



EOSDIS

NASA'S EARTH OBSERVING SYSTEM
DATA AND INFORMATION SYSTEM

ESIP Documentation Cluster Session: GCMD Keyword Update

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Presentation Outline

- I. Overview of GCMD Keywords
- II. How GCMD Keywords Are Being Used by U.S. and International Communities
- III. Learn More
- IV. Discussion

I. OVERVIEW OF GCMD KEYWORDS

GCMD Keywords

- A hierarchical set of controlled vocabulary covering Earth science disciplines that have been evolving for over 20 years.
- Describe Earth science data and services in a consistent and comprehensive manner.
- 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

 AGRICULTURE (2094) agricultural aquatic sciences, agricultural chemicals, agricultural engineering, agricultural plant science, animal commodities show all...	 ATMOSPHERE (8427) aerosols, air quality, altitude, atmospheric chemistry, atmospheric electricity show all...
 BIOLOGICAL CLASSIFICATION (4299) animals/invertebrates, animals/vertebrates, bacteria/archaea, fungi, plants show all...	 BIOSPHERE (8176) ecological dynamics, ecosystems, vegetation show all...
 CLIMATE INDICATORS (684) atmospheric/ocean indicators, biospheric indicators, cryospheric indicators, land surface/agriculture indicators, paleoclimate indicators show all...	 CRYOSPHERE (3284) frozen ground, glaciers/ice sheets, sea ice, snow/ice show all...
 HUMAN DIMENSIONS (4251) boundaries, economic resources, environmental governance/management, environmental impacts, habitat conversion/fragmentation show all...	 LAND SURFACE (6423) erosion/sedimentation, frozen ground, geomorphic landforms/processes, land use/land cover, landscape show all...
 OCEANS (11549) aquatic sciences, bathymetry/seafloor topography, coastal processes, marine environment monitoring, marine geophysics show all...	 PALEOCLIMATE (1619) ice core records, land records, ocean/lake records, paleoclimate reconstructions show all...
 SOLID EARTH (3149) earth gases/liquids, geochemistry, geodetics, geomagnetism, geomorphic landforms/processes show all...	 SPECTRAL/ENGINEERING (3174) gamma ray, infrared wavelengths, lidar, microwave, platform characteristics show all...
 SUN-EARTH INTERACTIONS (445) ionosphere/magnetosphere dynamics, solar activity, solar energetic particle flux, solar energetic particle properties show all...	 TERRESTRIAL HYDROSPHERE (3520) glaciers/ice sheets, ground water, snow/ice, surface water, water quality/water chemistry show all...

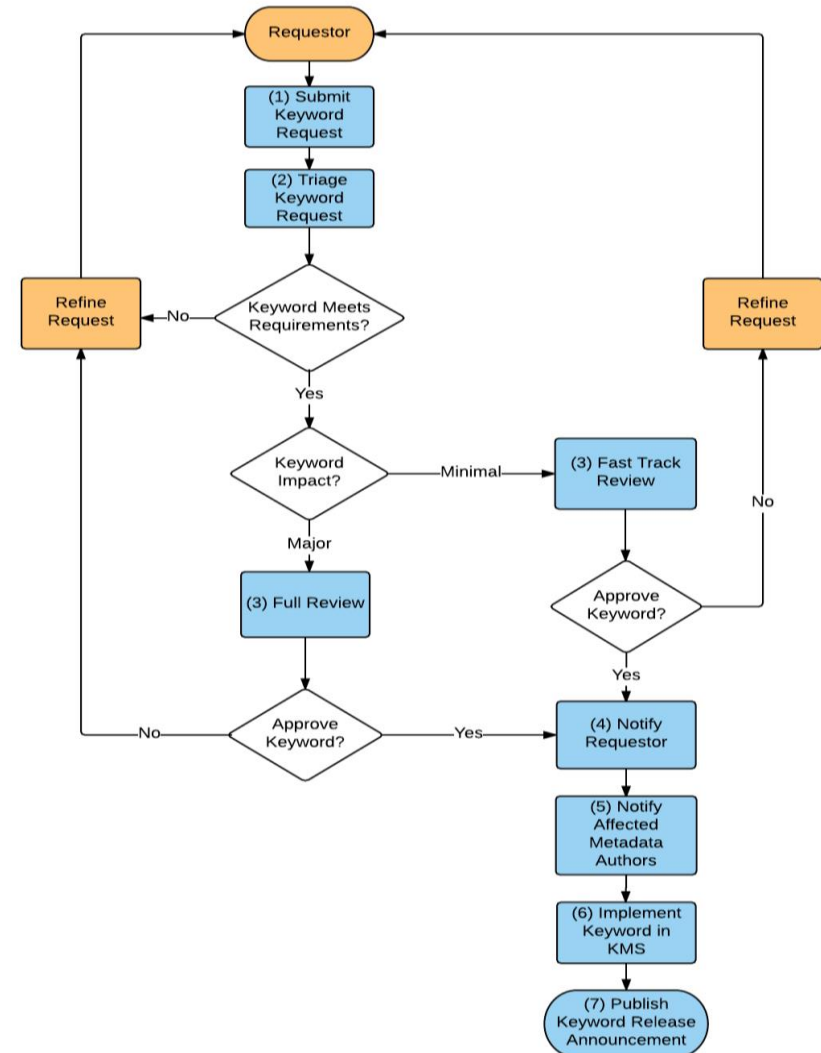
Keyword Examples

Category	Keyword Level	Example
Earth Science	Topic	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
Data Centers	Short Name	LP DAAC
	Long Name	Land Processes Distributed Active Archive Center
Projects	Short Name	ESIP
	Long Name	Earth Science Information Partner
Instruments-Sensors	Short Name	MODIS
	Long Name	Moderate-Resolution Imaging Spectroradiometer
Platforms-Sources	Short Name	Aqua
	Long Name	Earth Observing System, Aqua

Keyword Review Process

GCMD Keyword Review Workflow

- Keywords are either put on fast-track or full review
- Fast-track keywords are generally new keywords with no impact to providers
- GCMD, ESO, ESDIS solicit volunteers to participate in the full review
- GCMD prepares review package
- ESO distributes review package to reviewers (1 month review)
- GCMD and ESO respond to the feedback
- Further keyword refinement takes place
- GCMD finalizes the keyword release
- Aiming for 1 full keyword review and release a year



Keyword Version 8.6 Release (Spring 2018)

Related URL

- Added: 32
- Deleted: 4
- Modified: 17

Water Quality/Water Chemistry

- Added: 33
- Deleted: 0
- Modified: 24

**If you are interested in becoming a keyword reviewer,
please contact the ESO at eso-staff@lists.nasa.gov.**

II. HOW GCMD KEYWORDS ARE BEING USED BY U.S. AND INTERNATIONAL COMMUNITIES

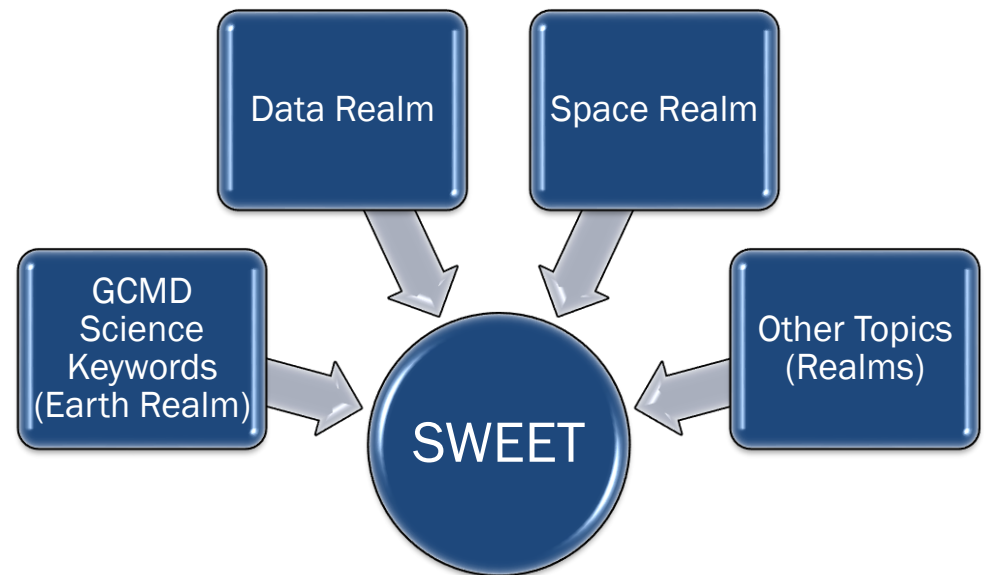
Authoritative Vocabulary, Taxonomy, or Thesaurus

Various organizations have adopted the GCMD keywords and use them to describe their Earth science data in a consistent and comprehensive manner.



Foundation for Building Ontologies in SWEET and Other Ontologies

- Ontologies, including the Semantic Web for Earth and Environmental Terminology (SWEET) and Sea Ice, are using the GCMD keywords as a “low-level” source of keywords (knowledge base) for building broader domain specific ontologies.
 - SWEET: Highly modular ontology suite with ~6000 concepts in ~200 separate ontologies covering Earth system science.
 - Sea Ice: Ontology describing all of the terms within the WMO sea ice nomenclature.
- Each community is working with their experts to build out domain areas, which is then fed into the mid to upper level SWEET ontology.



Integration Within Metadata Curation Tools

- CMR metadata providers are required to use the GCMD keywords to describe their data.
- CMR metadata team reviews science keywords in records for consistency and makes recommendations as needed for additional keywords to better describe providers' data.

docBUILDER

Science Keywords ⓘ: Select science keywords that describe the data set.

Select a Keyword Topic (from the upper box) to view only that Topic's subset of keywords in the lower box.

ALL
AGRICULTURE
ATMOSPHERE
BIOLOGICAL CLASSIFICATION
BIOSPHERE
CLIMATE INDICATORS

Search the list:

AGRICULTURE > AGRICULTURAL AQUATIC SCIENCES
AGRICULTURE > AGRICULTURAL AQUATIC SCIENCES > AQUACULTURE
AGRICULTURE > AGRICULTURAL AQUATIC SCIENCES > FISHERIES
AGRICULTURE > AGRICULTURAL CHEMICALS
AGRICULTURE > AGRICULTURAL CHEMICALS > FERTILIZERS
AGRICULTURE > AGRICULTURAL CHEMICALS > PESTICIDES
AGRICULTURE > AGRICULTURAL ENGINEERING
AGRICULTURE > AGRICULTURAL ENGINEERING > AGRICULTURAL EQUIPMENT
AGRICULTURE > AGRICULTURAL ENGINEERING > FARM STRUCTURES
AGRICULTURE > AGRICULTURAL PLANT SCIENCE
AGRICULTURE > AGRICULTURAL PLANT SCIENCE > CROP/PLANT YIELDS
AGRICULTURE > AGRICULTURAL PLANT SCIENCE > CROPPING SYSTEMS
AGRICULTURE > AGRICULTURAL PLANT SCIENCE > IRRIGATION
AGRICULTURE > AGRICULTURAL PLANT SCIENCE > PLANT BREEDING AND GENETICS
AGRICULTURE > AGRICULTURAL PLANT SCIENCE > PLANT DISEASES/DISORDERS/PESTS

Deselect Highlighted Items?

To add uncontrolled Science Keywords, [append detailed variables](#) to the selected keyword set(s) from the list above.
To add or modify a "controlled" keyword, please follow the [Procedures for GCMD Keyword Modification](#).

Metadata Management Tool

Science Keywords ⓘ

EARTH SCIENCE > TERRESTRIAL HYDROSPHERE > SURFACE WATER > SURFACE WATER PROCESSES/MEASUREMENTS > DRAINAGE > DRAINAGE AMOUNT ⓘ

Search for keywords...

AQUIFER DEPTH
RECHARGE AMOUNT
RECHARGE FREQUENCY

Science Keyword
EARTH SCIENCE
TERRESTRIAL HYDROSPHERE
SURFACE WATER
SURFACE WATER PROCESSES/MEASUREMENTS
AQUIFER RECHARGE

➕ Add Keyword

**Keyword Pick-List From
GCMD Keyword Management
System (KMS)**

Integration Within Metadata Catalogues for Search and Discovery

NASA Earthdata

The screenshot shows the NASA Earthdata Search interface. At the top, there is a search bar with the text "Type any topic, collection, or place name". Below the search bar is a map of the Middle East region. A pop-up window displays "1992 Matching Collections" and lists several collections, including "MODIS/Aqua Aerosol 5-Min L2 Swath 3km V006" and "NCEP/DOE Reanalysis II, for GSSTF 0.25 x 0.25 deg, Daily Grid V3 (GSSTF_NCEP) at GES DISC". The interface includes navigation controls, a "Show Tour" button, and a "Earthdata Login" button.

NASA GES DISC

The screenshot shows the NASA GES DISC interface. It features a search bar with the text "Enter search text". Below the search bar, there are sections for "Data Collections" and "Documentation". A "Refine By" section includes "Image" and "Measurement Sort". The "Measurement Sort" section lists various measurement types such as "Absorption (8)", "Aerosol Backscatter (3)", "Aerosol Extinction (22)", etc. A table at the bottom shows search results with columns for "Process Level", "Begin Date", and "End Date".

FEDEO

The screenshot shows the FEDEO FedEO Client interface. It features a map of the Middle East region. On the left side, there is a "Products" panel with fields for "Start date", "End date", "Place name", "Resolution (meter)", "Orbit number", "Orbit direction", "Track", "Frame", "Start time from...", and "Completion time...". Below the map, there is a "Keywords" section with text: "GEMET - INSPIRE Theme, Version 1.0; snow, ice, sea, vegetation, land", "NASA/Global Change Master Directory (GCMD) Earth Science", "Keywords, Version 8.0.0.0; Science Keywords > Earth Science > Spectral/Engineering > Visible Wavelengths > Visible Imagery", and "Other: FedEO, ESA OADS".

NOAA One Stop

The screenshot shows the NOAA One Stop interface. It features a search bar with the text "climate". Below the search bar, there are sections for "ADDITIONAL FILTERS" and "Search Results (showing 20 of 23)". The "ADDITIONAL FILTERS" section includes "Exclude Global CATEGORIES" and "Data Theme". The "Search Results" section lists various categories such as "Aerosol Optical Depth/Thickness (23)", "Aerosols (23)", "Atmosphere (23)", "Atmospheric Winds (21)", "Bulk Sea Surface Temperature (2)", "Ocean Temperature (21)", "Oceans (21)", "Sea Surface Temperature (21)", "Surface Winds (21)", and "Wind Speed/Wind Direction (21)". There are also thumbnail images of satellite data records.

Keywords and Tools Work Together

- Keyword taxonomies and curation tools work hand-in-hand to keep a metadata catalogue tidy.
- Normalized keywords help with search and discovery of Earth science data and services.



III. LEARN MORE

Keyword Landing Page

- ✓ Access the GCMD Keywords
- ✓ Submit a Keyword Request
- ✓ See the Keyword Release Announcements
- ✓ Review the Keyword Governance Document

The screenshot shows the 'Global Change Master Directory (GCMD) Keywords' landing page. At the top, there is a search bar and a breadcrumb trail: 'About EOSDIS > Global Change Master Directory (GCMD) > Global Change Master Directory (GCMD) Keywords'. The page is divided into several sections:

- GCMD Keyword Links (Earthdata Wiki):** Includes links for 'Access the GCMD Keywords', 'Submit a Keyword Request', 'Keyword Release Announcements', and 'Keyword Community Forum'.
- More Resources:** Lists 'Global Change Master Directory (GCMD)', 'Common Metadata Repository (CMR)', 'ESDIS Standards Office (ESO)', 'Keyword Governance and Community Guide Document', and 'GCMD Keyword Viewer (Alpha)'.
- Global Change Master Directory (GCMD) Keywords:** Features a list of categories: Earth Science, Earth Science Services, Data Centers, Projects, Instruments/Sensors, Platforms/Sources, Locations, Horizontal Data Resolution, Vertical Data Resolution, Temporal Data Resolution, URL Content Types, and Chronostratigraphic Units.
- GCMD Keyword Community Forum:** Provides information on how the forum is used for discussions and tracking keyword requests.
- More Information About the Keywords:** Contains three expandable sections: 'GCMD Keyword Structure', 'Community Use of GCMD Keywords', and 'GCMD Keyword Governance and Community Guide Document'.

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

Utilizing the KMS API

The **Keyword Management Service (KMS)** is a RESTful web service for maintaining and accessing the keywords.

Static Copy of Keywords

- Retrieve in CSV Format
- <https://wiki.earthdata.nasa.gov/display/CMR/GCMD+Keyword+Access>

Dynamic Keyword API

- Retrieve as SKOS, RDF, OWL, XML, CSV
- Retrieve previous versions
- Retrieve in different case (Native, Title Case, Upper Case, Lower Case)
- Search by keyword pattern (i.e. Search by 'Terra')
- <https://gcmdservices.gsfc.nasa.gov/kms/capabilities?format=html>

Documentation

- <https://wiki.earthdata.nasa.gov/x/gwxNBQ>

IV. DISCUSSION

This material is based upon work supported by the National Aeronautics and Space Administration under Contract Number **NNG15HZ39C**.

Raytheon