INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

PANEL ON WORLD DATA CENTRES
(Geophysical, Solar and Environmental)

GUIDE

to the

WORLD DATA CENTER SYSTEM

General Principles
World Data Centers
Data Services

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MISSION STATEMENT OF THE WORLD DATA CENTER SYSTEM

Data constitute the raw material of scientific understanding. The World Data Center system works to guarantee access to solar, geophysical and related environmental data. It serves the whole scientific community by assembling, scrutinizing, organizing and disseminating data and information.

PREFACE

This Guide is published at a time of great change in the World Data Center System. The System was created nearly forty years ago to meet the needs of scientists involved in the International Geophysical Year. Since that time it has provided geophysical and solar data and information to scientists in all countries. It even proved effective during the years of the Cold War. Today the WDC System is asked to respond to new scientific programs that involve new disciplines, use new technology, and have a broader international base.

ICSU programs in global change, climate, and the environment are placing new requirements on a world-wide system to serve the data needs of the scientific community. These programs involve environmental disciplines that go beyond those in the IGY which, by their nature, require new ways of handling data and information. At the same time, improvements in communications technology, notably the Internet, enable the World Data Centers to devise additional ways to link with their users and distribute products. This technology also makes feasible the extension of the system into countries that heretofore have not played an active role. The WDC system today is evolving to meet these changing conditions. At the same time it must remain true to the ICSU principle of open, non-discriminatory access to the system by scientists in all countries.

The 1996 *Guide to the World Data Center System* thus appears at a time when the system is undergoing considerable evolution. That evolution was begun under the leadership of Stan Ruttenberg, whose energy and vision have put new life into the ICSU Panel on World Data Centres. The editor of the Guide, Henry Rishbeth, sparked the creation of this new edition, and has done nearly all the work in preparing it for publication. In addition, Henry has contributed many years of service to the WDC System as the Panel Secretary. I am pleased to have this opportunity to acknowledge the enormous contributions of Stan and Henry and to thank them.

FERRIS WEBSTER Chairman, ICSU Panel on World Data Centres

EDITOR'S NOTE

It has been my privilege to edit this completely revised version of the *Guide to the World Data Center System*. Much has changed since the original Guide was published for the International Geophysical Year of 1957–1958. The Guide has served scientists well for four decades, but this 1996 edition—the sixth—may well be the last to be printed in traditional form. It will be placed on the Worldwide Web, where it can be updated electronically. Regular updating is essential, since the WDC system is constantly changing and a printed book captures only a snapshot in time.

I am very grateful to all my colleagues in the WDC community, which embraces many nations and several fields of science, for their help in this rewarding task. I have received help from many Directors and staff of WDCs and from my fellow members of the ICSU Panel, especially Stan Ruttenberg for supervising the production of the Guide in Boulder. Thanks are due to Susan McLean and Joy Ikelman of the National Geophysical Data Center for their help in producing this Guide, and also maintaining the Worldwide Web version.

HENRY RISHBETH Southampton, England

CONTENTS

CHAPTER 1. INTRODUCTION

Scientific data gathering has a long history. Information about solar and auroral activity in past millennia was chronicled by the Chinese and other peoples. In the Western world, systematic geophysical measurements extend back for centuries, but mechanisms for data distribution and exchange are more recent. In the 18th and 19th Centuries, data were exchanged from the early geomagnetic and seismic observatories largely through publication of annual station books. Oceanographic and geological data were recorded in expedition reports. Our knowledge of the geomagnetic field, plate tectonics and ocean currents owe much to these records, even though there were no convenient ways to copy the originals.

The first large-scale international scientific enterprises were the International Polar Years of 1882–1883 and 1932–1933, and eventually led to the International Geophysical Year of 1957–1958. Planning of the IGY was coordinated by CSAGI, the Special Committee for the IGY set up by the International Council of Scientific Unions. CSAGI established the World Data Center system to serve the IGY, and developed data management plans for each IGY scientific discipline. The data specifications were published in a series of *Guides to Data Exchange*, originally issued in 1957 and updated in 1963, 1973, 1979 and 1987. The IGY planners were remarkably prescient: the 1955 recommendation mentioned that Data Centers should be prepared to handle data in machine-readable form, which at that time meant punched cards and punched tape.

National IGY Committees were invited to establish and operate World Data Centers at national expense, abiding by the CSAGI rules. The U.S.A. and U.S.S.R. established complex centers, known respectively as WDC-A and WDC-B, to serve most IGY disciplines. In many disciplines there was a third or even a fourth center, known as WDC-C1 if in Western Europe and WDC-C2 if in Asia or Australia (the European centers being known simply as WDC-C if there was no corresponding WDC-C2). Multiple centers were deemed advisable to guard against catastrophic loss of data, and for the convenience of data providers and users.

Because of its success, the WDC system was made permanent and used for post-IGY data. New programs evolved, based on the IGY structure as a general framework, such as the International Quiet Sun Year of 1964–1965, the International Magnetospheric Study of 1976–1979, the Solar Maximum Year of 1979–1981 and the Middle Atmosphere Program of 1982–1985. Most of the

sponsoring national bodies agreed to continue the WDCs to serve these programs, and the data collections have remained accessible to users.

Since the IGY, the gathering and exchange of data has been transformed by technological advances, such as the replacement of analog with digital instruments, the networking of digital instruments to simplify collection and exchange of data, and unstaffed automatic observatories. Personal computers and compact disc readers are ubiquitous. Many WDCs publish collections of digital data sets on compact discs for easy distribution. Digital communication networks make it possible to transfer large data files by electronic mail, reducing much of the routine work of WDC staff, who are now largely engaged in developing new data compilations and new tools for data display and analysis. The environmental WDC disciplines make use of map-based data and information on natural features and human activities that differ in character from the numerical data sets of the older disciplines and require new analysis techniques.

Over the years the tally of WDCs has changed because of scientific, technical and economic factors. Solar-terrestrial physics developed into a unified discipline embracing many IGY subjects. Some specialized topics have declined in importance, and the WDC system has expanded into the environmental and Earth resource fields. A comprehensive set of WDC-D was established in China in 1988. WDC-A in the U.S.A. has expanded; many of its discipline centers are collocated with national data centers. WDC-B in Russia is now operated by three different organizations. Some of the C, C1 and C2 centers in Europe and Asia have moved or have closed (especially those that depended on the expertise of a particular research group), but new centers have opened. All centers now have computer facilities and most use electronic networks to meet requests, exchange catalog information and transfer data.

Today the WDC system is healthy and viable. Most centers are maintaining their funding, though not without struggle. Data acquisition, storage and distribution are expensive—WDCs cost money, but they are cost-effective in transferring data to users, and their operational costs represent a tiny fraction of worldwide scientific activity. The ICSU Panel on World Data Centres hopes that this Guide will provide a useful overview of the system. Users should read Chapter 2, especially section *F, Using the WDC System*, in conjunction with the information on individual WDCs in Chapters 3–7.

CHAPTER 2. THE WORLD DATA CENTER SYSTEM

This chapter spells out the functions of ICSU World Data Centers and the principles under which they operate, together with general information about the WDC system. Section A sets out the principles and responsibilities of WDCs and the rules for opening and closing centers. These are subject to formal agreements between ICSU and the national agencies that operate the WDCs. Sections B–F of this chapter gives other information that may be useful to users. The 1995 list of WDCs may be found on the inside back cover of this Guide, and details of individual Centers are given in Chapters 3–7. The topics dealt with in this chapter are as follows:

A. Principles and Responsibilities of ICSU World Data Centers
B. Rules for Opening and Closing World Data Centers
C. Contribution of Data to World Data Centers
D. Summary of the Activities of World Data Centers
E. The Modern WDC System: Opportunities and Problems
F. Using the WDC System

A. PRINCIPLES AND RESPONSIBILITIES OF ICSU WORLD DATA CENTERS

The basic principles and responsibilities of the international exchange of solar, geophysical and environmental data through the World Data Centers have carried forward under ICSU rules, essentially unchanged since the establishment of the WDC system for the IGY. The following text replaces the sections on "Principles and Responsibilities of the World Data Centers" in Part I of the *Guide to the World Data Center System*, dated November 1987.

1 World Data Centers are operated for the benefit of the international scientific community. WDCs in the United States are designated as WDC-A, in Russia as WDC-B, in other European countries as WDC-C or WDC-C1, in Japan or India as WDC-C2, and in China as WDC-D. They are supported by national organizations according to these Principles laid down by the ICSU Panel on World Data Centres.

2 The resources required to operate WDCs are the responsibility of the host country or institution, which is expected to provide these resources on a long-term basis. If for any reason a WDC is closed, the data holdings shall be transferred to another WDC.

3 WDCs will, subject to their financial resources, accept data according to the data management plans of appropriate ICSU scientific programs or monitoring activities, and store these data safely and in good condition. WDCs may enhance their holdings by seeking and collecting related data sets. They may prepare higher-order data products such as indices of activity and collated or condensed data sets.

4 WDCs will prepare and publish catalogs of their data holdings, or otherwise make freely available information on their holdings, e.g., by electronic access.

5 WDCs will exchange data among themselves, as mutually agreed and whenever possible without charge, to facilitate data availability, to provide back-up copies, and to aid the preparation of higher order data products.

6 No confidential or security-classified data are to be held in a WDC.

7 Data may be subject to privileged use by their originators, for a period to be agreed beforehand, and not to exceed two years from the date of acquisition by the WDC.

8 WDCs will provide data to scientists in any country free of charge, on an exchange basis or at a cost not to exceed the cost of copying and sending the requested data. Additional charges may be made for special services, or for acquiring data from outside the WDC system.

9 WDCs will accept any scientist as a visitor to work on site with data holdings held under WDC auspices.

10 WDCs will report to the ICSU Panel as requested.

B. RULES FOR OPENING AND CLOSING WORLD DATA CENTERS

I The aim of the WDC system is to support ICSU programs. To this end, it is desirable to maintain more than one WDC in any discipline or program area, as a safeguard against catastrophic loss of unique data, to share the work of preparing catalogs and deriving higher-order data products, and to provide convenient access to data and facilities. Experience suggests that about three centers in a given discipline suffice for these purposes.

II The following guidelines refer to the Panel's procedures for responding to new needs. Different cases arise for different categories of WDC, namely:

* Complex WDCs that comprise a comprehensive set of centers in one country, with a national coordination mechanism (para. *III*);
* Individual parts of a complex WDC (para. *IV*);
* Independent centers that are not part of a complex WDC (para. *V*).

III Any proposal for establishing an entire new complex WDC must initially be submitted to the Chairman. The Executive will require a very strong case for approving any such proposal.

IV In the case of a proposed new center within a complex WDC (i.e., WDC-A, WDC-B and WDC-D) the Panel will rely on that WDC's member for assurances that the new Center will conform to the Panel's Principles and Responsibilities of WDCs, as prescribed in the Panel's Guide to the WDC System. The new center must meet ICSU program requirements that are not already met in that WDC.

V In the case of a new independent WDC-C, the proposal should be submitted through the WDC-C1 or WDC-C2 representative, according to geographical location. It should also have the endorsement of the relevant national body adhering to ICSU. The case for establishing the new WDC will be evaluated by the Executive.

VI Any proposed WDC in a new discipline or program must have the general endorsement of the appropriate ICSU body or program organization, and be international in its activities. It should also have the endorsement of the relevant national body adhering to ICSU. For major programs the proposal should include a data management plan.

VII Circumstances may sometimes require the closing of a center, which nonetheless has terminal responsibilities to the WDC system. Any organization that wishes to close a WDC (whether it be part of a complex WDC or an independent WDC) should notify the Panel, specifying the arrangements for preserving the data holdings or transferring them to another WDC.

C. CONTRIBUTION OF DATA TO WORLD DATA CENTERS

1 World Data Centers receive data from individual scientists, projects, institutions, local and national data centers, and other WDCs. The mechanisms for data acquisition include:

a. Routine monitoring programs, which may be operated by the agency that operates the WDC.

b. ICSU-sponsored scientific programs. Major programs should include a data management program, developed in consultation with the ICSU Panel on WDC, giving details of data to be submitted by participants to the WDCs or other appropriate centers.

c. Statements or recommendations by international scientific organizations, approved by the ICSU Panel on World Data Centres, and published in the appropriate discipline section of the Guide to the WDC System.

d. The WDC Panel's "data rescue" program, which involves all parts of the WDC system and has two main aspects: (i) safeguarding older data sets which, for any reason, may be at risk of loss or deterioration; (ii) digitizing old data sets (e.g., geomagnetic and ionospheric data) to enable modern techniques to be used for their analysis.

e. Voluntary data contributions by agreement with a WDC. A WDC is not obliged to accept all such data offered to it.

2 Contributors are expected to provide data to the World Data Centers in specified formats with full documentation, preferably in computer-compatible form, and to take responsibility for quality control of their data. World Data Centers can normally only undertake quality control for data sets or data products that they themselves generate, though they are encouraged to assist data producers and users to assess data quality.

3 WDCs do not pay for data on a commercial basis. They may offer other data or services in exchange for data, or agree to contribute to the cost of acquisition.

D. SUMMARY OF THE ACTIVITIES OF WORLD DATA CENTERS

The following list expands on the formal responsibilities of WDCs, as listed in Section A above, and gives further examples of WDC activities. The list does not claim to be exhaustive.

1 Collecting and cataloguing data and information in cooperation with other WDCs.

2 Maintaining the data in good condition.

3 Providing data to users, at minimum costs of copying and distribution.

4 Working with originators of data to improve documentation of the data.

5 Preserving important old data sets by converting them from tabular to digital form.

6 Compiling specialized data sets for small-scale, regional and global geophysical research.

7 Making data sets available on such media as compact discs, enabling users to search large data collections and transfer them to their home laboratory.

8 Assessing technical issues of aging, error growth and lifetimes of data storage media.

9 Combining data from various sources to derive data products, such as indices of solar or geomagnetic activity.

10 Compiling numerical models to describe the time-varying and space-varying geophysical environment, such as the geomagnetic field and the upper atmosphere.

11 Maintaining on-line information services related to the above activities.

12 Operating visitor programs to enable scientists to work on WDC data holdings with the assistance of the WDCs' professional staff.

13 Assisting scientists to locate and access related data not held in the WDC System.

E. THE MODERN WDC SYSTEM: OPPORTUNITIES AND PROBLEMS

Experience has shown that many features of the original IGY WDC system are still useful, while others are obsolete. As the WDC system evolved and data holdings grew, the principle of multiple data sets had to be modified. Routine

exchange of data between WDCs continued in a few disciplines in which it was well established and not particularly burdensome, but it ceased to be general practice and could not be extended to newer types of data, for several reasons.

First, it became impracticable to duplicate the large data sets obtained from spacecraft, because of the physical size of the archives, and the fact that the cost would be well outside the WDCs' budgets. This outweighed concerns about possible catastrophic loss. Second, many spacecraft and some other data sets carry privileges of "first use" by the experimenters whose instruments acquired the data, at least for a specified period of time. Third, it is often more practical for large data sets to be archived at the experimenters' home institutions. In this case, the WDC system can often act in a "referral mode," by holding information about data sets, though not the actual data. This extension of WDC services benefits experimenters and users by increasing the flow of information, and enables the WDC staff to serve the community more effectively.

Some of the problems have been solved by establishing National Data Centers, which may be collocated with a WDC and share the same staff. The data in such centers are generally available to the international community, though their use may be subject to certain rules, and they carry no rights of free or cheap copying to other WDCs.

WDCs have developed new activities to support their basic purpose of providing data. They need to maintain contact with their user communities. Personal visits by users are encouraged, and some WDCs have guest scientist programs for extended visits. Some WDCs organize workshops to discuss data-related topics or undertake cooperative analysis of particular data sets by groups of scientists, e.g., the Coordinated Data Analysis Workshops (CDAW) of WDC-A. Such workshops are effective in promoting scientific interaction and good use of data.

Some WDCs have expertise for data processing services and compilation of data products. An example is the derivation of the much-used Auroral Electrojet (AE) magnetic index, originally undertaken by WDC-A and later transferred to WDC-C2, which also derives the equatorial Dst index. Another development is the production of joint catalogs in several disciplines. This was initiated in a joint WDC-A and WDC-B catalog for Geomagnetism, Report UAG-86 of 1982, later replaced by Report UAG-92 of 1985 which catalogued the holdings of the A, B, C1 and C2 centers. A similar catalog was issued for ionospheric data, Report UAG-91 of 1985 for Ionospheric Vertical Soundings data at A, B, C1 and C2. The catalogs are widely available on-line, and WDC information is increasingly available on the Worldwide Web (Section F). The success of these developments, and indeed the quality of all WDC services, depend on the work

of the WDCs' scientific staff. The staff may engage in personal scientific research using the data, often in cooperation with the outside user community.

In general, WDCs do not provide operational services such as short-term forecasting or real-time reporting of geophysical or environmental conditions (e.g., of geomagnetic disturbances). These are undertaken by FAGS services or other organizations, though some WDCs do contribute to these activities.

Today's WDC system faces many challenges. It has to serve international research programs that aim to describe the complex and interactive Earth system, with the ultimate goal of predicting its evolution and future state. The major ICSU programs are the Solar-Terrestrial Energy Program (STEP, 1990–1995), the International Geosphere-Biosphere Program (IGBP, 1991–2000), and the International Decade for Natural Disaster Reduction (IDNDR, 1990–1999). Of these, STEP is in a field long served by WDCs and will provide work for WDCs long after the experimental phase has ended. The others embrace disciplines and types of data not hitherto familiar to the WDC system, such as the biospheric and human-activity data needed for global change studies (e.g., maps of soil types, vegetation types and land-use), that may be non-numerical and non-continuous and thus require new analysis techniques.

The ICSU programs require the unrestricted exchange of solar, geophysical and environmental data, in order to describe the present state of Earth's climate and biospheric systems, to understand the workings of myriad individual physical and biospheric processes involved in the global system, and to monitor the progressive effects of those processes. The WDC community must always be on guard against attempts by national or commercial interests to restrict the flow of data. There is increasing difficulty, which is by no means confined to developing countries with their special problems, in maintaining the flow of data from the regular monitoring networks (e.g., geomagnetic, ionospheric and cosmic ray monitors). Even where networks are maintained for operational needs, as in meteorology, difficulties may arise in acquiring and preserving their data for long-term research.

F. USING THE WDC SYSTEM

A scientist who needs data should approach a WDC that serves the discipline concerned. All WDCs are open to visitors during normal working hours, but it is advisable, and in some cases essential, to arrange personal visits in advance. As mentioned in Section D, some WDCs organize workshops and some have guest

programs to provide for extended visits for using data and interacting with WDC staff. Interested scientists should contact an appropriate WDC for details.

The WDC's response to a data request will depend on where the data are held. If the data are held by the WDC, they can normally be provided quickly, at cost of copying and sending. If the data are held in a National Data Center, which may be collocated with a WDC, the WDC will forward the request. Data held in a national center may be available to any scientist, though their use may be subject to certain rules, and there are no rights of free or cheap copying to other WDCs. Sometimes a WDC can act as a referral service, suggesting possible sources of the required data. If the data are held in another country, the WDC may transmit the request to another WDC.

As specified in the Principles (Section A), WDCs may recover from users the cost of copying and sending the data. Additional charges may be made for special services, such as acquiring data from outside the WDC system. WDCs may provide services free of charge to scientists or institutions that provide data to the WDC.

Chapters 3–7 of this Guide contain descriptions of every WDC. The chapters are intended to give an overview of data and services that are available, and of any special features or activities of the WDC. It may be assumed, unless otherwise stated, that all WDCs are open during normal working hours on Mondays to Fridays, except public holidays. The postal addresses, telephone and fax numbers and Internet addresses should suffice for making contact with the WDC, but such details are of course subject to change. Directors' names are given; but changes of personnel take place from time to time, so general inquiries should be addressed to "The Director" rather than a named person.

Information about the WDC system as a whole may be found on the Worldwide Web Home Pages provided by WDC-A at the National Geophysical Data Center in Boulder, Colorado. The information is updated from time to time, and will include amendments to this WDC Guide. The address is:

http://www.ngdc.noaa.gov/wdcmain.html

The WDC pages are mirrored in Europe by WDC-C1 for STP at Chilton, England, and may be accessed via the WWW address given for that WDC in Chapter 5. Many WDCs have their own Home Pages; the current addresses are given in Appendix A but such information is always liable to change.

It should be noted that there exist organizations that describe themselves as "World Data Centers" but do not necessarily conform to the ICSU rules or provide services on the terms described in this Guide.

Finally, users should *always* acknowledge the original sources of their data and the assistance given by WDCs. Such acknowledgements are valuable to the WDCs, and may be required by the scientists who originally supplied the data.

CHAPTER 3. WORLD DATA CENTER A

World Data Center A is situated in the United States of America. It is a complex center, comprising thirteen discipline centers and a Coordination Office, managed by the U.S. National Academy of Sciences through its Committee on Geophysical and Environmental Data. The Coordination Office provides WDC-A representation on the ICSU Panel on World Data Centres, and facilitates visits and other activities that are common to the WDC-A discipline centers. Details of the Coordination Office are:

Dr Anne M. Linn, Director — Tel: +1 202 334 2744
WDC-A Coordination Office — Fax: +1 202 334 1377
National Research Council
National Academy of Sciences
2101 Constitution Avenue
WASHINGTON DC 20418 U.S.A. — Internet: alinn@nas.edu

The WDC-A Representative on the ICSU Panel on World Data Centres is:

Prof Ferris Webster — Tel. +1 302 645 4266
College of Marine Studies — Fax. +1 302 645 4007
University of Delaware
LEWES DE 19958 U.S.A. — Internet: ferris@udel.edu

Details of the 13 WDC-A discipline centers are given on the following pages:

WORLD DATA CENTER A FOR ATMOSPHERIC TRACE GASES

Mr Thomas Boden, Director — Tel: +1 423 241 4842
Ms Sonja Jones, Request Coordinator — Tel: +1 423 574 3645
WDC-A for Atmospheric Trace Gases — (General) Tel: +1 423 574 0390
Carbon Dioxide Information Analysis Center — Fax: +1 423 574 2232
Oak Ridge National Laboratory
P.O. Box 2008
OAK RIDGE TN 37831-6335 U.S.A. — Internet: cdiac@ornl.gov

WWW Home Page: http://cdiac.esd.ornl.gov/cdiac/wdcinfo.html

Maintained by: Oak Ridge National Laboratory, managed by Lockheed Martin Energy Systems Inc. for the U.S. Department of Energy. The WDC-A for Atmospheric Trace Gases is operated by, and collocated with, the Carbon Dioxide Information Analysis Center (CDIAC), sponsored by the U.S. Department of Energy's Environmental Sciences Division.

Summary of Data Held: Varied data on emissions of radiatively active trace gases and their concentrations in the atmosphere, oceans, and the biosphere, including:

- Time series of concentrations of carbon dioxide (CO_2), ozone, methane, nitrous oxide, chlorofluorocarbons (CFCs), CFC replacement species, and HCFCs from ice cores and monitoring stations around the world.
- Global, regional and national emissions of carbon dioxide from fossil fuel combustion and cement manufacturing, 1950–1993; decadal carbon dioxide emissions on a 1^o x 1^o lat/long global grid, 1950–1990.
- Carbon storage in ecosystems, on a $½^o$ x $½^o$ lat/long global grid.
- Oceanic ^{14}C, partial pressure of CO_2, total CO_2, and total alkalinity measurements.
- Organic soil carbon and nitrogen profiles.
- Atmospheric and oceanic carbon isotope measurements.
- Historic land-use changes and corresponding carbon emissions.
- Tropospheric and stratospheric optical depth measurements.
- Computer projections of fossil fuel CO_2 emissions based on demographic and energy parameters for 1975–2100.

User Services: Open to visitors during normal working hours; advance notification recommended (required for non-US citizens).

WORLD DATA CENTER A FOR GLACIOLOGY

Dr Roger G. Barry, Director
WDC-A for Glaciology
CIRES, Campus Box 449
University of Colorado
BOULDER CO 80309
U.S.A.

Tel: +1 303 492 5171
Tel: +1 303 492 6199
Fax: +1 303 492 2468

Internet: nsidc@kryos.colorado.edu
rbarry@kryos.colorado.edu

WWW Home Page: http://nsidc.colorado.edu/NOAA/wdc-a.html

Maintained by: Operated under a cooperative agreement between the University of Colorado, Cooperative Institute for Research in Environmental Sciences (CIRES), and the National Oceanic Atmospheric Administration (NOAA). The WDC-A for Glaciology is collocated with the National Snow and Ice Data Center (NSIDC).

Summary of Data Held: Digital data on numerous forms of snow and ice research including snow depth and extent; sea ice extent and concentration; ice cores; passive microwave data; freshwater ice. Other data holdings include imagery, an historical glacier photograph collection, and published information relating to all aspects of snow, ice, and permafrost research.

User Services: Located at 1540 30th Street, Boulder, Colorado. The WDC-A for Glaciology is open to visitors during normal working hours. Data copying, processing and analysis are available through in-house computers and image analysis capabilities. Literature searches on any topic can be performed on CITATION, the in-house on-line bibliographic data bank. Mail and telephone queries are welcome.

Publications: Quarterly accessions list, bibliographies, inventories, data reports in *Glaciological Data* series. Data announcements describing individual data sets held by the WDC-A are available on request.

WORLD DATA CENTER A FOR HUMAN INTERACTIONS IN THE ENVIRONMENT

Dr Roberta Balstrad Miller, Director Tel: +1 517 797 2727
WDC-A for Human Interactions in the Environment Fax: +1 517 797 2622
CIESIN
2250 Pierce Road
UNIVERSITY CENTER MI 48710 U.S.A. Internet: ciesin.info@ciesin.org

WWW Home Page: http://www.ciesin.org/home-page/WDC.html

Maintained by: The Consortium for International Earth Science Information Network (CIESIN), a six-member consortium of universities and research institutions. The WDC-A for Human Interactions in the Environment is collocated with the Information Cooperative, the NASA EOSDIS Socio-economic Data and Applications Center, and the Data and Information System of the International Human Dimensions of the Global Environmental Change Program.

Summary of Data Held: The following categories of data are maintained by or accessible through CIESIN:

- Population dynamics
- Land and freshwater resources
- Agriculture and food security
- Industry and energy
- Economic activity
- Policy and institutions
- Human attitudes, preferences and behavior
- Human and environmental health

Pathfinder data sets containing extensive socioeconomic and natural science data on several regions, including North America, China, Eastern Europe, and the former U.S.S.R.

User Services: WDC-A for Human Interactions in the Environment is located at CEISIN's Saginaw Headquarters and at its Washington office at 1747 Pennsylvania Avenue N.W., Suite 200, Washington, DC 20006. Open to visitors during normal working hours. Advance notice is recommended. The CIESIN User Services Department (telephone, fax, and e-mail as above) provides assistance for users of the WDC. Data are provided primarily on-line in digital form. Where practicable, data are made available in other media, such as floppy disks, CD-ROM and printed copy.

WORLD DATA CENTER A FOR MARINE GEOLOGY AND GEOPHYSICS

Dr Troy Holcombe, Director
WDC-A for Marine Geology and Geophysics
NOAA/NGDC Code E/GC3
325 Broadway
BOULDER CO 80303 U.S.A.

Tel: +1 303 497 6390
Fax: +1 303 497 6513
Internet: wdcamgg@ngdc.noaa.gov
tholcombe@ngdc.noaa.gov

WWW Home Page: http://www.ngdc.noaa.gov/mgg/wdcmgg

Maintained by: U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The WDC-A for Marine Geology and Geophysics is operated by, and collocated with, the National Geophysical Data Center (NGDC).

Summary of Data Held: WDC-A MGG manages all types of data from the ocean floor including descriptions and analyses of seafloor samples, deep drilling data, underway geophysical measurements, and derived gridded data sets including total sediment thickness of the world oceans. Other data types include coastlines and plate boundaries.

Geophysical data include bathymetry, gravity, and magnetics, and single-channel and multi-channel sub-bottom profiles collected on more than 4,000 oceanographic surveys covering millions of km from the world's oceans. Bathymetric data include i) underway bathymetric measurements (including multibeam data); ii) gridded bathymetric data for the world's oceans based on compilations by the U.S. Naval Oceanographic Office and; iii) hydrographic sounding in U.S. waters. WDC-A also offers gridded total sediment thickness data from ocean basins and sidescan sonar image data.

Geologic data are available for over one hundred thousand cores, grabs, dredges, and drill samples covering most of the world's oceans. Data include i) faunal counts; ii) geochemical measurements such as carbon and isotope data, trace metal analyses of sediment, and major-element analyses of rocks; iii) physical properties of sediment, including particle size and geotechnical properties such as vane shear and density; iv) visual descriptions; v) paleomagnetics; vi) downhole logging data and; vii) marine minerals data.

Data are contributed by sources from around the world and were originally collected for a variety of purposes, including academic research, international and interdisciplinary scientific projects, commercial mineral resource evaluations, defense, and government environmental baseline studies.

User Services: The WDC-A for MGG is located in Research Laboratory 3 at 3100 Marine Street, Boulder, Colorado. Visitors are welcome during normal working hours; advance notice is recommended. A visiting scientist program exists. Data processing, copying and analysis facilities are available. Data are available on most media including CD-ROM, via Internet, and other media on request. On-line access via Worldwide Web (URL address above), Gopher (gopher.ngdc.noaa.gov) and anonymous FTP (ftp.ngdc.noaa.gov). Login for FTP access is userid: anonymous, and password: your full e-mail address. WDC-A for MGG inventories are fully searchable via the WWW and many CD-ROM and other databases are available for on-line searching and data download.

Publications: WDC-A for MGG publication series includes color images, data reports, and scientific reports of interest to the MGG community.

Special Projects: WDC-A MGG participates in the Intergovernmental Oceanographic Commission (IOC) technical committee on International Oceanographic Data and Information Exchange (IODE), the General Bathymetric Chart of the Oceans (GEBCO), regional IOC mapping projects, and cooperates extensively with the International Ocean Drilling Program (ODP), for which it operates a parallel data archive..

WORLD DATA CENTER A FOR METEOROLOGY

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Maintained by: U.S. Department of Commerce, National Oceanic and Atmosphere Administration (NOAA). The WDC-A for Meteorology is operated by, and collocated with, the National Climatic Data Center (NCDC).

Summary of Data Held: Various data sets and data products from international programs and experiments, including meteorological and nuclear radiation data for International Geophysical Year (see IGY Annals Vol. 26); Global Atmospheric Research Program, World Climate Research Program, World Climate Data and Monitoring Program; and data exchanged with WDC-A by participating countries.

International Geophysical Year (IGY). Global meteorological and nuclear radiation data and data products, 1957–1958.

International Quiet Sun Year (IQSY). Global meteorological data and data products, 1964–1965.

Global Atmospheric Research Program (GARP):

GARP Atlantic Tropical Experiment (GATE) 1974; First GARP Global Experiment (FGGE) 1978–1979; Winter and Summer Monsoon Experiments (WMONEX, SMONEX) for 4-month periods within FGGE; Alpine Experiment (ALPEX) for 2-month period in 1982.

The World Climate Research Program (WCRP):

International Satellite Cloud Climatology Project (ISCCP). Global analyses of satellite radiance measurements, 1982–2000. Data products are archived at ISCCP Central Archive and are available from WDC-A.

Tropical Ocean Global Atmosphere (TOGA) for specified ocean area, 1985–1994; TOGA Coupled Ocean-Atmosphere Response Experiment for a 12-

month period in 1992–1993, including a 4-month intensive campaign in the Western Pacific.

Global Precipitation Climatology Project (GPCP). Monthly precipitation data from surface, radar and satellite measurements for 1986 onwards.

World Climate Data and Monitoring Program (WCDMP). Baseline Data sets prepared in cooperation with WMO, WDC-B and WDC-D and exchanges with participating countries.

Global Historical Climate Network (GHCN). Comprehensive monthly global baseline climate data set of temperature, precipitation, and pressure. The earliest record dates from 1697.

Comprehensive Ocean-Atmosphere Dataset (COADS) from ships and buoys, some dating from the 1850s.

Comprehensive Aerological Reference Dataset (CARDS) from radiosondes and rawinsondes, and station histories, 1948–1995.

High altitude rocketsonde data for 1959–1976.

Ozone. *Ozone Data for the World* from 1965, Atmospheric Environment Service, Department of the Environment, Canada, in cooperation with WMO.

Solar Radiation and Radiation Balance Data from World Radiation Data Center, St. Petersburg, Russia, in cooperation with WMO, from 1964.

Synoptic Data for surface and upper air observations, daily and monthly summaries, some in computer form, from countries participating in data exchange activities with WDC-A.

User Services: Open to visitors during normal working hours. Advance notice is recommended. Facilities include computers, microfilm and microfiche readers, printers and copiers. Services include data and map reproduction, statistical analysis, library searches, certification of records. Referral service for data not held by WDC-A. Visiting scientists may be supported by parent organizations, WMO training programs, or grants from U.S. National Research Council.

Publications: Monthly Climatic Data for the World, monthly in cooperation with WMO, including climate data from World Weather Watch Program. *1961–1990 Global Standard Climate Normals,* in cooperation with WMO.

WORLD DATA CENTER A FOR OCEANOGRAPHY

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Maintained by: U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The WDC-A for Oceanography is operated by, and collocated with, the National Oceanographic Data Center (NODC).

Summary of Data Held: A variety of oceanographic data sets, collected during international projects and routine observational programs. Examples are:

International Geophysical Year: IGY and IGC oceanographic data 1957–1959.

International projects: Data from the Tropical Atlantic (ICITA), Indian Ocean (IIOE) Programs, and the first GARP Global Experiment (FGGE). Data sets from Climate Research Programs (TOGA, WOCE, and JGOFS).

Routine observations: Data from fixed stations and ship cruises since 1900; Nansen cast and salinity/temperature/depth (STD/CTD) data, bathythermograph data, biological data, current measurements.

User Services: Open to visitors during normal working hours. Advance notice is recommended. NODC data processing facilities and data management services are available to users of the WDC-A.

Data Publications: Annual reports of *Oceanographic Data Exchange*; data catalog to 1975, with *Change Notices* from 1975 onward; *Accessioned Publications, 1957–1967*, with biennial supplements; data reports and special catalogs for international oceanographic programs.

Data Products: Time Series Data Sets for the World's Oceans. Responsible National Oceanographic Data Center (RNODC) data sets for Integrated Global Ocean Services System (IGOSS), FGGE operational year, Drifting Buoy Data, Southern Oceans WOCE Upper Ocean Thermal Data Set, World Ocean Atlas 1994 (atlases and CDs), Atlas of Surface Marine Data 1994 (atlases and CDs).

WORLD DATA CENTER A FOR PALEOCLIMATOLOGY

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Maintained by: U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The WDC-A for Paleoclimatology is operated by, and collocated with, the National Geophysical Data Center (NGDC).

Summary of Data Held: Estimates of past environments derived from tree rings, ice cores, marine and lake sediments, etc. Most data are for the Quaternary (the past 700,000 years), some for earlier climates. Archives include the raw data used to reconstruct climate variables. Examples include:

Tree rings: Time series of ring-width and wood density, climate reconstructions. Global distribution, spanning 10,000 years BP.

Ocean Sediments: Geochemical measurements (Cd/Ca, ^{14}C, C and O isotopes), counts of fossil plankton, and estimates of temperature, salinity, ocean circulation. Global distribution, spanning 500,000 yr BP.

Lake and Mire Sediments: Sediment accumulation, geochemical measurements, pollen and plankton, reconstructions of vegetation, precipitation, lake levels, temperatures, etc. Global distribution, spanning 20,000 yr BP.

Ice Cores: Aerosols, stable isotopes, atmospheric trace-gas content, etc. Global distribution, spanning 300,000 yr BP.

Corals: Geochemical analyses of banded corals. Distribution: tropical oceans, spanning the last several hundred years BP.

Climate Forcing and Boundary Conditions: Volcanic aerosols, solar variability, insolation, ice volume, sea level, land surface albedo, atmospheric trace gas content. Global distribution, spanning 5,000,000 BP.

Numerical Model Simulations: Input and results from computer climate model simulations for specific intervals and model sensitivity experiments to examine the role of climate forcing. Global distribution, spanning 20,000 yr BP and older intervals.

Climate Reconstructions: Raw and gridded map reconstructions of sea level, vegetation, albedo, temperature, precipitation, circulation patterns. Global distribution, spanning 20,000 yr BP, older intervals including the last interglacial, 126,000 yr BP).

User Services: The WDC-A for Paleoclimatology is located in Research Laboratory 3 at 3100 Marine Street, Boulder, Colorado. Visitors are welcome during normal working hours; advance notice is recommended. A visiting scientist program exists. Data processing, copying and analysis facilities are available.

Data are available on most media including CD-ROM, via Internet, and other media on request. On-line access via Worldwide Web (URL address above), Gopher (gopher.ngdc.noaa.gov) and anonymous FTP (ftp.ngdc.noaa.gov). Login for FTP access is userid: anonymous, and password: your full e-mail address.

Publications: The Paleoclimate Data Record.

Special Projects: Past Global Changes (PAGES), an International Geosphere Biosphere Program Core Project, is distributing data via the WDC-A. The Paleoclimate Model Intercomparison Project, sponsored by NATO, will compare numerical climate model simulations for different geological eras. Data from this project will be archived at and distributed via the WDC-A.

WORLD DATA CENTER A FOR REMOTELY SENSED LAND DATA

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U.S. Geological Survey — Fax: +1 605 594 6589
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WWW Home Page:
http://edcwww.cr.usgs.gov/doc/edchome/world/wdcguide.html

Maintained by: U.S. Geological Survey (USGS). The WDC-A for Remotely Sensed Land Data is collocated with the EROS Data Center.

Summary of Data Held: Digital and photographic images of land areas, with extensive "metadata;" over 2 million images acquired from satellites and over 8 million aerial photographs. Examples are:

Landsat Multispectral Scanner (MSS): MSS data acquired by the United States during 1972–1992, providing coverage of areas throughout the world, (predominantly in North America); information on foreign Landsat holdings.

Advanced Very High Resolution Radiometer (AVHRR): Enhanced and derivative AVHRR data, providing coverage of areas throughout the world, from 1986 to the present. (Standard Level 1B products are distributed by the National Oceanic and Atmospheric Administration.)

Skylab/Gemini/Apollo Photography: Over 60,000 frames of black-and-white, color, and color infrared photographs providing intermittent coverage of the Earth, from the Skylab Earth Resource Experiment Package during three missions in 1973–1974.

Space Shuttle Earth Observations Hand-Held Photography: 80,600 frames of Earth-observing, hand-held photographs by Shuttle astronauts in natural color, color infrared, and black-and-white. The photography provides site-specific coverage throughout the world, from April 1981 onwards.

Aircraft Photography of Antarctica: 300,000 aerial photographs of Antarctica, mostly in black-and-white but some in color. These photographs

were produced by the U.S. and other member nations of the Scientific Committee on Antarctic Research and acquired between 1946 and the present.

User Services: Requests for information on data, establishment of customer accounts, or orders for products should be directed to "Customer Services" at the address noted above. Available facilities include advanced data analysis laboratories, production digital and photographic data processing systems, and on-line computerized access to data directory, catalog and inventory information about Center holdings and land data holdings of other facilities.

The Global Land Information System (GLIS), an interactive on-line database describing certain of the WDC-A holdings, can be accessed through the Internet. For information on GLIS access contact the Customer Services staff at Tel: +1 800 252 4547 or e-mail: glis@glis.cr.usgs.gov.

WORLD DATA CENTER A FOR ROCKETS AND SATELLITES

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Worldwide Web: http://nssdc.gsfc.nasa.gov/about/about_wdc-a.html

Maintained by: U.S. National Aeronautics and Space Administration, Goddard Space Flight Center (GSFC). The WDC-A for Rockets and Satellites is operated by, and collocated with, the National Space Science Data Center (NSSDC).

Summary of Data Held: Information about rocket, satellite, and space probe launches (information on current rocket launches is no longer maintained); satellite orbit elements and ephemerides; descriptions of spacecraft and experiments. NSSDC holds many data from NASA space science spacecraft, accessible to non-U.S. users in off-line form (CD-ROMs and tapes) by requests directed to the Request Coordination Office of WDC-A-RandS. Some NSSDC holdings are accessible electronically.

User Services: Open to visitors during normal working hours (advance notification recommended). Disseminates spacecraft launch information with newly assigned international identifiers within days of launches. Forwards international data requests for NSSDC-held data. On-line information about NSSDC data holdings may be obtained via WWW http://nssdc.gsfc.nasa.gov, which links to NASA Master Directory and other data and services.

Publications: SPACEWARN Bulletin which summarizes spacecraft launches monthly (also at http://nssdc.gsfc.nasa.gov/spacewarn/spacewarn.html); detailed catalogs of NSSDC data holdings; data books and CD-ROMs for selected NSSDC data.

WORLD DATA CENTER A FOR THE ROTATION OF THE EARTH

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Maintained by: The Earth Orientation Parameters Division of the Time Service Department, U.S. Naval Observatory.

Summary of Data Held:

Earth rotation data: Rotation rate data (1933 to present), and polar motion data (1894 to present).

Astronomical observations: Latitude and longitude observations with photographic zenith tubes, transit instruments, moon-position cameras, astrolabes and interferometers.

Satellite data: Laser ranging data for the Moon and LAGEOS satellite.

Other: Doppler and VLBI data.

User Services: Open to visitors during normal working hours and Monday evenings. Advanced notice is required. Current data are available on the NEOS electronic bulletin board system. The system operates at 2400 baud, 8 data bits, 1 stop, no parity. The telephone number is +1 202 653 0597.

Publications: *IERS Bulletin A,* almanacs, circulars, *Time Service Announcements*, and the *IERS Annual Report*.

WORLD DATA CENTER A FOR SEISMOLOGY

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WWW Home Page: http://wwwneic.cr.usgs.gov

Maintained by: U.S. Department of Interior, U.S. Geological Survey (USGS). The WDC-A for Seismology is operated by, and collocated with, the National Earthquake Information Service (NEIS), whose data may be available through the WDC.

Summary of Data Held: Seismograms from worldwide stations for Earthquakes designated "IDE" as provided for in the ICSU Guide.

Worldwide Standardized Seismograph Network: Analog data from the WWSSN stations (1961 onwards).

Digital data: Digital waveform data on magnetic tape and compact discs, from the USGS/IRIS Global Digital Network.

User Services: The WDC-A for Seismology is located at 1711 Illinois Street, Golden, Colorado. Open to visitors during normal working hours. Advance notice is recommended. Computer facilities are available.

Data Products, Publications: NEIS *Quick and Preliminary Earthquake Epicenter Determinations* (PDE), monthly epicenter listings, data reports, and the annual publication *U.S. Earthquakes*. Epicenter catalogs, Earthquake focal mechanisms including first motions and moment tensors, all available on CD-ROMs. Seismicity maps.

The WDC keeps a WWW home page (see above) describing products and information available from the National Earthquake Information Center.

WORLD DATA CENTER A FOR SOLAR-TERRESTRIAL PHYSICS

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Maintained by: U.S. Department of Commerce, National Oceanic and Atmospheric Administration. The WDC-A for STP is operated by, and collocated with, the National Geophysical Data Center (NGDC).

Summary of Data Held: WDC-A for Solar-Terrestrial Physics (STP) collects, analyzes, archives, and disseminates data that describe the space environment from the surface of the sun to the surface of the Earth including the sun, interplanetary space, the magnetosphere, the ionosphere, the thermosphere, geomagnetism, and cosmic rays. Special emphasis is given to data sets that support the modeling of, and coupling between, regions of space.

Solar activity: Data sets cover a wide range of routine solar measurements and events including sunspot numbers, solar radio emissions, solar x-rays, energetic particles, listings of event characteristics, and solar magnetic fields.

Space environment monitors: Ground-based instruments and NOAA satellites monitor magnetospheric magnetic fields, energetic particles, inferred interplanetary sector structure, and magnetosphere-ionosphere coupling.

Ionosphere: Remote sensing data from ground-based instruments are used to monitor ionospheric densities and total electron content. DMSP and NOAA satellites record ionospheric densities, temperatures, composition, drifts, and images of the aurora.

Geomagnetism: Geomagnetic variations recorded on satellites and on the ground are maintained at one minute, one hour, daily, and monthly resolution and are summarized as global indices of magnetic activity.

Cosmic rays: Neutron monitor data are received from 50 stations.

User Services: The WDC-A for STP is located in Research Laboratory 3 at 3100 Marine Street, Boulder, Colorado. Visitors are welcome during normal working hours; advance notice is recommended. A visiting scientist program exists.

Digital and analog data are available on a variety of media. Digital data are provided for online file transfers or publication quality prints; magnetic media or CD-ROM. WDC-A for STP supports the Space Physics Interactive Data Resource (SPIDR) that allows Worldwide Web users to access, browse, display, and analyze STP data.

Electronic Access:

Gopher: gopher.ngdc.noaa.gov
Worldwide Web: http://www.ngdc.noaa.gov/stp.html
FTP: ftp.ngdc.noaa.gov
STP Bulletin Board via modem access at +1 303 497 7319,
login "online"

Data are available on most media including CD-ROM, via Internet, and other media on request. On-line access via Worldwide Web (URL address above), Gopher (gopher.ngdc.noaa.gov) and anonymous FTP (ftp.ngdc.noaa.gov). Login for FTP access is userid: anonymous, and password: your full e-mail address.

Data Publications: WDC-A for STP publishes two data reports, *Solar Geophysical Data* is distributed monthly and UAG data reports are distributed on an irregular basis. CD-ROMs of frequently requested data sets are also published.

Special Projects: Defense Meteorological Satellite Program (DMSP) satellites provide global coverage of ionospheric, meteorological, and environmental events. Data from NOAA space environment monitoring satellites at geosynchronous orbit (Geosynchronous Operational Environmental Satellite) and polar orbit (NOAA Polar Operational Environmental Satellite) are available from WDC-A for STP and SPIDR.

WORLD DATA CENTER A FOR SOLID EARTH GEOPHYSICS

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Maintained by: U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The WDC-A for Solid Earth Geophysics is operated by, and collocated with, the National Geophysical Data Center (NGDC).

Summary of Data Held: The WDC-A for Solid Earth Geophysics (SEG) manages all types of data from the solid Earth, including topography, geomagnetism, ecosystems, gravity, seismology, natural hazards, and other global phenomena. Data are contributed by sources from around the world. Special emphasis is given to data supporting IUGG and UNEP programs.

Topography: A number of regional and global topographic models are available, including the most recent release of a global 5-minute digital elevation model (DEM). The WDC-A also participates in the GLOBE Project, initiated by the Committee on Earth Observing Satellites, to develop a 1-km gridded, quality-controlled DEM.

Geomagnetism: Data include surface, ocean, airborne, and satellite measurements. Also included are models relating to analyses of the main field and its secular change. Magnetic observatory monthly and annual mean data, repeat station observations, and the complete Project Magnet vector survey data are among the databases available for model development.

Global Ecosystems Data: Ecosystems data, such as vegetation, climate, topography, soils, and land cover are available from the WDC-A SEG. Pilot projects include integration of different databases to support model building.

Gravity: The latest gravity compilation contains over 100 data sets, including U.S. station data, absolute measurements, regional surveys from the U.S. and seven international surveys, 34 gridded regional data sets and nine gridded global data sets, and correlative data such as global geoids, geoids from the U.S., Canada, and a 5-minute topography grid.

Paleomagnetism: The latest IAGA supported paleomagnetic data compilations are available including the Global Paleomagnetic Data Base, Paleointensity Data Base, Polarity Transitions Data Base, and Secular Variation Data Base.

Geological Hazards: Information is available for historical tsunamis, earthquakes, volcanic eruptions, lava forms, and land slides. Digital data include historical tsunamis, earthquake epicenters, and strong motion data. Other information is available as a series of slide sets and publications.

User Services: The WDC-A for SEG is located in Research Laboratory 3 at 3100 Marine Street, Boulder, Colorado. Visitors are welcome during normal working hours; advance notice is recommended. A visiting scientist program exists. Data processing, copying and analysis facilities are available.

Data are available on most media including CD-ROM, via Internet, and other media on request. On-line access via Worldwide Web (URL address above), Gopher (gopher.ngdc.noaa.gov) and anonymous FTP (ftp.ngdc.noaa.gov). Login for FTP access is userid: anonymous, and password: your full e-mail address.

Publications: *Solid Earth Reports*, including annual reports on the global magnetic observatory network. Many reports are also available in digital form through the Worldwide Web. Some reports are published jointly with WDC-B.

Special Projects: The WDC-A for SEG is participating in the GLOBE Project initiated by the Committee on Earth Observing Satellites to develop a quality 1-km gridded global digital elevation model, and in the Ørsted Satellite Mission sponsored and developed by the Danish Meteorological Institute to make accurate measurements of the magnetic field surrounding the Earth.

CHAPTER 4. WORLD DATA CENTER B

World Data Center B is situated in Russia and has seven discipline centers. It operates under the overview of the National Geophysical Committee of the Russian Academy of Sciences (WDC-B for Solar-Terrestrial Physics, Solid Earth Physics), the Federal Service of Russia for Hydrometeorology and Monitoring of the Environment (WDC-B for Meteorology, Oceanography, Rockets and Satellites, Rotation of the Earth), and Russian Federation Committee on Geology and Use of Mineral Resources (WDC-B for Marine Geology and Geophysics).

The WDC-B representative on the ICSU Panel on WDC is:

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WWW Home Page for WDC-B: http://www.wdcb.rssi.ru/WDCB

Details of the seven WDC-B are given on the following pages:

WDC-B	Marine Geology and Geophysics	Gelendzhik	Russia	35
WDC-B	Meteorology	Obninsk	Russia	37
WDC-B	Oceanography	Obninsk	Russia	38
WDC-B	Rockets and Satellites	Obninsk	Russia	39
WDC-B	Rotation of the Earth	Obninsk	Russia	40
WDC-B	Solar-Terrestrial Physics	Moscow	Russia	41
WDC-B	Solid Earth Physics	Moscow	Russia	43

WDC-B PCNETS Project: The Permanent Committee on Networking Strategies (PCNETS) is the coordinating body in Russia and other Former Soviet Union countries in the field of computer telecommunication and data management. Much of PCNETS activity is devoted to the implementation and use of Internet and other computer networks in the daily operations and special projects of the WDC system and its users from the Earth and planetary science community. PCNETS projects in 1995–1997 include Internet training courses for scientific and educational personnel from FSU countries.

PCNETS works in close collaboration with WDC-B (especially WDC-B for Solid Earth Physics) and is hosted by the Moscow Center of Geophysical Computer Data Studies. It provides efficient links between WDC-B and international organizations such as the Commission of the European Community, UNESCO, UNDP, UNIDO and UNEP.

WORLD DATA CENTER B
FOR MARINE GEOLOGY AND GEOPHYSICS

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Maintained by: UNESCO Intergovernmental Oceanographic Commission, Government of Russian Federation (State Property Committee), Russian Federation Committee on Geology and Use of Mineral Resources, Ministry of Science and Technological Policy, Geophysical Committee of Russian Academy of Science, International Informatization Academy (UN). The WDC is collocated with the National Marine Geological and Geophysical Data Center.

Summary of Data Held:

Metadata Base (5 files, 179 parameters, 2265 cruises).
Geology (27 files, 915 parameters, 320 cruises).
Geological stations (3 files, 72 parameters, 1026 cruises, 63700 geological sampling stations).
Deep Sea Drilling Project (33 files, 433 parameters, 96 cruises, 1112 holes).
Bathymetry (4 files, 3 parameters, 64 Mb).
Ocean Drilling Program (20 files, 462 parameters, 29 cruises, 409 holes).
GEOphysical DAta System (2 files, 81 parameters, 4158 cruises).
Shore Line (6 files, 6 scales to 1:50,000, 79 Mb).
Collections (20 collections of geological samples, thin sections, bottom photos, TV survey, microfilms of seismic, side scan sonar and seismoacoustic profiles, seismic primary records on magnetic media).
GIS data and maps (scales 1:2,500,000–1:100,000) for geology, geotechnical properties, hydrogeology and ecology of Black Sea region.

User Services: Preparing and disseminating data bulletins, information, collections and data sources; data of databases; specimens of sediments, rocks and copies of non-digital data collections and sources of data; scientific products.

Regular training for marine geological and geophysical data collection and management.

Publications: Bulletins of MGG data, information, collections and data sources. Track lines of geophysical profiles and positions of geological/geochemical data on worldwide charts. Instructions and standards for data collection, processing and holding. Training Courses programs and reports. Digital maps. Monographs, scientific papers and reports.

WORLD DATA CENTER B FOR METEOROLOGY

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WWW Home Page: http://wdcb.rssi.ru/WDCB/wdcb_met.html

Maintained by: Federal Service of Russia for Hydrometeorology and Monitoring of the Environment.

Summary of Data Held:

Surface meteorology: 600 magnetic tapes, containing data for 1891–1994, the maximum number of stations for individual periods being 7,000; 40 magnetic tapes with gridded data (5x10; 5x5; 2.5x2.5 degrees) for 1880–1991; CD-ROMs with data for 1871–1992; 48,500 publications with summarized data for 1891–1994.

Marine meteorology: 200 magnetic tapes with ship observations for 1890–1994.

Aerology: 195 magnetic tapes with data from 800 stations for 1960–1994; 4 CD-ROMs with data for 1980–1991; 2,980 publications with summarized data for 1947–1994.

The data are in the form of magnetic tapes, diskettes, CD-ROMs, and hard copies. Data can be transferred in standard formats to diskettes and magnetic tapes. Long term data series, quality controlled global and regional data sets are available.

User Services: The WDC provides copies of data and information products, information on incoming data; use of library, e-mail, fax and post.

Publications: Catalogs of data and information, annual reports of WDC-B activities and prospects.

WORLD DATA CENTER B FOR OCEANOGRAPHY

Dr Vyacheslav I. Smirnov, Director
WDC-B for Oceanography
6 Korolev Str
OBNINSK
KALUGA REGION 249020
RUSSIA

Tel: +7 08439 25 925
Fax: +7 095 255 2225
Internet: wdcb@storm.iasnet.com

WWW Home Page: http://wdcb.rssi.ru/WDCB/wdcb_oce.html

Maintained by: Federal Service of Russia for Hydrometeorology and Monitoring of the Environment.

Summary of Data Held: Data from 15,771 research vessel cruises from 64 countries (including former Soviet Republics). These contain data from over 1,090,000 oceanographic stations, 565,000 bathythermograph profiles, 25,000 CTD profiles, and 4,000 deep sea and surface current meters for 1890–1994.

The data are in the form of magnetic tapes, diskettes, CD-ROMs, and hard copies. Data can be transferred in standard formats to diskettes and magnetic tapes. Long term data series and quality controlled global and regional data sets are available.

User Services: The WDC provides copies of data and information products, information on incoming data; use of library, e-mail, fax and post.

Publications: Catalogs of data and information, annual reports of WDC-B activities and prospects.

WORLD DATA CENTER B FOR ROCKETS AND SATELLITES

Dr Marsel Z. Shaimardanov, Director
WDC-B for Rockets and Satellites
6 Korolev Str
OBNINSK
KALUGA REGION 249020
RUSSIA

Tel: +7 08439 25 181
+7 08439 20 423
+7 095 255 2194
Fax: +7 095 255 2225

Internet: wdcb@storm.iasnet.com
marsel@storm.iasnet.com

WWW Home Page: http://wdcb.rssi.ru/WDCB/wdcb_met.html

Maintained by: Federal Service of Russia for Hydrometeorology and Monitoring of the Environment.

Summary of Data Held: 478 publications with summarized data for 1960–1994.

User Services: The WDC provides copies of data and information products, information on incoming data; use of library, e-mail, fax and post.

Publications: Catalogs of data and information, annual reports of WDC-B activities and prospects.

WORLD DATA CENTER B FOR ROTATION OF THE EARTH

Dr Marsel Z. Shaimardanov, Director
WDC-B for Rotation of the Earth
6 Korolev Str
OBNINSK
KALUGA REGION 249020
RUSSIA

Tel: +7 08439 25 181
+7 08439 20 423
+7 095 255 2194
Fax: +7 095 255 2225

Internet: wdcb@storm.iasnet.com
marsel@storm.iasnet.com

WWW Home Page: http://wdcb.rssi.ru/WDCB/wdcb_met.html

Maintained by: Federal Service of Russia for Hydrometeorology and Monitoring of the Environment.

Summary of Data Held: 3000 publications with summarized data for 1957–1994.

User Services: The WDC provides copies of data and information products, information on incoming data; use of library, e-mail, fax and post.

Publications: Catalogs of data and information, annual reports of WDC-B activities and prospects.

WORLD DATA CENTER B FOR SOLAR-TERRESTRIAL PHYSICS

Dr Evgeny P. Kharin, Director
WDC-B for Solar-Terrestrial Physics
Molodezhnaya 3
MOSCOW 117296
RUSSIA

Tel: +7 095 930 5619
Fax: +7 095 930 5509

Internet: kharin@wdcb.rssi.ru

WWW Home Page: http://www.wdcb.rssi.ru/WDCB/wdcb_stp.html.

Maintained by: Geophysical Center, Russian Academy of Sciences

Summary of Data Held:

Solar phenomena: sunspot areas and classifications, solar indices, optical observations, magnetic fields, solar radiation, X-ray and UV radiation, energetic protons and electrons, proton bursts.

Interplanetary phenomena: solar wind density and velocity, electric and magnetic fields.

Geomagnetic variations: magnetic variations, pulsations, magnetospheric boundaries.

Ionosphere: routine probing from the surface and satellites, radio-wave absorption, radio interference, flare associated events.

Cosmic rays: solar and galactic neutrons, mesons.

The data are available in different traditional and computer forms, e.g., paper, photofilm, microfiche, magnetic tape, floppy disk and compact disc (CD-ROM). Some special collections of experimental data are held.

User Services: Open to visitors during normal working hours, Monday through Friday. Advance notice of visit is recommended. Reading rooms, copying, processing, and analysis facilities are available. The facilities include computers, CD-ROM readers, microfilm and microfiche readers, printers and copiers. Data in archives can be found through on-line inventories. These searches are free of charge. WDC staff give consultations and select, copy and send data for users visiting the WDC or requesting data by phone or mail at cost of copying and mailing.

Remote access to on-line data and submission of requests is available via Internet using FTP and HTTP. Scientific project and program data management and research are undertaken on a contract basis. Assistance with educational programs for high school pupils, students and postgraduates.

Publications: Catalogs are published periodically, and are available on computers and on the Internet using FTP and HTTP. Special data collections are published in *Materials of the World Data Center B* and in computer-readable form (e.g., CD-ROM). Some reports are published jointly with WDC-A.

WORLD DATA CENTER B FOR SOLID EARTH PHYSICS

Dr Natalia A. Sergeyeva, Director
WDC-B for Solid Earth Physics
Molodezhnaya 3
MOSCOW 117296
RUSSIA

Tel: +7 095 930 1762
Fax: +7 095 930 5509

Internet: sep@wdcb.rssi.ru
nata@wdcb.rssi.ru

WWW Home Page: http://www.wdcb.rssi.ru/WDCB/wdcb_sep.html

Maintained by: Geophysical Center, Russian Academy of Sciences

Summary of Data Held:

Seismology: seismograms from worldwide stations, station bulletins from 1957, catalogs of event parameters, microseismic data, maps, station information.

Gravimetry: catalogs of gravity survey values, maps of the Earth's gravity field and its anomalies.

Magnetic measurements (main field and secular variations): catalogs of magnetic survey values, mean annual values of geomagnetic field elements, maps of isolines of elements.

Archeomagnetism and paleomagnetism: catalogs of determinations of ancient geomagnetic field elements, maps of paleomagnetic anomaly axes in the World Ocean.

Heat flow: catalogs of heat flow values, maps of heat flow isolines.

Recent movements of the Earth's crust: catalogs of calculated values of vertical movement velocities, maps of velocity isolines of vertical movements.

Marine geology and geophysics: geochemical data for marine igneous rocks and manganese nodules, summary data from the Deep Sea Drilling Project and Ocean Drilling Program, measurements of bathymetry, magnetic and gravity fields in the World Ocean.

The data are available in different traditional and computer forms, e.g., paper, photofilm, microfiche, magnetic tape, floppy disk and compact disc (CD-ROM). Some special collections of experimental data are held.

User Services: Open to visitors during normal working hours, Monday through Friday. Advance notice of visit is recommended. Reading rooms, copying, processing, and analysis facilities are available. The facilities include computers, CD-ROM readers, microfilm and microfiche readers, printers and copiers. Data in archives can be found through on-line inventories. These searches are free of charge. WDC staff give consultations and select, copy and send data for users visiting WDC or requesting data by phone or mail at cost of copying and mailing.

Remote access to on-line data and submission of requests is available via Internet using FTP and HTTP. Scientific project and program data management and research are undertaken on a contract basis. Assistance with educational programs for high school pupils, students and postgraduates.

Publications: Catalogs are published periodically, and are available on computers and on the Internet using FTP and HTTP. Special data collections are published in *Materials of the World Data Center B* and in computer-readable form (e.g., CD-ROM). Some reports are published jointly with WDC-A.

CHAPTER 5. WORLD DATA CENTER C1

World Data Center C1 consists of nine independent centers for various disciplines, situated in Europe. There is no formal coordination mechanism. If no corresponding C2 center exists for a discipline, the European center is described simply as WDC-C. The representative of the C and C1 centers on the ICSU Panel on World Data Centres is:

Prof Eigil Friis-Christensen — Tel: +45 39 157470
WDC-C1 for Geomagnetism — Fax: +45 39 157460
Lyngbyvej 100
DK-2100 Copenhagen
DENMARK — Internet: efc@dmi.min.dk

The nine C and C1 discipline centers are described in the following pages:

WORLD DATA CENTER C FOR EARTH TIDES

Bernard Ducame, Director
Olivier Francis, Vice-Director
WDC-C for Earth Tides
Observatoire Royal de Belgique
Avenue Circulaire 3
BRUSSELS B-1180
BELGIUM

Tel: +32 2 373 0248

Fax: +32 2 374 9822

Internet: bernard@oma.be
francis@oma.be

WWW Home Page: http://www.oma.be/KSB-ORB/ICET

Maintained by: Royal Observatory of Belgium. Associated with the International Center of Earth Tides, a FAGS service supported by UNESCO and ICSU.

Summary of Data Held: Data from about 360 worldwide gravity stations: individual values, analysis of the main tidal waves, residual vectors, oceanic attraction and loading vectors. The data bank also contains data from tiltmeters and extensometers.

User Services: The Center provides assistance for the setting up of new stations and for data processing, as well as for tidal analysis. Assistance may be provided either through visits to the Center or by FORTRAN programs. The ICET also makes available Earth tidal predictions for any place or time, needed for field gravimetry, absolute gravity and for tilt measurements. The predictions can be computed either on the basis of elastic Earth models and oceanic co-tidal maps, or on the basis of direct measurements.

Data Products, Publications, Catalogs: The *Bulletin d'Information Marees Terrestres*, published two or three times a year, contains a great number of translations of Russian and Chinese papers. A *General Bibliography* with 3,700 references is published regularly.

WORLD DATA CENTER C1 FOR GEOMAGNETISM, COPENHAGEN

Dr Susanne Vennerstrøm, Director
WDC-C1 for Geomagnetism
Lyngbyvej 100
DK-2100 COPENHAGEN
DENMARK

Tel: +45 39 157488
Fax: +45 39 157460

Internet:wdcc1@dmi.min.dk
sv@dmi.min.dk

WWW Home Page: http://www.dmi.dk/projects/wdcc1/

Maintained by: Solar Terrestrial Physics Division, Danish Meteorological Institute.

Summary of Data Held:

Digital data:

Hourly values from 223 observatories,
1 minute values from some observatories,
Geomagnetic indices Kp, ap, PC.

Analog data:

Normal-run magnetograms, geomagnetic hourly values, rapid-run magnetograms, geomagnetic indices, lists of special events, Earth current data.

The geomagnetic data holdings include data from 406 observatories mainly from the IGY (1957) onwards, also data from the Second Polar Year, 1932–1933. Most data are held as microfilm, microfiche, publications and sheets.

User Services: The WDC is open to visitors, who have access to its facilities. Digital hourly values, recent 1 minute values, and geomagnetic indices Kp, ap and PC, and catalogue of data holdings, are available through anonymous ftp:

ftp.dmi.min.dk in dir: pub/Data/WDCC1

Data Products, Publications: PC index. Data catalog in joint WDC catalog UAG-92.

WORLD DATA CENTER C1 FOR GEOMAGNETISM, EDINBURGH

Dr David Kerridge, Director
WDC-C1 for Geomagnetism
British Geological Survey
Murchison House, West Mains Road
EDINBURGH EH9 3LA
UNITED KINGDOM

Tel: +44 131 650 0234
Fax: +44 131 668 4368
Internet: d.kerridge@bgs.ac.uk

WWW Home Page: http://ub.nmh.ac.uk

Maintained by: British Geological Survey, Natural Environment Research Council.

Summary of Data Held:

Machine readable data: Hourly values from worldwide observatories; annual means; 2.5-min values up to 1970; 1-min values from three U.K. observatories from 1979 onwards.

Selected land, marine and aeromagnetic survey data, selected repeat station data, IMS and SABRE radar data, conductivity array data 1982–1984.

Magnetic activity indices: K, aa, AE, Dst.

Archive magnetograms for several U.K. stations from c.1850.

Library containing yearbooks, expedition memoirs, original survey observations, etc. from c.1850.

User Services: The WDC is open to visitors by prior arrangement.

Data Products, Publications, Catalogs: Data booklets containing magnetograms and hourly means of D, H, Z, K for U.K. observatories, and annual bulletins. Catalog of machine readable data. Included in the joint WDC catalog UAG-92.

WORLD DATA CENTER C FOR GLACIOLOGY

Mr Oliver Merrington, Manager
WDC-C for Glaciology
Scott Polar Research Institute
Lensfield Road
CAMBRIDGE CB2 1ER
UNITED KINGDOM

Tel: +44 1223 336556
Fax: +44 1223 336549

Internet: ojm21@cam.ac.uk

WWW Home Page: http://www.spri.cam.ac.uk

Maintained by: The Royal Society and the Scott Polar Research Institute, University of Cambridge.

Summary of Data Held: Published data related to glaciers, sea ice, ice sheets, snow and ice engineering, avalanches, glaciohydrology, frozen ground engineering, permafrost, frost action on rocks and soil, ice ages, physics and chemistry of ice, remote sensing methods and techniques, astronomical and biological aspects of glaciology.

User Services: Open to visitors in normal working hours. Advance notice recommended. Literature searches on any glaciological topic, postal and telephone inquiry service, public information on glaciological topics. Library facilities.

Data Products, Publications, Catalogs: On-line catalog available. The WWW Home Page incorporates a bibliographic database called ICE AND SNOW which uses the WWW search engine Muscat and contains 22,000 references on glaciology, including cover-to-cover abstracts of key journals and conference proceedings. The WDC contributes to the *Arctic and Antarctic* CD-ROM and COLD database on Orbit-Questel.

WORLD DATA CENTER C FOR RECENT CRUSTAL MOVEMENTS

Dr Pavel Vysko_il, Director
Dr Jaroslav Sidek
WDC-C for Recent Crustal Movements
International Center for Recent Crustal Movements
25066 Zdiby 98
County Praha-Vychod
CZECH REPUBLIC

Tel: +42 2 685 7965
Fax: +42 2 685 7056
Internet: vugtk@earn.cvut.cz

Maintained by: International Center for Recent Crustal Movements.

Summary of Data Held: Digital data on recent crustal movements, according to geographic coordinates (mainly vertical component of movement). Detailed data on vertical and horizontal movements in special areas. Bibliographical data on publications relating to recent crustal movement studies.

User Services: The data archive, library and map room are open to visitors by prior arrangement. Information can be provided on written request. The main data service is the provision of data on magnetic tapes. The center provides consultation, training in methods of monitoring recent crustal movements (especially for developing countries) and study visits.

Data Products, Publications, Catalogs: *ICRCM Bulletin*, published twice yearly, containing reports on activities, lists of material available in the center, current information on meetings and symposia, and scientific communications. It also issues the collection of survey maps of the territories of subcommissions of the Commission on Recent Crustal Movements, showing areas and localities covered by recent studies. The guide book *Procedures for Monitoring Recent Crustal Movements*, Vol. 1, has been published for specialists in developing countries and Vol. 2 is in preparation.

WORLD DATA CENTER C FOR SOILS

Dr L. Roel Oldeman, Director — Tel: +31 317 471715
Dr Hans van Baren, Deputy Director — Tel: +31 317 471716
WDC-C for Soils
International Soil Reference and
Information Center — Tel: +31 317 471711
P.O. Box 353 — Fax: +31 317 471700
6700 AJ Wageningen
THE NETHERLANDS — Internet: soil@isric.nl

WWW Home Page: http://www.isric.nl

Maintained by: International Soil Reference and Information Center (ISRIC).

Summary of data held: Soil monoliths with field and soil analytical data in digital format; a world pedon database for global environmental research; a GIS-referenced soil and terrain database for selected countries and continents (in preparation); maps, slides, reports.

User Services: Open to visitors at street address Duivendaal 9, Wageningen. Railway station Ede-Wageningen (8 km) and bus/taxi. The WDC serves as a documentation center on land resources (maps, reports, databases), with emphasis on land resources of developing countries; improves methods of soil analysis through research and international cooperation; stimulates and contributes to new developments in soil characterization and land evaluation; transfers information by publications, training, lectures and advisory services; carries out consultancies in aspects of soil science with emphasis on GIS-referenced soil and terrain database development and soil laboratory management.

Publications: *Annual Reports, Technical Papers, Country Reports, Soil Briefs.*

WORLD DATA CENTER C FOR SOLAR ACTIVITY

Dr Pierre Lantos, Co-director — Tel: +331 4507 7767
Dr Nicole Mein, Co-director — Tel: +331 4507 7801
WDC-C1 for Solar Activity — Fax: +331 4507 7959
Observatoire de Meudon
F-92195 MEUDON CEDEX
FRANCE — Internet: lantosp@mesioa.obspm.fr

WWW Home Page: http://www.obspm.fr/departement/dasop/dasop.html

Maintained by: Observatoire de Paris, France.

Summary of Data Held: Solar flares: observation reports and survey intervals from the Solar Flare Patrol Network (duplication of data from Boulder, Colorado). The observatory (not the WDC) holds the collection of spectro-heliograms used to derive the synoptic charts of the chromosphere since 1919.

User Services: Open to visitors, advance notice recommended. Databases for solar radio activity and spectroheliograms are under development.

Data Products, Publications, Catalogs: Evaluation of the flare events recorded by observatories, to establish a list of solar flares published in *Quarterly Bulletin of Solar Activity* and *Solar Geophysical Data*. Synoptic charts of solar flare positions and catalogs of flare activity for each active region published in *Cartes Synoptiques de la Chromosphere Solaire, Observatoire de Paris.*

WORLD DATA CENTER C1 FOR SOLAR TERRESTRIAL PHYSICS

Dr Michael Lockwood, Director
WDC-C1 for Solar Terrestrial Physics
Daresbury and Rutherford Appleton Laboratory R25
Chilton
DIDCOT OXON OX11 0QX
UNITED KINGDOM

Tel: +44 1235 446579
Fax: +44 1235 445848
Internet: m.wild@rl.ac.uk

WWW Home Page: http://www.wdc.rl.ac.uk

WDC-C1-STP also mirrors the general WDC Home Pages produced by WDC-A at Boulder, Colorado (see Chapter 2 F). The provisional address is:

http://www.wdc.rl.ac.uk/wdcmain

Maintained by: Central Laboratories of the Research Councils, U.K.

Summary of Data Held:

Ionosphere: Vertical soundings for about 300 stations, mostly from 1957 onwards; hourly and monthly median values of scaled parameters; film ionograms; f-plots; absorption data from pulse echo, riometers, and field strength measurements.

Solar-Geophysical Indices: Final, provisional and forecast sunspot numbers; solar 10.7 cm radio flux; Kp, Ap, Dst, AE, IF2 and IG12.

Reports and forecasts of solar-geophysical conditions: Solar activity; geomagnetic activity; radio propagation conditions by daily fax and e-mail; reports from WDC-A Boulder, Germany, Australia, Russia and India.

Solar wind data: Magnetic field and plasma data from 1963 onwards (IMP-X and AMPTE-UKS/CCE).

User Services: Open to visitors during normal working hours. Access from highway A34; railway station, Didcot Parkway (10 km). On-line database of solar-terrestrial parameters, ionospheric data and MSIS thermospheric model.

Data Products, Publications, Catalogs: Joint WDC catalog for ionospheric data; ionospheric bulletins for Slough/Chilton, Lerwick and Port Stanley; bulletins of ionospheric indices IG12 and IF2.

WORLD DATA CENTER C FOR SUNSPOT INDEX

Dr Pierre Cugnon, Director
WDC-C for Sunspot Index
Observatoire Royal de Belgique
3 Avenue Circulaire
BRUSSELS B-1180
BELGIUM

Tel: +32 3 373 02 76
Fax: +32 3 373 02 24

Internet: pierrec@oma.be
pcugnon@solar.stanford.edu

WWW Home Page: http://www.oma.be/KSB-ORB/SIDC/index.html

Maintained by: Royal Observatory of Belgium. Associated with the Sunspot Index Data Center, a FAGS service supported by UNESCO and ICSU.

Summary of Data Held: Zürich daily, monthly, monthly smoothed and yearly sunspot numbers, respectively since 1812, 1750 and 1700 (Rz) up to 1980; daily, monthly, monthly smoothed and yearly International Sunspot Numbers Ri computed from local Wolf numbers observed by a network of 45 (provisional data) to 100 (definitive data) observing stations, including Brussels, with Locarno (Associazione Specola Solare Ticinese) as reference station, since 1981; since 1992, North and South daily and monthly sunspot numbers Rn and Rs from a network of 25 to 45 stations (a subsystem of the former); individual original data on spots and groups from which Ri is calculated.

User Services: Monthly distribution of Ri, Rn and Rs to a network of more than 400 users, by fax or electronic mail and through the *Sunspot Bulletin*, with the predictions for the next 12 months. The International Sunspot Numbers files and predictions are also accessible through anonymous ftp (at present, jupiter.oma.be) and will be on WWW. A daily Prompt Photometric Sunspot Index (PPSI) is also provided. Information concerning the stability and dispersion of the individual data is furnished yearly to every station. The daily mean solar radio flux at 600 MHz is published in the *Sunspot Bulletin*.

Data Products, Publications, Catalogs: International sunspot numbers Ri since 1980 (continuation of the Zürich sunspot number Rz) and predictions of North and South sunspot numbers, PPSI. Publications are *Sunspot Bulletin* (monthly), *SIDC News* (4 to 6 times a year), some data in Part 1 of the *Quarterly Bulletin of Solar Activity*, and publications related to sunspot index analysis, and to positions and evolution of sunspot groups.

CHAPTER 6. WORLD DATA CENTER C2

There are a number of discipline centers in Japan and India, designated WDC-C2. Most are in the area of Solar-Terrestrial Physics. One is in India. The eight others are in Japan, and are administratively separate, being operated by different parent organizations. The Japanese centers are linked by a Working Group on World Data Centers whose chairman is the C2 representative on the ICSU Panel on World Data Centres. Details are as follows:

Working Group on World Data Centers
National Committee on Solar-Terrestrial Physics
Science Council of Japan
Chairman and Panel Representative for WDC-C2:

Prof Masahisa Sugiura Tel: +81 3 3467 2211
Tokai University Fax: +81 3 3467 6177
Institute of Research and Development
2-28 Tomigaya, Shibuya-ku
TOKYO 151
JAPAN Internet: sugiura@jspan.kugi.kyoto-u.ac.jp

The nine WDC-C2 discipline centers are described in the following pages:

WORLD DATA CENTER C2 FOR AIRGLOW

Dr Takashi Sakurai, Director
WDC-C2 for Airglow
National Astronomical Observatory
Mitaka
TOKYO 181
JAPAN

Tel: +81 422 34 3716
Fax: +81 422 34 3700
Internet: sakurai@spot.mtk.nao.ac.jp

Maintained by: Ministry of Education, Japan.

Summary of Data Held: Hourly zenith values, all-sky distributions, and north/south intensity ratios of [OI] 5577Å and [OI] 6300Å airglow at several stations (since 1957), also 5300Å continuum, [NaI] 5890/5896Å, OH bands at some stations, tabulated in digital form. Raw photometric data obtained at National Astronomical Observatory since IGY.

User Services: Microfiche reader/printer and photo-slide copier are available.

Data Products, Publications, Catalogs: *Airglow Data in Japan*, published annually. Preliminary analyses of collected airglow data are published occasionally. Data for 1957–1975 are listed in the *Catalog of Airglow Data* stored in World Data Center C2 (1977). Inquire at Center for data since 1976. Data and publications are available on request, free of charge.

WORLD DATA CENTER C2 FOR AURORA

Prof Masaki Ejiri, Director
Mr Akira Kadokura, Acting Manager
WDC-C2 for Aurora
National Institute of Polar Research
1-9-10 Kaga, Itabashi-ku
TOKYO 173
JAPAN

Tel: +81 3 3962 6482
Fax: +81 3 3962 6482

Internet: ejiri@nipr.ac.jp
kadokura@nipr.ac.jp

Maintained by: Ministry of Education, Japan.

Summary of Data Held: Auroral and associated data obtained by Japanese Antarctic Research Expeditions since 1957: all-sky camera; visual observations; VLF-ULF emission data; data obtained from television cameras, riometers, magnetometers. Auroral image and particle data obtained by satellites. Worldwide data from Southern Hemisphere.

User Services: Microfilm and microfiche reader-printer, duplicating system for video data, auroral database system for auroral data, computer software for data analysis.

Data Products, Publications, Catalogs: Data catalog published every two years.

WORLD DATA CENTER C2 FOR COSMIC RAYS

Prof Takashi Watanabe, Managing Director
Managing Office, WDC-C2 for Cosmic Rays
Department of Environmental Sciences
Ibaraki University
MITO 310
JAPAN

Tel: +81 29 228 8399
Fax: +81 292 28 8405

Internet: wdccr@stelab.nagoya-u.ac.jp
watanabe@env.sci.ibaraki.ac.jp

WWW Home Page: http://www.stelab.nagoya-u.ac.jp

Maintained by: Solar-Terrestrial Environment Laboratory, Nagoya University, WDC-C2 for Cosmic Rays, Prof Yasushi Muraki, Director.

Summary of Data Held: Cosmic-ray neutron monitor data from worldwide observatories since 1953, 1-hour values corrected for atmospheric pressure, and related solar-interplanetary data.

User Services: Open to visitors during normal working hours. Advance notice is recommended. An on-line database is accessible through the WWW home 63page or an anonymous ftp account (FTP env.sci.ibaraki.ac.jp).

Data Products, Publications, Catalogs: Hourly cosmic-ray neutron intensities are published in yearly data books. Monthly and yearly neutron counting rates are also given. Data catalogs are published. All publications are free of charge.

WORLD DATA CENTER C2 FOR GEOMAGNETISM, BOMBAY

Dr Bhisham Prasad Singh, Director
Dr D.R.K. Rao, Ms M. Jadhav
WDC-C2 for Geomagnetism
Indian Institute of Geomagnetism
Dr Nanabhai Moos Marg, Colaba
BOMBAY 400005
INDIA

Tel: +91 22 215 0293
Tel: +91 22 218 9569
Fax: +91 22 218 9568

Internet: singh@iigm0.ernet.in
dkrao@iigm0.ernet.in

Maintained by: Indian Institute of Geomagnetism, Department of Science and Technology, India.

Summary of Data held: Magnetograms, geomagnetic hourly values, year books of various observatories, digital data on magnetic tape, diskettes and CD-ROMs, microfilms and microfiche of the magnetograms, solar geophysical data bulletins containing solar rotation number Kp, Ap, Cp and Zürich sunspot numbers, indices such as Dst, AE, AU, AL, aa.

User Services : The Center is equipped with many facilities for data retrieval such as CD-ROM reader and printer, computer system, microfilm and microfiche reader printer. Data are made available in machine readable form upon written request or personal visit to the Data Center.

Data Products, Publications, Catalogs: Data catalogs and Indian magnetic data volumes.

WORLD DATA CENTER C2 FOR GEOMAGNETISM, KYOTO

Prof Tohru Araki, Director Tel: +81 75 753 3951
Dr Toshihiko Iyemori, Acting Manager Tel: +81 75 753 3929/3949
WDC-C2 for Geomagnetism Fax: +81 75 722 7884
Data Analysis Center for Geomagnetism and Spacemagnetism
Faculty of Science
Kyoto University
KYOTO 606
JAPAN Internet: araki@kugi.kyoto-u.ac.jp
iyemori@kugi.kyoto-u.ac.jp

WWW Home Page: http://swdcdb.kugi.kyoto-u.ac.jp

Maintained by: Kyoto University and Ministry of Education, Japan.

Summary of Data Held: Normal-run magnetograms, rapid-run magnetograms, geomagnetic hourly values, normal-run tellurigrams, rapid-run tellurigrams, Earth current hourly values, geomagnetic indices and lists of special events. Digital data on magnetic tape and CD-ROM, including geomagnetic hourly, 1-minute and 1-sec values and geomagnetic indices.

User Services: The WDC is open to visitors during normal working hours. Copies of the data are available upon request at the cost of copying. Facilities available include microfilm and microfiche readers, microfilm and microfiche cameras, microfilm and microfiche duplicators, photographic and electrostatic printers, and a computer system for data processing.

Data Products, Publications, Catalogs: Data catalogs, data book of AE Indices, mid-latitude geomagnetic indices ASY and SYM (Provisional), provisional geomagnetic data plots, monthly tables of provisional hourly Equatorial Dst values.

Databases: Status of data collection, geomagnetic indices, hourly, 1-minute and 1-second geomagnetic data, etc.

WORLD DATA CENTER C2 FOR IONOSPHERE

Dr Katsuhide Marubashi, Director — Tel: +81 423 27 7529
Fax: +81 423 27 6677
Mr Kiyoshi Igarashi, Acting Manager — Tel: +81 423 27 7478
WDC-C2 for Ionosphere — Fax: +81 423 27 7606
Communications Research Laboratory
4-2-1 Nukuikita-machi
Koganei-shi
TOKYO 184
JAPAN — Internet: kmaru@crl.go.jp
igarashi@crl.go.jp

WWW Home Page: http://hiraiso.crl.go.jp/wdc-c2/intro.html

Maintained by: Communications Research Laboratory, Ministry of Posts and Telecommunications, Japan.

Summary of Data Held: Ionospheric vertical soundings (ionograms of six Japanese stations from 1950 and about 100 worldwide stations from 1957); monthly tabulations for 220 worldwide stations from 1946; some older ionograms; topside soundings; radio wave absorption; ionospheric drifts; ionospheric backscatter; whistlers and VLF emissions; atmospheric radio noise; radio propagation predictions, etc.

User Services: Microfilm and microfiche reader, printer, duplicator, CD-ROM reader.

Data Products, Publications, Catalogs: Annual catalog; *Ionospheric Data in Japan* (monthly report).

WORLD DATA CENTER C2 FOR NUCLEAR RADIATION

Dr Masanori Shiraki, Director
WDC-C2 for Nuclear Radiation
Observation Division
Japan Meteorological Agency
1-3-4 Ote-machi
TOKYO 100
JAPAN

Tel: +81 3 3212 8341
Fax: +81 3 3213 1742

Maintained by: Japan Meteorological Agency, Ministry of Transportation.

Summary of Data Held: Data on atmospheric radioactivity are available beginning 1957 (IGY).

Data Products, Publications, Catalogs: *Bulletin of Atmospheric Radioactivity* (annually). No catalog.

WORLD DATA CENTER C2 FOR SOLAR RADIO EMISSION

Prof Shinzo Enome, Director
WDC-C2 for Solar Radio Emissions
Nobeyama Radio Observatory
Minamisaku
NAGANO 384-13
JAPAN

Tel: +81 267 98 4488
Fax: +81 267 98 2506
Internet: senome@nro.nao.ac.jp

WWW Home Page: http://solar.nro.nao.ac.jp

Maintained by: Nobeyama Radio Observatory.

Summary of Data Held: Worldwide solar radio data (collected directly and through WDC-A and WDC-B), with critical analysis and compilations giving corrected daily values. Available data include radio polarimeter records for 1958–1977 on microfiche and on magnetic tape from 1978.

Data Products, Publications, Catalogs: Results are published in the *IAU Quarterly Bulletin of Solar Activity*, with catalogs of discrete events, and solar activity charts incorporating meter wave data from Nançay, France and centimeter wave data from Toyokawa, Japan.

WORLD DATA CENTER C2 FOR SOLAR-TERRESTRIAL ACTIVITY

Dr Masahiro Hoshino, Director
WDC-C2 for Solar Terrestrial Activity
Institute of Space and Astronautical Science
3-1-1 Yoshinodai
Sagamihara
KANAGAWA 229
JAPAN

Tel: +81 427 51 3911
Fax: +81 427 59 4255
Internet: hoshino@gtl.isas.ac.jp

Maintained by: Ministry of Education, Japan.

Summary of Data Held: This Data Center is being reorganized. Archival databases are being constructed for data from satellites including YOHKOH, ASCA, AKEBONO and GEOTAIL. It is anticipated that some of these data will become available through this WDC in 1996. Limited amounts of data from older satellite projects may be available at present, where possible.

User Services: The WDC is open to visitors during normal working hours. The planned information system will make it possible for the user to have access to a directory and data through a WWW server. The Center facilities will include a high capacity magnetic tape library and a workstation for data retrieval and analysis.

Data Products, Publications, Catalogs: Edited results have been published as *Solar-Terrestrial Activity Charts* (STAC) giving summary plots of selected key parameters of solar activity, solar wind condition and magnetospheric activity.

CHAPTER 7. WORLD DATA CENTER D

World Data Center D was established in 1988, following discussions between the Chinese Academy of Sciences and the ICSU Panel on World Data Centres. It comprises nine centers, situated in China and operated by their host institutes. The WDC-D Coordination Office is located in premises of the Chinese Academy:

Prof Huang Dingcheng, Director — Tel: +86 10 859 7536
Ms Guo Yaxi, Mr Zhao Yongren, Vice-Directors — Tel: +86 10 859 7531
WDC-D Coordination Office — Fax: +86 10 851 2458
Chinese Academy of Sciences
52 Sanlihe Road
BEIJING 100864
CHINA — Internet: yxguo@rose.cashq.ac.cn

The WDC-D Representative on the ICSU Panel on World Data Centres is:

Prof Li Qibin — Tel: +86 10 255 1968
Beijing Astronomical Observatory — Fax: +86 10 256 1085
Chinese Academy of Sciences
BEIJING 100080
CHINA

The nine discipline centers of WDC-D are described in the following pages:

WORLD DATA CENTER D FOR ASTRONOMY

Prof Li Qibin, Director
WDC-D for Astronomy
Beijing Astronomical Observatory
Chinese Academy of Sciences
BEIJING 100080
CHINA

Tel: +86 10 255 1968
Fax: +86 10 256 1085
Internet: kdr@bao01.bao.ac.cn

Maintained by: Beijing Astronomical Observatory, Chinese Academy of Sciences.

Summary of Data Held:

- Chinese Solar-Geophysical Data from 1971 onward:
  - Daily relative sunspot numbers, sunspot areas and groups, daily magnetograms of active regions from Purple Mountain Observatory
  - Smoothed predicted monthly sunspot numbers
  - H-alpha solar flares and patrol observations
  - Solar radio emission flux and outstanding occurrences, patrol observations and burst profiles
  - Cosmic ray meson and neutron intensity, from Center for Space Science and Applied Research
  - Sudden ionospheric disturbances (D-region)
  - Geomagnetic activity indices K and Ak
  - List of magnetic storms, from Beijing Geomagnetic Observatory
  - Special issues for data of selected events
- Forecasts of solar flares, sudden ionospheric disturbances
- Ancient records of sunspots and phenomena related to Solar-Terrestrial Physics
- Earth rotation parameters from several stations from 1959; Earth rotation parameters from optical astrometry from 1989

User Services: Open to visitors during normal working hours. Advance notice is recommended.

Data products, publications: Coordinates of epoch pole and time signals. *Chinese Solar-Geophysical Data*; Earth rotation parameters (*Annual Report, Monthly Bulletin, Weekly Bulletin*, Earth rotation parameters from optical astrometry). *Catalog of Ancient Solar Events.*

WORLD DATA CENTER D FOR GEOLOGY

Prof Zhu Yusheng, Director
WDC-D for Geology
Chinese Academy of Geological Sciences
Ministry of Geology and Mineral Resources
26 Baiwanzhuang Road
BEIJING 100037
CHINA

Tel: +86 10 831 1133
Fax: +86 10 831 0894

Maintained by: Chinese Academy of Geological Sciences, supervised by Ministry of Geology and Mineral Resources.

Summary of Data Held: Stratigraphy, palaeontology, petrology, mineralogy, laboratory geology, isotope geology and field geology, metallogenic models, ore-searching models.

User Services: Open to visitors during normal working hours. Data are in machine-readable form, some on microfiche or paper.

Publications: Catalog.

WORLD DATA CENTER D FOR GEOPHYSICS

Prof Wang Guangfu, Director (Ext.325)
WDC-D for Geophysics
Institute of Geophysics
Chinese Academy of Sciences
BEIJING 100101
CHINA

Tel: +86 10 201 1118
Fax: +86 10 203 1995

Maintained by: Institute of Geophysics, Chinese Academy of Sciences.

Summary of Data Held: Geomagnetic data from observations, geomagnetic main field charts, magnetotelluric and seismic deep sounding, geomagnetic pulsation and whistlers, paleomagnetic and archaeomagnetic data, geothermal data, seismic and magnetic prospecting, high temperature and high pressure rheological experimental data.

User Services: Open to visitors during normal working hours. Data are on magnetic tape, disks and paper.

Publications: Catalog.

WORLD DATA CENTER D
FOR GLACIOLOGY AND GEOCRYOLOGY

Prof Cheng Guodong, Director
WDC-D for Glaciology and Geocryology
Lanzhou Institute of Glaciology and Geocryology
Chinese Academy of Sciences
LANZHOU 730000
CHINA

Tel: +86 931 882 2818
Fax: +86 931 888 5241

Maintained by: Lanzhou Institute of Glaciology and Geocryology, Chinese Academy of Sciences.

Summary of Data Held: Variation of glaciers, snow cover, frozen ground and meltwater runoff; general observation data of hydrology, climatology, glaciers and periglacial in Tianshan Glaciological Station, and the Qinghai-Xizang plateau comprehensive observation station, data of snow drifts and avalanches, engineering parameters for prevention of frost damage in high cold region, etc. Glacier inventories of Qilian Shan, Altay Mountains, and Tianshan Mountains.

User Services: Open to visitors during normal working hours.

Data Products, Publications: Glacier Inventory of China on diskette, part of World Glacier Inventory.

WORLD DATA CENTER D FOR METEOROLOGY

Prof Chen Lian-Shou, Director
WDC-D for Meteorology
National Meteorological Center
46 Baishiqiao Road
BEIJING 100081
CHINA

Tel: +86 10 217 5930
Fax: +86 10 832 7390

Maintained by: National Meteorological Center of the China Meteorological Administration, collocated with the Climatic Data and Application Office.

Summary of Data Held :

- Synoptic meteorology in real-time (2000 surface stations, 128 upper air stations, ships)
- Climatic data—surface evaporation, snow cover, sunshine, surface radiation, precipitation, wind, temperature, pressure
- Atmospheric chemistry (ozone, carbon dioxide, etc)
- Data from special observations (rockets, drifting buoys, low-level balloons, aircraft)
- Satellite data
- Dendroclimatology data

User Services: Open to visitors during normal working hours.

Publications: *Monthly Meteorological Report of China, Annual Meteorological Report of China, Synoptic Weather Maps*.

WORLD DATA CENTER D FOR OCEANOGRAPHY

Prof Hou Wenfeng, Director
WDC-D for Oceanography
National Marine Data and Information Service
State Oceanic Administration
93 Liu Wei Road, Hedong District
TIANJIN 300171
CHINA

Tel: +86 22 430 5213
Fax: +86 22 430 4408
Internet: houwf@bepc2.ihep.ac.cn

Maintained by: State Oceanographic Administration, collocated with National Oceanographic Data and Information Center.

Summary of Data Held : Data from domestic and international marine research projects, ships of opportunity, marine research vessels and offshore platforms:

- Oceanographic station data
- Ocean current data
- Wave data from coastal stations
- T and S data
- Cruise and data report of China-U.S.A. Joint Air-Sea Interaction: studies in the Western Tropical Pacific Ocean
- Oceanographic observations at coastal stations, 1960–1982
- Marine geophysical data
- Side analysing marine sediments data
- Marine geochemical data
- Marine meteorological data from coastal stations
- Marine ice data
- Oceanic manganese nodule data
- Marine biological data
- Marine pollution data

User Services: Computer readable data and products on magnetic tape and/or disks are available.

Publications: *Pacific Oceanographic Atlas, Atlantic Oceanographic Atlas, Indian Ocean Oceanographic Atlas, China–Japan Joint Research Program on the Kuroshio Oceanographic Atlas, Cruise and Data Report on China–U.S.A. Joint Air-Sea Interaction, Studies in the Western Tropical Pacific Ocean, Oceanographic Observations at Coast Station 1960–1978, Oceanographic observations 1954–1978, Oceanographic Standard Profiles 1960–1982, Tidal Current Table in China Sea, World and China Tide Tables, Oceanographic and Meteorological Observations at China Coast Stations 1960–1969.*

WORLD DATA CENTER D
FOR RENEWABLE RESOURCES AND ENVIRONMENT

Prof Sun Jiulin, Director
WDC-D for Renewable Resources and Environment
Commission for Integrated Survey of Natural Resources
Chinese Academy of Sciences, P.O. Box 9717
BEIJING 100101
CHINA

Tel: +86 10 494 8478
Fax: +86 10 491 4230

Maintained by: Commission for Integrated Survey of Natural Resources, Chinese Academy of Sciences and State Planning Committee.

Summary of Data Held: The WDC is concerned with the collection, management, distribution and utilization of data from Chinese provinces, autonomous regions and counties, including:

- Resource data: management, distribution and utilization of land, water, climate, forest, grassland, minerals, energy, etc.
- Environmental data: pollution, environmental quality, change, natural disasters, soli erosion, etc.
- Biological resources: animals, plants, wildlife
- Social economy: agriculture, industry, transport, commerce, infrastructure, etc.
- Population and labor
- Geographic background data on scales of 1:4M, 1:1M, 1:½M, 1:2500, etc.

User Services: The WDC is in 917 Building, Datun Road, Chao Yang District, Beijing. Open to visitors during normal working hours. Data can be provided in machine readable form on magnetic tapes and disks, or by fax, e-mail, and Internet.

Publications: *Digest of Territorial Resources*, 1987 onwards.

WORLD DATA CENTER D FOR SEISMOLOGY

Prof Zhao Zhonghe, Director
WDC-D for Seismology
National Center for Seismic Data and Information
State Seismological Bureau
56 Sanlihe Road, P.O. Box 2141
BEIJING 100045
CHINA

Tel: +86 10 853 0255
Fax: +86 10 853 0226
Internet: zhzhao@wdcds.csdi.ac.cn

WWW Home Page: http://gt.csdi.ac.cn

Maintained by: National Center for Seismic Data and Information, State Seismological Bureau.

Summary of Data Held :

Seismograms on microfilm from 24 seismic stations since 1979.
Preliminary Seismological Report of Chinese Seismic Stations since 1979.
Bulletin of seismological observations of Chinese stations, 1966–1990.
Report of geomagnetic observations from 8 Chinese stations, starting dates are between 1950 and 1959.
Report of magnetic storms at 7 Chinese stations since 1979.
Digital waveform data from 11 CDSN stations.

User Services: Open to visitors during normal working hours. Requests may be made through e-mail or fax. Information about new data will be put on the WWW Home Pages of WDC-D for Seismology.

Publications: Monthly reports and annual bulletins. *Chinese Seismological Catalog, Epicenttral Distributions of Earthquakes, Bulletin of Historical Seismic Data of China.*

WORLD DATA CENTER D FOR SPACE SCIENCES

Prof Du Heng, Director
WDC-D for Space Sciences
Center for Space Science and Applied Research
Chinese Academy of Sciences, P.O. Box 8701
BEIJING 100080
CHINA

Tel: +86 10 254 2551
Fax: +86 10 254 2551

Internet: duheng@sun20.cssar.ac.cn
qjliu@sun20.cssar.ac.cn

Maintained by: Center for Space Science and Applied Research, Beijing, and China Research Institute of Radiowave Propagation, Xinxiang, Henan Province.

Summary of Data Held:

Raw data (density of upper atmosphere, 500–900 km, charged particle flux in near Earth space) from DQ-1 and SJ-4 satellites.
Observational data from cosmic ray observatories: Beijing from 1960; Guangzhou from 1987: Beijing superneutron monitor from 1984.
Observational data from 5 Chinese geomagnetic observatories (hourly mean values).
Observational data from 5 Chinese ionospheric observatories.
Global geomagnetic and ionospheric data during IGY 1958–1959.

User Services: Open to visitors during normal working hours.

Publications: Cosmic ray intensity, hourly meson intensity, 1960–1986, superneutron monitor data, 1984–1994 (Beijing Cosmic Ray Observatory).

NOTE: Vertical incidence ionospheric data (ground based and topside sounder ionograms) are held at the China Research Institute of Radiowave Propagation, P.O.Box 2525, Xinxiang, Henan Province.

CHAPTER 8. ICSU Panel on World Data Centres

The Panel on World Data Centres (Geophysical, Solar and Environmental) was established in 1968 at the 12th General Assembly of ICSU, to advise the Officers of ICSU on the management of the World Data Centers, and to carry out related activities. It succeeded the other ICSU bodies that created the World Data Center system for the International Geophysical Year of 1957–1958 and which supervised its operation during and after the IGY. Today the Panel oversees about forty World Data Centers which are maintained by their host countries and are responsible for collecting, archiving and distributing a wide range of data. These data cover time scales ranging from seconds to millennia and provide baseline information for research in many disciplines, especially for monitoring changes in the geosphere and biosphere—gradual or sudden, foreseen or unexpected, natural or man-made. Through its varied activities and initiatives, the Panel promotes the use of new technology, enabling good science to be done with both new and old data by the scientists of many nations.

CONSTITUTION OF THE PANEL ON WORLD DATA CENTRES

Approved by the International Council of Scientific Unions, 1993

OBJECTIVES

The Panel shall use its best endeavors to further the following objectives:

1 To ensure permanent archiving and availability of geophysical, solar and environmental data, wherever possible in computer-readable form, for the benefit of the world community.

2 To establish the standards and criteria to be met by the WDCs, to review the operation of WDCs, to approve the formation and closure of WDCs, to agree and enforce the rules for exchange and availability of data, and to identify the range of WDCs and their services most needed by the world scientific community.

3 To work with other ICSU bodies to ensure the continuation of long-term monitoring of the solar-geophysical environment and the

permanent preservation of the data so acquired for the benefit of the international community of users.

4 To collaborate with the organizing committees and data managers of international scientific programs, and global operational programs where appropriate, to identify their WDC requirements and to ensure that these services are provided.

5 To collaborate with CODATA and FAGS in matters of joint interest.

6 To advise ICSU as required on matters relating to scientific data within the Panel's fields of interest.

ACTIVITIES

The Panel's activities to further these objectives shall include the following:

7 The Panel shall compile and publish Guides to the World Data Center system, containing information about data holdings and international programs.

8 The Panel shall give guidance and encouragement to WDCs on such matters as data catalogs, electronic communication links, working visits, new methods of data storage or dissemination, and the conversion of analog data into digital form.

9 The Panel shall promote awareness of the WDC system and its data dissemination mechanisms through publications, workshops, exhibitions, and other means.

10 The Panel shall collaborate with the Directors of WDCs to identify data sets that are most needed by ICSU bodies, global environmental studies, and other international programs.

11 The Panel may undertake or sponsor special operations to acquire data from remote or unusual sources, to convert data into machine-readable form, or to develop special analysis or applications services.

12 The Panel may designate Officers and Working Groups for specific tasks, e.g., publishing reports, executing projects, or liaising with other bodies.

13 The Panel shall report to ICSU annually or otherwise as required.

MEMBERSHIP

14 The Panel membership represents ICSU organizations concerned with the international exchange and dissemination of geophysical, solar and related environmental data. Non-ICSU organizations may be invited to appoint members. The Panel membership should represent all aspects of the Panel's objectives as set out above. In particular, it should reflect the Panel's interest in long-term solar, geophysical and environmental monitoring as well as the needs of specific programs.

15 The Panel shall comprise the Executive as defined in paragraph 16, representatives of the World Data Centers, representatives of ICSU programs and organizations concerned with geophysical, solar and related environmental data, and liaison members.

16 The Chairman of the Panel and a Member-at-large shall be appointed by ICSU, with advice from the Panel. The Panel shall appoint its Vice-Chairman, Treasurer and Secretary. The duties of Treasurer may be undertaken by another officer. One or two Assistant Secretaries may be appointed to perform duties as requested by the Chairman. These officers form the Executive.

17 Four members shall constitute a quorum for decisions of the Executive.

18 The Officers shall be appointed for a period of four years, and are eligible for re-appointment for one further term of office.

19 The Executive shall appoint representatives of the components of the World Data Center system, traditionally known as WDC-A (U.S.A.), WDC-B (Russia), WDC-C1 (Europe), WDC-C2 (Asia) and WDC-D (China), and of any other comprehensive WDC systems that may be recognized by the Panel.

20 Each ICSU body concerned with geophysical, solar and environmental science, and each major ICSU-sponsored program within the Panel's field of interest, shall be invited to appoint one member of the Panel.

21 CODATA and FAGS shall each be requested to appoint one liaison member to the Panel. The Panel will liaise with IOC and WMO.

22 Representatives of additional ICSU programs, initiatives and organizations may be appointed at the invitation of ICSU on the advice of the Panel Executive.

23 The appointment of a member to the Panel shall be taken to imply a commitment by the body making the appointment that its representative will receive proper briefing, will participate in Panel meetings, and will duly report back on the Panel's proceedings.

24 Other ICSU bodies and national members of ICSU shall be invited to appoint Correspondents to the Panel.

25 All Directors of ICSU World Data Centers shall be ex-officio Correspondents of the Panel.

26 The membership and the representation of other bodies on the Panel shall be formally reviewed at intervals of four years, although members may be co-opted at any time.

MEETINGS

27 Meetings of the Panel or the Executive shall normally be called by the Chairman.

28 Meetings of the Panel shall take place approximately every two years, generally in conjunction with an Assembly of another ICSU body. A summary of actions or recommendations arising from each meeting shall be distributed to all Panel members and correspondents.

29 Meetings of the Panel may be held in conjunction with other scientific or technical meetings (i.e., "meetings of opportunity"). Efforts shall be made to ensure that a good proportion of Panel members can be present. Panel meetings may instead be fully independent events,

including a range of scientific and business activities that will attract members.

30 WDC Directors and other Correspondents are encouraged to attend Panel meetings and take part in discussion.

31 All Panel members shall be contacted four months before a meeting of the Panel and invited to submit papers or reports. The agenda of the meeting and documents to be considered shall, whenever possible, be circulated beforehand. The Secretary shall circulate a summary of decisions and actions to Panel members and correspondents after meetings.

32 The Panel shall normally conduct affairs by consensus, but when an election or other matter requires to be put to the vote, all members of the Panel shall have one vote. Absent members will be invited to cast an absentee vote, preferably by electronic means. The matter will be decided by a simple majority of those voting. The Chairman shall have a casting vote.

33 Extraordinary meetings of the Executive may be called at the request of a majority of the Executive.

34 Decisions of the Executive are normally reached by consensus. Should a vote on any matter be necessary, it will be decided by a simple majority of the whole Executive, each member having one vote. In the event of a tied vote, the Chairman shall have a casting vote.

35 Decisions of the Executive shall be reported to the Panel. The Officers will decide whether any resulting actions can be taken under the authority of the Chairman, or whether they require endorsement by the full Panel.

FINANCE

36 The normal work of individual World Data Centers in receiving, archiving and distributing data is financed by their host countries or organizations. No Panel funds are to be used in these operations of any WDC.

37 The Panel receives funds from ICSU for its basic operation. It may receive funds for special projects from ICSU and other national and international bodies. Such funds may be contracted to WDCs specifically for work on those projects.

38 Panel funds may be used to support the attendance at Panel meetings of the Chairman and Secretary, and of other Panel officers whose presence the Chairman considers necessary. They may also be used to support the attendance of members of the Executive at meetings of ICSU or other bodies at which the Chairman decides that the Panel needs to be represented.

39 Panel funds may be used to assist the attendance at Panel meetings of WDC representatives whose institutions are unable to meet the full cost.

40 Travel and other expenses necessary to carry out the Panel's objectives or projects must be authorized by the Chairman.

41 ICSU bodies or programs that appoint members to the Panel are responsible for supporting these members' attendance at meetings.

42 The Panel shall maintain its own bank accounts under the operational control of the Treasurer, or other officer acting as Treasurer.

43 Accounts shall be rendered annually to ICSU for approval.

AMENDMENTS

44 Amendments to this Constitution are subject to the approval of ICSU.

CHAPTER 9. WDC PUBLICATIONS AND WWW HOME PAGES

The *Guide to International Data Exchange through the World Data Centers* was originally published in 1957, during the International Geophysical Year. Later editions were issued in 1963, 1963 and 1979. A completely revised *Guide to the World Data Center System* was issued by the Panel in 1987 and updated in 1989, and was followed by new *Guides* for a few disciplines—ionosphere, geomagnetism and oceanography. The Panel does not propose to issue further discipline guides.

Publications of the World Data Centers began with catalogs of data for the IGY (1957–1958) and with instruction manuals for the collection and processing of IGY data. These are documented in the *Annals of the IGY*. Some publications in the early years of the WDC System are listed in the 1979 edition of the Guide (pages 100–107) but it seems that a complete WDC bibliography has never been compiled. A selection of WDC publications is listed below. Users should contact a particular center for detailed information about catalogs, data reports, and other types of publications.

Detailed information on the establishment of the IGY data centers, the general principles covering them, their locations, the original *Guides for Data Exchange* in each discipline, and the Catalogs of data for the IGY 1957–1958 and IGC 1959 are contained in the IGY Annals Volume 2, pp. 367–369 and pp. 614–639, Volume 7, pp. 143–388; and Volume 36.

GUIDES TO THE WDC SYSTEM—NEW SERIES

Part 1	General Principles, Locations and Services	1987
Part 1(a)	Updates, Corrections and Additions to Part 1	1989
Parts 2 and 3	Ionosphere, Geomagnetism	1989
Part 4	Oceanography (issued also as IOC Manual 9)	1991

GENERAL ARTICLES ON THE WDC SYSTEM

Rishbeth H, "History and Evolution of the World Data Center System," *J. Geomagnetism and Geoelectricity*, Vol. 43 (Supplement), pp. 921–929, 1991.

Ruttenberg S and Rishbeth H, "World Data Centers—Past, Present and Future," *J. Atmospheric and Terrestrial Physics*, Vol. 56, pp. 865–870, 1994.

WDC SYSTEM HOME PAGE

The WDC Home Pages are rapidly expanding, and the addresses are subject to change. Up-to-date information is maintained on the WDC System Home Pages at WDC-A in Boulder, Colorado, which are mirrored in Europe by the WDC-C1 for Solar Terrestrial Physics at Chilton, England. At the time of writing, these addresses are:

http://www.ngdc.noaa.gov/wdc/wdcmain.html
http://www.wdc.rl.ac.uk/wdcmain
http://www.lmcp.jussieu.fr/icsu/

HOME PAGE ADDRESSES FOR WORLD DATA CENTERS

WDC-A for Atmospheric Trace Gases (Oak Ridge)

http://cdiac.esd.ornl.gov/cdiac/wdca/wdcinfo.html

WDC-A for Glaciology (Boulder)

http://nsidc.colorado.edu/NOAA/wdc-a.html

WDC-A for Human Interactions in the Environment (Saginaw)

http://www.ciesin.orghome-page/WDC.html

WDC-A for Marine Geology and Geophysics (Boulder)

http://www.ngdc.noaa.gov/mgg/wdcamgg

WDC-A for Meteorology (Asheville)

http://www.ncdc.noaa.gov/wdcamet.html

WDC-A for Oceanography (Silver Spring)

http://www.nodc.noaa.gov/NODC-dataexch.html

WDC-A for Paleoclimatology (Boulder)

http://www.ngdc.noaa.gov/paleo/paleo.html

WDC-A for Remotely Sensed Land Data (Sioux Falls)

http://edcwww.cr.usgs.gov/doc/edchome/world/wdcguide.html

WDC-A for Rockets and Satellites (Greenbelt)

http://nssdc.gsfc.nasa.gov/about/about_wdc-a.html

WDC-A for Rotation of the Earth (Washington)

http://maia.usno.navy.mil

WDC-A for Seismology (Golden)

http://wwwneic.cr.usgs.gov

WDC-A for Solar Terrestrial Physics (Boulder)

http://www.ngdc.noaa.gov/stp/WDC/wdcstp.html

WDC-A for Solid Earth Geophysics (Boulder)

http://www.ngdc.noaa.gov/seg/wdca/wdcaseg.html

WDC-B General Page (Moscow)

http://www.wdcb.rssi.ru/WDCB

WDC-B for Marine Geology and Geophysics (Gelendzhik)

http://www.sea.ru/cmgd/wdc.html

WDC-B for Meteorology (Obninsk)

http://www.wdcb.rssi.ru/WDCB/wdcb_met.html

WDC-B for Oceanography (Obninsk)

http://www.wdcb.rssi.ru/WDCB/wdcb_oce.html

WDC-B for Rockets and Satellites (Obninsk)

http://www.wdcb.rssi.ru/WDCB/wdcb_met.html

WDC-B for Rotation of the Earth (Obninsk)

http://www.wdcb.rssi.ru/WDCB/wdcb_met.html

WDC-B for Solar-Terrestrial Physics (Moscow)

http://www.wdcb.rssi.ru/WDCB/wdcb_stp.html.

WDC-B for Solid Earth Physics (Moscow)

http://www.wdcb.rssi.ru/WDCB/wdcb_sep.html

WDC-C for Earth Tides (Brussels)

http://www.oma.be/KSB-ORB/ICET

WDC-C1 for Geomagnetism (Copenhagen)

http://www.dmi.min.dk/projects/wdcc1

WDC-C1 for Geomagnetism (Edinburgh)

http://ub.nmh.ac.uk

WDC-C for Glaciology (Cambridge)

http://www.spri.cam.ac.uk/wdcc.html

WDCC for Soils (Wageningen)

http://www.isric.nl

WDC-C1 for Solar Activity (Meudon)

http://www.obspm.fr/departement/dasop/dasop.html

WDC-C1 for Solar Terrestrial Physics (Chilton)

http://www.wdc.rl.ac.uk

WDC-C for Sunspot Index (Brussels)

http://www.oma.be/KSB-ORB/SIDC/sidc_txt.html

WDC-C2 for Cosmic Rays (Mito)

http://www.stelab.nagoya-u.ac.jp

WDC-C2 for Geomagnetism (Kyoto)

http://swdcdb.kugi.kyoto-u.ac.jp

WDC-C2 for Ionosphere (Tokyo)

http://www.hiraiso.crl.go.jp/wdc-c2/intro.html

WDC-D for Seismology (Tiansin)

http://gt.csdi.ac.cn

APPENDIX A

ICSU ORGANIZATIONS AND PROGRAMS

ICSU has other organizations that deal with data. The Federation of Astronomical and Geophysical Services, established in 1956, covers similar areas of science to those of the WDC system, but the functions are different. The Committee on Data for Science and Technology, CODATA, formed in 1966, compiles data on physical and chemical constants and on properties of substances and materials. ICSU has fostered cooperation between FAGS, CODATA and the WDC Panel. In particular, the CODATA Working Group on Data Access (currently chaired by F. Webster, Chairman of the ICSU Panel on WDC), deals with data issues of common concern to the three bodies. This Appendix gives basic information on FAGS and CODATA, and on ICSU and ICSU-related programs that generate large amounts of data, and have links with the ICSU WDC System.

FEDERATION OF ASTRONOMICAL AND GEOPHYSICAL DATA ANALYSIS SERVICES

The Federation of Astronomical and Geophysical Data Analysis Services (FAGS) was formed by ICSU in 1956 and includes ten Permanent Services each operating under the authority of one or more of the interested Unions: IAU, IUGG, and URSI. Their continuous tasks are to collect observations, information and data related to astronomy, geodesy, geophysics and applied sciences; to analyze, synthesize, and draw conclusions from them; to distribute data; and to publish the results obtained. FAGS centers process large amounts of data to derive indices or summaries characterizing the dynamics of the Earth system. It is not their prime responsibility to archive and distribute the raw data, though some FAGS centers are also WDCs and are listed as such in Chapters 5–6 of this Guide. More information may be found in the *IUGG Chronicle* (Special Issue No. 194). The Permanent Services and their Directors (1995) are as follows:

International Earth Rotation Service:
(IERS: IAU-IUGG-URSI) M. Feissel (Paris, France)

International Service of Geomagnetic Indices:
(ISGI: IUGG) M. Menvielle (Orsay, France)

Bureau Gravimétrique International:
(BGI: IUGG) G. Balmino (Toulouse, France)

Quarterly Bulletin on Solar Activity:
(QBSA: IAU) T. Hirayama (Tokyo, Japan)

Permanent Service for Mean Sea Level:
(PSMSL: IUGG) P.L. Woodworth (Bidston, U.K.)

International Centre for Earth Tides:
(ICET: IUGG) B. Ducarme (Brussels, Belgium)

International Ursigram and World Days Service:
(IUWDS: URSI-IAU-IUGG) R.J. Thompson (Sydney, Australia)

World Glacier Monitoring Service:
(WGMS: IUGG) W. Haeberli (Zürich, Switzerland)

Centre de Données Stellaires:
(CDS: IAU-IUGG) M. Creze (Strasbourg, France)

Sunspot Index Data Centre:
(SIDC: IAU) P. Cugnon (Brussels, Belgium)

Secretary
Prof. Dr-Ing.habil Hans-Georg Wenzel Tel: +49 721 6082307
Geodätisches Institut Universität Karlsruhe Fax: +49 721 694552
Englerstraße 7
D-76128 KARLSRUHE
GERMANY Internet: wenzel@gik.bau-verm.uni-karlsruhe.de

COMMITTEE ON DATA FOR SCIENCE AND TECHNOLOGY

The Committee on Data for Science and Technology (CODATA) was set up in 1966 by the 11th General Assembly of ICSU. CODATA is concerned with quantitative data resulting from experimental measurements or observations in the physical, biological, geological and astronomical sciences. Particular emphasis is given to data management problems common to different disciplines and to data used outside the field in which they were generated. The general objectives are improving the quality and accessibility of data, and the methods by

which data are acquired, managed and analyzed; facilitating international cooperation among those collecting, organizing, and using data; and promoting increased awareness in the scientific and technical community of the importance of these activities.

Mrs Phyllis Glaeser, Secretary
CODATA
51 Boulevard de Montmorency
PARIS F-75016
FRANCE

Tel : +33 1 4525 0496
Fax : +33 1 4288 1466
Internet : codata@paris7.jussieu.fr

SOLAR-TERRESTRIAL ENERGY PROGRAM

The Solar-Terrestrial Energy Program (STEP) is the umbrella program of the ICSU Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) during most of the 1990s. The STEP Steering Committee (Chairman G. Rostoker; International Coordinator J. G. Roederer) includes the heads of STEP Working Groups and Panels. The working groups span disciplinary interests concerned with solar energy and its effects in all the regions from the Sun to the Earth's surface and the human environment. The Informatics group maintains a Bulletin Board and is concerned with real-time information on alerts, data flow, project databases, and specialized data sets and models. The support panels are concerned with long-term databases, experimental techniques, and simulation and models. STEP newsletters started in 1990 and will continue till 1997. Magnetometer chain data are available on CD-ROM and through the National Geophysical Data Center WWW home pages:

http://www.ngdc.noaa.gov/stp/stp.html

Many other geophysical and STP databases are available on neighboring pages, and may also be obtained on floppy disk or CD-ROM.

Vital support for STEP activities is provided by several of the WDCs and FAGS services. Of particular interest to solar-terrestrial scientists is the CEDAR database at the National Center for Atmospheric Research (NCAR), Boulder, Colorado. Information on data holdings and access may be obtained via:

http://www.hao.ucar.edu/public/research/tiso/cedar/cedar.html

WORLD CLIMATE RESEARCH PROGRAM

WCRP, undertaken jointly by WMO, IOC/UNESCO and ICSU, seeks to determine the extent to which climate can be predicted and how it is affected by human activities. Its unifying theme is the development of comprehensive global models of the Earth's climate. WCRP organizes investigations of the basic physical processes that play a fundamental role in the system, and fosters the refinement of models that provide quantitative estimates of long-term changes. A major WRCP landmark was the formal conclusion in 1994 of the ten-year Tropical Ocean and Global Atmosphere (TOGA) study. Longer-term changes in the Earth's climate depend on the slowly varying components of the climate system, namely oceans and ice. The WCRP World Ocean Circulation Experiment (WOCE) is a worldwide study which observes and models the oceans as a whole.

Building on the achievements of TOGA and WOCE, a new WCRP study of Climate Variability and Predictability (CLIVAR) began in 1995. CLIVAR expands the scope of studies of climate variability and predictability, on time scales from a month to a century, and aims to improve confidence in predictions of anthropogenic climate change. The Global Energy and Water Cycle Experiment (GEWEX) has the goal of understanding how the global inputs of solar energy, along with changes in the atmosphere and at the surface, influence the global hydrological cycle, cloudiness, evaporation and rainfall.

Two WCRP projects deal with regions of special importance and scientific interest. The Arctic Climate System Study (ACSYS) uses ships, aircraft, satellites, automatic stations, buoys and bottom mooring to investigate the Arctic Ocean circulation and its impact on global climate. The Study of Stratospheric Processes and their Role in Climate (SPARC) investigates the natural variability of the stratosphere, the impact of human activities, and how changes in the stratosphere affect the penetration of ultraviolet radiation to the surface.

Existing operational networks implemented through the World Weather Watch and other programs acquire and process information for meteorological, marine and hydrological applications. The Global Climate Observing System (GCOS) is developing additional observing systems to support climate applications, characterize climate impacts on the environment, and contribute to knowledge of the Earth system. WCRP promotes observation projects for specific requirements, that include data from research satellite systems and involve specialized oceanographic, cryospheric and related land surface data sets.

Each WRCP component develops its own plans for data archiving. Data from TOGA, the International Satellite Cloud Climatology Project and the Global Precipitation Climatology Project are archived in the ICSU WDCs. Data plans under development for other WCRP projects include electronic access to data sets via the WCRP and other (e.g., GEWEX) WWW Home Pages:

http://www.wmo.ch/web/wcrp/wcrp-home.html
http://www.cals.com/gewex/gewex.html

The ICSU WDCs will continue to receive, archive and provide access to some of the specialized data sets noted above, and provide referral information on related data sets outside the WDC system.

INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAM

IGBP (Global Change) aims to understand the Earth and its environment as a whole, in order to detect global change and to help in the planning of responses. Previous ICSU programs concerning the biosphere, lithosphere, hydrosphere, cryosphere, atmosphere, magnetosphere, and other successfully studied individual components of the Earth system. IGBP works towards a synthesis of how these individual components interact in the dynamics of the whole, with the goal of predicting the future of the Earth in the next 100 years. To this end, IGBP has adopted many cross-disciplinary projects.

For information contact the IGBP Secretariat, Royal Swedish Academy of Sciences, Box 50005, Stockholm 10405, Sweden. Tel. +46 8 166448, Fax. +46 8 166404, Internet sec@igbp.kva.se.

APPENDIX B

WORLD METEOROLOGICAL ORGANIZATION DATA CENTERS

GLOBAL ATMOSPHERE WATCH (GAW)

This program is summarized in GAW Report 99/WMO Technical Document 636, *Status of the WMO Global Atmosphere Watch Programme as at 31 December 1993*. The major components of GAW are the network of observing stations (about 400 in December 1993), the related chemical laboratories, the WMO World Data Centers, the Data Quality Assurance/Science Activity Centers and the Instrument Calibration Centers.

The functions of the WMO World Data Centers under the GAW Programme are to collect and archive data on the background chemical composition and related physical characteristics of the atmosphere from all parts of the globe, to manage the resulting data base, to distribute the collected data and the products and information derived from them, to provide services to the users, in collaboration with the stations and laboratories submitting the data, other GAW and non-GAW Centers and the WMO Secretariat.

WMO World Data Centers are established and operated on behalf of the organization by the member countries concerned. Those currently in operation or in preparation are described in the following pages:

Note from Editor: *Prospective users should contact the centers for information on user services. WMO data centers are not part of the ICSU World Data Center System and are not bound by the "WDC Principles and Responsibilities" listed in Chapter 2 of this Guide. WMO puts no restrictions on the exchange of data*

for research and educational purposes. For commercial purposes, users should ascertain from the centers the terms on which data are supplied.

WMO WORLD DATA CENTER FOR OZONE AND ULTRAVIOLET RADIATION

Contact: Dr Edward W. Hare Start of operations: 1962 (ozone), 1991 (UV)

WMO World Data Center for Ozone and UV
Atmospheric Environment Service
4905 Dufferin Street
DOWNSVIEW, Ontario M3H 5T4
CANADA

Tel: +1 416 739 4635
Fax: +1 416 739 4281
Internet: wodc@dow.on.doc.ca

Sponsor: Atmospheric Environment Service.

Summary of Data Held: Total ozone, Umkehr, horizontal distribution, ozonesonde, surface ozone, others, commencing with the data for the year 1960.

Data products, Publications, Catalogs: GAW Data Volume III—Ozone Data for the World; index of stations, types of stations, organizations operating stations, etc. Catalog of available data.

WMO WORLD DATA CENTER FOR GREENHOUSE GASES

Contact: Dr Takayo Matsuo Start of operations: 1990

WMO World Data Center for Greenhouse Gases
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
TOKYO 100
JAPAN

Tel: +81 3 3211 4966
Fax: +81 3 3211 2032

Sponsor: Japan Meteorological Service.

Summary of Data Held: Hourly, daily, monthly and event values of carbon dioxide, chlorofluorocarbons (CFCs), methane, nitrous oxide, carbon monoxide,

nitrogen oxides, sulfur dioxide, krypton-85, etc from about 106 land stations in 39 countries and ships in marine areas. The data cover the period 1968–1994.

Data Products, Publications, Catalogs: GAW Data Volume IV/WMO WDCGG Data Report—Greenhouse and Other Atmospheric Gases, issued semiannually; content: data analysis (means, trends, etc.). Catalog issued every 2 years.

WMO WDCGG CD-ROM, issued periodically; content: data received at the center during selected period; first issue in March 1995, data for 1967–1993.
WMO WDCGG Data Catalog, issued every 2 years.

WMO WORLD DATA CENTER FOR AEROSOLS

Contact: Dr Julian Wilson

WMO World Data Center for Aerosols
European Commission Joint Research Center
Environment Institute, TP 460
21020 ISPRA (Varese)
ITALY

Tel: +39 332 785204
Fax: +39 332 789453
Internet: jwilson@jrc.it

Sponsor: European Commission.

Summary of Data Held: Condensation nuclei, size-segregated chemical composition of aerosol samples, in situ aerosol light scattering/absorption parameters.

Data Products, Publications, Catalogs: To be determined.

User Services (in preparation): Local Graphysical User Interface for queries, etc.; Database access through an anonymous ftp server; Ultimately full GUI using WWW hypertext to allow interactive access.

WMO WORLD RADIATION DATA CENTER

Contact: Dr Anatoli Tsvetkov — Start of operations: 1964

WMO World Radiation Data Center
Voeikov Main Geophysical Observatory — Fax: +7 812 247 0103
Karbyshev Str. 7
194018 ST PETERSBURG
RUSSIA

Maintained by: Voeikov Main Geophysical Observatory.

Summary of Data Held: Daily and monthly totals of global radiation; monthly totals of sunshine duration; hourly, daily, and monthly totals of radiation balance; and monthly means of hourly totals of global radiation.

Data Products, Publications, Catalogs: Quarterly publication entitled *Solar Radiation and Radiation Balance Data*. Catalog of the WRDC.

WMO WORLD DATA CENTER FOR AEROSOL OPTICAL DEPTH

Contact: Dr J. Diicontis — Start of operations: 1974

WMO World Data Center for Aerosol Optical Depth
National Climatic Data Center — Fax: +1 704 271 4328
Federal Building
151 Patton Avenue
ASHEVILLE, NC 28801
U.S.A. — Internet: diicontis@ncdc.noaa.gov

Sponsor: National Oceanic and Atmospheric Administration (NOAA).

Summary of Data Held: Daily and monthly means of aerosol optical depth covering the period 1973–1994.

Data Products, Publications, Catalogs: GAW Data Volume I—Atmospheric Aerosol Optical Depth, issued yearly.

WMO WORLD DATA CENTER FOR PRECIPITATION CHEMISTRY

Contact: Dr Bruce Baker — Start of Operations: 1974

WMO World Data Center for Precipitation Chemistry
Global Climate Laboratory — Tel: +1 704 271 4330
Aerosol Research Section — Fax: +1 704 271 4328
National Climatic Data Center (NCDC)
151 Patton Avenue
ASHEVILLE, NC 28801
U.S.A. — Internet: baker@ncdc.noaa.gov

Sponsor: Air Resources Laboratory, NOAA.

Summary of Data Held: Monthly values of precipitation amounts, electrical conductivity, acidity, alkalinity, pH and ions (sodium, potassium, magnesium, calcium, chloride, fluoride, ammonium, nitrate, sulfate) for 1972–1984.

Data Products, Publications, Catalogs: GAW Data Volume II—Precipitation chemistry, issued yearly.

WMO GLOBAL RUNOFF DATA CENTER

Contact: Dr W. Grabs

Global Runoff Data Center
Federal Institute of Hydrology — Tel: +49 261 1306 224
Kaiserin-Augusta-Anlagen 15-17 — Fax: +49 261 1306 280
56008 KOBLENZ
GERMANY — Internet: 100347.3140@compuserve.com

Sponsor: Federal Institute of Hydrology under the aegis of the World Meteorological Organization, in collaboration with WHO, UNESCO, UNEP, the World Bank and ICSU.

Summary of Data Held: Records of river flows from some 3300 stations in about 150 countries across the globe, including mean monthly and daily discharges.

Data Products, Publications, Catalogs: Database catalogs and yearly status reports are produced and disseminated, as well as publications in the GRDC report series.

WMO WORLD DATA CENTER FOR GLOBAL PRECIPITATION CLIMATOLOGY

Contact: Dr. Bruno Rudolf Start of Operations: 1989

WMO World Data Center for Global Precipitation Climatology
Deutscher Wetterdienst Tel: (+49) 69 80622981
Postfach 100465 Fax: (+49) 69 80622880
D-63004 OFFENBACH AM MAIN Telex: 4152817 OFDW D
GERMANY Internet: routwzn@wzn.za-offenbach.dwd.d400.de

Sponsor: Deutscher Wetterdienst

Summary of Data Held: Monthly precipitation observations are regularly exchanged world-wide for about 4,500 stations, in synoptic and CLIMAT messages via the WMO World Weather Watch Global Telecommunication System (GTS). These GTS-data are complemented by other international data collections (NOAA/NMC and FAO) up to world-wide 6,700 stations, which is the basis for the GPCP/GPCC interim land-surface precipitation grid. The Center has designed and operates a data processing system with the following functions:

a) collect and archive monthly precipitation data world-wide
b) quality control these data
c) calculate a real mean totals on the basis of the conventional measurements over land
d) merge these analyses with precipitation estimates from other observational techniques (e.g., satellite images), or from mode simulations in order to obtain global precipitation data sets
e) determine the error range of the analysis results

Data Products, Publications, Catalogs: The GPCP/GPCC interim product for the earths land-surface precipitation, available on a grid of 2.5 by 2.5 degrees latitude by longitude for the period from January 1986 onwards. These results are available as digital gridded datasets via ftp as as well as on floppy diskettes including software for display of maps. Global products based on the terrestrial raingauge products combined with satellite observations and numerical weather forecasts will be available by end of 1996.

ftp-address: ftp://ftp.ncdc.noaa.gov/pub/data/gpcp/gpcc

APPENDIX C

RESOLUTIONS ADOPTED BY ICSU

From time to time, statements and resolutions relating to the World Data Center System have been adopted by the International Council of Scientific Unions. Resolutions of this kind were formally adopted at the 17th, 18th, 19th and 22nd General Assemblies of ICSU.

***17th General Assembly of ICSU* (Athens, 1978):**

> Recommends that prior to approving the initiation of new projects in the fields of geophysics and solar-terrestrial physics, the Executive Board should ensure that the planning for these projects includes clear provision for data collection, archiving and distribution and that such plans have been developed in consultation with the ICSU Panel on World Data Centres.

***18th General Assembly of ICSU* (Amsterdam, 1980):**

> Noting that international geophysical programs are increasingly generating data sets which are largely, if not entirely, digital and machine readable, and therefore that it is of the greatest importance that the World Data Centers acquire the necessary equipment, procedures and personnel for the efficient processing, archiving and retrieval of data in large quantities in machine readable form;
>
> Recognizing that the costs of maintaining the WDCs are borne entirely by those countries in which they are located, but that the Centers are required to meet the changing needs of the international scientific community as determined by the relevant Unions, Associations, Commissions and Committees of ICSU;
>
> Records its deep appreciation of the enormous service provided by the World Data Centers, to the world scientific community;

Invites the responsible National Agencies to consider ways and means of meeting the need for continued modernization of WDC data handling facilities.

***19th General Assembly of ICSU* (Cambridge, 1982):**

Aware that in 1982 the system of World Data Centers in geophysics and solar-terrestrial physics celebrates its 25th anniversary;

Noting that the data collected by the World Data Centers during the past 25 years contain the results of observations from a world network of stations in a wide range of scientific disciplines, from international and national expeditions to remote regions of the globe including Antarctica, from ocean research vessels, and from space probes in the near-Earth environment; and that these data were the sources of many important discoveries in the fields of planetary geophysics and solar terrestrial physics;

Noting further that many countries have spent large sums to finance observations the results of which are now stored at the World Data Centers and made generally available to the world scientific community; and

Recognizing that the principles underlying the activities of the World Data Centers and the relations these activities have established among national scientific communities are a demonstration of the great progress achieved in international cooperation among scientists;

Congratulates all those involved in the World Data Center system in geophysics and solar-terrestrial physics;

Thanks the ICSU National Members in the U.S.A., U.S.S.R. and other countries for arranging the facilities necessary for maintaining the operation of WDCs A, B, and C; and

Recommends that scientists within the ICSU family who have not availed themselves of the services offered by the World Data Center system establish contact with the system and with the ICSU Panel on World Data Centres.

22nd General Assembly of ICSU **(Beijing, 1988):**

Noting that:

i. the success of international cooperative programs in science depends on an unprecedented sharing of scientific data and information;

ii. ICSU has a longstanding commitment to the free circulation of scientists and access to scientific data and information; and

iii. processes of data and information handling and dissemination are rapidly becoming technically more sophisticated and potentially more expensive for those who provide and use these services;

Recommends all ICSU members to support the fundamental principle of open exchange of data and information for scientific purposes by strongly urging public and private organizations in all countries to facilitate access to scientific information and data needed to address the research objectives of ICSU programs; and

Further recommends that the Executive Board establish a mechanism to monitor the implementation of this principle and take action on problems that may arise.

Resolutions on free and open access to scientific and environmental data have been made by ICSU bodies, for example:

International Union of Radio Science (URSI): Resolution on free access to environmental data, Approved at the URSI General Assembly, Kyoto, 1993.

Scientific Committee on Solar-Terrestrial Physics (SCOSTEP): Bureau Resolution, 1994.

Recommendations may also be found in the Report of the United Nations Conference on the Environment and Development (UNCED), Sections 31 and 35, 1992.

APPENDIX D

PRINCIPLES AND RESPONSIBILITIES OF WDCS
1987 VERSION

GENERAL PRINCIPLES

1 World Data Centers (WDCs) operate under the auspices of the International Council of Scientific Unions (ICSU) for the benefit of the international scientific community and provide a mechanism for international exchange of data in all disciplines related to the Earth, its environment, and the Sun.

2 World Data Centers in the United States are designated as WDC-A. Those in the Soviet Union are designated WDC-B. The WDC-C centers, C1 and C2, are located in other countries. An individual WDC may treat one or several of the disciplines or programs covered in the *Guide to the World Data Center System.*

3 World Data Centers, to the extent their resources allow, acquire and store data from national and international sources, in accordance with procedures and standards recommended by various international scientific bodies in the ICSU family, or other appropriate international organizations, and approved by the ICSU Panel on World Data Centres. These procedures are published periodically in the *Guide to the World Data Center System.*

4 World Data Centers exchange data among themselves on a mutually agreed, reciprocal basis.

5 Data held by a World Data Center must be completely accessible by scientists in all countries, upon written request or personal visit. Charges may be imposed to cover the costs of providing services to users.

6 The resources required for the activities of a World Data Center are the responsibility of the host country or institution. In order to provide continuity, the host country is expected to provide these resources on a long-term basis.

7 The coordination of WDC activities within a country is the responsibility of the appropriate national committee or scientific institution under which it is established.

8 The designation of institutions as WDCs is normally the responsibility of the host country acting with the approval of the ICSU Panel.

9 A WDC which for some reason may not be able to continue its activities and services is invited to make its holdings and records available to another WDC in the same discipline, and to notify the ICSU Panel through the A, B, C1 or C2 representative.

10 Each WDC is expected to report on its activities as requested by ICSU.

RESPONSIBILITIES OF A WORLD DATA CENTER

1 In accord with the General Principles, World Data Centers will fulfil data exchange requirements set out in the current version of the Guide to the World Data Center System. To the extent possible they will also respond to resolutions and recommendations from appropriate international organizations.

2 Duplication of data collections between WDCs may be specified in some disciplines.

3 Whenever possible the exchange of data between World Data Centers will take place without charge.

4 The provision of WDC data to an individual scientist or institution will normally require a charge to cover the costs of duplication and handling. This charge may be waived when the individual or institution is a contributor to the WDC concerned.

5 A WDC may also provide a mechanism for a scientist to request data not explicitly described in the Guide to the World Data Center System. In response to a bona fide request for such data, the WDC will attempt to obtain the data or forward the request to another WDC for action.

6 Where a WDC maintains a data collection, it must provide proper facilities for data storage and maintenance, and ensure that data copies are subject to adequate standards of accuracy, clarity and durability.

7 World Data Centers will explore the utilization of modern technology for data storage, data communications and user access.

8 Each World Data Center must be open to visitors and guest workers from any country and all data held under WDC auspices must be accessible to such visitors and workers.

9 Each World Data Center has a responsibility to make available to other WDCs and the scientific community a detailed description of the data available through the WDC.

10 Where more than one WDC holds or has access to data in a given discipline, joint data catalogs or inventories should be compiled.

11 World Data Centers endeavor to coordinate their activities, standardize data formats and cooperate in international projects and to this end visits by WDC staff to other WDCs and to international scientific meetings are encouraged.

12 World Data Centers receive data from many sources. While every attempt will be made to assure reasonable standards of data quality and related documentation, the ultimate responsibility for data reliability lies with the data contributor, not the WDC.

APPENDIX E

LIST OF ACRONYMNS

This list does not claim to be exhaustive. It is incomplete regarding such items as geophysical parameters and chemical substances, names of satellites, and non-ICSU projects and organizations. Some acronyms that appeared in previous Guides, but are not actually used in the present edition, are retained as they may be needed again in the future.

ACSYS	Arctic Climate System Study
ALPEX	Alpine Experiment
AVHRR	Advanced Very High Resolution Radiometer
BGI	Bureau Gravimétrique International
BP	Before Present
CARDS	Comprehensive Aerological Reference Dataset
CCIR	International Radio Consultative Committee
CDAW	Coordinated Data Analysis Workshop
CDIAC	Carbon Dioxide Information Analysis Center
CD-ROM	Compact Disc, Read-Only Memory
CDS	Centre de Données Stellaires
CEDAR	Coupling, Energetics and Dynamics of Atmospheric Regions
CIESIN	Consortium for International Earth Science Information Network
CFC	Chlorofluorocarbon
CIRES	Cooperative Institute for Research in Environmental Sciences
CLIVAR	Climate Variability and Predictability
COADS	Comprehensive Ocean-Atmosphere Dataset
CODATA	Committee on Data for Science and Technology
COSPAR	Committee on Space Research
CSAGI	Comité Special de l'Annee Geophysique Internationale
DMSP	Defense Meteorological Satellite Program
EROS	Earth Resources Observing Satellite
EUV	Extreme Ultra Violet
FAGS	Federation of Astronomical and Geophysical Data Analysis Services
FGGE	First GARP Global Experiment

FSU	Former Soviet Union
FTP	File Transfer Protocol
GARP	Global Atmospheric Research Program
GATE	GARP Atlantic Tropical Experiment
GAW	Global Atmosphere Watch
GCOS	Global Climate Observing System
GCPC	Global Precipitation Climatology Project
GEBCO	General Bathymetric Chart of the Oceans
GEWEX	Global Energy and Water Cycle Experiment
GHCN	Global Historical Climate Network
GIS	Geographical Information System
GLIS	Global Land Information System
GOOS	Global Ocean Observing System
GSFC	Goddard Space Flight Center
HTTP	Hypertext Transfer Protocol
IAGA	International Association of Geomagnetism and Aeronomy
IAMAS	International Association of Meteorology and Atmospheric Sciences
IASPEI	International Association of Seismology and Physics of the Earth's Interior
IAPSO	International Association for the Physical Sciences of the Ocean
IAVCEI	International Association of Volcanology and Chemistry of the Earth's Interior
IAU	International Astronomical Union
ICET	International Center for Earth Tides
ICITA	International Cooperative Investigation of the Tropical Atlantic
ICL	International Commission on the Lithosphere
ICRCM	International Center for Recent Crustal Movement
ICSU	International Council of Scientific Unions
IDE	International Declared Event
IDNDR	International Decade for Natural Disaster Reduction
IERS	International Earth Rotation Service
IGBP	International Geosphere-Biosphere Program (Global Change)
IGC	International Geophysical Cooperation
IGOSS	Integrated Global Ocean Services System
IGY	International Geophysical Year
ILP	International Lithosphere Program
IMS	International Magnetospheric Study
IOC	Intergovernmental Oceanographic Commission

IPS	Interplanetary Scintillation
IQSY	International Quiet Sun Years
IRI	International Reference Ionosphere
IRIS	Incorporated Research Institutions in Seismology
ISCCP	International Satellite Cloud Climatology Project
ISGI	International Service of Geomagnetic Indices
ISRIC	International Soil Reference and Information Center
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
IUPAC	International Union of Pure and Applied Chemistry
IUPAP	International Union of Pure and Applied Physics
IUWDS	International URSIgram and World Days Service
MGG	Marine Geology and Geophysics
MONEX	Monsoon Experiment
MONSEE	Monitoring of the Sun-Earth Environment
MSIS	Mass Spectrometer and Incoherent Scatter
MSS	Multispectral Scanner (Landsat)
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCDC	National Climatic Data Center
NEIS	National Earthquake Information Service
NGDC	National Geophysical Data Center
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NSIDC	National Snow and Ice Data Center
NSSDC	National Space Science Data Center
PAGES	Past Global Changes
PCNETS	Permanent Committee on Networking Strategies
PDE	Preliminary Determination of Epicenter
PPSI	Prompt Photometric Sunspot Index
PSMSL	Permanent Service for Mean Sea Level
QBSA	Quarterly Bulletin on Solar Activity
RMC	Regional Meteorological Center
RNODC	Responsible National Oceanographic Data Center

SABRE	Sweden and Britain Radar Experiment
SCAR	Scientific Committee on Antarctic Research
SCOPE	Scientific Committee on Problems of the Environment
SCOR	Scientific Committee on Oceanic Research
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics
SE	Solid Earth
SEG	Solid Earth Geophysics
SGD	Solar-Geophysical Data (Reports)
SIDS	Sunspot Index Data Center
SMONEX	Summer Monsoon Experiment
SPARC	Study of Stratospheric Processes and their Role in Climate
SPIDR	Space Physics Interactive Data Resource
SSC	Satellite Situation Center
STAC	Solar-Terrestrial Activity Charts
STD/CTD	Salinity temperature depth/conductivity temperature depth
STEP	Solar-Terrestrial Energy Program
STP	Solar-Terrestrial Physics
TOGA	Tropical Oceans and the Global Atmosphere
UAG	Upper Atmosphere Geophysics (STP data reports)
UNCED	United Nations Conference on the Environment and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
URL	Universal Resource Locator
URSI	International Union of Radio Science
USGS	United States Geological Survey
VLBI	Very Long Baseline Interferometry
VLF/ULF	Very Low Frequency/Ultra Low Frequency
WCDMP	World Climate Data and Monitoring Program
WCRP	World Climate Research Program
WDC	World Data Center
WDCA	WMO World Data Center for Aerosols
WDCGG	WMO World Data Center for Greenhouse Gases
WGMS	World Glacier Monitoring Service
WMO	World Meteorological Organization
WMONEX	Winter Monsoon Experiment
WOCE	World Ocean Circulation Experiment

WODC	World Ozone Data Center
WOUDC	WMO World Data Center for Ozone and Ultraviolet Radiation
WRDC	WMO World Radiation Center
WWSSN	Worldwide Standard Seismic Network
WWW	Worldwide Web