

THE GLOBAL OBSERVING SYSTEMS INFORMATION CENTER (GOSIC): A COMPREHENSIVE PORTAL FOR GLOBAL CLIMATE DATA AND INFORMATION

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ABSTRACT

The Global Observing Systems Information Center (GOSIC), which was initiated in 1997 at the request of the Global Climate Observing System (GCOS) Steering Committee, responds to a need identified by the global climate observing community for easier and more effective access to observational climate data and information. GOSIC manages an online portal providing an entry point for users of climate-related global observing systems data and information systems and also helps serve the needs of the World Data Center for Meteorology, Asheville.

Keywords: Climate, Observations, Data, GCOS, ECV, NCDC

1 INTRODUCTION

The Global Observing Systems Information Center (GOSIC) [see <http://gotic.org>] was established by the Global Climate Observing System (GCOS) program as a way to provide better and more centralized access to an extremely diverse array of climate related datasets that cross atmospheric, oceanic, and terrestrial domains that are collected from non-satellite, in-situ and satellite observing platforms. To aid in improving access to climate observing datasets, the GOSIC staff located at NOAA's National Climatic Data Center (NCDC) has developed an Essential Climate Variables (ECV) Data Access Matrix. The basic intent of the ECV matrix is to provide users with a centralized resource to access climate observing datasets from trusted sources for each of the defined atmospheric, oceanic and terrestrial variables as well as metadata and reference documentation. The GOSIC staff is constantly adding new climate datasets identified by the global observing systems and the world data centers as the best available collection of data for a particular variable. Information on spatial and temporal coverage, data gaps, quality control and additional data needs is also available in the matrix. The ECV Matrix is meant to be a "one-stop-shop" to access trusted ECV datasets and information and can be accessed online at: <http://gotic.org/ios/MATRICES/ECV/ECV-matrix.htm> body text of the paper should be Times New Roman, 10pt and justified. The introduction should outline the motivation for the research and contain a review of the relevant literature. The paper should be organized into logical parts or sections and include a description of the problem, the means of solution, results and conclusions.

2 MISSION AND BACKGROUND OF THE GOSIC

The GOSIC's mission is to provide a broad spectrum of users with a centralized resource to aid in finding worldwide climate observing system datasets and related information from the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS). However, the GOSIC does not limit itself to these three systems, and also incorporates access to climate data from other partner programs such as the Global Atmosphere Watch (GAW) and the Atmospheric Circulation Reconstructions over the Earth (ACRE), and does so in a consistent fashion across a diverse array of international data centers.

The GOSIC was established in 1997 by the GCOS Steering Committee to develop methods for easy on-line access to the comprehensive base of Global Observing Systems data and information. Under an initial joint National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration

(NASA) grant, the GOSIC was developed at the University of Delaware, College of Marine Studies, building on experience with information systems for international climate research programs. Guidance and evaluation of the GOSIC is provided by the various scientific and steering committees of the three observing systems. The GOSIC reports at these meetings and receives directions for further development. Formal performance reviews were conducted in 2001 and 2003 by groups appointed by each observing system, and the results of these were extremely helpful in shaping the form and function of the GOSIC. Since 2007 the GOSIC has become operational and is a facility operated under the auspices of the U.S. Global Climate Observing System (USGCOS) program based at NOAA's NCDC, and is run on behalf of the international observing community (Diamond, 2009). In addition, the GOSIC has become a key part of the infrastructure in helping to serve data via the World Data Center for Meteorology, Asheville [see <http://wdca-meteorology.org>].

3 THE ESSENTIAL CLIMATE VARIABLES (ECV) DATA ACCESS MATRIX

The ECV Matrix was developed by the GOSIC staff to provide users with a centralized "one-stop-shop" resource to access climate observing datasets from trusted sources for each of the defined atmospheric, oceanic and terrestrial essential climate variables.

GCOS first defined a list of the ECVs in 2003 that were identified as "feasible for global implementation and have a high impact" on the requirements of the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). Originally there were 44 ECVs that included such variables as air temperature, precipitation, sea surface temperature, salinity, snow cover, and albedo. By the end of August 2010, GCOS published an updated set of ECVs that built on the original set by adding variables such as soil moisture, soil carbon, ocean oxygen content, and also recognizing the role of precursors in forming ozone and aerosols. The updated list of 50 ECVs is as follows:

Atmospheric (over Land, Sea & Ice):

Surface: Pressure, Air Temperature, Precipitation, Surface Radiation Budget, Water Vapor, Wind Speed and Direction.

Upper-Air: Cloud properties, Earth Radiation Budget, Temperature, Water Vapor, Wind Speed and Direction.

Composition: Carbon Dioxide, Methane and other Long-Lived Green House Gases (Nitrous Oxide (N₂O), Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrofluorocarbons (HFCs), Sulfur Hexafluoride (SF₆), and Perfluorocarbons (PFCs)), Ozone, Aerosol Properties, Precursors supporting the Aerosols and Ozone ECVs (NO₂, SO₂, HCHO, CO).

Oceanic:

Surface: Carbon Dioxide Partial Pressure, Current, Ocean Color (for Biological Activity), Sea Ice, Sea Level, Sea State, Sea Surface Salinity (SSS), Sea Surface Temperature (SST), Ocean Acidity, Phytoplankton.

Sub-surface: Temperature, Salinity, Current, Nutrients, Carbon, Ocean Tracers, Phytoplankton, Ocean Acidity, Oxygen.

Terrestrial: River Discharge, Water Use, Ground Water, Lakes Levels, Snow Cover, Glaciers and Ice Caps, Permafrost and Seasonally-Frozen Ground, Albedo, Land Cover (including Vegetation Type), Fraction of Absorbed Photosynthetically Active Radiation (FAPAR), Leaf Area Index (LAI), Above Ground Biomass, Fire disturbance, Soil moisture, Ice Sheets, Soil Carbon.

The design of the ECV Matrix provides users with a quick overview of the ECVs identified by domain and easy access to data download, metadata and other information with a minimal amount of clicks. See Figure 1 below for a view of the ECV Matrix main page on the GOSIC Portal.

Each of the 50 ECVs has a dedicated web page that provides a list of trusted data sets identified by the global observing systems and world data centers and divided into two categories: 1) Non-Satellite or in-situ 2) Satellite (see example in Fig. 2). The data sets for each of the ECVs are identified based on documentation such as the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (Update 2010) August 2010, GCOS-138, GTOS-184, GTOS-76, WMO-TD/No.1523 publication I and the GTOS Assessments of the Status of the Development of Standards for the Terrestrial Essential Climate Variables. II Each data set has a description of content, data download link, metadata, data documentation, list of variables, program information, and more. These web pages also include additional information such as definitions, spatial and temporal coverage, data gaps, quality control, contributing and status of networks, additional data needs, and reference documentation.

The GOSIC Portal provides convenient, central, one-stop access to data and information identified by the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS) and their partner programs, such as the Global Atmosphere Watch (GAW) and regional observing systems, such as the GOOS Regional Alliances (GRA). [More About the GOSIC](#) - [What's New on the GOSIC Portal](#)

How do I find Climate Datasets Quickly?

- Search Data by GCOS Essential Climate Variable (ECV)
- Search Global Observing Data
- Search using Data Access Matrices
- Text Search
- Metadata Search
- Find and plot data with the Climate Explorer (KNMI)
- NASA Satellite Data Access (Mirador)
- NCAR/CSI Research Data Archive
- Global Surface Databank
- Asia Pacific Data Research Center
- JAMSTEC Data Search Portal

Access to Observing System Data, Metadata & Information

- GCOS - The Global Climate Observing System
- GAW - The Global Atmosphere Watch
- GTOS - The Global Terrestrial Observing System
- GOOS - The Global Ocean Observing System
 - National Activities Summaries of Operational & Planned Observation Programs
 - Overview of the GOOS Observation Programs' Growth
- GRA - The GOOS Regional Alliances - [News](#)
- Metadata
- Maps and Google Earth™ Products
- Publications
- Observational Datasets in Support of the IPCC
- GEO - [Group on Earth Observations](#)
 - GEO Portal
 - GOSIC on the GEO Portal
 - GOSIC Works with GEO Portal to Provide Climate Information

Related Observing System Information

- What's New
- Data Flow Diagrams
- Meeting Calendars: GCOS - GOOS - GTOS
- Publications/Documents: GCOS - GOOS - GTOS - GAW - GOSIC
- Data Management Plans: GCOS/GOOS/GTOS - GCOS - GOOS - GTOS - GAW
- Strategic Plans: GCOS - GAW - GCOS/GOOS/GTOS
- Review the scientific and technical basis for the design of GCOS - GOOS - GTOS - GCOS/GOOS/GTOS
- WMO Integrated Global Observing System (WIGOS)
- Scientific Panels (AOPC, OOPC & TOPC)
- Frequently Asked Questions (FAQ):
 - [What's New on the GOSIC Portal](#)
 - [GOSIC on the GEO Portal](#)
 - [GOSIC Works with GEO Portal to Provide Climate Information](#)

Figure 1. Main View of the ECV Matrix

GCOS Atmospheric Surface ECV*
Pressure

**over land, sea and ice*

- Definition
- Introduction
- Atmospheric Surface Domain ECVs
- Contributing Networks & Status
- Observations over Land and Ocean
- News: The NOAA/NCDC Climate Analysis Branch is pleased to announce the release of the Global Historical Climatology Network - Monthly (GHCNM) version 3.0 (beta). The public is encouraged to provide feedback during this beta phase to help improve and enhance the dataset. To direct questions, comments, or feedback, specific to the GHCNM please e-mail at NCDC_GHCNM@noaa.gov. See below for more information.

Data, Product, Metadata and Information Access
[ECV Matrix Main Page] [About the ECV Matrix] [Reference Documents] [Contact] [Updated June 3, 2011]

Non-Satellite or in-situ	Satellite
<ul style="list-style-type: none"> • GCOS Surface Network (GSN) Monthly Data (GSNMOH) (NOAA/NCDC) is a global network of approximately 1000 stations selected from the network of many thousands of existing meteorological stations. The GSN is intended to comprise the best possible set of land stations with a spacing of 2.5 to 5 degrees of latitude, thereby allowing coarse-mesh horizontal analyses for some basic parameters. These data are archived at NCDC after QC of the CLIMAT temperature and precipitation data have been completed (in general about 2 months after the end of the observation month) (see GSNMC data sets below) (data access) (metadata) (data documentation) (GSN program information) (contact) • GCOS Surface Network (GSN) Monitoring Centre Monthly Data (GSNMC) (MWD) In order to offer an earlier access to the GSN data, a so called "quick" GSN data set is provided as soon as it becomes available (about day 23 of the following month). This data set is marked by a '0' in the table (see data access below) and does NOT include any information about data quality. The quality flags included are all set by default to "1". The final GSNMC data set, marked as "F", is sent on a monthly basis to the WMO for Meteorology in Ashburnville, NC, USA (after the 20th of the 3rd MWD). 	

Figure 2. Example of Individual ECV web page - Partial view of the Atmospheric Surface Pressure ECV page

Since its inception, the success of the GOSIC has been in its ability to incorporate new search methodologies as well as to work in a synergistic way with other facilities to ensure maximum exposure of the GOSIC to as wide an audience as possible. The GOSIC has worked with the Group on Earth Observations (GEO)¹, the World

¹ See <http://www.geowebportal.org/>

Meteorological Organization Information System (WIS)², as well as the NOAA Climate Portal³, to ensure that work already undertaken by the GOSIC does not have to be duplicated by these systems. As such, the consistent look and feel of the GOSIC that many users have become accustomed to can also now be found as powering the climate data search engines of these major systems. NCDC has been nominated by the U.S. to be a formal WIS Data Collection and Production Center (DCPC)⁴, and the GOSIC will form a key part of that DCPC function for NCDC; this nomination was confirmed at the 16th WMO Congress in May 2011.

4 CONCLUSION

The unique value that the GOSIC offers its users is the ability to search, using a variety of tools, and quickly link users to a wide range of downloadable data sets that reside at multiple data centers around the world via a consistent and user friendly interface. The goal of the GOSIC Portal is to provide access to global observing system data with the fewest number of clicks as well as provide tailored search capabilities through a variety of search tools such as matrices, registries and search by key word, global observing system, data center, program and joint programs, theme, variable, and more.

The newly developed ECV Matrix provides another data access tool that allows users to search for data sets based on the 50 ECVs. Using this tool, the users can efficiently view all of the ECVs by domain (atmosphere, ocean and land), and with the fewest number of clicks access individual web pages for each of the ECVs listing trusted data sets with links to data download, metadata, and other relevant information. The GOSIC staff is constantly adding new climate datasets identified by the global observing systems and the world data centers as the best available collection of data for the ECVs. The GOSIC staff invites persons to become actively involved in the site by providing us feedback at <gosic@noaa.gov>; the staff is quite responsive and their goal is to provide the easiest and most convenient access to global climate observing datasets from the atmospheric, oceanic, and terrestrial observing domains. Finally, the GOSIC has a very small staff and depends on users to help us identify datasets for inclusion. The staff is quite flexible and looks forward to input and suggestion from users to assist us. Therefore, people should feel welcome to provide feedback and rest assured that it will be addressed in a timely fashion.

5 ACKNOWLEDGEMENTS

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6 REFERENCES

Diamond, H.J. & C. J. Lief (2009). A Comprehensive Data Portal for Global Climate Information, EOS Trans. AGU, 90(39), doi:10.1029/2009EO390001

² See <http://gis.ncdc.noaa.gov/geoportal/catalog/main/home.page>

³ See <http://climate.gov>

⁴ See http://www.wmo.int/pages/prog/www/WIS/centres_en.html