

## J8.8 GLOBAL OBSERVING SYSTEM INFORMATION (GOSIC) DATA SET INFORMATION AVAILABLE THROUGH NASA'S GLOBAL CHANGE MASTER DIRECTORY (GCMD)

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### 1. INTRODUCTION

The Global Observing System Information Center (GOSIC) (<http://gotic.org>) was created to provide a single point of access to data and information, observational requirements, data flows, and products for the three global observing systems: the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS), GOSIC representatives are collaborating with NASA's Global Change Master Directory (GCMD) (<http://gcmd.nasa.gov>) to locate and discover Earth science data sets relevant to GTOS, GCOS, GOOS.

### 2. GCMD BACKGROUND

Since 1994, the GCMD has facilitated the search and discovery of Earth science data sets for global change research through online and web-based interfaces (Figure 1). Over 15,000 Earth science data set descriptions (or metadata), many contributed by collaborators such as GOSIC, can be searched from the following areas:

- Agriculture and food production
- Atmosphere, meteorology and climatology including past climate changes (paleoclimatology)
- Biosphere, biodiversity, and ecosystems studies
- Land surface processes and land-cover changes
- Human dimensions of climate change such as land use, population and health
- Hydrology, including surface and ground water processes
- Oceanography and ocean-atmosphere climate patterns such as El Nino
- Snow and ice dynamics, including glaciological and polar processes
- Geophysics and geological processes

- Sun-Earth interactions
- Imagery and satellite remote sensing

Researchers can also discover more than 1000 Earth science data set services and tools, such as those designed for data analysis and visualization, data handling, models, and educational resources.

Successful retrieval of information depends on well-structured metadata and comprehensive indexing of records from a controlled Earth science vocabulary, combined with well-populated text fields to enhance free-text searching.



Figure 1: GCMD Home Page <http://gcmd.nasa.gov>. Search by Earth science or services keywords or free-text.

The GCMD's more than 1200+ Earth science keywords allow data set providers to choose the appropriate keywords to classify their data set descriptions. GCMD keywords form the

basis for the GTOS Data Matrix (described below) for retrieving data set information and for discovering global observing systems data sets.

### 3. THE GLOBAL OBSERVING SYSTEMS AND GOSIC

The international global observing systems, GCOS, GOOS and GTOS will allow participating nations to:

- Detect climate change at the earliest possible time
- Document natural climate change variability and extreme climate events
- Model, understand, and predict climate variability and change
- Assess the potential impact on ecosystems and socio-economics
- Develop strategies to diminish potentially harmful effects
- Support sustainable development

The global observing systems use a variety of observation methods ranging from space platforms to in-situ measurements. They encompass all components of the climate system including the atmosphere, biosphere, cryosphere, hydrosphere, and land surface, as well as socio-economic relationships.

The Global Observing Systems Information Center (GOSIC) (See Figure 2) provides access to data and information identified by the three global observing systems. Guidance and evaluation of GOSIC is provided by the Steering Committees of the three global observing systems. GOSIC will become operational under the management of an international organization in 2006.

The role of GOSIC is to:

- Function as a central source for all global observing systems data and information including observing requirements, operational data systems, and access procedures for finding and obtaining data and products of the three global observing systems.
- Provide users with the ability to search for and identify the availability, the data processing status, the location(s), and the accessibility of relevant data.

- Provide users with metadata sufficient for them to determine if data meet their requirements in terms of content, coverage, and quality and register that metadata with the GCMD.
- Provide access to an integrating overview of the management and development of the three global observing systems programs, including observing requirements, standards, and terms of reference of the panels and expert teams.



Figure 2. GOSIC Home Page and access to Global Observing System data and information. <http://gosic.org>.

### 4. FINDING GOSIC DATA SET INFORMATION

To meet the information needs of the GOSIC community, the following applications have been implemented to make it easier to locate global observing systems data sets:

1. Customized GOSIC portals for easier access to information through the GCMD.
2. Tools to exchange metadata with participating organizations.
3. Applications to directly retrieve data set information from the GCMD through the GTOS Data Matrix

#### 4.1 GOSIC portals for easier access to information through the GCMD

Customized views of the database have been created so that users only need search a

subset of the available metadata records in the GCMD database. These views, or portals, provide a customization of information content to meet the needs of the Earth science community. Portal content can be based on science keywords, projects, data center, or any combination of terms that are available in the GCMD database.

Individual portals have been implemented for searching GCOS, GTOS, and GOOS data set information separately. An integrated GOSIC portal was also implemented for simultaneous searching for all the available global observing systems data (<http://gcmd.nasa.gov/Data/portals/gosic/>). [See Figure 3]. To date, more than 350 GOSIC data sets have been identified and entered into the GCMD. The GCMD portals allow users to quickly locate data sets of interest, and, where possible, download the data.

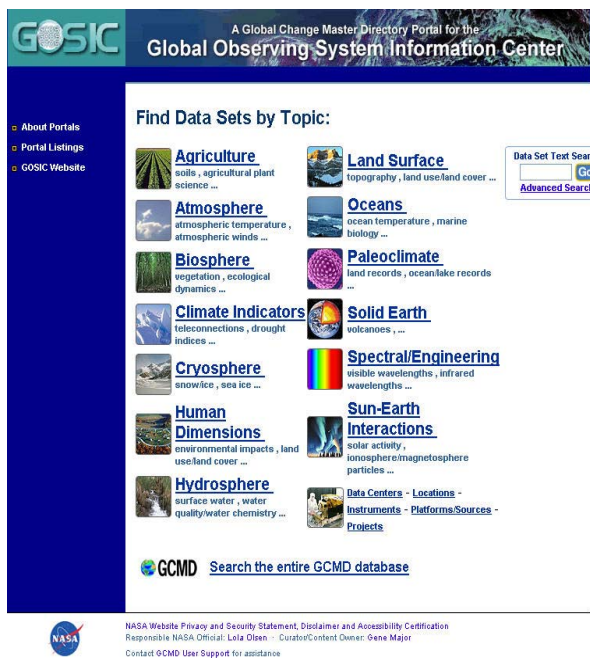


Figure 3: GOSIC portal to search for data set information from the Global Observing Systems. <http://gcmd.nasa.gov/Data/portals/gosic/>

#### 4.2 Metadata exchange with GOSIC identified data sets

Other data contributors to the global observing systems have their own metadata catalogs, yet desire to have their metadata records searchable through the GOSIC portals.

Fortunately, information technologies are available to assist in the process of translating between different metadata formats. The GCMD and GOSIC, along with the NOAA National Climatic Data Center (NCDC), developed a process to streamline the exchange of metadata. The GCMD and NCDC hold data set descriptions in different metadata standards. NCDC provides metadata in the Content Standard for Digital Geospatial Metadata (CSDGM) format, and GCMD provides metadata in the Directory Interchange Format (DIF). Both of these metadata formats are expressed in the eXtensible Markup Language (XML) format. The eXtensible Stylesheet Language Transformation (XSLT) is the W3C standard for translating one XML document to another. XSLT was applied so that NCDC metadata records could be represented in the GCMD database and available through the GOSIC portals.

#### 4.3 Access to GTOS information through the GTOS Data Matrix

The Global Terrestrial Observing System (GTOS) (<http://www.fao.org/gtos/>), the component of the global observing systems responsible for the observations, modelling, and analysis of terrestrial ecosystems to support sustainable development, has developed an online Data Matrix (See Figure 4). The GTOS Data Matrix is a data management tool to support the Terrestrial Ecosystem Monitoring Sites (TEMS), an international directory of sites (named T.Sites) and networks that carry out long-term terrestrial monitoring and research activities. The Data Matrix consists of TEMS keywords, which are used to seamlessly pass queries to the GCMD through an open Application Programmers Interface (API) based on the HTTP protocol, thereby providing access to selected datasets registered in the GCMD.

Facilitating Access to Global Observing Systems Data & Information

### GTOS Observing Networks

The Global Terrestrial Observing System (GTOS) programme structure is composed of panels, regional projects and technical programmes. Implementation of the observing programs is accomplished using satellite missions, technical programs, and existing and expanded terrestrial networks. Users can access GTOS data and information through the GTOS MATRIX below or in the "more about GTOS" section. The GTOS MATRIX is based on the GOSIST hierarchical strategy. The hierarchy divides into five tiers, each with unique characteristics and roles, although existing facilities often straddle more than one tier. The concept is applicable to the three main areas which GOSIST is concerned with - the land surface, freshwater ecosystems and ice surfaces - each with its own hierarchy, but all share tier five.

Topic	Variables	GCMD	GTOS	GOSIC
Land	48	GCMD	GTOS	
Water	41	GCMD	GTOS	
Biodiversity	18	GCMD	GTOS	GOSIC
Climate	60	GCMD	GTOS	
Pollution	20	GCMD	GTOS	
NPP (Net Primary Production)	18	GCMD	GTOS	GOSIC
TCO (Terrestrial Carbon Observation)	28	GCMD	GTOS	GOSIC
GOLD (Global Observation of Forest and Land Cover Dynamics)	16	GCMD	GTOS	GOSIC

Figure 4. The GTOS data matrix. The matrix facilitates access to GTOS information with direct access to metadata descriptions in the GCMD. [http://www.gosic.org/ios/GTOS\\_observing\\_system.asp](http://www.gosic.org/ios/GTOS_observing_system.asp)

## 5.0 FUTURE INTERACTIONS

Representative from the GCMD and GOSIC will continue to collaborate on improving access to global observing systems data and information, to:

- (1) Enhance the Earth science keywords for indexing data set descriptions and searching for data sets
- (2) Increase the population of the GCMD with global observing systems data set descriptions.
- (3) Investigate the use of geospatial technologies for improved search and retrieval.

Further improvements in query refinement and management of GTOS data sets will help meet the data and metadata needs of the global change and global observing systems community. Similar data and metadata management processes, such as the GTOS Data Matrix, that were undertaken with GTOS can be extended to the GCOS and GOOS.

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