
"CONTINENT","AUSTRALIA/NEW ZEALAND","AUSTRALIA","","","ce0984da-1151-41ff-
8d92-ab551c9d08bc"
"CONTINENT","AUSTRALIA/NEW ZEALAND","NEW ZEALAND","","","d225920a-b027-
4931-83d4-b60918251b59"
"CONTINENT","AUSTRALIA/NEW ZEALAND","AUSTRALIA","NEW SOUTH
WALES","","xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxxxx"
```

The CMR will use the second one and fill in the higher elements in the UMM structure. So the UMM record will look like the following:

LocationKeywords/Category = CONTINENT

LocationKeywords/Type = AUSTRALIA/NEW ZEALAND

LocationKeywords/Subregion1 = AUSTRALIA

Best Practices

Location Keywords identify areas where data collection occurred, and are provided in a hierarchical structure. The keywords can be chosen to classify broad study areas/regions or very specific places. However, it is suggested that location keywords are as specific as possible to aid in data discovery. Providing a Location Keyword is optional. If provided, the top level of the Location Keyword hierarchy must be provided (at a minimum). If a specific location keyword is not already included in the KMS, a request to have it added can be made through the GCMD Keywords Community Forum.

<https://earthdata.nasa.gov/gcmd-forum>

Examples:

LocationKeywords/Category: "CONTINENT"

LocationKeywords/Topic: "NORTH AMERICA"

LocationKeywords/Subregion1: "UNITED STATES"

LocationKeywords/Subregion2: "ALABAMA"

LocationKeywords/DetailedLocation: "THE UNIVERSITY OF ALABAMA IN HUNTSVILLE"

LocationKeywords/Category: "CONTINENT"

LocationKeywords/Topic: "NORTH AMERICA"

LocationKeywords/Subregion1: "CANADA"

LocationKeywords/Subregion2: "ONTARIO"

LocationKeywords/Category: "GEOGRAPHIC REGION"

LocationKeywords/Topic: "TROPICS"

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.

- Verify that existing facets and other controlled keyword values are consistent and suitable for the data.
- Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value from KMS.
 - Check that the field value is not a duplicate.
 - Check that the 'Detailed_Variable' field length is not greater than 80 characters.
- CMR Validation
 - If this element is used, every location keyword must have at least the category sub element populated.
 - All location keyword sub elements except for DetailedLocation must be valid according to the keyword management system.
- ARC Validation Report
 - Marked as high priority
 - The location keyword does not align with the KMS.
 - The location keyword does not exist in KMS.
 - A keyword(s) is missing from the hierarchy.
 - A keyword(s) is placed in the incorrect position of the hierarchy (e.g. a Subregion 2 keyword is placed in the Subregion 1 field).
 - The location keyword is not appropriate for the dataset.
 - Marked as medium priority
 - A recommendation is made to add to an existing keyword in the metadata (i.e. to extend a keyword hierarchy down to a more detailed keyword).
 - Marked as low priority
 - A recommendation is made to add a relevant location keyword to the metadata.
 - No recommended changes
 - The element is provided and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags

Recommended, Controlled Vocabulary, Faceted, Search API, Free Text Search

Mappings

DIF 9:

/DIF/Location/

DIF 10:

/DIF/Location/

ECHO 10 Collection:

/Collection/SpatialKeywords/Keyword

ISO 19115-2:

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString
with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:type/gmd:MD_KeywordTypeCode[@codeListValue="place"]

Examples

DIF 9:

```
<Location uuid="d0081284-5cef-484d-b1ee-a6787b197a33">
  <Location_Category>CONTINENT</Location_Category>
  <Location_Type>NORTH AMERICA</Location_Type>
  <Location_Subregion1>CANADA</Location_Subregion1>
  <Detailed_Location>BOWEN ISLAND</Detailed_Location>
</Location>
<Location uuid="88bc8b39-ad19-4415-b426-e7d37450341a">
  <Location_Category>CONTINENT</Location_Category>
  <Location_Type>NORTH AMERICA</Location_Type>
</Location>
<Location uuid="46769685-522d-49c3-ad81-22e1cc8c0c2b">
  <Location_Category>GEOGRAPHIC REGION</Location_Category>
  <Location_Type>MID-LATITUDE</Location_Type>
</Location>
```

DIF 10:

```
<Location>
  <Location_Category>OCEAN</Location_Category>
  <Location_Type>SOUTHERN OCEAN</Location_Type>
  <Location_Subregion1>SOUTH SHETLAND ISLANDS</Location_Subregion1>
</Location>
<Location>
  <Location_Category>CONTINENT</Location_Category>
  <Location_Type>ANTARCTICA</Location_Type>
</Location>
```

ECHO 10:

```
<SpatialKeywords>
  <Keyword>Africa</Keyword>
  <Keyword>Asia</Keyword>
  <Keyword>Australia</Keyword>
  <Keyword>Equatorial</Keyword>
  <Keyword>Europe</Keyword>
  <Keyword>Global</Keyword>
  <Keyword>Mid-Latitude</Keyword>
  <Keyword>North America</Keyword>
```



```

<Keyword>Oceania</Keyword>
<Keyword>Polar</Keyword>
<Keyword>South America</Keyword>
</SpatialKeywords>

```

ISO 19115-2:

```

<gmd:descriptiveKeywords>
  <gmd:MD_Keywords>
    <gmd:keyword>
      <gco:CharacterString>Africa</gco:CharacterString>
    </gmd:keyword>
    <gmd:keyword>
      <gco:CharacterString>Asia</gco:CharacterString>
    </gmd:keyword>
    ...
    <gmd:type>
      <gmd:MD_KeywordTypeCode
codeList=http://www.ngdc.noaa.gov/metadata/published/xsd/schema/resources/Codelist/gmxCo
delists.xml#MD_KeywordTypeCode
codeListValue="place">place</gmd:MD_KeywordTypeCode>
      </gmd:type>
      <gmd:thesaurusName>
        ...
      </gmd:thesaurusName>
    </gmd:MD_Keywords>
  </gmd:descriptiveKeywords>

```

B.2.7 Acquisition Information

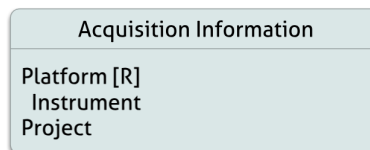


Figure B-10. Acquisition Information

B.2.7.1 Platform [R]

Element Specification

```

Platform (1..*)
Platform/Type (0..1)
Platform/ShortName (1)
Platform/LongName (0..1)
Platform/Characteristics (0..*)
Platform/Characteristics/Name (1)
Platform/Characteristics/Description (1)
Platform/Characteristics/DataType (1)

```

Platform/Characteristics/Unit (1)

Platform/Characteristics/Value (1)

Platform/Instrument (0..*) {See Instrument for full specification}

Description

The platform elements enable the specification of platforms used to collect the data available in the dataset. Platforms provided in CMR metadata must be chosen from a controlled keyword hierarchy maintained in the Keyword Management System (KMS). A list of valid platform keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/platforms?format=csv

Optionally, attributes specific to the platform (such as equator crossing time, inclination angle, orbital period, etc.) may be specified in the characteristics elements. Please see the Characteristics wiki page for a detailed description of the characteristics sub-elements.

Best Practices

Platform keywords are important for the discovery of data. All relevant platforms should be listed for each dataset. It is preferred that more specific platform keyword terms be chosen from the KMS when available. For example, if data were collected from the NASA DC-8 aircraft, it is preferred that "NASA DC-8" be listed as the platform as opposed to the more generic "AIRCRAFT" keyword. If a particular platform keyword is missing from the KMS, it is possible to put in a request to have it added. The KMS is managed by the Global Change Master Directory (GCMD) and new keyword requests may be made through the GCMD Keywords Community Forum.

<https://earthdata.nasa.gov/gcmd-forum>

In the KMS, there is a hierarchy for platform keywords. Platform keywords should be provided in the metadata field corresponding to the appropriate position of the keyword hierarchy, otherwise the keyword will be rendered invalid. For example, the platform short name specified in the KMS should not be provided in the platform 'long name' field in the metadata. When listing platforms, a platform short name will always be required. While platform long names are not required, it is highly encouraged that long names be provided if one is listed in the KMS. Many platform short names are comprised of acronyms, so inclusion of the long name provides additional context to a user who may not be familiar with the acronym. Platform keywords are not case sensitive.

It is recommended that platform keywords be assigned in a consistent manner. For example, if data for several collections were collected by the "LANDSAT-8" satellite, it is recommended that the metadata for all of those collections list "LANDSAT-8" as the platform short name. Providing "LANDSAT-8" as the platform in some records, but the more generic "LANDSAT" as the platform in other records, results in an inconsistent experience for a user discovering data. This is especially true for users narrowing down their search results in the Earthdata Search client by using the faceted search options.

In the case that it does not make sense to provide a platform for a dataset, "Not Applicable" is an accepted value.

Examples (ShortName > LongName):

Terra > Earth Observing System, Terra (AM-1)

METOP-A > Meteorological Operational Satellite - A

VIC-LSM > Variable Infiltration Capacity (VIC) Land Surface Model

MESONET > Mesoscale Meteorological Network

BE-200 > Beechcraft King Air BE-200

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.
 - Verify that existing facets and other controlled keyword values are consistent and suitable for the data.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value from KMS.
 - Check that the field value is not a duplicate.
 - Check that the field length is not greater than the maximum characters allowed for each sub-element.
- CMR Validation
 - The specific platform must be unique within the collection. The uniqueness is established by combining the platform short name along with its characteristic's name and value.
 - The platform short name must match with what is in the KMS.
 - If a granule has a platform short name in it, it must match to one that is defined in the collection.
 - If removing a platform from a collection, none of its granules can reference that platform's short name.
- ARC Validation Report
 - Marked as high priority
 - The element is not included at all.
 - The platform short name tags are provided in the metadata but are left empty.
 - The platform keyword does not align with the KMS.
 - The platform keyword does not exist in KMS.
 - A keyword(s) is placed in the incorrect position of the hierarchy (e.g. the platform short name is placed in the long name field).
 - Keywords from two different KMS hierarchies are listed in the same hierarchy in the metadata (i.e. hierarchies cannot be mixed and matched)
 - Not all relevant platforms are listed.
 - An incorrect platform is listed.
 - A recommendation is made to replace a valid platform with a more specific/appropriate platform keyword.

- Please see the Characteristics wiki page for high priority issues related to the Characteristics sub-elements.
- Marked as medium priority
 - A recommendation is made to add a platform long name when a long name exists in the KMS.
 - A recommendation is made to add the platform type to the metadata (this aligns with the platform category keywords in KMS).
 - Platforms are provided in an inconsistent manner across related datasets.
 - Please see the Characteristics wiki page for medium priority issues related to the Characteristics sub-elements.
- Marked as low priority
 - The platform type and/or long name tags are provided in the metadata but are left empty.
 - Please see the Characteristics wiki page for low priority issues related to the Characteristics sub-elements.
- No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

1..*

Tags

Required, Free Text Search, Search API, Controlled Vocabulary, Faceted, Validated Relationship

Mapping

DIF 9:

/DIF/Source_Name

DIF 10:

/DIF/Platform/

ECHO 10 Collection:

/Collection/Platforms/Platform/

ISO 19115-2:

/gmi:MI_Metadata/gmi:acquisitionInformation/gmi:MI_AcquisitionInformation/gmi:platform/eos:EOS_Platform/

and

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString

with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gmd:type/MD_KeywordTypeCode[@codeListValue="platform"]

Examples

DIF 9:

```
<Source_Name uuid="e66a90c4-3a5c-4e52-b039-bc93857642bf">
  <Short_Name>GPS</Short_Name>
  <Long_Name>Global Positioning System Satellites</Long_Name>
</Source_Name>
```

DIF 10:

```
<Platform>
  <Type>Earth Observation Satellites</Type>
  <Short_Name>AQUA</Short_Name>
  <Long_Name>Earth Observing System, AQUA</Long_Name>
  <Characteristics>
    <Name>EquatorCrossingTime</Name>
    <Description>Local time of the equator crossing and direction (ascending or descending)
  </Description>
    <DataType>Time/direction (ascending)</DataType>
    <Unit>Local Mean Time</Unit>
    <Value>3:30, ascending</Value>
  </Characteristics>
  <Instrument>
    <Short_Name>MODIS</Short_Name>
    <Long_Name>Moderate-Resolution Imaging Spectroradiometer</Long_Name>
    <Technique>Imaging Spectroradiometry</Technique>
    <Sensor>
      <Short_Name>MODIS</Short_Name>
      <Long_Name>Cross-track Scanning Radiometer</Long_Name>
      <Technique>Radiometry</Technique>
    </Sensor>
  </Instrument>
</Platform>
```

ECHO 10 Collection:

```
<Platforms>
  <Platform>
    <ShortName>ICESat</ShortName>
    <LongName>Ice, Cloud, and Land Elevation Satellite</LongName>
    <Type>Spacecraft</Type>
    <Characteristics>
      <Characteristic>
        <Name>OrbitInclination</Name>
        <Description>Angle between the orbit plane and the Earth's equatorial
plane</Description>
        <DataType>float</DataType>
        <Unit>Degrees</Unit>
```

```

    <Value>94.0</Value>
  </Characteristic>
  <Characteristic>
    <Name>OrbitalPeriod</Name>
    <Description>Orbital period in decimal minutes.</Description>
    <DataType>float</DataType>
    <Unit>Minutes</Unit>
    <Value>96.7</Value>
  </Characteristic>
</Characteristics>
<Instruments>
  ...
</Instruments>
</Platform>
</Platforms>

```

ISO 19115-2:

```

  <gmi:platform>
    <eos:EOS_Platform id="d142e304">
      <gmi:identifier>
        <gmd:MD_Identifier>
          <gmd:code>
            <gco:CharacterString>ICESat</gco:CharacterString>
          </gmd:code>
          <gmd:codeSpace>
            <gco:CharacterString>gov.nasa.esdis.umm.platformshortname</gco:CharacterString>
          </gmd:codeSpace>
          <gmd:description>
            <gco:CharacterString>Ice, Cloud, and Land Elevation
Satellite</gco:CharacterString>
          </gmd:description>
          </gmd:MD_Identifier>
        </gmi:identifier>
        <gmi:description>
          <gco:CharacterString>Spacecraft</gco:CharacterString>
        </gmi:description>
        <gmi:instrument xlink:href="#d142e335"/>
        <gmi:instrument xlink:href="#d142e423"/>
        <eos:otherProperty>
          <gco:Record>
            <eos:AdditionalAttributes><!--Platform Characteristic-->
              <eos:AdditionalAttribute>
                <eos:reference>
                  <eos:EOS_AdditionalAttributeDescription>
                    <eos:type>

```

```

        <eos:EOS_AdditionalAttributeTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#EOS_Additio
nalAttributeTypeCode"
codeListValue="platformInformation">platformInformation</eos:EOS_AdditionalAttributeType
Code>
        </eos:type>
        <eos:name>
        <gco:CharacterString>OrbitInclination</gco:CharacterString>
        </eos:name>
        <eos:description>
        <gco:CharacterString>Angle between the orbit plane and the Earth's
equatorial plane</gco:CharacterString>
        </eos:description>
        <eos:dataType>
        <eos:EOS_AdditionalAttributeDataTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#EOS_Additio
nalAttributeDataTypeCode"
codeListValue="float">float</eos:EOS_AdditionalAttributeDataTypeCode>
        </eos:dataType>
        <eos:parameterUnitsOfMeasure>
        <gco:CharacterString>Degrees</gco:CharacterString>
        </eos:parameterUnitsOfMeasure>
        </eos:EOS_AdditionalAttributeDescription>
        </eos:reference>
        <eos:value>
        <gco:CharacterString>94.0</gco:CharacterString>
        </eos:value>
        </eos:AdditionalAttribute>
        ...
    </eos:AdditionalAttributes>
</gco:Record>
</eos:otherProperty>
</eos:EOS_Platform>
</gmi:platform>
-----
<gmd:descriptiveKeywords>
    <gmd:MD_Keywords>
        <gmd:keyword>
            <gco:CharacterString>ICESat &gt; Ice, Cloud, and Land Elevation
Satellite</gco:CharacterString>
        </gmd:keyword>
        <gmd:type>
            <gmd:MD_KeywordTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_Keywor
dTypeCode" codeListValue="platform">platform</gmd:MD_KeywordTypeCode>
        </gmd:type>

```

```

    <gmd:thesaurusName>
    ...
  </gmd:thesaurusName>
</gmd:MD_Keywords>

```

B.2.7.1.1 Instrument

Element Specification

Platform/Instrument (0..*)
 Platform/Instrument/ShortName (1)
 Platform/Instrument/LongName (0..1)
 Platform/Instrument/Technique (0..1)
 Platform/Instrument/Characteristics (0..*)
 Platform/Instrument/Characteristics/Name (1)
 Platform/Instrument/Characteristics/Description (1)
 Platform/Instrument/Characteristics/DataType (1)
 Platform/Instrument/Characteristics/Unit (1)
 Platform/Instrument/Characteristics/Value (1)
 Platform/Instrument/OperationalMode (0..*)
 Platform/Instrument/NumberOfInstruments (0..1)
 Platform/Instrument/ComposedOf/Instrument (0..*)

Description

The Instrument element is nested within the Platform element and is used to register the device that measured or recorded the data, including direct human observation. This is useful to find data from a specific instrument. Note that the use of the "Sensor" object has been removed from UMM to avoid confusion between the names "Sensor" and "Instrument" as well as rationalizing the use of Instrument with the ISO Instrument representation. To provide compatibility with DIF 10 we map /DIF/Platform/Instrument/Sensor to Platform/Instrument/Instrument in UMM. For ECHO 10, we also map Sensor objects to UMM Instrument objects.

The "ComposedOf" relationship shown above provides the ability for an instrument to be composed of one or more other instruments. This hierarchical representation of Instrument composition provides the mechanism for modeling the complexity of modern instruments. The nesting of instruments within an instrument is currently limited to 1 level and all instrument short names within a platform must be unique.

Significant changes in UMM Version 1.3

The use of the terms "Instrument" and "Sensor" has been a source of confusion and debate throughout the evolution of ESDIS metadata standards development. GCMD's DIF standard used SensorName to represent an instrument. ECHO-10 later attempted to model the complexity of modern instruments by creating an instrument object that can be composed of multiple sensors. During the development of UMM, both approaches were supported by creating both Instrument and Sensor objects. Beginning with Version 1.3 of UMM-Common, the Sensor object was removed in favor of using Instrument as the generalization of both Instrument and Sensor. There was little semantic difference between the objects, so removing the Sensor class while retaining the ECHO-like relationships between instruments provides a rich structure for describing the

instruments provided on a modern platform and eliminates the Sensor/Instrument debate for the entire CMR community.

The ECHO model of an Instrument that is composed of Sensors is implemented in UMM by using instrument composition. Figure 2 below shows the relationships between the Acquisition Information, Platform and Instrument objects. Note that the Instrument object now has a recursive relationship that is titled "ComposedOf". This relationship enables a hierarchy of Instrument objects where each instrument can be composed of one or more other instruments. This provides the capability to model complex instruments without resorting to a Sensor object.

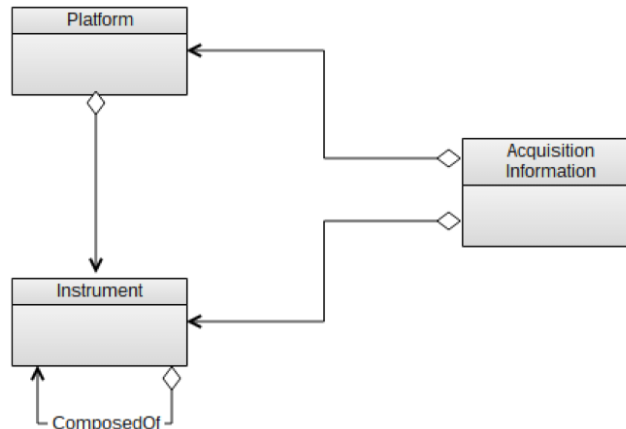


Figure B-11. Platform and Instrument Relationships

Using the ECHO 10 example from below, a UMM-C representation written in JSON, as is implemented in the CMR, would look like the following:

```

...
  "Instruments": [
    {
      "ShortName": "GLAS",
      "LongName": "Geoscience Laser Altimeter System",
      "Technique": "Laser Altimetry and Light Detection and Radar",
      "Characteristics": [
        {
          "DataType": "int",
          "Description": "The width of the sensor scan as the satellite moves along the
ground track.",
          "Name": "SwathWidth",
          "Unit": "kilometers",
          "Value": "2"
        }
      ],
      "ComposedOf": {
        "Instruments": [
          {
            "ShortName": "LA",

```

```

    "LongName": "Laser Altimeter",
    "Technique": "Exact Measurement of Time between Transmit Pulse and
receive ground return",
    "Characteristics": [
      {
        "DataType": "varchar",
        "Description": "transmission",
        "Name": "wavelength",
        "Unit": "nanometer",
        "Value": "1064 nm"
      },
      {
        "DataType": "varchar",
        "Description": "digitizer",
        "Name": "waveform",
        "Unit": "counts",
        "Value": "0-255"
      }
    ]
  },
  {
    "ShortName": "PC",
    "LongName": "Photon Counter for the 532 nm Aerosol Returns",
    "Technique": "Counting of 532nm photon return in 75m bins 40km to
surface",
    "Characteristics": [
      {
        "DataType": "varchar",
        "Description": "detector",
        "Name": "wavelength",
        "Unit": "nanometer",
        "Value": "532nm"
      }
    ]
  }
  ...
]
}
},
{
  "ShortName": "GPS",
  "LongName": "Global Positioning System Receiver",
  "Technique": "Radionavigation",
  "ComposedOf": {
    "Instruments": [
      {

```

```
        "ShortName": "GPS Receiver",
        "LongName": "Dual frequency GPS receiver",
        "Technique": "Pseudorange and carrier phase"
    }
  ]
}
]
...
```

Best Practices

Instrument keywords are important for the discovery of data. All relevant instruments should be listed for each dataset, and each instrument listed should be provided under its associated platform. It is preferred that more specific instrument keyword terms be chosen from the KMS when available.

For example, if data were collected from the AMSR-E instrument, it is preferred that "AMSR-E" be listed as the instrument as opposed to the more generic "RADIOMETERS" keyword. If a particular instrument keyword is missing from the KMS, it is possible to put in a request to have it added. The KMS is managed by the Global Change Master Directory (GCMD) and new keyword requests may be made through the GCMD Keywords Community Forum. <https://earthdata.nasa.gov/gcmd-forum>

In the KMS, there is a hierarchy for instrument keywords. Instrument keywords should be provided in the metadata field corresponding to the appropriate position of the keyword hierarchy, otherwise the keyword will be rendered invalid. For example, the instrument short name specified in the KMS should not be provided in the instrument 'long name' field in the metadata. When listing instruments, an instrument short name will always be required. While instrument long names are not required, it is highly encouraged that long names be provided if one is listed in the KMS. Many instrument short names are comprised of acronyms, so inclusion of the long name provides additional context to a user who may not be familiar with the acronym. Instrument keywords are not case sensitive.

Providing instruments is optional, however, it is strongly recommended that an instrument be provided with each platform if feasible. In the case that it does not make sense to provide an instrument for a dataset, the instrument may be left blank or a value of "Not Applicable" may be provided. Multiple instruments may be listed under a single platform if appropriate. Platform/instrument relationships are not currently validated within the KMS, so care should be taken to ensure that the correct instrument is listed under the correct platform.

It is recommended that instrument keywords be assigned in a consistent manner. For example, if data for several collections were collected by the "SMAP L-Band Radiometer" instrument, it is recommended that the metadata for all of those collections list "SMAP L-Band Radiometer" as the instrument short name. Providing "SMAP L-Band Radiometer" as the instrument in some records, but the more generic "RADIOMETERS" as the instrument in other records, results in an inconsistent experience for a user discovering data. This is especially true for users narrowing down their search results in the Earthdata Search client by using the faceted search options.

The Instruments/Technique field is optional. It can be used to further describe the technique utilized by the instrument for data collection. For example, the technique for a laser altimeter instrument on board a satellite could read "Measures the distance of the satellite from the Earth's surface by taking a precise measurement of the time it takes a transmitted laser pulse to hit the ground and then return to the instrument."

The Instruments/NumberOfInstruments field is optional. It can be used to indicate the number of instruments (i.e. sensors) used on the instrument while acquiring data. For example, the Terra satellite carries the ASTER instrument. The ASTER instrument is made up of 3 instrument subsystems (VNIR, SWIR, and TIR). In this example, the Instruments/NumberOfInstruments field would read "3".

The Instruments/OperationalModes field is optional and may be repeated. This field can be used to specify the mode(s) in which an instrument collects data. For example, the Sentinel-1 satellite collects data in four different modes. If a collection were to contain data acquired in all four modes, the OperationalModes field could be repeated four times and read "Stripmap (SM)", "Interferometric Wide swath (IW)", "Extra-Wide swath (EW)", "Wave (WV)"

Examples (ShortName > LongName):

SMMR > Scanning Multichannel Microwave Radiometer

OLI > Operational Land Imager

UAVSAR > Uninhabited Aerial Vehicle Synthetic Aperture Radar

LIS > Lightning Imaging Sensor

XPOL > NOAA/ETL X-band Polarimetric Doppler Radar

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.
 - Verify that existing facets and other controlled keyword values are consistent and suitable for the data.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value from KMS.
 - Check that the field value is not a duplicate.
 - Check that the field length is not greater than the maximum characters allowed for each sub-element.
 - Check that the field '/Instrument/NumberOfSensors' is an integer value.
- CMR Validation
 - The specific instrument must be unique within the collection. The uniqueness is established by combining the instrument short name along with its characteristic's name.
 - The instrument short name must match with what is in the KMS.
 - ARC Metadata QA/QC

- If a granule has an instrument short name in it, it must match to one that is defined in the collection.
- If removing an instrument from a collection, none of its granules can reference that instrument's short name.
- ARC Validation Report
 - Marked as high priority
 - No Instrument(s) are provided in DIF10 format metadata (Instrument is a required element in DIF10).
 - The instrument keyword does not align with the KMS.
 - The instrument keyword does not exist in KMS.
 - A keyword(s) is placed in the incorrect position of the hierarchy (e.g. the instrument short name is placed in the long name field).
 - Keywords from two different KMS hierarchies are listed in the same hierarchy in the metadata (i.e. hierarchies cannot be mixed and matched)
 - Not all relevant instruments are listed.
 - An incorrect instrument is listed.
 - An instrument is listed under the incorrect platform.
 - Please see the Characteristics wiki page for high priority issues related to the Characteristics sub-elements.
 - Marked as medium priority
 - When no Instruments are provided, a recommendation is made to add an Instrument value that could aid in data discovery (UMM and ECHO10 formats - Instrument is optional in these formats).
 - A recommendation is made to replace a valid instrument with a more specific/appropriate instrument keyword.
 - A recommendation is made to add an instrument long name when a long name exists in the KMS.
 - Instruments are provided in an inconsistent manner across related datasets.
 - Please see the Characteristics wiki page for medium priority issues related to the Characteristics sub-elements.
 - Marked as low priority
 - The instrument long name tags are provided in the metadata but are left empty.
 - Please see the Characteristics wiki page for low priority issues related to the Characteristics sub-elements.
 - No recommended changes
 - The element is provided, and follows all applicable criteria specified in the best practices section above.

Cardinality

0..*

Tags

Recommended, Free Text Search, Search API, Controlled Vocabulary, Faceted, Validated Relationship

Mapping

DIF 9:

/DIF/Sensor_Name/

DIF 10:

/DIF/Platform/Instrument/

and

/DIF/Platform/Instrument/Sensor

ECHO 10 Collection:

/Collection/Platforms/Platform/Instruments/Instrument/

and

/Collection/Platforms/Platform/Instruments/Instrument/Sensors/Sensor/

ECHO 10 Granule:

/Granule/Platforms/Platform/Instruments/Instrument/

ISO 19115-2:

/gmi:MI_Metadata/gmi:acquisitionInformation/gmi:MI_AcquisitionInformation/gmi:instrument/
eos:EOS_Instrument/

and

/gmi:MI_Metadata/gmi:acquisitionInformation/gmi:MI_AcquisitionInformation/gmi:instrument/
eos:EOS_Instrument/eos:sensor/eos:EOS_Sensor/

and

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString

with

/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gmd:type/MD_KeywordTypeCode[@codeListValue="instrument"]

Examples

DIF 9:

<Sensor_Name uuid="e5fde4c4-15cd-4278-b922-005488df096f">

<Short_Name>GPS</Short_Name>

<Long_Name>Global Positioning System</Long_Name>

</Sensor_Name>

<Sensor_Name uuid="029feed6-79dc-4316-b8ac-be8f1e557f89">

<Short_Name>GPS RECEIVERS</Short_Name>

</Sensor_Name>

DIF 10:

<Platform>

<Type>Earth Observation Satellites</Type>

<Short_Name>AQUA</Short_Name>

```

<Long_Name>Earth Observing System, AQUA</Long_Name>
<Characteristics>
  <Name>EquatorCrossingTime</Name>
  <Description>Local time of the equator crossing and direction (ascending or
descending)</Description>
  <DataType>Time/direction (ascending)</DataType>
  <Unit>Local Mean Time</Unit>
  <Value>3:30, ascending</Value>
</Characteristics>
<Instrument>
  <Short_Name>MODIS</Short_Name>
  <Long_Name>Moderate-Resolution Imaging Spectroradiometer</Long_Name>
  <Technique>Imaging Spectroradiometry</Technique>
  <Sensor>
    <Short_Name>MODIS</Short_Name>
    <Long_Name>Cross-track Scanning Radiometer</Long_Name>
    <Technique>Radiometry</Technique>
  </Sensor>
</Instrument>
</Platform>

```

ECHO 10 Collection:

```

<Instruments>
  <Instrument>
    <ShortName>GLAS</ShortName>
    <LongName>Geoscience Laser Altimeter System</LongName>
    <Technique>Laser Altimetry and Light Detection and Radar</Technique>
    <Characteristics>
      <Characteristic>
        <Name>SwathWidth</Name>
        <Description>The width of the sensor scan as the satellite moves along
the ground track.</Description>
        <DataType>int</DataType>
        <Unit>kilometers</Unit>
        <Value>2</Value>
      </Characteristic>
    </Characteristics>
    <Sensors>
      ...
    </Sensors>
  </Instrument>
  <Instrument>
    <ShortName>GPS</ShortName>
    <LongName>Global Positioning System Receiver</LongName>
    <Technique>Radionavigation</Technique>
    <Sensors>

```

```

    <Sensor>
      <ShortName>GPS Receiver</ShortName>
      <LongName>Dual frequency GPS receiver</LongName>
      <Technique>Pseudorange and carrier phase</Technique>
    </Sensor>
  </Sensors>
</Instrument>
</Instruments>

```

EOS Extension of ISO 19115-2:

```

<gmi:instrument>
  <eos:EOS_Instrument id="d142e335">
    <gmi:citation>
      <gmd:CI_Citation>
        <gmd:title>
          <gco:CharacterString>GLAS<>Geoscience Laser Altimeter
System</gco:CharacterString>
        </gmd:title>
        <gmd:date gco:nilReason="unknown"/>
      </gmd:CI_Citation>
    </gmi:citation>
    <gmi:identifier>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>GLAS</gco:CharacterString>
        </gmd:code>
        <gmd:description>
          <gco:CharacterString>Geoscience Laser Altimeter System</gco:CharacterString>
        </gmd:description>
      </gmd:MD_Identifier>
    </gmi:identifier>
    <gmi:type>
      <gco:CharacterString>Laser Altimetry and Light Detection and
Radar</gco:CharacterString>
    </gmi:type>
    <gmi:description gco:nilReason="missing"/>
    <gmi:mountedOn xlink:href="#d142e304"/>
    <eos:otherProperty>
      <gco:Record>
        <eos:AdditionalAttributes><!--Instrument Characteristic-->
          <eos:AdditionalAttribute>
            <eos:reference>
              <eos:EOS_AdditionalAttributeDescription>
                <eos:type>

```



```

        <eos:EOS_AdditionalAttributeTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/eosCodelists.xml#EOS_Additio
nalAttributeTypeCode"

codeListValue="instrumentInformation">instrumentInformation</eos:EOS_AdditionalAttribute
TypeCode>
        </eos:type>
        <eos:name>
        <gco:CharacterString>SwathWidth</gco:CharacterString>
        </eos:name>
        <eos:description>
        <gco:CharacterString>The width of the sensor scan as the satellite moves
along the ground track.</gco:CharacterString>
        </eos:description>
        <eos:dataType>
        <eos:EOS_AdditionalAttributeDataTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/eosCodelists.xml#EOS_Additio
nalAttributeDataTypeCode"

codeListValue="int">int</eos:EOS_AdditionalAttributeDataTypeCode>
        </eos:dataType>
        <eos:parameterUnitsOfMeasure>
        <gco:CharacterString>kilometers</gco:CharacterString>
        </eos:parameterUnitsOfMeasure>
        </eos:EOS_AdditionalAttributeDescription>
        </eos:reference>
        <eos:value>
        <gco:CharacterString>2</gco:CharacterString>
        </eos:value>
        </eos:AdditionalAttribute>
        ...
        </eos:AdditionalAttributes>
        </gco:Record>
        </eos:otherProperty>
        ...
    </eos:EOS_Instrument>
</gmi:instrument>
-----
<gmd:descriptiveKeywords>
    <gmd:MD_Keywords>
        <gmd:keyword>
            <gco:CharacterString>GLAS &gt; Geoscience Laser Altimeter
System</gco:CharacterString>
        </gmd:keyword>
        <gmd:keyword>

```

```

    <gco:CharacterString>GPS &gt; Global Positioning System
Receiver</gco:CharacterString>
    </gmd:keyword>
    <gmd:type>
    <gmd:MD_KeywordTypeCode
codeList="https://cdn.earthdata.nasa.gov/iso/resources/Codelist/gmxCodelists.xml#MD_Keywor
dTypeCode"

codeListValue="instrument">instrument</gmd:MD_KeywordTypeCode>
    </gmd:type>
    <gmd:thesaurusName>
    ...
    </gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>

```

B.2.7.2 Project

Element Specification

Project

Project/ShortName (1)

Project/Campaign (0..*)

Project/LongName (0..1)

Project/StartDate (0..1)

Project/EndDate (0..1)

Description

The Project element describes the scientific endeavor(s) with which the collection is associated. Scientific endeavors include field campaigns, flight campaigns, projects, interdisciplinary science investigations, missions, scientific programs, etc. This element may also cover a long term project that continuously creates new datasets.

Best Practices

Project names are important for data search and discovery. In order to provide a consistent search experience, project names are controlled by GCMD vocabulary maintained in the Keyword Management System (KMS). This is especially important for faceted searches by project name in the Earthdata Search Client. A list of valid project keywords can be found here:

https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/projects?format=csv

Providing a Project is optional, however, it is highly recommended that a Project be provided in the metadata if possible. If a dataset is associated with more than one Project, then multiple Projects may be listed. Project also includes the 'Campaign' sub-element in order to support multiple sub-campaigns under the same project. The following sub-elements are used to describe Project:

ShortName: If the Project element is provided, then the Short Name field is required. The Project Short Name must be selected from the 'Short_Name' column in the GCMD Project Keyword list.

Project names are controlled to ensure consistency when searching for data using keywords or via the Project faceted search.

LongName: Providing a Project Long Name is optional, however, it is encouraged that a long name be provided if one exists in the GCMD Project Keyword list. Providing a Project Long Name is encouraged because the associated Project Short Name may be comprised of acronyms. Project Long Names should be selected from the Long_Name column in the keyword list.

Campaign: The Campaign sub-element can be used to list the names of smaller projects/campaigns which fall within the scope of the Project listed. If necessary, multiple Campaigns may be associated with a single Project.

StartDate: The Start Date should indicate the date that the Project began. Providing the Start Date is optional.

EndDate: The End Date should indicate the date that the Project ended/ will end. For Projects that are still underway, the End Date may be in the future. Providing the End Date for the Project is optional.

Examples:

ShortName: ISLSCP II

LongName: International Satellite Land Surface Climatology Project II

StartDate: 1986-01-01

EndDate: 1995-12-31

ShortName: MEaSUREs

LongName: Making Earth System Data Records for Use in Research Environments

Campaign: NVAP-M

Validation and Quality Assurance/Quality Control

- Validation by the Metadata Quality Assurance/Control team
 - Manual Review
 - Identify errors, discrepancies or omissions.
 - Verify that all pertinent keywords have been applied.
 - Verify that existing facets and other controlled keyword values are consistent and suitable for the data.
 - Automated Review
 - Check that the field has been populated.
 - Check that the field is populated with a valid value from KMS.
 - Check that the field value is not a duplicate.
 - Check that the field length is not greater than the maximum characters allowed for each sub-element.
 - Check that the Date format is valid.
- CMR Validation
 - The specific project must be unique within the collection.
 - The project short name must match with what is in the KMS.

- If a granule has a project short name in it, it must match to one that is defined in the collection.
- If removing a project from a collection, none of its granules can reference that project's short name.
- ARC Validation Report
 - Marked as high priority
 - The Project Short Name and/or Long Name keyword does not comply with the KMS.
 - The Project Short Name and /or Long Name keyword does not exist in the KMS.
 - A keyword(s) is placed in the incorrect position of the hierarchy (e.g. the Project Short Name is placed in the Long Name field).
 - Keywords from two different KMS hierarchies are listed in the same hierarchy in the metadata (i.e. hierarchies cannot be mixed and matched).
 - The Project and/or Campaign listed is incorrect for the dataset.
 - The Start Date and/or End Date are incorrect for the Project.
 - Marked as medium priority
 - There is no Project provided. While not required, providing a Project is highly recommended.
 - A recommendation is made to add a Project Long Name when a long name exists in the KMS.
 - Project and/or Campaign names are provided in an inconsistent manner across related datasets.
 - Marked as low priority
 - N/A
 - No recommended changes
 - The element is provided, a correct valid value is used, and the valid value matches the status of the dataset.

Cardinality

0..*

Tags*Recommended, Free Text Search, Search API, Controlled Vocabulary, Faceted, Validated Relationship***Mapping**

DIF 9:

/DIF/Project/

DIF 10:

/DIF/Project/

ECHO 10 Collection:

/Collection/Campaigns/Campaign/

ISO 19115-2:

```
/gmi:MI_Metadata/gmi:acquisitionInformation/gmi:MI_AcquisitionInformation/gmi:operation/gmi:MI_Operation/
and
```

```
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString
with
```

```
/gmi:MI_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gmd:type/MD_KeywordTypeCode[@codeListValue="project"]
```

Examples

DIF 9:

```
<Project uuid="f560fb6c-341d-4626-969f-2978d261f161">
  <Short_Name>OBIS</Short_Name>
  <Long_Name>OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM</Long_Name>
</Project>
<Project uuid="bb4e35cc-520c-4d24-984f-d81cb2965a85">
  <Short_Name>COML</Short_Name>
  <Long_Name>CENSUS OF MARINE LIFE</Long_Name>
</Project>
```

DIF 10:

```
<Project>
  <Short_Name>MEASURES</Short_Name>
  <Campaign>SO2</Campaign>
  <Long_Name>Making Earth Science Data Records for Use in Research
Environments</Long_Name>
</Project>
```

ECHO 10 Collection:

```
<Campaigns>
  <Campaign>
    <ShortName>2009_AN_NASA</ShortName>
    <LongName>Operation IceBridge West Antarctica/Antarctic Sea Ice 2009</LongName>
    <StartDate>2009-01-01T00:00:00Z</StartDate>
    <EndDate>2009-12-31T00:00:00Z</EndDate>
  </Campaign>
  <Campaign>
    <ShortName>2010_GR_NASA</ShortName>
    <LongName>Operation IceBridge Greenland/Arctic Sea Ice 2010</LongName>
    <StartDate>2010-01-01T00:00:00Z</StartDate>
    <EndDate>2010-12-31T00:00:00Z</EndDate>
  </Campaign>
</Campaigns>
```

```

    <ShortName>2010_AN_NASA</ShortName>
    <LongName>Operation IceBridge West Antarctica/Antarctic Sea Ice 2010</LongName>
    <StartDate>2010-01-01T00:00:00Z</StartDate>
    <EndDate>2010-12-31T00:00:00Z</EndDate>
  </Campaign>
  <Campaign>
    <ShortName>2011_GR_NASA</ShortName>
    <LongName>Operation IceBridge Greenland/Arctic Sea Ice 2011</LongName>
    <StartDate>2011-01-01T00:00:00Z</StartDate>
    <EndDate>2011-12-31T00:00:00Z</EndDate>
  </Campaign>
  ...
</Campaigns>

```

ISO 19115-2:

```

...
  <gmi:operation>
    <gmi:MI_Operation>
      <gmi:description>
        <gco:CharacterString>2009_AN_NASA &gt; Operation IceBridge West
        Antarctica/Antarctic Sea Ice 2009 2009-01-01T00:00:00Z to 2009-12-
        31T00:00:00Z</gco:CharacterString>
      </gmi:description>
      <gmi:identifier>
        <gmd:MD_Identifier>
          <gmd:code>
            <gco:CharacterString>2009_AN_NASA</gco:CharacterString>
          </gmd:code>
        </gmd:MD_Identifier>
      </gmi:identifier>
      <gmi:status/>
      <gmi:parentOperation gco:nilReason="inapplicable"/>
    </gmi:MI_Operation>
  </gmi:operation>
  <gmi:operation>
    <gmi:MI_Operation>
      <gmi:description>
        <gco:CharacterString>2010_GR_NASA &gt; Operation IceBridge Greenland/Arctic Sea
        Ice 2010 2010-01-01T00:00:00Z to 2010-12-31T00:00:00Z</gco:CharacterString>
      </gmi:description>
      <gmi:identifier>
        <gmd:MD_Identifier>
          <gmd:code>
            <gco:CharacterString>2010_GR_NASA</gco:CharacterString>
          </gmd:code>
        </gmd:MD_Identifier>
      </gmi:identifier>
    </gmi:MI_Operation>
  </gmi:operation>

```

```

    </gmi:identifier>
    <gmi:status/>
    <gmi:parentOperation gco:nilReason="inapplicable"/>
  </gmi:MI_Operation>
</gmi:operation>
<gmi:operation>
  <gmi:MI_Operation>
    <gmi:description>
      <gco:CharacterString>2010_AN_NASA &gt; Operation IceBridge West
Antarctica/Antarctic Sea Ice 2010 2010-01-01T00:00:00Z to 2010-12-
31T00:00:00Z</gco:CharacterString>
    </gmi:description>
    <gmi:identifier>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>2010_AN_NASA</gco:CharacterString>
        </gmd:code>
      </gmd:MD_Identifier>
    </gmi:identifier>
    <gmi:status/>
    <gmi:parentOperation gco:nilReason="inapplicable"/>
  </gmi:MI_Operation>
</gmi:operation>
<gmi:operation>
  <gmi:MI_Operation>
    <gmi:description>
      <gco:CharacterString>2011_GR_NASA &gt; Operation IceBridge Greenland/Arctic Sea
Ice 2011 2011-01-01T00:00:00Z to 2011-12-31T00:00:00Z</gco:CharacterString>
    </gmi:description>
    <gmi:identifier>
      <gmd:MD_Identifier>
        <gmd:code>
          <gco:CharacterString>2011_GR_NASA</gco:CharacterString>
        </gmd:code>
      </gmd:MD_Identifier>
    </gmi:identifier>
    <gmi:status/>
    <gmi:parentOperation gco:nilReason="inapplicable"/>
  </gmi:MI_Operation>
</gmi:operation>
...
-----
  <gmd:descriptiveKeywords>
    <gmd:MD_Keywords>
      <gmd:keyword>

```

```

    <gco:CharacterString>2009_AN_NASA &gt; Operation IceBridge West
Antarctica/Antarctic Sea Ice 2009</gco:CharacterString>
  </gmd:keyword>
  <gmd:keyword>
    <gco:CharacterString>2010_GR_NASA &gt; Operation IceBridge Greenland/Arctic Sea
Ice 2010</gco:CharacterString>
  </gmd:keyword>
  <gmd:keyword>
    <gco:CharacterString>2010_AN_NASA &gt; Operation IceBridge West
Antarctica/Antarctic Sea Ice 2010</gco:CharacterString>
  </gmd:keyword>
  <gmd:keyword>
    <gco:CharacterString>2011_GR_NASA &gt; Operation IceBridge Greenland/Arctic Sea
Ice 2011</gco:CharacterString>
  </gmd:keyword>
  ...
  </gmd:keyword>
  <gmd:type>
    <gmd:MD_KeywordTypeCode
codeList="http://earthdata.nasa.gov/metadata/resources/Codelists.xml/gmxCodelists.xml#MD_K
eywordTypeCode" codeListValue="project">project</gmd:MD_KeywordTypeCode>
  </gmd:type>
  <gmd:thesaurusName>
    <gmd:CI_Citation>
      <gmd:title>
        <gco:CharacterString>NASA/GCMD Project Keywords</gco:CharacterString>
      </gmd:title>
      <gmd:date gco:nilReason="unknown"/>
      <gmd:citedResponsibleParty>
        ...
      </gmd:citedResponsibleParty>
    </gmd:CI_Citation>
  </gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>

```


Appendix A Tags Glossary

Tag Name	Description
Required	This element is required.
Free Text Search	This element will be indexed by the CMR as part of the Free Text Search.
Search API	This element will be indexed by the CMR and will be exposed via the CMR. For example, the CMR will expose a "platform" search option, so the "Platform" element will have this tag. This is not to be confused with parameters (or variables) that are part of a collection's science data.
Controlled Vocabulary	This element will have a vocabulary that will be used to validate the value. This will most likely be done via a vocabulary management service.
Faceted	This element should be exposed by the CMR catalog via a faceted search response.
Markdown Support	This element supports markdown-formatted text. Additional information on markdown can be found at http://en.wikipedia.org/wiki/Markdown .
Recommended	This element is recommended.
Validated Relationship	Any associated granules use this element for validation against the collection, or associated collections are checked for validity.
Normalize	The values contained in this element should be normalized (via enumerations or controlled vocabulary).

Appendix B Abbreviations and Acronyms

ACL	Access Control List
API	Application Programming Interface
CMR	Common Metadata Repository
DAAC	Distributed Active Archive Center
DIF	Directory Interchange Format
DOI	Digital Object Identifier
ECHO	Earth Observing System (EOS) Clearing House
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System
GCMD	Global Change Master Directory
ISO	International Organization for Standardization
KMS	Keyword Management System
MAS	Metadata Architecture Studies
MENDS	Metadata Evolution for NASA Data Systems
MMT	Metadata Management Tool
NASA	National Aeronautics and Space Administration
UMM	Unified Metadata Model
UMM-C	Unified Metadata Model - Collections
UMM-Common	Unified Metadata Model - Common Elements
URL	Uniform Resource Locator
XML	Extensible Markup Language
XPath	XML Path Language