

THE GLOBAL OBSERVING SYSTEMS INFORMATION CENTER (GOSIC): A COMPREHENSIVE AND EVOLVING 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. The GOSIC continues to evolve and expand its responsibilities, and this paper is an update to a similar paper (Diamond & Lief, 2009) that was presented at the 1st ICSU World Data System Conference in Kyoto, Japan in September 2011. Since 2009, there have been considerable updates made to the GOSIC portal that will be discussed in the paper.

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

1 INTRODUCTION

The Global Observing Systems Information Center (GOSIC) (see: <http://gosic.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 and 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://gosic.org/ios/MATRICES/ECV/ECV-matrix.htm>, and has been updated considerably since 2009.

2 MISSION AND BACKGROUND OF THE GOSIC

The GOSIC's mission continues to be focused on providing 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; it 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 and Lief, 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://www.ncdc.noaa.gov/oa/wdc/index.php>).

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.

In 2003, GCOS first defined a list of the ECVs 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 Figure 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.

GOSIC Global Observing Systems Information Center

Facilitating Access to Global Observing Systems Data and Information

Home > GTOS > GCOS Essential Climate Variables (ECV) Data Access Matrix

GCOS Essential Climate Variables (ECV) Data Access Matrix

The Essential Climate Variables (ECV) Data Access Matrix provides easy access to ECV data sets and information. The input for the variable descriptions were provided by WMO/GCOS. Essential Climate Variables are required to support the work of the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). All Essential Climate Variables are technically and economically feasible for systematic observation. It is these variables for which international exchange is required for both current and historical observations. It is emphasized that the ordering within the table is simply for convenience and is not an indicator of relative priority. There are currently 50 Essential Climate Variables.

- A GOSIC-GCOS Media-Wiki page has been implemented to facilitate communications and identification of key Essential Climate Variables data sets. Once the datasets are identified and vetted they will be added to the GOSIC ECV Data Access Matrix. This project is in cooperation with the WMO/GCOS, CEOS, NCDC, CICS and the GOSIC. For more information on this project please contact Christina.Lied@noaa.gov
- The State of the Climate in 2011 data sets are presently being added to the Matrix (** indicates data are available). These data sets are part of the peer-reviewed articles in the supplement to the Bulletin of the American Meteorological Society (BAMS) July 2012 issue (Vol. 93, No. 7). [More information](#)

Latest Update December 17, 2012

ATMOSPHERIC (over Land, Sea & Ice)	OCEANIC	TERRESTRIAL [2]
Surface [4]	Surface [6]	River Discharge (ECV T1) **
Surface Air Pressure	Carbon Dioxide Partial Pressure	Water Use (ECV T2)
Surface Air Temperature	Current **	Ground Water (ECV T3)
Surface Precipitation	Ocean Acidity *	Lakes (ECV T4) * **
Surface Radiation Budget	Ocean Color **	Snow Cover (ECV T5) **
Water Vapour (Surface humidity)	Phytoplankton *	Glacier and Ice Caps (ECV T6) *
Near-Surface Wind Speed and Direction	Sea Ice	Permafrost (ECV T7)
Upper-Air [5]	Sea Level **	Albedo (ECV T8) * **
Cloud Properties **	Sea State	Land Cover (including Vegetation Type) (ECV T9)
Earth Radiation Budget (including Solar Irradiance) *	Sea Surface Salinity (SSS) **	Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) (ECV T10) **

Figure 1. Main View of the ECV Matrix

GOSIC Global Observing Systems Information Center

Facilitating Access to Global Observing Systems Data and Information

Home > GCOS Atmospheric Surface ECV - Air Pressure

GCOS Atmospheric Surface ECV - Air Pressure

*over land, sea and ice

Main climate application

Surface air pressure data provide vital information about atmospheric circulation patterns in the climate system. Long-term air pressure data compilations can be used to assess changes, fluctuations and extremes in climatic circulation regimes. Such analyses aid ongoing efforts to assess the relative importance of anthropogenic and natural influences, and to estimate possible future impacts of atmospheric circulation changes on human activities.

Contributing Network(s):

- GCOS Surface Network (GSN; subset of the WMO World Weather Watch (WWW)/Global Observing System (GOS) network)
- WWW/GOS surface synoptic network
- Additional national networks
- Buoys and ships (see Ocean Surface section)

Contributing baseline GCOS observations

The GSN is a subset of approximately 1,000 stations that supports the global network of locations that provide local and regional-scale observations. The GSN promotes best practice and is a baseline against which to assess the long-term homogeneity of the rest of the surface network. GSN must be augmented with additional surface air pressure data, especially over the oceans, in order to provide more detailed patterns of spatial changes, fluctuations and extremes in atmospheric circulation.

Other contributing observations

The SYNOP network of approximately 10,000 surface recording stations. Additional national and research observing networks. Voluntary Observing Ships, fixed platforms, moored and drifting buoys often report air pressure over the ocean.

Status:

- At least 95 % of stations are active, but only about 80% transmit CLIMAT reports.
- There are some inconsistencies in pressure reduction methods to mean sea level.
- Some national networks are inadequate for climate studies.

Current capability

Surface air pressure is monitored adequately over most of the earth's land surface. However, data coverage over some regions of the ocean, particularly in the Southern Hemisphere, and over Antarctica remains too sparse.

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) (<http://www.geowebportal.org/>), the World Meteorological Organization Information System (WIS) (<http://gis.ncdc.noaa.gov/geoportal/catalog/main/home.page>), as well as the NOAA Climate Portal (<http://www.climate.gov>), 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) (http://www.wmo.int/pages/prog/www/WIS/centres_en.html), 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. Finally, the GOSIC Portal provides narratives that explain the data systems, and provides an integrated overview of the global observing programs as well as online access to their data, information, and services.

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 site is constantly evolving in order to improve the interface to the site and associated content. Beginning in August 2012, the GOSIC underwent a transition to a more flexible open source content management system known as Drupal[®] which will serve to improve the overall access of data and information to the GOSIC user community. The GOSIC staff is quite flexible and looks forward to input and suggestions 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.

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6 REFERENCES

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

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