DataCite Recommendation Analysis for the National Center for Atmospheric Research

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# Executive Summary

This report presents the results of a completeness evaluation of the National Center for Atmospheric Research (NCAR) metadata with respect to the DataCite recommendation. DataCite is an organization formed to help improve consistent identification of data and other resources with the goal of making data more accessible and useful. DataCite provides a metadata recommendation that includes mandatory, recommended, and optional elements. This recommendation places a high priority on making data, people and organizations discoverable through the use of unique identifiers.

NCAR has many ways of sharing the data they produce and archive. The Data Stewardship Engineering Team (DSET) is responsible for helping NCAR labs share their data efficiently and in a unified manner. Currently there are 9 labs, each with varying types of information collections. There are also a variety of metadata practices employed; some groups use XML standards from external sources, some use XML standards formed at NCAR, and some have their own structured documentation in the form of a database or ASCII headers. This report focuses on the ISO, MODS, DataCite, netCDF, and RDA-CISL holdings at NCAR. We acquired samples of each of these collections in order to explore completeness with respect to the DataCite recommendation and as an introduction to the metadata evaluation and improvement tools we are developing. Applying the DataCite recommendation to a data center’s metadata, regardless of the dialect they utilize, can help prepare organizations that are hoping to improve the identification of their information collections through the use of Digital Object Identifiers (DOIs).

One important observation is that only the DataCite dialect contains all of the concepts required by the DataCite recommendations. Given the focus of DataCite, several of the missing concepts are related to identifiers for resources and people/organizations. RDA-CISL is missing three mandatory concepts, two recommended concepts, and two optional concepts. ISO is missing three mandatory concepts, and two recommended concepts. MODS is missing two mandatory concepts, two recommended concepts, and two optional concepts. netCDF is missing three mandatory concepts, four recommended concepts, and four optional concepts. EOL is missing four mandatory concepts, four recommended concepts, and one optional concept. If it is essential to meet the DataCite recommendation, choices must be made regarding expanding or changing the current dialects in use at NCAR. It is also interesting to note that all of the DataCite shared metadata records from NCAR labs do not use any of the concepts in the DataCite recommendation that dialects like ISO do not contain.

The metadata samples included 2505 records from 7 NCAR labs. Of those, no records included all of the metadata concepts in the DataCite recommendation that are represented in the dialect the record is written in. The first two signature groups of the ISO dialect are the most complete records at NCAR labs with respect to the DataCite Recommendation. CGD did not provide assets with sharable metadata. Mapping was done with CGD to determine whether the CESM experiments database contained the concepts in the DataCite Recommendation and with EOL to provide comparisons of unstructured (unshared) metadata to the concepts in the DataCite Recommendation. ACOM did not have metadata, or machine readable structured documentation. As such, research was done to find shared vocabularies and ontologies in chemistry to help them document their data. Decisions have to made about how they want to store and create metadata before the assets can be assessed.

## NCAR Labs and the Dialects Analyzed

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | CGD | DataCite | EOL | ISO | MODS | netCDF | RDA-CISL |
| Atmospheric  Chemistry Observations and Modeling (ACOM) |  |  |  |  |  |  |  |
| Climate & Global Dynamics (CGD) | X |  |  |  |  |  |  |
| Computational and Informational  Systems Lab (CISL) |  |  |  |  |  |  | X |
| Earth Observing Lab (EOL) |  |  | X | X |  |  |  |
| High Altitude  Observatory (HAO) |  | X |  |  |  |  |  |
| Integrated  Information Services (IIS) |  |  |  |  | X |  |  |
| Mesoscale and  Microscale  Meteorology (MMM) |  | X |  |  |  |  |  |
| Research  Applications Lab (RAL) |  |  |  |  |  | X |  |
| Unidata (UCP) |  | X |  | X |  |  |  |

# DataCite – What is it?

[DataCite](https://www.datacite.org) is an organization founded to help make data more accessible and usable. DataCite is the originating organization of the DOI, and manages the distribution of these identifiers by their member organizations. Their purpose is to develop and support methods to locate, identify and cite data and other research objects. Specifically, they develop and support the standards behind persistent identifiers for data.

In the context of the terminology we use (see [Glossary](#_Glossary_1)), DataCite is an organization that created a set of recommendations at three levels, mandatory, recommended, and optional (described in the [DataCite Metadata Schema](http://schema.datacite.org/meta/kernel-3.1/doc/DataCite-MetadataKernel_v3.1.pdf)) and an XML schema (a dialect) for implementing those recommendations. Concepts included in all three levels are listed with definitions and XPaths in several dialects on the [DataCite Recommendation Page](http://wiki.esipfed.org/index.php/Data_Discovery_(DataCite)). The dialect is currently being used in the DataCite [search portal](http://search.datacite.org/ui) and in creating DOI landing pages. The recommendations are useful for communities looking for expert guidance about metadata concepts that are intended to enhance data discovery. Applying the DataCite recommendation to a data center’s metadata, regardless of the dialect they utilize, can help prepare organizations that are currently hoping to improve the identification of their dataset through DOIs.

The [DataCite Metadata Schema](http://schema.datacite.org/meta/kernel-3.1/doc/DataCite-MetadataKernel_v3.1.pdf) is a list of metadata elements defined by DataCite for the accurate and consistent identification of a resource for citation and retrieval purposes, along with recommended use instructions. The schema is intended to help DOI users document resources that have been assigned DOIs. The resource that is being identified with a DOI can be of any type, but it is typically a dataset (used in its broadest sense). It may include not only numerical data, but also any other research outputs.

This assessment of a sampling of 9 collections from 7 NCAR labs is based on the DataCite 3.1 recommendation. The NCAR collections are in 5 XML dialects, ISO, MODS, DataCite, netCDF, RDA-CISL. The mapping of the EOL Zith database as well as CGD’s CESM experiments database are also added to the comparison of dialect maxima with the DataCite recommendation to highlight the opportunities labs at NCAR have to develop structured documentation, or metadata into shared metadata.

# Recommendation Dialect Comparison – How Does My Dialect Fit?

Recommendations are created in order to address metadata requirements perceived by the organizations that create them, e.g. data discovery, use, understanding. It is important to understand the fit, and the misfit, between the recommendation and the dialects.

This section provides information about similarities and differences between the DataCite recommendations and the NCAR dialect implementations. We describe the recommendation-dialect fit in the following ways:

* A recommendation comparison report
* A chart comparing the concepts in the DataCite recommendation and the NCAR dialects.
* A graph comparing the maximum number of concepts in each dialect compared to the recommendation.
* A Recommendation/Dialect comparison that lists all concepts in the DataCite recommendation and NCAR dialects.
* Tables that describe the concepts in the DataCite recommendation that are missing in the NCAR dialects.

## Recommendation Level Comparison Report

The purpose of the Recommendation Level Comparison report is to show the concepts that are included in each of the recommendation levels (see Glossary) being compared. A concept is a generalized term for a documentation entity, and a recommendation level is a list of concepts that an organization identifies as necessary for achieving a documentation goal. A concept may appear in multiple levels because the concept is general and may have multiple specific elements that appear in different recommendation levels. For example, there may be multiple resource identifiers that identify different resources. The recommendation levels included in this study are: mandatory, recommended, optional (see table below).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Concept | Score | Description | Mandatory | Recommended | Optional |
| Abstract | 1 | A paragraph describing the resource. |  | X |  |
| Author /  Originator | 1 | The principal author of the resource | X |  |  |
| Author /  Originator Identifier | 1 | A unique identifier for a resource author or originator | X |  |  |
| Author /  Originator Identifier Type | 1 | The type of unique identifier for a resource author or originator | X |  |  |
| Contributor Name | 1 | Contributor to the resource |  | X |  |
| Contributor Role | 1 | The role of any individuals or institutions that contributed to the creation of the data. |  | X |  |
| Keyword  Vocabulary | 1 | If you are following a guideline or using a shared vocabulary for the words/phrases in your 'keywords' attribute, put the name of that guideline here. |  | X |  |
| Publisher | 1 | Publisher of the cited resource | X |  |  |
| Related Resource Identifier | 1 | Identifier for a resource related to the resource being described. |  | X |  |
| Resource Creation/Revision Date | 2 | The date the resource was created or revised | X | X |  |
| Resource Format | 1 | The physical or digital manifestation of the resource |  |  | X |
| Resource Identifier | 2 | Identifier for the resource described by the metadata | X |  | X |
| Resource Identifier Type | 1 | The type of identifier used to uniquely identify the resource. | X |  |  |
| Resource Language | 1 | The language of the resource. |  |  | X |
| Resource Title | 1 | A short description of the resource. The title should be descriptive enough so that when a user is presented with a list of titles the general content of the data set can be determined. | X |  |  |
| Resource Type | 1 | A resource code identifying the type of resource; e.g. dataset, a collection, an application (See MD\_ScopeCode) for which the metadata describes. |  | X |  |
| Resource Version | 1 | Version of the cited resource |  |  | X |
| Responsible Party Identifier | 1 | A unique identifier for a person or an organization |  | X |  |
| Responsible Party Identifier Type | 1 | The type of a unique identifier for a person or an organization |  | X |  |
| Rights | 1 | Information about rights held in and over the resource |  |  | X |
| Spatial Extent | 1 | The spatial extent of the resource. |  | X |  |
| Theme Keyword | 1 | A word or phrase that describes some aspect of a resource. Can be one of several types. |  | X |  |
| Transfer Size | 1 | The size of the digital resource |  |  | X |

## Recommendation/Dialect Maximum Graph

This graph compares the number of concepts included in the DataCite recommendations (recommendation maximum) to the maximum number of these concepts supported by the NCAR dialects (dialect maximum). The three levels of the DataCite recommendation (mandatory, recommended and optional) include 8, 11, and 6 concepts respectively as indicated by the upper line in the Figure below. This Recommendation Maximum defines the highest completeness scores with respect to these recommendations for any metadata dialect. The difference between the Recommendation Maximum (8 11 6) and the Dialect Maximum e.g. RDA-CISL (5 9 4) indicates that there are three mandatory DataCite concepts that are missing from the RDA-CISL dialect, as well as two recommended concepts and two optional concepts. The ISO dialect is missing three mandatory concepts, and two recommended concepts. MODS is missing two mandatory concepts, two recommended concepts, and two optional concepts. The netCDF dialect is missing three mandatory concepts, four recommended concepts, and four optional concepts. The EOL dialect is missing four mandatory concepts, four recommended concepts, and one optional concept. The preliminary mapping of CGD is missing seven mandatory concepts, seven recommended and three recommended concepts.

## Recommendation/Dialect Comparison Report

These tables identify all of the concepts included in the DataCite recommendation, and verify their existence in the NCAR dialects with an “X”.

Mandatory Level

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Concept | Score | Description | DCITE | RDA-CISL | ISO | MODS | netCDF | CGD | EOL |
| Author / Originator | 6 | The principal author of the resource | X | X | X | X | X |  | X |
| Author / Originator Identifier | 1 | A unique identifier for a resource author or originator | X |  |  |  |  |  |  |
| Author / Originator Identifier Type | 1 | The type of unique identifier for a resource author or originator | X |  |  |  |  |  |  |
| Publisher | 5 | Publisher of the cited resource | X | X | X | X | X |  |  |
| Resource Creation/Revision Date | 6 | The date the resource was created | X | X | X | X | X |  | X |
| Resource Identifier | 6 | Identifier for the resource described by the metadata | X | X | X | X | X |  | X |
| Resource Identifier Type | 2 | The type of identifier used to uniquely identify the resource. | X |  |  | X |  |  |  |
| Resource Title | 7 | A short description of the resource. The title should be descriptive enough so that when a user is presented with a list of titles the general content of the data set can be determined. | X | X | X | X | X | X | X |

Recommended Level

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Concept | Score | Description | DCITE | RDA-CISL | ISO | MODS | netCDF | CGD | EOL |
| Abstract | 7 | A paragraph describing the resource. | X | X | X | X | X | X | X |
| Contributor Name | 7 | Contributor to the resource | X | X | X | X | X | X | X |
| Contributor Role | 6 | The role of any individuals or institutions that contributed to the creation of the data. | X | X | X | X | X |  | X |
| Keyword Vocabulary | 5 | If you are following a guideline or using a shared vocabulary for the words/phrases in your 'keywords' attribute, put the name of that guideline here. | X | X | X | X | X |  |  |
| Related Resource Identifier | 6 | Identifier for a resource related to the resource being described. | X | X | X | X |  | X | X |
| Resource Creation/Revision Date | 6 | The date the resource was created | X | X | X | X | X |  | X |
| Resource Type | 5 | A resource code identifying the type of resource; e.g. dataset, a collection, an application (See MD\_ScopeCode) for which the metadata describes. | X | X | X | X |  | X |  |
| Responsible Party Identifier | 1 | A unique identifier for a person or an organization | X |  |  |  |  |  |  |
| Responsible Party Identifier Type | 1 | The type of a unique identifier for a person or an organization | X |  |  |  |  |  |  |
| Spatial Extent | 6 | The spatial extent of the resource. | X | X | X | X | X |  | X |
| Theme Keyword | 7 | A word or phrase that describes some aspect of a resource. Can be one of several types. | X | X | X | X | X | X | X |

Optional Level

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Concept | Score | Description | DCITE | RDA-CISL | ISO | MODS | netCDF | CGD | EOL |
| Resource Format | 6 | The physical or digital manifestation of the resource | X | X | X | X |  | X | X |
| Resource Identifier | 6 | Identifier for the resource described by the metadata | X | X | X | X | X |  | X |
| Resource Language | 4 | The language of the resource. | X |  | X | X |  |  | X |
| Resource Version | 3 | Version of the cited resource | X |  | X | X |  |  |  |
| Rights | 5 | Information about rights held in and over the resource | X | X | X |  | X |  | X |
| Transfer Size | 4 | The size of the digital resource | X | X | X |  |  |  | X |

## DataCite Concepts missing from NCAR Dialects

The Tables below provide lists of the DataCite recommendation concepts that are missing from the NCAR dialects for each of the three levels. The DataCite dialect contains all concepts. If a level is missing from the dialect’s section it is complete; there are no missing concepts.

### RDA-CISL

**Missing Mandatory Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |
| Resource Identifier Type | The type of identifier used to uniquely identify the resource. |

**Missing Recommended Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Responsible Party Identifier | A unique identifier for a person or an organization |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |

**Missing Optional Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Resource Language | The language of the resource. |
| Resource Version | Version of the cited resource |

### ISO

**Missing Mandatory Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |
| Resource Identifier Type | The type of identifier used to uniquely identify the resource. |

**Missing Recommended Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Responsible Party Identifier | A unique identifier for a person or an organization |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |

### MODS

**Missing Mandatory Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |

**Missing Recommended Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Responsible Party Identifier | A unique identifier for a person or an organization |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |

**Missing Optional Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Rights | Information about rights held in and over the resource |
| Transfer Size | The size of the digital resource |

### netCDF

**Missing Mandatory Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |
| Resource Identifier Type | The type of identifier used to uniquely identify the resource. |

**Missing Recommended Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Responsible Party Identifier | A unique identifier for a person or an organization |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |
| Related Resource Identifier | Identifier for a resource related to the resource being described. |
| Resource Type | A resource code identifying the type of resource; e.g. dataset, a collection, an application for which the metadata describes. |

**Missing Optional Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Resource Language | The language of the resource. |
| Resource Version | Version of the cited resource |
| Transfer Size | The size of the digital resource |
| Resource Format | Format of the resource |

### EOL

**Missing Mandatory Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |
| Resource Identifier Type | The type of identifier used to uniquely identify the resource. |
| Publisher | Publisher of the cited resource |

**Missing Recommended Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Responsible Party Identifier | A unique identifier for a person or an organization |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |
| Keyword Vocabulary | If you are following a guideline or using a shared vocabulary for the words/phrases in your 'keywords' attribute, put the name of that guideline here. |
| Resource Type | A resource code identifying the type of resource; e.g. dataset, a collection, an application (See MD\_ScopeCode) for which the metadata describes. |

**Missing Optional Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Resource Version | Version of the cited resource |

### CGD

**Missing Mandatory Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |
| Resource Identifier Type | The type of identifier used to uniquely identify the resource. |

**Missing Recommended Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Responsible Party Identifier | A unique identifier for a person or an organization |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |
| Related Resource Identifier | Identifier for a resource related to the resource being described. |
| Keyword Vocabulary | If you are following a guideline or using a shared vocabulary for the words/phrases in your 'keywords' attribute, put the name of that guideline here. |
| Contributor Role | The role of any individuals or institutions that contributed to the creation of the data. |

**Missing Optional Concepts**

|  |  |
| --- | --- |
| Concept | Description |
| Resource Language | The language of the resource. |
| Rights | Information about rights held in and over the resource |
| Transfer Size | The size of the digital resource |
| Resource Language | The language of the resource. |
| Resource Version | Version of the cited resource |

## Metadata Analysis – How Complete are My Metadata?

This section presents the results of an analysis of the completeness of a collection of metadata records in a dialect or a set of dialects with respect to the recommendation(s) being reported on. A collection is a group of metadata records, commonly organized by data center, organization or project and often stored in a database or web accessible folder. Collections are composed of metadata records of the same dialect.

Sample metadata were obtained from RAL, Unidata, CISL, EOL, HAO, MMM, and IIS after meetings with labs to determine the state of the metadata for the assets the lab wanted to have analyzed. CGD and ACOM had a database and ASCII headers respectively. These two assets are considered incomplete. They are not ready to support the DataCite Recommendation. The samples from the other assets are highly variant in size, from 4 to 1300 records. This section presents the results of an analysis of the completeness of these metadata collections with respect to the DataCite recommendation. Completeness is measured by determining how many concepts from each DataCite recommendation are contained in the metadata records.

These results are presented as counts of records with identical completeness scores with respect to the recommendation(s). The completeness scores are given in terms of the **number of elements that are missing** from a record, so **low scores are good**. When a recommendation includes multiple levels (e.g. Mandatory, Recommended, and Optional), the scores are given as a series of numbers, one for each level. These are termed signatures (see Glossary). Typically, many records are missing the same concepts and, therefore, have identical signatures. The signature 2 3 1 indicates a metadata record that has been tested for three levels and is missing 2 mandatory, 3 recommended, and 1 optional concepts. This record is less complete than a record with a signature of 1 1 1 and more complete than a record with a signature of 3 4 3.

## Completeness Results for NCAR Metadata Dialects

The differences between the completeness scores in the following chart reflect concepts that are present in the more complete records and missing from the less complete ones. By organizing records based on their scores across all three levels we create a set of signatures for the collection, which allows us to identify groups of records that typically contain the same concepts.

We report completeness for the three DataCite recommendation levels. The order of the levels is mandatory, recommended, and optional. A score of “0 0 0” indicates that the record is as complete as possible with respect to the DataCite recommendations. There are no complete records in any of the collections analyzed in this report.

Additionally, the concepts missing in each signature group are given. Concepts that do not appear in any records but are contained in the given dialect are listed and described as “unused concepts”. All “incomplete concept” signatures also include the unused concepts.

### RDA-CISL

Unused Concepts

|  |  |
| --- | --- |
| Concept | Description |
| Resource Format | Format of the resource |
| Contributor Role | The role of any individuals or institutions that contributed to the creation of the data. |
| Rights | Information about rights held in and over the resource |

Incomplete Concepts by Signature

|  |  |
| --- | --- |
| Signature | Concepts |
| 0 1 2 | The unused concepts described above. |
| 0 2 2 | Spatial Extent |
| 0 2 3 | Related Resource Identifier, Transfer Size |
| 0 3 3 | Related Resource Identifier, Spatial Extent, Transfer Size |
| 1 1 2 | Author / Originator |
| 1 2 2 | Author / Originator, Spatial Extent |
| 1 2 3 | Author / Originator, Related Resource Identifier, Transfer Size |
| 1 3 3 | Author / Originator, Related Resource Identifier, Spatial Extent, Transfer Size |
| 1 4 3 | Author / Originator, Contributor Name, Related Resource Identifier, Spatial Extent, Transfer Size |
| 1 5 3 | Author / Originator, Contributor Name, Resource Type, Related Resource Identifier, Spatial Extent, Transfer Size |
| 2 4 3 | Author / Originator, Resource Creation/Revision Date(2), Related Resource Identifier, Spatial Extent, Transfer Size |

### MODS

Unused Concepts

|  |  |
| --- | --- |
| Concept | Description |
| Spatial Extent | The spatial extent of the resource. |
| Resource Format | Format of the resource |
| Resource Version | Version of the cited resource |

Incomplete Concepts By Signature

|  |  |
| --- | --- |
| Score | Concepts |
| 0 1 2 | The unused concepts described above. |
| 1 2 2 | Resource Creation/Revision Date(2) |
| 1 3 2 | Resource Creation/Revision Date(2), Keyword Vocabulary, Related Resource Identifier |
| 1 3 3 | Publisher, Contributor Name, Contributor Role, Resource Language |
| 1 4 2 | Resource Creation/Revision Date(2), Keyword Vocabulary, Related Resource Identifier, Abstract |
| 1 5 2 | Resource Creation/Revision Date(2), Keyword Vocabulary, Related Resource Identifier, Abstract |
| 2 2 2 | Publisher, Resource Creation/Revision Date(2) |
| 2 2 3 | Publisher, Resource Creation/Revision Date(2), Resource Language |
| 2 3 2 | Publisher, Resource Creation/Revision Date(2), Keyword Vocabulary, Related Resource Identifier |
| 2 4 2 | Publisher, Resource Creation/Revision Date(2), Keyword Vocabulary, Contributor Name, Contributor Role, Related Resource Identifier, Abstract |
| 2 4 3 | Publisher, Resource Creation/Revision Date(2), Contributor Name, Contributor Role, Resource Language |
| 2 5 2 | Publisher, Resource Creation/Revision Date(2), Keyword Vocabulary, Related Resource Identifier, Abstract, Resource Language |

### ISO

Unused Concepts

|  |  |
| --- | --- |
| Concept | Description |
| Resource Format | Format of the resource |
| Transfer Size | The size of the digital resource |

Incomplete Concepts by Signature

|  |  |
| --- | --- |
| Score | Concepts |
| 0 0 3 | Resource Version |
| 0 1 3 | Resource Version, Related Resource Identifier |
| 0 2 3 | Keyword Vocabulary, Related Resource Identifier, Rights |
| 0 2 4 | Keyword Vocabulary, Related Resource Identifier, Resource Version, Rights |
| 0 3 4 | Keyword Vocabulary, Related Resource Identifier, Rights |
| 1 1 3 | Resource Creation / Revision Date, Resource Version |
| 1 2 4 | Author / Originator, Keyword Vocabulary, Related Resource Identifier, Resource Version, Rights |
| 1 3 4 | Author / Originator, Keyword Vocabulary, Related Resource Identifier, Resource Version, Rights, Abstract |
| 2 3 3 | Author / Originator, Publisher, Related Resource Identifier, Resource Version |

### DataCite

Unused Concepts

|  |  |
| --- | --- |
| Concept | Description |
| Resource Identifier Type | The type of identifier used to uniquely identify the resource |
| Author / Originator Identifier | A unique identifier for a resource author or originator |
| Author / Originator Identifier Type | The type of unique identifier for a resource author or originator |
| Contributor Role | The role of any individuals or institutions that contributed to the creation of the data. |
| Responsible Party Identifier Type | The type of a unique identifier for a person or an organization |
| Responsible Party Identifier | A unique identifier for a person or an organization |

Incomplete Concepts by Signature

|  |  |
| --- | --- |
| Score | Concepts |
| 3 4 2 | The unused concepts described above plus Spatial Extent, Transfer Size, Resource Version |
| 3 5 2 | Related Resource Identifier, Spatial Extent, Resource Version, Rights |
| 3 6 2 | Keyword Vocabulary, Related Resource Identifier, Spatial Extent, Transfer Size, Rights |
| 4 4 4 | Resource Creation/Revision Date(2), Resource Language, Transfer Size, Resource Format, Resource Version |
| 4 6 4 | Resource Creation/Revision Date(2), Keyword Vocabulary, Spatial Extent, Resource Language, Transfer Size, Resource Format, Resource Version |

### netCDF

Unused Concepts

|  |  |
| --- | --- |
| Concept | Description |
| Keyword Vocabulary | If you are following a guideline or using a shared vocabulary for the words/phrases in your "keywords" attribute, put the name of that guideline here. |
| Contributor Role | Format of the resource |

## Specific Guidance – How to Improve the Shared Metadata

The analysis above identifies specific concepts that are missing from NCAR metadata records, but are included in their respective dialects. This section provides specific guidance on how to write metadata for those concepts in a variety of dialects. A positive and straightforward first step is to assess what some NCAR records already include and implement them collection wide. The information is presented in three ways

* A table to describe the dialects usage at NCAR in relation to the recommendation.
* An incomplete concepts chart for each dialect
* Guidance links for incomplete and unused concepts

The table below is comprised of rows for each DataCite recommendation concept and columns for each dialect. Cells are filled with a color or a percentage. The percentage is how many records in the sample set contain that concept. Green represents 100%. Yellow represents 0%, a concept that the dialect contains but is not in any record in the sample set for that dialect. Red represents a concept missing from the dialect. The table is intended to show not only how complete a dialect is for the DataCite recommendation, as well as how complete the records are with respect to the dialect maxima. An important use of the table is also determining if the currently used dialect is the best for the purposes of labs at NCAR.

We provide charts for each dialect showing how many records are missing a concept and what level the concept belongs to. These charts are intended to help identify the most important and most attainable goals to maximize results for each iteration towards improvement. If the concept is missing from 95% of records but only from the Optional level of the DataCite recommendation it should be lower priority than a Mandatory concept missing in only 50% of records. The Mandatory level is red, the Recommended level is green, and the optional level is blue.

The guidance links resolve to pages on the Earth Science Information Partners wiki. These pages describe the concept as well as dialect specific XPaths to describe how the concept can be contained in a record. They are given for for the concepts that are missing from some records and concepts contained in the dialect but unused in the collection. These links also contain XML samples of how the concept is shared using DIF, ECHO, ISO, and CSDGM dialects. Not every concept has a hyperlink because all of the guidance pages are not yet created.

## NCAR Labs Usage of Concepts in the DataCite Recommendation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **DCITE** | **ISO** | **MODS** | **RDA-CISL** | **netCDF** |
| **Total Number of Records** | **8** | **541** | **1297** | **655** | **4** |
| Resource Identifier |  |  |  |  |  |
| Resource Identifier Type |  |  |  |  |  |
| Author / Originator |  | 97% |  | 4% |  |
| Author / Originator Identifier |  |  |  |  |  |
| Author / Originator Identifier Type |  |  |  |  |  |
| Resource Title |  |  |  |  |  |
| Publisher |  | 99.82% | 81% |  |  |
| Resource Creation/Revision Date | 75% | 97% | 8% |  |  |
| Theme Keyword |  |  |  |  |  |
| Keyword Vocabulary | 75% | 6% | 71% |  |  |
| Contributor Name |  | 99.82% | 89% |  |  |
| Contributor Role |  | 99.82% | 89% |  |  |
| Responsible Party Identifier Type |  |  |  |  |  |
| Responsible Party Identifier |  |  |  |  |  |
| Resource Creation/Revision Date | 75% | 97% | 9% |  |  |
| Resource Type |  |  |  |  |  |
| Related Resource Identifier | 63% | 3% | 60% | 35% |  |
| Abstract |  | 99.45% | 89% |  |  |
| Spatial Extent | 13% |  |  | 49% |  |
| Resource Language | 75% |  | 89% |  |  |
| Resource Identifier |  |  |  |  |  |
| Transfer Size | 25% |  |  | 35% |  |
| Resource Format | 75% |  |  |  |  |
| Resource Version | 13% | 6% |  |  |  |
| Rights | 63% | 6% |  |  |  |

### RDA-CISL Evaluation

A mapping of the native dialect XML representation of the Research Data Archive to the DataCite metadata concepts was created. When the dialect rubric was created it was applied to all of the records in the RDA. All of the records had an Open Archives Initiative – Protocol for Metadata Harvesting (OAI-PMH) wrapper that needed to be removed. Additionally the records all declare the OAI-PMH namespace for the default namespace, but use the RDA schema. This should be addressed by declaring the default namespace to the schema that is used to create the records, not the OAI schema.

Metadata Improvement

The concepts in the table below are either not contained in every record (incomplete), or in any record (unused). All of the concepts listed below can be contained in Research Data Archive native dialect records. Click on the concept below to access online guidance for writing the concept in a variety of dialects.

Guidance Links

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Incomplete | [Author/ Originator](http://wiki.esipfed.org/index.php/Documenting_Author_/_Originator) | Related Resource Identifier | [Spatial](http://wiki.esipfed.org/index.php/Documenting_Spatial_Extent)  [Extent](http://wiki.esipfed.org/index.php/Documenting_Spatial_Extent) | [Transfer Size](http://wiki.esipfed.org/index.php/Distribution_Information_Documentation) | [Resource Creation /Revision Date(2)](http://wiki.esipfed.org/index.php/Documenting_Resource_Creation_/_Revision_Date) | [Contributor Name](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) | [Resource Type](http://wiki.esipfed.org/index.php/Documenting_Resource_Type) |
| Unused | [Resource Format](http://wiki.esipfed.org/index.php/Documenting_Resource_Format) | [Contributor Role](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) |  |  |  |  |  |

### MODS Evaluation

The MODS User Guidelines version 3 was used to map the dialect to the concepts found in the DataCite recommendation. The user guide comes from the Library of Congress and can be found [here](https://www.loc.gov/standards/mods/userguide/index.html). There were 48 records that used a namespace from NSDL. These records were removed from the analysis. This is the largest collection analyzed.

Metadata Improvement

The concepts in the table below are either not contained in every record (incomplete), or in any record (unused). All of the concepts listed below can be contained in MODS dialect records. Click on the concept below to access online guidance for writing the concept in a variety of dialects.

Guidance Links

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Incomplete | [Publisher](http://wiki.esipfed.org/index.php/Documenting_Publisher) | [Resource Creation/ Revision Date](http://wiki.esipfed.org/index.php/Documenting_Resource_Creation_/_Revision_Date) | Keyword  Vocabulary | [Contributor Name](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) | Resource  Language |
|  | [Contributor Role](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) | Related Resource  Identifier | Abstract |  |  |
| Unused | [Spatial Extent](http://wiki.esipfed.org/index.php/Documenting_Spatial_Extent) | [Resource Format](http://wiki.esipfed.org/index.php/Documenting_Resource_Format) | Resource  Version |  |  |

### ISO Evaluation

The ISO records came from collections at EOL and Unidata as well as the DCERC ISO sample set of EOL records.

Metadata Improvement Guidance

The concepts in the table below are either not contained in every record (incomplete), or in any record (unused). All of the concepts listed below can be contained in ISO dialect records. Click on the concept below to access online guidance for writing the concept in a variety of dialects.

Guidance Links

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Incomplete | [Author/ Originator](http://wiki.esipfed.org/index.php/Documenting_Author_/_Originator) | [Publisher](http://wiki.esipfed.org/index.php/Documenting_Publisher) | Keyword Vocabulary | [Contributor Name](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) | [Contributor Role](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) | [Resource Creation/ Revision Date](http://wiki.esipfed.org/index.php/Documenting_Resource_Creation_/_Revision_Date) |
|  | Related Resource Identifier | Abstract | [Resource Version](http://wiki.esipfed.org/index.php/Citation_Documentation) | [Rights](http://wiki.esipfed.org/index.php/Documenting_Rights) |  |  |
| Unused | [Transfer Size](http://wiki.esipfed.org/index.php/Distribution_Information_Documentation) | [Resource Format](http://wiki.esipfed.org/index.php/Documenting_Resource_Format) |  |  |  |  |

### DataCite Evaluation

The DataCite sample set is the most diverse, coming from MMM, HAO, Unidata, and CISL. While the sample size is quite small there are many differences as to what is included in a record. It is worth noting that the records leave recommended concepts out even though the recommendation is from the same organization.

Metadata Improvement

The concepts in the table below are either not contained in every record (incomplete), or in any record (unused). All of the concepts listed below can be contained in ISO dialect records. Click on the concept below to access online guidance for writing the concept in a variety of dialects.

Guidance Links

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Incomplete | [Resource](http://wiki.esipfed.org/index.php/Documenting_Resource_Creation_/_Revision_Date)  [Creation/](http://wiki.esipfed.org/index.php/Documenting_Resource_Creation_/_Revision_Date)  [Revision Date(2)](http://wiki.esipfed.org/index.php/Documenting_Resource_Creation_/_Revision_Date) | Keyword  Vocabulary | Resource Version | Related  Resource Identifier | [Spatial](http://wiki.esipfed.org/index.php/Documenting_Spatial_Extent)  [Extent](http://wiki.esipfed.org/index.php/Documenting_Spatial_Extent) | [Rights](http://wiki.esipfed.org/index.php/Documenting_Rights) |
|  | Resource  Language | [Transfer Size](http://wiki.esipfed.org/index.php/Distribution_Information_Documentation) | [Resource](http://wiki.esipfed.org/index.php/Documenting_Resource_Format)  [Format](http://wiki.esipfed.org/index.php/Documenting_Resource_Format) |  |  |  |
| Unused | Resource Identifier Type | Author /  Originator Identifier | Author /  Originator Identifier Type | [Contributor Role](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) | Responsible Party  Identifier Type | Responsible Party  Identifier |

### netCDF Evaluation

The NcML files in the sample set were extracted from RAL NetCDF files. There are no concepts that appear in some files and not others.

Metadata Improvement

The concepts in the table below are not contained in any record (unused) while they do exist in the ISO-1 dialect. Click on the concept below to access online guidance for writing the concept in a variety of dialects.

Guidance Links

|  |  |  |
| --- | --- | --- |
| **Unused** | Keyword Vocabulary | [Contributor Role](http://wiki.esipfed.org/index.php/Individual,_Organization,_and_Role_Documentation) |

# Glossary

**Collection**: A group of metadata records commonly organized by a data facility, organization or project and often stored in a database or web accessible folder.

**Concept**: General term for describing a documentation entity. Concepts can occur in many dialects where they are typically represented (in XML) by an element.

**Dialect**: A particular form of the documentation language that is specific to a community.

**Dialect Maximum**: The maximum number of concepts from a particular recommendation that are included in a particular recommendation. Note: the dialect maximum is always less than or equal to the recommendation maximum.

**Element**: An item providing a value for a concept, typically in an XML representation. Elements depend on dialects. They are the instantiation of a concept in a dialect.

**Level**:   Recommendations may have different degrees of necessity associated with a concept’s occurrence in a record. These subsets of concepts within a recommendation are called levels.

**Recommendation**: A set of concepts that an organization identifies for achieving a documentation goal.

**Recommendation Maximum**: The number of concepts included in a particular recommendation. Note that the recommendation maximum is the maximum completeness score available for a metadata record being evaluated with respect to that recommendation. The recommendation maxima are always greater than or equal to all dialect maxima for that recommendation.

**Signature**: A series of numbers that give the number of concepts/elements missing from a metadata record (or a group of metadata records) in a series of levels. Signatures with low numbers indicate fewer missing elements and a signature made up completely of 0’s indicates a record or group of records that is complete with respect to a particular recommendation/dialect combination. A signature of 2 3 indicates that 2 elements are missing from the first level and 3 are missing from the second. The sum of the numbers in a signature is the total number of elements missing from a record or group of records.