

Global Change Master Directory (GCMD) Keywords: A Resource for Building an Earth Science Ontology



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- GCMD Introduction
- GCMD Keywords Overview
- Keyword Development Process
- Keyword Ontology Applications
- Conclusions





GCMD Introduction



What is the GCMD?

- Facilitates the discovery of Earth science data and related services.
- Provides a search interface that allows users to search by free text, browse the GCMD controlled keywords, and do keyword refinements.
- Powered by the NASA Common Metadata Repository (CMR), the authoritative source for NASA's and IDN metadata.



http://gcmd.nasa.gov





GCMD Keywords Overview



- Are a hierarchical set of controlled vocabulary covering Earth science disciplines that have been evolving for over 20 years.
- Are used for describing Earth science data and services in a consistent and comprehensive manner to allow for the precise searching of collection metadata and subsequent retrieval of data.
- Follow a governance process which defines the procedure for recommending additions, modifications, and/or deprecations to the keywords, and the process by which the user community will be informed of changes.

Earth Science Keywords







• (# of keyword 'concepts' per category)



Earth Science Category

Keyword Level	Example
Category	Earth Science
Торіс	Atmosphere
Term	Weather Events
Variable Level 1	Subtropical Cyclones
Variable Level 2	Subtropical Depression
Variable Level 3	Subtropical Depression Track
Detailed Variable	Subtropical Depression 7 Track

Platform/Sources Category

Keyword Level	Example
Short Name	Aqua
Long Name	Earth Observing System, Aqua

Mage Mow Organizations Are Using GCMD Keywords

Over 50 organizations are using the keywords in the following ways:

- Authoritative Vocabulary, Taxonomy, or Thesaurus
 - Committee on Earth Observation Satellites, Standing Committee on Antarctic Data Management (SCADM), Socioeconomic Data and Applications Center, Japan Aerospace Exploration Agency (JAXA)
- Foundation for Building Ontologies
 - SWEET
- Integration Within Metadata Catalogues
 - Earth Data Search Client, ORNL Mercury, NOAA One-Stop
- Integration Within Metadata Curation Tools
 - docBUILDER, Metadata Management Tool

Keyword Development Process





Keyword Development/Governance Process

- Describes the end-to-end process of a keyword from initial request, triage, approval, notification, and implementation.
- Keywords are managed using a configuration management tool insert, update, move, delete, and relate keywords and associated definitions/references.
- The Keyword Governance Process is derived from the Keyword Governance document.



Criteria For What Makes Good Keywords

- Applicable to an established science discipline and practical to a broad range of users and metadata providers.
- Composed of conventional terminology that is functional and understandable by the international community.
- Should not overlap with keywords that already exist.
- Parallel in scope at any level of the hierarchy.
- All chosen topics, terms, and variables, at any level within the hierarchy, must be distinctive minimizing overlap as much as possible. This will ensure a concise keyword list.
- Should be logically/semantically correct.

Discuss Keywords Via The Community Forum

The <u>GCMD Keyword Community Forum</u> provides keyword users and metadata providers with an area for discussion of topics related to the GCMD Keywords. Participants are invited to use the forum to ask questions, submit keyword requests, discuss trade-offs, and track the status of keyword requests. See <u>http://earthdata.nasa.gov/gcmd-forum</u>.

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GCMD Keywords Community Forum eated by Ross Bagwell, last modified by Tyler Stevens on Oct 31, 2016 elcome! The purpose of this forum is to provide keyword users and meta eywords. Participants are invited to use this forum to ask questions, subr	N HOME	rith an area for discu: ests, discuss trade-o	ssion of topics r ffs, and track th	related to the GCMD ne status of keyword requests.	NASA	Have a Recomment for a Keyword of Question About		
Announcements CCMD Keywords Version 8.4 Release GCMD Keyword Governance and Community Guide Document					How To Use This Forum To post, an Earthdata Login account is required.	GCMD Keywords		
Forum					> Directions for Using the Forum			
Search for Topics	8	+ New Topic	⑦ 12 topics	found	> Requirements for Posting to the Forum			
nclude comments 🗹 Show /	Advanced Filters			Sticky topics on top 🗹	Keyword FAQ's			
Keyword Topic	Author	Creation Date	# of Replie	es Last Activity Date	What Are the GCMD Keywords? How Do I Submit a Keyword Request or Issue?			
GOES-R Platform Keyword Changed to GOES-16 new The GOES-R satellite was successfully launched from Cape Canaveral, Florida, on November 19, 2016 at 6:42pm EST. The GCMD Platform Keyword name has been changed from GOES-18 ocOES-18 according to NASA/NOAA post launch protocol. GOES-16 home page: http	Scott Ritz	Dec 01, 2016	0	Dec 01, 2016	How Do I Access the GCMD Keywords? How Do I Cite the GCMD Keywords? Related Keyword Links			
Investigation of Keyword Viewer GCMD is considering support for end users to browse the hierarchical set of GCMD Keywords in a web browser similar to how users browse collection-level metadata in the GCMD and Earthdata search interfaces https://wiki.earthdata.nasa.gov/www.followthesteps	Tyler Stevens	Jun 30, 2016	1	Nov 30, 2016	More on GCMD Keywords Other Related Links			
Identifying individual GCMD keyword sets I was reading this forum posting https://wiki.earthdata.nasa.gov/pages //iewpage.action?pageId=74619388 and have a related question. GCMD comprises II sets of keywords. Although each keyword set covers a particular subject area, the recommended dation f	Rowan Brownlee	Nov 16, 2016	1	Nov 22, 2016	Open Keyword Requests All Keyword Requests			
Summary of Proposed Keywords For Version 8.5 and 8.6 This spreadsheet conveys a summary of the proposed 8.5 and 8.6 keywords that will be reviewed through the NASA ESDIS Standards Office (ESO) Husy/kentrdata nasa gov/abou/teshi-project/esdis- standards-office-eso. If you are interested in becoming a keyw	Tyler Stevens	Nov 21, 2016	0	Nov 21, 2016	Other Forums Atmospheric Science User Forum Ocean Science: Ocean Biology Distributed Active Archive			
Usage of GCMD concept URIs I'm interested in understanding more about GCMD usage. I work for the Australian National Data Service (ANDS). ANDS has a catalogue of Australian data collections (Research Data Australia), or RDA). Some of the providers of metadata to RDA use GCMD keyword	Rowan Brownlee	Nov 16, 2016	1	Nov 17, 2016	Center (08.DAAC) • Physical Oceanography Distributed Active Archive Center (PO.DAAC)			





Keyword Ontology Applications

GCMD Platform-Instrument Ontology

An ontology relating Earth Observation Satellites to their associated instruments, utilizing existing GCMD keywords.

- Accessible via KMS API
- Applied in docBUILDER metadata authoring tool (suggests instruments based on platform selected)



GCMD Ontology Implementation

Keywords are linked and related via unique identifiers known as UUIDs. Keywords are represented as SKOS Concepts (RDF).





- Initial effort focused on Earth Observation Satellites and their Instruments/Sensors
 - Encompasses most of NASA's datasets
 - Relationships are strongly defined:
 - Instrument "A" flies on Satellite "B"
 - Example: MODIS flies on Aqua
- Researched relationships using GCMD/IDN Metadata, product guides & catalogs, external taxonomies/ontologies, science expertise
- Documented relationships in KMS
 - 254 Platforms; 527 Instruments

Ontology Application in Metadata Curation

Metadata Authoring

 Restrict keying of Platform/Instrument fields in docBUILDER to known relationships.





Conclusions

- Strengths of Keyword Approach:
 - Defines a well structured hierarchy (for foundation of ontology building)
 - Established sets of diverse keywords across the Earth Sciences
 - Governance process that solicits community participation
 - Process for continually reviewing data products and updating keywords as needed to describe those products
 - Established tools for managing the keywords
 - Publically accessible in standardized formats
 - Regular keyword releases (bi-annually)

We are interested to hear how your community may be using the GCMD Keywords.



Background



Accessing the Keywords

• Background Information on the GCMD Keywords

• <u>https://earthdata.nasa.gov/about/gcmd/global-change-master-directory-gcmd-keywords</u>

Access the Static Copy of the Keywords

<u>https://wiki.earthdata.nasa.gov/display/CMR/GCMD+Keyword+Access</u>
 o Available in CSV Format

Access the Dynamic Keyword API

- <u>http://gcmdservices.gsfc.nasa.gov/kms/capabilities?format=html</u>
 - Available in SKOS/RDF/OWL/XML formats

Types of Support Provided by the GCMD

Provide Online Services:

- GCMD Home Page
- GCMD Search Interface
- Portals
- Support Metadata Creation Through docBuilder
- Support Keyword Development and Access via KMS

Support Standards and Tools:

- DIF9 and DIF10, SERF, Keywords, CMR Unified Metadata Model
- QA Rules, Curation and Keyword Tools
- Access CMR Database via Ingest API and Search API

Ingest and Curate Records:

- From CEOS Partners, International Partners and US Agencies
- Translation and Ingest Support
- Curation (Automated and Manual)



Organizations Using GCMD Keywords











GeoConnections GéoConnexions

Canada





GOSIC Global Observing Systems Information Center

marinescotland

science













The Federation of Earth Science Information Partners Fostering connections to make data matter





The Scottish