



IDN Update

CEOS WGISS-47

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Hosted by the National Oceanic and Atmospheric
Administration (NOAA)

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Outline

- **IDN Activities (since WGISS-46)**
- **Registration of services for the IDN**
- **Setting up CEOS 2-Step OpenSearch in the IDN (CMR)**
- **Update on efforts to provide consistent Quality Assurance (QA) Rule messaging.**



I. IDN Activities (since WGISS-46)



Adding FedEO Platform/Instrument relations in KMS

- The relationships show the linkage of Instruments to Platforms.
- Services (Web Services and APIs) used for task:
 - **Skosmos (ESA Thesaurus)**: is a web based open source ontology browser.
 - URL: <http://fedeo.spacebel.be/thesaurus/en/>
 - **GCMD Keyword Manager (KMS)**: is a web based management system for maintaining and registering Keywords (not available externally).
 - **GCMD KMS API**: is a RESTful web service for maintaining keywords (science keywords, platforms, instruments, data centers, locations, projects, services, resolution, etc.) in the GCMD/IDN system.
 - Documentation URL:
<https://wiki.earthdata.nasa.gov/display/gcmdkey/Keyword+Management+Service+Application+Program+Interface>



FedEO Platform/Instrument relations in KMS

ESA Thesaurus

Content language English

Search

Alphabetical

Hierarchy

CR2 Cryosat

CS1..CS4, CS_1 COSMO-SkyMed

DE1,DE2 Deimos

EA1 TERRA

ECA EarthCARE

EN1 Envisat

EPI AQUA

ER1,ER2 ERS

FS2 FORMOSAT

GE1 GeoEye

GO1 GOCE

GR GRACE

GS1 GOSAT

ITC, ITD, IP3, IP5, IP6, IP7, IP8, IR2 IRS

IK2 IKONOS

JA1 Jason

JE1 JERS

KO1,KO2 KOMPSAT

L01..L08 Landsat

MA1,M1B MOS

MD1,DM2 DMC

MOA, MOB, MOC Metop

N01..N19 NOAA

NG1, NG2 NigeriaSat

N17 Nimbus

OC2 OceanSat

OD1 ODIN

OV2 OrbView

PL1 Pleiades

PR1,PRV PROBA

PS1 Parasol

QB2 QuickBird

QS1 QuikSCAT

RE1..RE5, RE_1 RapidEye

RO2 ResourceSat-2

RS2 RADARSAT

S1A, S1B, S1C, S1D Sentinel-1

S2A, S2B, S2C, S2D Sentinel-2

S3A, S3B, S3C, S3D Sentinel-3

SSP Sentinel-5P

SCI SCISAT

SE1 Seasat

SM1 SMOS

SP1..SP7 SPOT

SWA,SWB,SWC,SW_1 Swarm

TSK TerraSAR-X

UK1,UK2 UK-DMC

XX1..XXN XXXX

Earth Observation Satellite > Sentinel-1

PREFERRED TERM **S1A, S1B, S1C, S1D Sentinel-1**

DEFINITION

Sentinel-1 is the European Radar Observatory, representing the first new space component of the GMES (Global Monitoring for Environment and Security) satellite family, designed and developed by ESA and funded by the EC (European Commission). The Copernicus missions (Sentinel-1, -2, and -3) represent the EU contribution to GEOSS (Global Earth Observation System of Systems). Sentinel-1 is composed of a constellation of two satellites, Sentinel-1A and Sentinel-1B, sharing the same orbital plane with a 180° orbital phasing difference. The mission provides an independent operational capability for continuous radar mapping of the Earth with enhanced revisit frequency, coverage, timeliness and reliability for operational services and applications requiring long time series.

BROADER CONCEPT Earth Observation Satellite

ENTRY TERMS SENTINEL-1

NOTE A,B,C,D

HOSTS SAR

URI <https://earth.esa.int/concept/sentinel-1>

Download this concept: RDF/XML TURTLE JSON-LD

SEE ALSO

https://directory.eoportal.org/web/eoportal/satellite-missions/c-missions/copernicus-sentinel-1	directory.eoportal.org
https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/sentinel-1	earth.esa.int

EXACTLY MATCHING CONCEPTS

https://gcmdservices.gsfc.nasa.gov/kms/concept/007c3084-89db-458e-8387-14e192b6cb8e	gcmdservices.gsfc.nasa.gov
---	----------------------------



FedEO Platform/Instrument relations in KMS

GCMD

Version: 8.6 (PRODUCTION)

Undo Trash Can

- ☐ SCD
- ☐ SCISAT-1/ACE
- ☐ SEASAT 1
- ☒ SENTINEL-1
 - ☐ SENTINEL-1A
 - ☐ SENTINEL-1B
- ☐ SENTINEL-2
- ☒ SENTINEL-3
 - ☐ SENTINEL-3A
 - ☐ SENTINEL-3B
- ☐ SES-14
- ☐ SME
- ☐ SMS (Synchronous Meteorological Satellite)
- ☒ SPOT
 - ☐ SPOT-1
 - ☐ SPOT-2
 - ☐ SPOT-3
 - ☐ SPOT-4
 - ☐ SPOT-5
 - ☐ SPOT-6

Keyword Editor

Save Keyword Reset Form Print Keyword Close Window

Keyword UUID: c7279e54-f7c1-4ee7-a957-719d6021a3f6

Broader Keyword: Platforms>Earth Observation Satellites>SENTINEL-1

Preferred Label: SENTINEL-1A

Alternate Label(s)

primary SENTINEL-1A

Add Alternate Label

Resource(s)

image http://www.esa.int/images/sentinel2_alcatel_M.gif

Add Resource

Definition: The SENTINEL-1 mission is the European Radar Observatory for the Copernicus joint initiative of the European Commission (EC) and the European Space Agency (ESA). Copernicus, previously known as GMES, is a European initiative for the implementation of information services dealing with environment and security. It is based on observation data received from Earth Observation satellites and ground-based information.

Definition Reference: Enter reference for keyword definition

Related Keyword(s)

C-SAR (instruments)

Remove

Edit

Add Related Keyword

Edit Keyword Relation

UUID: ed400e7c-229e-48be-9a93-84f2fc864448

Keyword Title: C-SAR

Relationship Strength: Enter value between 0 to 1.0, 0.5 by default

Relationship Type:

Platform-Instrument

Done Cancel

Helpful Notes

Relationship Strength: 0-1, 1 being the strongest, 0.5 by default

Relationship Types:

- Platform-Instrument
- Instrument-Sensor
- Similar: Two keywords in same scheme which are close but different
- Transitive: Keyword in scheme A is the same as keyword in scheme B with x% probability
- Undefined: Default



Platform/Instrument relation using KMS API (JSON)

```
← → ↺ https://gcmdservices.gsfc.nasa.gov/kms/concept/c7279e54-f7c1-4ee7-a957-719d6021a3f6?format=json 🔍 ☆

{
  "termsOfUse": "See http://gcmd.nasa.gov/z/1/TermsOfUse",
  "keywordVersion": "8.6",
  "schemeVersion": "2019-03-26 18:35:48",
  "lastModifiedDate": "2019-02-22 13:54:55.0",
  "id": "345757",
  "uuid": "c7279e54-f7c1-4ee7-a957-719d6021a3f6",
  "prefLabel": "SENTINEL-1A",
  "altLabels": [
    { "category": "primary", "text": "SENTINEL-1A" }
  ],
  "resources": [
    { "type": "image", "url": "http://www.esa.int/images/sentinel2_alcatel_M.gif" }
  ],
  "isLeaf": "true",
  "broader": [
    {
      "id": "367691",
      "uuid": "007c3084-89db-458e-8387-14e192b6cb8e",
      "prefLabel": "SENTINEL-1",
      "conceptScheme": "platforms",
      "isLeaf": "false"
    }
  ],
  "related": [
    {
      "id": "349091",
      "uuid": "ed400e7c-229e-48be-9a93-84f2fc864448",
      "prefLabel": "C-SAR",
      ,
      ,
      "conceptScheme": "instruments",
      "isLeaf": "true"
    },
    {
      "id": "346471",
      "uuid": "1c53d85e-3792-4081-9748-192fd3140aa6",
      "prefLabel": "SENTINEL-1 C-SAR",
      ,
      ,
      "conceptScheme": "instruments",
      "isLeaf": "true"
    }
  ],
  "conceptScheme": { "name": "platforms", "longName": "Platforms" }
}
```



Ingest of NOAA_NCEI (NOAA OneStop) Native ISO

- IDN preformed a comparison between NASA MEND's ISO metadata and NOAA OneStop ISO metadata.
- 4 issues were discovered that prevented the NOAA OneStop's ISO from ingesting directly into the CMR for the IDN.
- NOAA, NASA CMR, and IDN worked together to revolve these issues.
- Presently, 70 NOAA_NCEI GHRST ISO have been ingested into the CMR for the IDN.



New JAXA GCOM-C collection records

- 149 JAXA GCOM-C collection records have been ingested for discovery in the IDN (CMR)
- CEOS WGISS “Discovery and Access” page has information on GCOM-C products:
 - <http://ceos.org/ourwork/workinggroups/wgiiss/access/>
- IDN access to collection metadata:
 - [https://idn.ceos.org/search/Titles.do?subset=idn&json={"condition":{"and":\[{"keyword":"*"}\],{"project":"GCOM-C"}}}](https://idn.ceos.org/search/Titles.do?subset=idn&json={)

Keyword Viewer:

<https://gcmd.nasa.gov/search/Keywords.do#keywords>



Transition of DIF-9 to DIF-10

Provider	# of records	# of records transition	# of records not transition	Completion Percentage	State
SCIOPS	15933	15933		100%	Completed
AU_AADC	2819	0	2819	0%	Starting Q2
CNES	20	20	0	100%	Completed
ESA	112	20	92*	18%	On-going
EUMETSAT	37	37	0	100%	Completed
INPE	43	43	0	100%	Completed
ISRO	34	34	0	100%	Completed
JAXA	388	388	0	100%	Completed
NOAA_NCEI	5563	84	5479**	1%	On-going
USGS_EROS	146	146	0	100%	Completed
Total	25095	16705	8390	67%	

* New delivery of FedEO ESA records in calendar Q2 will replace existing records.

** Remove and replace NOAA/NCEI records.



Attended Conferences: AGU and ESIP

- ESIP Winter Meeting 2019 (Presentation)
 - [Topic](#): GCMD Keyword Management Process and Life-Cycle
 - [Summary](#): Show the process for GCMD keywords - fast track and yearly reviews through the ESDIS Standards Office, and how Earth science users can influence keyword additions and modifications. Highlight how keywords facilitate the discovery of EOSDIS data and services. Upcoming keyword reviews.
 - Session Abstract link:
 - <https://2019esipwintermeeting.sched.com/event/JORW/gcmd-keyword-management-process-and-lifecycle>
- AGU Winter Meeting 2018 (Poster)
 - [Topic](#): Structured Methods for Organization and Discovery of Variables within NASA's Common Metadata Repository

Structured Methods for Organization and Discovery of Variables within NASA's Common Metadata Repository

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Simon Cantrell | Christopher Lynnes

IN53E-2731



NASA's Common Metadata Repository is evolving to support discovery at the level of individual variables, and to support the end-to-end process of data analytics that starts with the discovery of specific variables and ends with analysis-ready data sets. Variable-level metadata records will focus on provisioning variables with an extensible set of attribute/value pairs, producing CMR-compliant metadata records that can describe the underlying phenomenon and measurement approach represented in the data. Such records will not only help with data discovery, but will also lay the foundation for developing automated data transformation services, which require variable-specific metadata to prepare heterogeneous data for use in multi-variate analyses. A phased approach to provisioning variables with CMR-compliant metadata is planned, beginning with metadata that will identify the measurement object (the feature of interest) and the quantity being measured. Because the approach to generating variable-level metadata records is to assign descriptive attribute/value pairs to variables (e.g., measurement object/ambient aerosol, quantity/optical depth) it is easily extensible and additional attribute/value pairs can be phased in as needed, based on input from data processing application developers and the science community about what descriptors are needed to support the desired transformation processes.

- 2017 ES&S focus group investigated data transformation use cases and requirements and found that most use cases involve multi-variate analyses using variables from a number of disparate data sets.
- During the data discovery phase, users need to identify suitable variables for their research - Keyword tags are not informative enough to determine suitability.
- Subsetting by variable is one of the most common pre-processing tasks performed by researchers.
- During the analysis phase users need to pre-process multiple variables from heterogeneous data sets to make them interoperable - variable level metadata is needed to support these processes.

Similar phenomena may be measured using different techniques; users need information, during the discovery phase, about what was measured, what quantity of that thing was measured, as well as other distinguishing characteristics of the measurement approach adequate to determine if the data are suitable for a particular research purpose.

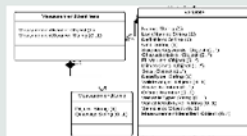
Measurement Object	Quantity	Vertical Profile
- Ambient aerosols - Ambient aerosols - Aerosol dust - Clouds - Radiation - Radiation - Black Carbon Particles - Cirrus Cloud - Cirrus Cloud Bottom - Air - Air - Ocean	- Optical Depth - Mass Concentration - Optical Depth - Optical Depth - Irradiance - Irradiance - Diameter - Water path - Height - Pressure - Temperature - Temperature	- Integrated vertical column - Pressure levels - Pressure levels - Integrated vertical column - Top of the atmosphere

Maps on variables allow us to sort them into classes and to identify both how two or more variables are similar and how they are different. The modularity of mapping, as opposed to assigning fully specified standard names, helps to support different approaches to data discovery. Users can, for example, search for all variables for which the measurement object is aerosols, and discover, e.g., that there are measurements of aerosol optical depth as well as aerosol density.

Similarly, users might search on temperature and discover that there are air temperature measurements as well as ocean temperature measurements. Additional maps, such as vertical profile maps, can further classify or differentiate similar variables. For example, two variables representing measurements of aerosol optical depth might differ in the vertical profiles.

Ultimately, this approach to variable-level metadata records lays the foundation for automating pre-processing tasks required to support data analytics. These processes need to be done at the variable-level: subsetting, regridding, reprojecting, and automated processing pipelines need access to metadata that is specific to individual variables.

Class Design



Metadata Examples

Measurement Names: in format
 <Object>__<Quantity>
 atmosphere_aerosol_radiation__incoming__shortwave__absorbed__energy_flux
 atmosphere_aerosol_radiation__incoming__shortwave__reflected
 soil_surface_water__infiltration__volume_fraction
 soil_surface_water__volume_fraction
 soil_ice__mass_fraction
 glacier_ice__temperature
 glacier_ice__thickness

Sources: "CSDMS", "CF", "BODC"
 Topic: "Atmosphere", "Land", "Cryosphere"

Process Workflows

- Ingest variable metadata, names, dimensions, standard names, etc.
- Map Measurement Names to variable record using specific rules.
- Peer Review mappings with community standards and references for Measurement Names, if necessary.

Issues/Challenges

- Mapping variables can be challenging, both because of the number of variables that need to be mapped and because semantically consistent maps are needed.

Solutions

- Use more formal metadata naming structure and source identification.
- Allow measurement names to be mapped to variables at the time of ingest.





II. Registration of services for the IDN



Registering Services into the CMR for IDN

- (Future) CEOS Providers will be able to register services using the Draft Metadata Management Tool (MMT)
- (Present) providers can send to the IDN the UMM-S Service JSON file or fill out a template of the fields' values.



Draft Metadata Management Tool (MMT)

The screenshot shows the NASA Earthdata Metadata Management Tool (MMT) interface. The top navigation bar is blue and contains the NASA logo, the text "EARTHDATA Metadata Management Tool", a search input field labeled "Enter Search Term", and a "Search Services" button. The user's name "Michael Morahan" and the provider "DEV07" are displayed in the top right. Below the navigation bar, there are two tabs: "MANAGE COLLECTIONS v1.12" and "MANAGE SERVICES v1.2". The "MANAGE SERVICES v1.2" tab is active, showing two main sections: "Create Service Record" and "DEV07 Service Drafts". The "Create Service Record" section has a "Create New Record" button and a note: "OR use the search in the top right corner to find published services to clone or edit." The "DEV07 Service Drafts" section lists three drafts: "2018-11-07 | DEV07_ESI DEV07 ESI EOSDIS Service Impl...", "2018-10-12 | DEV07 SFD Service DEV07 SFD Service 01", and "2018-02-22 | <Blank Name> <Untitled Service Record>". Annotations with orange arrows point to various elements: "User and Provider" points to the top right user information; "Search in CMR" points to the search input field; "Create new draft" points to the "Create New Record" button; and "Open drafts" points to the "DEV07 Service Drafts" section.

Annotations:

- User and Provider
- Search in CMR
- Create new draft
- Open drafts

Interface Elements:

- NASA EARTHDATA Metadata Management Tool
- Michael Morahan DEV07
- Enter Search Term Search Services
- MANAGE COLLECTIONS v1.12
- MANAGE SERVICES v1.2
- Create Service Record
- Create New Record
- OR use the search in the top right corner to find published services to clone or edit.
- DEV07 Service Drafts
- 2018-11-07 | DEV07_ESI DEV07 ESI EOSDIS Service Impl...
- 2018-10-12 | DEV07 SFD Service DEV07 SFD Service 01
- 2018-02-22 | <Blank Name> <Untitled Service Record>

V 1.95.5 · NASA Official: Stephen Berrick · FOIA · NASA Privacy Policy · USA.gov



UMM-S Required Fields

Field Name	Description
Name	The name of the service, software, or tool. (Example: "AIRS_L3_OPENDAP".)
LongName	The long name of the service, software, or tool. It provides a human readable name for the service. (Example: "OPENDAP (Hyrax) framework for AIRS Level 3 data products".)
Type	The type of the service, software, or tool. (Example: OPeNDAP)
Version	The edition or version of the service, software, or tool. The version should be defined in the form x, y, and z. where 'x.y.z' means 'major.minor.incremental' version numbers. Typically, 'x' and 'y' are numbers (0 through 9) and 'z' is a number (0 through 99). (Example: 1.1.1)
Description	A brief description of the service, software, or tool. For example, a description might contain information about what is the service, the purpose of the service, and the parameters (or variables) being invoked, and what are the sources of these data.
RelatedURLS	This element contains important information about the Uniform Resource Locator (URL) for the service.
ServiceKeywords	Allows for the specification of Earth Science Service keywords that are representative of the service, software, or tool being described. The controlled vocabulary for Service Keywords is maintained in the Keyword Management System (KMS). (Example: "ServiceCategory: Earth Science Services, ServiceTopic: Data Management/Data Handling, ServiceTerm: Data Search and Retrieval".)
ServiceOrganizations	The service provider, or organization, or institution responsible for developing, archiving, and/or distributing the service, software, or tool. (Example: "Role: SERVICE PROVIDER, ShortName: INPE, LongName: National Institute for Space Research, Brazil".)



CMR SEARCH API

Service records can be searched using the CMR SEARCH API:

Search for all

```
curl 'https://cmr.earthdata.nasa.gov/search/services'
```

Search by Keyword

```
curl 'https://cmr.earthdata.nasa.gov/search/services?keyword=OPeNDAP&pretty=true'
```

Search for specific service

```
curl 'https://cmr.earthdata.nasa.gov/search/services.umm_json?name=MUR-JPL-L4-GLOB-v4.1&pretty=true'
```

CMR SEARCH API Documentation:

```
https://cmr.earthdata.nasa.gov/search/site/docs/search/api.html#searching-for-services
```



III. Setting up CEOS 2-Step OpenSearch in the IDN (CMR)



CEOS 2-Step OpenSearch “Option 1”

- Send to the IDN a populated spreadsheet with the following values:
 - CMR collection record’s Concept ID (if the record exist in the IDN (CMR) (e.g.: C1532648141-ESA)
 - Collection record’s Entry_ID (ShortName)
 - Granule OSDD link (Example):
"http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS:CryoSat.products"

Concept_ID	Entry_ID (ShortName)	OpenSearch Granule OSDD
C1532648141-ESA	CryoSat products	http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS:CryoSat.products
C1214560189-ESA	SMOS.MIRAS.MIR_OSUDP2	http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS:SMOS.MIRAS.MIR_OSUDP2



CEOS 2-Step OpenSearch “Option 2”

- Populate the DIF-10 Field Related_URL with the following values:
 - Type with “USE SERVICE API”
 - Subtype with “OpenSearch”
 - URL with the granule OSDD link
 - Description with tag_key: opensearch.granule.osdd
- Example of the DIF-10 text:

```
<Related_URL>
  <URL_Content_Type>
    <Type>USE SERVICE API</Type>
    <Subtype>OpenSearch</Subtype>
  </URL_Content_Type>
  <URL>http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:FEDEO:C
  COLLECTIONS:CryoSat.products</URL>
  <Description>tag_key: opensearch.granule.osdd</Description>
  <Mime_Type>application/opensearchdescription+xml</Mime_Type>
</Related_URL>
```



Search for Tags using CMR API

- IDN staff will add the `opensearch.granule.osdd` tag in the CMR for providers.
- Providers can verify the addition of the tag using the CMR Search API:
https://cmr.earthdata.nasa.gov/search/collections.json?concept_id=C1532648141-ESA&include_tags=*&pretty=true
- Example of JSON output of the query:

```
...
"tags" : {
  "opensearch.granule.osdd" : {
    "data" :
"http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:FEDEO:COLLECTIONS:CryoSat.products" },
    "int.esa.fedeo" : { },
    "org.ceos" : { }
  },
  "id" : "C1532648141-ESA",
  ...
```



OSDD URL within OpenSearch Metadata

- Discovery: The OpenSearch collection metadata URL is returned to the client user.

<https://cmr.earthdata.nasa.gov/opensearch/collections.atom?uid=C1532648141-ESA>

- Within the collection metadata is the OSDD URL used for granule searches:

```
...  
<link  
href="http://fedeo.esa.int/opensearch/description.xml?parentIdentifier=EOP:ESA:FEDEO:COLLEC  
TIONS:CryoSat.products" hreflang="en-US" type="application/opensearchdescription+xml"  
rel="search" title="Non-CMR OpenSearch Provider Granule Open Search Descriptor  
Document"/>...
```



IV. Update on efforts to provide consistent Quality Assurance (QA) Rule messaging.



Registering Services into the CMR for IDN

- **New Task:** QA Rule Set Consolidation and Implementation Strategy Across Tools
- **Background:** CMR and IDN Metadata Validation services/tools for providers use different implementations and/or QA Rules.
- **Overall Goal:** Give metadata providers consistent QA results when creating, publishing and updating IDN (CMR) collection metadata base on QA Rule checks.



Questions

Please provide questions/comments to:

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valerie.dixon@nasa.gov (NASA)

christopher.s.lynnes@nasa.gov (NASA)



Background Information

Example: CERES EBAF Edition 4.0 TOA Cloud Effective Temperature Daynight Monthly.

```
{
  "Name":"ceres_ebaf_e4_toa_cldtemp_total_daynight_mon",
  "LongName":"Cloud Effective Temperature, Monthly Means, Daytime-and-Nighttime conditions",
  "Description":"CERES EBAF Edition 4.0 TOA Cloud Effective Temperature Daynight Monthly. ",
  "Type":"WEB PORTAL",
  "Version":"1.6",
  "RelatedURLs":
  [{
    "Description":"Cloud Effective Temperature, Monthly Means, Daytime-and-Nighttime conditions
    Image Service",
    "URLContentType":"DistributionURL",
    "Type":"GET SERVICE",
    "URL":"https://asdc-arcgis.larc.nasa.gov/server/rest/services/CERES/ceres_ebaf_e4_toa_cldtemp_total_daynight_mon/ImageServer"
  }],
}
```

```
"AccessConstraints":"Users must have a NASA Earthdata Login account to use the ASDC Web
Portal site.",
"ServiceOrganizations":
[{
  "Roles":["SERVICE PROVIDER"],
  "ShortName":"NASA/LaRC/ASDC",
  "LongName":"Atmospheric Sciences Data Center, Langley Research Center, NASA",
  "ContactPersons":
  [{
    "Roles":["SERVICE PROVIDER"],
    "FirstName":"Matt",
    "LastName":"Tisdale"
  }],
  "ContactInformation":
  {
    "RelatedUrls":
    [{
      "URLContentType":"DataCenterURL",
      "Type":"HOME PAGE",
      "URL":"https://asdc-arcgis.larc.nasa.gov/portal/home/"
    }],
    "ContactMechanisms":
    [{
      "Type":"Email",
      "Value":"matthew.s.tisdale@nasa.gov"
    }],
    "Addresses":
    [{
      "StreetAddresses":
      [
        "NASA Langley Research Center",
        "Mail Stop 157D"
      ],
      "City":"Hampton",
      "StateProvince":"VA",
      "Country":"United States",
      "PostalCode":"VA 23681-2199"
    }],
  }
}
```

```

  }
},
  "ServiceKeywords":
  [{
    "ServiceCategory":"EARTH SCIENCE SERVICES",
    "ServiceTopic":"DATA ANALYSIS AND VISUALIZATION"
  }],
  "ScienceKeywords":
  [{
    "Category":"EARTH SCIENCE",
    "Topic":"ATMOSPHERES",
    "Term":"CLOUD PROPERTIES"
  }],
  {
    "Category":"EARTH SCIENCE",
    "Topic":"ATMOSPHERE",
    "Term":"CLOUDS"
  }],
  "Platforms":
  [{
    "ShortName":"Terra",
    "LongName":"Earth Observing System, Terra (AM-1)",
    "Instruments":
    [{
      "ShortName":"CERES",
      "LongName":"Clouds and the Earth's Radiant Energy System (CERES)"
    }],
    {
      "ShortName":"Aqua",
      "LongName":"Earth Observing System, Aqua",
      "Instruments":
      [{
        "ShortName":"CERES",
        "LongName":"Clouds and the Earth's Radiant Energy System (CERES)"
      }],
      {
        "ShortName":"Suomi-NPP",
        "LongName":"Suomi, NPOESS Preparatory Project",
        "Instruments":
        [{
          "ShortName":"CERES",
          "LongName":"Clouds and the Earth's Radiant Energy System (CERES)"
        }],
        {
          "OperationMetadata":
          [{
            "OperationName":"GetMap",
            "DistributedComputingPlatform":["XML","WEBSERVICES"],
            "OperationDescription":"The GET operation returns image data for a specific identifier,
            detailed service capabilities, bounding boxes (extent), authorities (projections), grid axes, labels,
            time extent and formats",
            "InvocationName":"ASDC ArcGIS Image Server",
            "ConnectPoint":
          }
        ]
      }
    ]
  }
}
```

```

  {
    "ResourceName":"ceres_ebaf_e4_toa_cldtemp_total_daynight_mon",
    "ResourceLinkage":"https://asdc-arcgis.larc.nasa.gov/server/rest/services/CERES/ceres_ebaf_e4_toa_cldtemp_total_daynight_mon/ImageServer",
    "ResourceDescription":"Access the Cloud Effective Temperature, Monthly Means,
    Daytime-and-Nighttime conditions monthly image data through ArcGIS for Server REST Service"
  },
  "CoupledResource":
  {
    "ScopedName":"ceres_ebaf_e4_toa_cldtemp_total_daynight_mon",
    "CouplingType":"TIGHT",
    "DataResource":
    {
      "DataResourceIdentifier":"ceres_ebaf_e4_toa_cldtemp_total_daynight_mon",
      "DataResourceSourceType":"Map",
      "DataResourceSpatialType":"BOUNDING_BOX",
      "DataResourceSpatialExtent":
      {
        "SpatialBoundingBox":
        {
          "CRSIdentifier":"4326",
          "WestBoundingCoordinate":-180.0,
          "SouthBoundingCoordinate":-90.0,
          "EastBoundingCoordinate":180.0,
          "NorthBoundingCoordinate":90.0
        }
      },
      "SpatialResolution":36,
      "SpatialResolutionUnit":"KM",
      "DataResourceTemporalType":"TIME_RANGE",
      "DataResourceTemporalExtent":
      {
        "TimePoints":
        [{
          "Time":"%Y%M",
          "Value":"2012-01",
          "Description":"Start date of the image data"
        }],
        {
          "Time":"%Y%M",
          "Value":"2017-12",
          "Description":"End date of the image data"
        }
      ],
      "TemporalResolution":1,
      "TemporalResolutionUnit":"MONTH"
    }
  }
}
```